

Executive Director 's Message:

Good things remain good only because they are always scant. I am glad to unfold this wonderful magazine as an appreciation of the admirable efforts put forth by the team. The effort taken to bring about content is appreciable. This is a productive technical material and subsidiary skill developing tool for the students. The release of this brilliant fourth issue of the technical magazine "TARANG" has added the value of the department. I also applaud the coordination & efforts behind the team to bring out this issue.



**Hon. Shri Anil A Bagane
Executive Director**

Principal's Message:

We have been gifted with this blessed life. The program of society is mainly depended on many people who are working behind the scenes, overtime round the clock planning things to the smallest. This technical magazine will be a medium to provide proper acknowledgement and respect to all of this effort and its results. This is only a small step towards a long journey. This fourth issue of technical magazine should inspire all of us for a new beginning enlighten with hope, confidence and faith in each other In the road ahead for innovation work. It is expected that wide support for this mission will be provided through the reader's valuable suggestions and comments.....



**Dr. Sanjay A Khot
Principal**

HOD'S Message:

I feel delighted to introduce the Seventh Issue of Technical Magazine prepared by the Department of Electrical Engineering. We at SITCOE promise to increase knowledge, enhancing the critical thinking, ability to change information into knowledge & power of analyzing the things technically of each & every individual of ever-changing society through students.

FACULTY editor Message:

Greetings from the Editorial members board of the Technical Magazine "TARANG Volume VIII". It is the snap shot of the various technologies and technological changes associated with Electrical Engineering.

We profusely thank our Honorable Executive Director Shri Anil Bagane, Principal Dr. Sanjay A Khot and Head of Electrical Engineering Department Dr. K Hussain for giving support and encouragement and a free hand in this endeavor. This Technical Magazine will be a medium to provide proper acknowledgement and respect to all of those efforts and its results.

Wishing you Happy Reading



Dr. K Hussain
Head of the Department
Dept. of Electrical Engineering



Mr. Chandrashekhar Patil
Assistant Professor

Final Year Electrical Engineering

It's truly an interesting and exciting experience for all of us as student editors of this technical magazine "TARANG Volume VIII for was one such cherished work that had its roots in the persuasion. It would be a snap shot of the various activities and advancements in the field of Electrical Engineering Dept.

This Technical Magazine will serve to reinforce and allow increased awareness about research activities. Interaction and Team Work among all of us, usually we fail to appreciate the good deeds of many people and activities that happen around us as we are engaged in irrelevant talks and assumptions. It could all change if we just pause to think of our contribution to society.



Miss. Vaishnavi Arvind Mane



Miss. Sharada Manoj Mane



Miss. Vaibhavi Dilip Mali

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The Future of Electrical Engineering: Trends, Technologies, and Opportunities

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The future of electrical engineering is being shaped by rapid technological advancements, emerging energy demands, and the global shift toward sustainable, intelligent systems, creating vast opportunities for innovation and growth. As industries embrace automation, renewable energy, and digitalization, electrical engineers are at the forefront of designing smarter grids, developing advanced control systems, and integrating cutting-edge technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and 5G communication into electrical infrastructures. Renewable energy integration, especially solar, wind, and geothermal power, will drive the need for advanced power electronics, efficient energy storage solutions, and intelligent grid management to ensure stability and reliability. Electric mobility, including electric vehicles and charging infrastructure, will continue to expand, requiring breakthroughs in battery technology, power management, and grid connectivity. In industrial sectors, Industry 4.0 is transforming manufacturing through smart sensors, embedded systems, and autonomous machines, enabling predictive maintenance, real-time monitoring, and optimized production. The rise of smart cities will demand advanced electrical solutions for transportation, energy management, communication networks, and public safety. Furthermore, innovations in high-voltage transmission, superconductors, and wireless power transfer will redefine how energy is transmitted and utilized. The field will also see

greater emphasis on cybersecurity in electrical systems to protect critical infrastructure from digital threats. Opportunities will emerge for engineers skilled in interdisciplinary domains, blending electrical engineering with computer science, materials science, and data analytics to create next-generation solutions. As climate change and energy security concerns grow, electrical engineers will play a pivotal role in building sustainable, resilient, and intelligent energy systems that not only meet global demands but also drive economic and technological progress in the decades to come.

