R. C. PATEL
INSTITUTE OF TECHNOLOGY
An Autonomous Institute

Department of Electrical Engineering

ELECTRA'25

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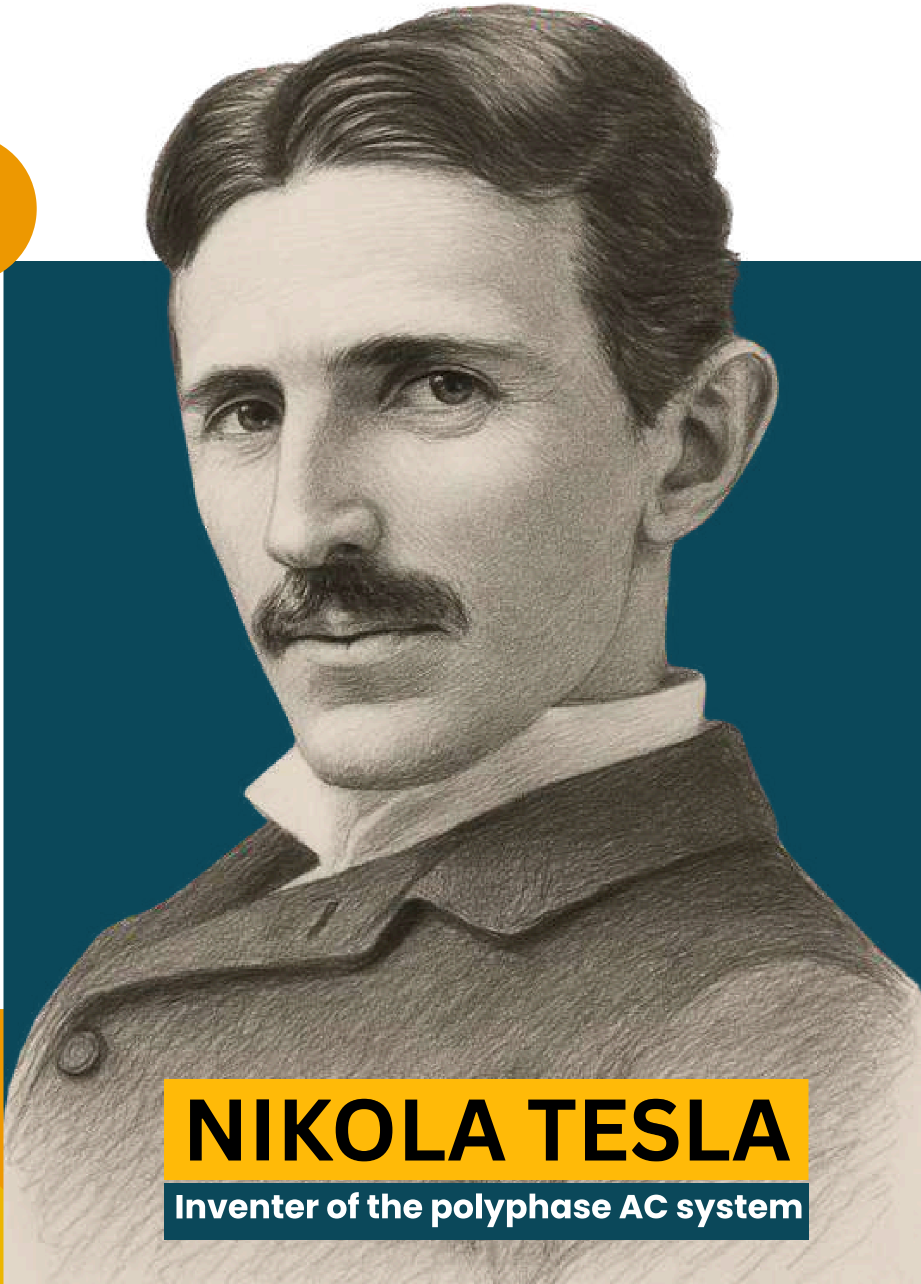

NIKOLA TESLA

Inventer of the polyphase AC system

Vision-Mission

Institute Vision

To build electrical engineers with a global perspective and a strong dedication to Societal service.