Smart Grids and Renewable Energy: Powering the Future

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Smart grids and renewable energy are revolutionizing the way electricity is generated, distributed, and consumed, creating a more sustainable, efficient, and resilient power system for the future. A smart grid integrates advanced digital communication, automation, and control technologies into traditional electrical networks, enabling real-time monitoring, two-way power flow, and dynamic demand-response management. When combined with renewable energy sources such as solar, wind, hydro, and geothermal, smart grids can efficiently balance supply and demand while minimizing reliance on fossil fuels. These intelligent systems use sensors, smart meters, and IoT-enabled devices to collect and analyze data from across the grid, allowing operators to detect faults, isolate outages, and restore power more quickly. Renewable energy integration into smart grids requires advanced forecasting, storage solutions, and power electronics to handle variability in generation caused by changing weather conditions. Energy storage technologies such as lithium-ion batteries, flow batteries, and pumped hydro storage play a critical role in stabilizing the grid, storing excess renewable power during peak generation, and releasing it during high demand. Furthermore, smart grids enable distributed generation, allowing households and businesses with rooftop solar panels or small wind turbines to feed surplus power back into the grid, creating a more decentralized and participatory energy ecosystem. The use of artificial intelligence and machine learning in smart grid management is enhancing predictive maintenance, optimizing energy distribution,

and reducing transmission losses. As climate change concerns grow and global energy demand increases, the synergy between smart grids and renewable energy offers a pathway to a cleaner, more efficient, and reliable energy future, empowering societies to transition toward carbon neutrality while ensuring economic and environmental benefits

Geothermal Energy: Harnessing Earth's Heat for Sustainable Power

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Geothermal energy is a form of renewable energy that originates from the natural heat stored beneath the Earth's surface. This heat is generated primarily from the decay of radioactive isotopes within the Earth's core and the residual energy from the planet's formation billions of years ago. The temperature inside the Earth increases with depth, a phenomenon known as the geothermal gradient, which averages about 25–30°C per kilometer in the crust. In certain regions, this gradient is much higher due to geological activity such as tectonic plate movements, volcanic eruptions, or the presence of hot springs. By tapping into this heat, humans can produce electricity, provide heating and cooling for buildings, and even support industrial processes. The concept of using Earth's internal heat is not new; civilizations as early as the Roman Empire used hot springs for bathing and heating. Today, geothermal energy is recognized as a sustainable, clean, and dependable source of energy that can play a significant role in reducing reliance on fossil fuels and mitigating climate change.

The process of harnessing geothermal energy depends on accessing underground reservoirs of hot water and steam. These geothermal reservoirs are often found in regions with active tectonic activity such as Iceland, Indonesia, the Philippines, the United States, and parts of East Africa. To extract energy, wells are drilled into the Earth to bring the hot water or steam to the surface. In high-temperature geothermal fields, the steam can directly drive turbines in a power plant to generate electricity; this method is known as a dry steam system. In other cases, the hot water is passed through a heat exchanger to produce steam in

a secondary fluid with a lower boiling point, a method known as a binary cycle system. The choice of technology depends on the temperature and chemistry of the geothermal resource. After use, the cooled water is typically reinjected into the ground to maintain reservoir pressure and ensure the sustainability of the resource. This closed-loop system minimizes environmental impact while providing a continuous source of energy, unlike intermittent renewables such as solar or wind.

One of the major advantages of geothermal energy is its reliability. Unlike solar power, which depends on sunlight, or wind power, which relies on wind speeds, geothermal energy is available 24 hours a day, year-round, regardless of weather conditions. This makes it an excellent option for providing base-load electricity, the constant minimum demand on the electrical grid. Additionally, geothermal power plants have a small physical footprint compared to other renewable energy sources and produce extremely low greenhouse gas emissions. Studies show that the carbon dioxide emissions from geothermal plants are a fraction of those from fossil fuel-based plants, making them an environmentally responsible choice. Moreover, direct use of geothermal heat for district heating, greenhouses, aquaculture, and industrial drying processes can be highly efficient, further reducing the need for other energy sources. For example, Iceland, which sits atop an active volcanic zone, meets about 90% of its heating needs through direct geothermal applications.

Despite these benefits, geothermal energy faces several challenges that limit its widespread adoption. One significant challenge is geographic dependency. High-quality geothermal resources are often located in areas with specific geological conditions, such as near plate boundaries or volcanic regions. Developing geothermal power in areas without naturally occurring high-temperature resources can be technically difficult and expensive, often requiring advanced drilling technologies and

enhanced geothermal systems (EGS) to artificially create or expand reservoirs. The initial capital cost for drilling deep wells and constructing power plants is also high, although operational and maintenance costs are relatively low once the system is running. Environmental concerns, though minimal compared to fossil fuels, still exist; these include the potential release of trace gases like hydrogen sulfide, the risk of induced seismicity from deep drilling or reinjection, and the possibility of subsidence if reservoirs are not properly managed.

Advances in technology are steadily addressing these limitations. Enhanced geothermal systems, for instance, involve injecting water into hot but dry rock formations to create artificial reservoirs. This method greatly expands the potential for geothermal development beyond naturally occurring hydrothermal areas. New drilling techniques, including those borrowed from the oil and gas industry, have made it possible to reach deeper and hotter resources more efficiently. In addition, hybrid renewable plants that combine geothermal with solar or biomass energy are being developed to optimize energy production and reduce costs. Governments and private investors are also recognizing the potential of geothermal energy, with many countries offering financial incentives, research funding, and policy support to encourage its adoption. As climate change continues to drive the global shift toward cleaner energy systems, geothermal power is gaining increased attention for its role in providing stable, low-carbon electricity and heat.

Looking to the future, geothermal energy could become a cornerstone of sustainable energy strategies worldwide. Its ability to provide constant power, combined with innovations in exploration and extraction, make it a valuable complement to other renewable energy sources. In densely populated areas, geothermal district heating can significantly reduce urban air pollution and reliance on fossil fuels for residential and commercial heating.

In rural and developing regions, small-scale geothermal systems can offer reliable off-grid energy solutions, supporting local economies and improving living standards. Furthermore, research into supercritical geothermal systems—where water exists at extremely high temperatures and pressures deep within the Earth—promises to unlock massive amounts of energy with higher efficiency than current methods. If successfully harnessed, supercritical fluids could revolutionize the way we think about geothermal power, potentially offering an energy output several times greater than conventional systems.

In conclusion, geothermal energy is a proven, reliable, and environmentally friendly source of power that draws on the Earth's vast and renewable heat reserves. While it faces certain technical and geographic constraints, ongoing advancements in drilling, resource mapping, and enhanced geothermal systems are steadily expanding its reach and efficiency. As nations seek to decarbonize their energy systems and secure stable power supplies, geothermal energy stands out as a clean alternative capable of delivering both electricity and direct heat applications. With thoughtful investment, careful environmental management, and continued innovation, geothermal energy has the potential to supply a significant share of the world's energy needs, contributing to a greener and more resilient global energy future.

Recent Trends in AI with electrical engineering

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Artificial Intelligence (AI) is rapidly transforming the landscape of electrical engineering by enabling smarter, more efficient, and autonomous systems across power, control, communication, and automation domains. Recent trends show a strong integration of AI techniques such as machine learning, deep learning, and reinforcement learning into applications like smart grids, renewable energy optimization, electric vehicle management, predictive maintenance, and advanced robotics. In the power sector, AI is being employed for real-time load forecasting, fault detection, and dynamic energy distribution to ensure stability and efficiency in modern grids. The rise of smart grids has further accelerated the use of AI for demand-side management, enabling automated decision-making based on real-time data from IoT-enabled sensors and meters. In renewable energy systems, AI algorithms are optimizing solar and wind power generation by predicting weather patterns, adjusting operating parameters, and improving energy storage management. Electric vehicle infrastructure benefits from AI in battery health monitoring, charging optimization, and route planning for energy efficiency. Additionally, AI-driven condition monitoring and fault diagnosis are revolutionizing electrical machines, transformers, and transmission systems by reducing downtime and maintenance costs. The integration of AI with embedded systems and edge computing is enabling faster, localized decision-making in industrial automation and smart manufacturing, reducing latency and enhancing reliability. Moreover, AI-powered computer vision is advancing quality control in electrical component manufacturing and enabling inspection of power lines and substations through drones. With advancements in neural networks, hybrid AI models, and explainable AI, electrical engineering is moving toward

self-optimizing systems that can adapt to changing operational conditions. As the industry transitions toward Industry 4.0 and sustainable energy solutions, AI continues to be a driving force, bridging the gap between traditional electrical systems and intelligent, data-driven infrastructures that are more efficient, resilient, and environmentally friendly.

Next-Generation Solar Panels: Unlocking Efficiency and Durability

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Solar panels are essential for using solar energy, which has emerged as a viable renewable energy source. The creation of next-generation solar panels has been a focus of study and innovation as technology develops. The solar energy sector will be revolutionised by these cutting-edge solar panels designed to maximise efficiency and longevity. The potential of next-generation solar panels to change the landscape of renewable energy is highlighted in this article as we examine their main characteristics and advantages.

- 1. Increased Efficiency:** Next-generation solar panels are engineered to attain much greater energy conversion efficiencies than older models. These panels maximise the capture and conversion of sunlight into practical electricity using cutting-edge materials and manufacturing processes. Modern designs prioritise reducing energy losses via reflection, heat dissipation, and other sources to increase efficiency. Higher energy yields and a quicker return on investment are made possible by improved efficiency, which translates into increased electricity generation and improved system performance for solar power installations.
- 2. Advanced Materials:** Next-generation solar panels are built with cutting-edge materials, which boosts their durability and efficiency. For instance, perovskite, a novel semiconductor material, is being investigated for its excellent light absorption capabilities, which could lead to higher conversion efficiencies. Additionally, improvements in surface texturing and antireflective coatings help reduce energy loss from reflection and maximise incoming sunshine. These cutting-edge materials significantly improve performance and efficiency for solar panel designs.
- 3. Longevity and endurance:** The endurance of next-generation solar panels is ensured by engineering, which also makes them resistant to the effects of the environment. The main emphasis of

researchers and producers is the development of sturdy panel designs that can endure harsh temperatures, humidity, and other testing conditions. The panels' operational lifespan is extended by improved encapsulation materials and shielding coatings that protect them from moisture, UV rays, and physical harm. This improved toughness lowers maintenance requirements, boosts the dependability of solar power systems, and results in more consistent energy production throughout the panel's lifetime.

4. Flexible and Lightweight Designs: Flexible and lightweight solar panels have attracted much attention recently. The increased design flexibility of these next-generation panels makes them appropriate for various uses, such as curved surfaces, portable gadgets, and wearable technologies. These panels can be effortlessly integrated into many different goods and structures thanks to cutting-edge materials and production processes, increasing the potential solar energy applications. These panels' adaptability and light weight make installation easier and lessen the overall weight strain on structures, creating new opportunities for the use of solar energy.

Charging the Future: The Electric Vehicle Revolution

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Electric vehicles (EVs) are undergoing a profound transformation that is changing the automotive sector. This revolution is being sparked by the rising desire for more eco-friendly transportation options, a decline in the use of fossil fuels, and the fight against global warming. The vital component of charging infrastructure, which is at the fore of this transformation and is essential to guaranteeing the smooth adoption and broad usage of EVs, is at the forefront. We will discuss The importance of charging infrastructure and its crucial role in determining the future of electric mobility. The Importance of Charging Infrastructure: Electric vehicle (EV) owners can recharge their vehicles thanks to a charging station network. This infrastructure is essential for sustaining the increasing number of EVs on the road today. Convenience, accessibility, and dependability are assured by a vital charging infrastructure, all of which decrease major objections to EV adoption. Convenience and Accessibility: The availability of charging stations is one of the main issues for prospective EV purchasers. A well-designed charging infrastructure offers a network of stations thoughtfully positioned in diverse settings, including homes, businesses, shopping malls, and along main thoroughfares. This ubiquitous accessibility guarantees EV owners the ease of charging their cars whenever necessary, minimising range anxiety and boosting ownership confidence. Efficiency and Reliability: Charging infrastructure is essential to assuring the dependability and effectiveness of EV charging. Modern, fast charging stations with the latest technology make quick recharge periods possible, which minimises downtime for EV owners. Fast-charging stations and other advanced charging infrastructure can provide a significant amount of energy quickly, making long distance driving possible and equivalent to refuelling at conventional petrol

stations. Integration with the Power Grid: Charging infrastructure must be easily linked with the current power grid to allow the broad adoption of EVs. To maximise the usage of renewable energy sources while avoiding overtaxing the grid, this integration necessitates precise planning and coordination. The charging process can be improved, and the load on the power grid during peak times can be reduced with innovative charging technologies like demand response and time-of-use pricing. Additionally, thanks to bidirectional charging technology, EVs can function as mobile energy storage devices, which offers a potential remedy for grid stabilisation and energy management. Future Prospects and Challenges: Infrastructure for electric vehicle charging must keep up with the market's rapid growth. To increase accessibility and convenience for EV owners, governments, businesses, and stakeholders must work together to invest in constructing more charging stations, particularly in public spaces and rural areas. Standardising charging connectors and protocols is essential to ensuring compatibility and interoperability across various EV models and charging stations.

Revolutionizing Power Systems: Advancements in Renewable Energy Integration

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The global energy landscape is undergoing a dramatic transformation with the rapid integration of renewable energy sources. This issue of the Electrical Engineering Magazine delves into the advancements in renewable energy integration, focusing on the engineering innovations that are revolutionizing power systems. 1. Smart Grid Technologies: Enabling a Sustainable Future

Exploring the role of smart grid technologies in integrating renewable energy sources efficiently. Intelligent grid management and control systems for enhanced reliability and stability. Investigating the latest developments in HVDC transmission systems for long-distance renewable energy transmission. Overcoming challenges and optimizing efficiency in HVDC systems. Highlighting breakthroughs in energy storage technologies, including batteries, flywheels, and compressed air energy storage. Assessing the impact of energy storage on grid stability, load balancing, and peak shaving. Examining the design and operation of microgrids as a means to integrate renewable energy at a local level. Case studies showcasing successful microgrid implementations and their benefits. The global energy landscape is undergoing a dramatic transformation with the rapid integration of renewable energy sources. This issue of the Electrical Engineering Magazine delves into the advancements in renewable energy integration, focusing on the engineering innovations that are revolutionizing power systems. 1. Smart Grid Technologies: Enabling a Sustainable Future 2. High-Voltage Direct Current (HVDC) Transmission: Powering the Green Revolution 3. Energy Storage Solutions: Empowering Renewable Energy Reliability 5. Power Electronics for Renewable Energy Systems

Exploring advancements in power electronics for efficient conversion and control of renewable energy sources. Integration of power electronics in wind turbines, solar photovoltaics, and other renewable energy systems

6. Electrification of Transportation: Challenges and Opportunities

Analyzing the impact of electric vehicles on the electrical grid and charging infrastructure requirements. Solutions for managing increased power demand and optimizing charging infrastructure

Cybersecurity in Power Systems: Protecting Critical Infrastructure

Discussing the growing importance of cybersecurity in the context of smart grids and renewable energy integration. Strategies for safeguarding power systems against cyber threats and ensuring reliable operation.

Future Trends: The Next Frontier in Renewable Energy Integration

Speculating on emerging technologies and future trends that will shape the integration of renewable energy into power systems. Potential advancements in energy harvesting, transmission, and distribution.

By exploring these cutting-edge topics, this issue aims to provide electrical engineers, researchers, and industry professionals with valuable insights into the ongoing revolution in power systems and renewable energy integration.

Wireless Power Transfer: Beyond Charging Devices

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A revolutionary technique, wireless power transfer has far-reaching applications beyond simple device charging. With this innovative technology, electrical energy can be transferred from a power source to an electronic item without physical connections or cords. The electromagnetic induction theory serves as the foundation for the idea of wireless power transfer. It entails the creation of a magnetic field by a power source, which a compatible device may effectively absorb and transform back into electrical energy. This technology has created new opportunities for several applications across numerous industries. Electric vehicles (EVs) are one well-known industry where wireless power transfer has significantly influenced. The need to physically plug electric vehicles into charging stations is removed when charged wirelessly. Due to this convenience, EV owners have more flexibility and freedom, streamlining and simplifying the charging process. Additionally, wireless power transfer has been extremely useful in the medical field. Traditional battery replacement or recharge procedures for medical implants like pacemakers or insulin pumps were intrusive. These gadgets can now be recharged outside thanks to wireless power transfer, eliminating the need for surgery and improving patient safety and comfort. Wireless power transfer has uses in industries other than consumer electronics and healthcare. For instance, it makes it possible for sensors, displays, or robotic devices to be powered wirelessly and effectively in factories and manufacturing facilities. Because of the decreased need for unwieldy cords or frequent battery replacements, productivity is boosted, and costs are reduced. The idea of wireless power transfer has also been expanded to encompass larger-scale systems, such as wireless power grids. These grids could revolutionise how power is distributed and enable energy transfer to remote or inaccessible locations by

transmitting electricity over vast distances without requiring extensive infrastructure. Wireless power transfer does confront several difficulties, despite its many benefits. One such barrier is energy transfer efficiency over greater distances, as energy losses might happen during transmission. Researchers are actively working to advance technology and discover creative solutions to maximise efficiency and reduce power loss. In conclusion, wireless power transfer has become an innovative technology beyond just charging gadgets. Its uses cut across many industries, providing convenience, adaptability, and efficiency. Wireless power transmission can transform how we power our devices and remodel our energy infrastructure for a more connected and sustainable future as research and development proceed

IoT and Embedded Systems in Electrical Applications: Building Smarter Systems

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Mr Rakesh Shinde

The integration of the Internet of Things (IoT) and embedded systems in electrical applications is revolutionizing the way energy, automation, and control systems are designed and operated, enabling the development of smarter, more connected, and efficient infrastructures. IoT refers to a network of interconnected devices capable of collecting, exchanging, and processing data in real time, while embedded systems are specialized computing units embedded within electrical devices to perform dedicated functions. In modern electrical engineering, IoT-enabled embedded systems are being deployed in smart grids to monitor power generation, distribution, and consumption with high precision, facilitating demand-response management and predictive maintenance. These systems use sensors, actuators, and communication modules to gather real-time data from transformers, circuit breakers, and transmission lines, allowing operators to detect faults, optimize energy usage, and prevent outages. In renewable energy systems such as solar and wind farms, IoT-based embedded controllers optimize output by tracking weather conditions, adjusting system parameters, and improving energy storage operations. Industrial automation is another major area where IoT and embedded systems enhance productivity, enabling remote monitoring and control of machinery, process optimization, and predictive fault diagnosis, which reduce downtime and operational costs. In building automation, smart lighting, HVAC, and energy management systems leverage IoT-embedded technology to adjust settings based on occupancy and environmental conditions, significantly improving energy efficiency. Furthermore, in electric vehicle infrastructure, IoT and embedded controllers manage battery charging, health monitoring, and vehicle-to-grid (V2G) interactions. With the rise of edge computing, these systems are becoming more capable of processing data locally, reducing latency and enhancing security. As 5G and low-power wide-area networks (LPWAN) expand connectivity, IoT and embedded systems in

electrical applications are expected to evolve into fully autonomous, self-optimizing networks, paving the way for a new era of intelligent, sustainable, and highly responsive electrical systems.

Recent trend in solar energy

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Mr Pavan Bandgar

Recent trends in solar energy are redefining how the world harnesses and utilizes sunlight, driven by rapid technological advancements, falling costs, and the urgent need for clean, sustainable power. One major development is the rise of high-efficiency solar panels, including monocrystalline, bifacial, and heterojunction (HJT) technologies, which can capture more sunlight and generate greater output even in limited space. Perovskite solar cells have emerged as a breakthrough material, offering high efficiency, flexibility, and lower manufacturing costs, with ongoing research focusing on improving their stability and scalability. Floating solar farms, or “floatovoltaics,” are gaining popularity, particularly in regions with limited land availability, as they reduce water evaporation and operate at cooler temperatures for higher efficiency. Solar tracking systems, which adjust panel orientation to follow the sun’s path, are becoming more affordable and widely adopted, further boosting energy yield. Integration of solar power with energy storage systems, especially lithium-ion and emerging solid-state batteries, is enhancing grid reliability and enabling 24/7 renewable power availability. In addition, smart inverters and IoT-enabled monitoring systems are improving performance management, predictive maintenance, and grid stability. Hybrid systems combining solar with wind, hydro, or biomass are being deployed to provide more consistent energy generation. The global shift toward decentralized energy is also encouraging the adoption of rooftop solar, community solar projects, and solar-powered microgrids, especially in rural and off-grid areas. Government policies, financial incentives, and corporate sustainability commitments are accelerating large-scale solar installations, while innovations in solar thermal technologies are expanding applications beyond electricity, such as industrial heating

and desalination. As climate goals tighten and renewable adoption accelerates, solar energy is poised to become a dominant force in the global energy mix, driving both environmental and economic transformation.

Andrew Gordon, a Scottish Benedictine monk and physicist

Name:

Mr. Chandrakant Ashok Jadhav

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Andrew Gordon, a Scottish Benedictine monk and physicist in the 1740s, is credited with inventing the first electric motor, a simple electrostatic device that laid the foundation for future developments in electrical motors.

Andrew Gordon was born in 1712 in Forfarshire, Scotland, and became a Benedictine monk, studying philosophy, theology, and physics. His interest in electricity led him to experimentation during the 1740s, where he created a device known as the "electrical whirl," considered the first electric motor. This early motor used electrostatic forces to produce rotary motion by suspending a lightweight metallic star on a sharp pivot so that it would spin when charged electrically. Although Gordon's motor was primitive by today's standards and worked on static electricity rather than electromagnetic principles, it was a pioneering invention demonstrating the conversion of electrical energy into mechanical motion. His experiments were significant enough to be documented in his works on electricity, influencing later inventors.

The true scientific understanding of motor operation evolved later with discoveries such as Ampère's force law in 1820, which explained the mechanical force created by interactions between magnetic fields and electric currents. Subsequently, further innovators like Michael Faraday, William Sturgeon, and Thomas Davenport built on Gordon's legacy to develop electromagnetic motors capable of performing useful work.

Andrew Gordon's contribution remains a key milestone in the history of electric motors, representing the earliest attempt to harness electrical energy for mechanical motion and setting the stage for the

complex and powerful motors we rely on today in countless devices and industrial applications.

This early electrostatic motor not only symbolizes a remarkable technical achievement for the 18th century but also exemplifies the spirit of curiosity and innovation that fueled the advancement of electrical engineering.

In summary, Andrew Gordon's invention in the 1740s marks the birth of the electric motor, a device that has transformed technology and society over the following centuries.