Institute Mission

To impart high quality Technical Education through :

- Innovative and Interactive learning process and high quality, internationally recognized instructional programs.
- Fostering a scientific temper among students by the means of a liaison with the Academia, Industries and Government.
- Preparing students from diverse backgrounds to have aptitude for research and spirit of Professionalism.
- Inculcating in students a respect for fellow human beings and responsibility towards the society.

Vision

To build electrical engineers with a global perspective and a strong dedication to Societal service.

Mission

M1: To transform the students from diverse background into skilled electrical engineers.

M2: To enhance industrial interaction to meet the changing industrial needs.

M3: To serve society with deep awareness of social responsibilities and ethical values.

HOD's Message

Dr. Shailaja Patil
Head of Department

I am delighted to share the most recent edition of our department's publication, **"ELECTRA'25"** magazine, which is dedicated to highlighting the exceptional literary potential of our students and faculty members, and fostering their leadership abilities. This publication is intended to inspire aspiring writers to explore new avenues of creative expression, and serve as a platform for sharing their work with a wider audience.

I extend my sincere appreciation and gratitude to the editorial team for their unwavering dedication and invaluable assistance in producing this magazine. Their countless hours of hard work and commitment have ensured that the final product is of the highest quality.

Moreover, I would like to express my heartfelt gratitude to Dr. J. B. Patil, our esteemed Director, whose unwavering support and guidance have been instrumental in the development of these publications.

Finally, I would like to express our deep appreciation to all the talented writers who have contributed their articles to this magazine. Their contributions have been invaluable in showcasing the diverse range of literary talent present within our community.

Magazine Committee

Staff Coordinator

Editor

Mr. Krunalkumar Gandhi
Assistant Professor

Student Coordinator

Arti Patil

Rutuja Mali

Anjali Marathe

Bhumika Mali

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Technical Article

Solar Cells from Living Algae: A Green Breakthrough in Renewable Energy

In a fascinating development blending biology with electrical engineering, a team of Indian researchers has created a bio-photovoltaic (BPV) device using live freshwater macroalgae. This innovative work demonstrates the promise of a sustainable, green alternative to traditional silicon-based solar cells.
The team's research, published in the Journal of Science: Advanced Materials and Devices, presents a device fabricated from Pithophora, a filamentous macroalgae commonly found in ponds and stagnant freshwater bodies. This green algae, known for forming thick mats on water surfaces, was harvested, cleaned, crushed into a biofilm, and employed as a photoactive layer in the solar cell.

The cell structure is uniquely organic yet engineered with precision. The researchers sandwiched the algal layer between two modified electrodes:

- A top electrode of copper coated with activated carbon (serving as the hole transport layer, HTL)
- A bottom electrode of fluorine-doped tin oxide (FTO) glass coated with titanium oxide (TiO_2), which acts as the electron transport layer (ETL)

This design, with a surface area of just 1 cm^2, generated an open-circuit voltage of 0.35 V and a short-circuit current of 10.19 μA under standard conditions. More impressively, under UV light (365 nm), the device produced a photocurrent of 1.25 mA and a photovoltage of 0.5 V without any external bias.The innovation doesn't stop at the lab scale. In outdoor experiments under natural sunlight, a setup of 10 such devices connected in series achieved a collective voltage of 5.53 V, demonstrating the concept's viability for low-power applications, especially in the Internet of Things (IoT) domain.

Sudip Kumar Batabyal, one of the lead researchers, emphasized that this is "possibly the first reported work where freshwater live macroalgae generates electricity by sandwiching it between two modified electrodes." He further noted that unlike conventional photovoltaics, this algae-based solar cell avoids toxic or expensive materials, offering a truly eco-friendly energy solution.

Despite its promise, the technology faces some limitations. One major challenge is the presence of a liquid reservoir within the device, which affects scalability and stability. Batabyal acknowledged that while the power output is currently low compared to silicon-based cells, ongoing research aims to overcome these hurdles. This development aligns with a global surge in biological photovoltaics. Parallel research from South Korea and Spain is also exploring energy harvesting through algae-carbon nanofiber composites and bacterial-microalgae hydrogen generation, respectively.

For electrical engineering students, this marks a thrilling frontier where bioengineering, materials science, and circuit design converge. As we seek greener and smarter technologies, such research reaffirms that nature could be the next energy engineer—quietly growing in our ponds, ready to power the future.

Mr. Krunalkumar Gandhi
Assistant Professor

Silicon Revolution and Electrical Engineer

When you look at electronics or semiconductor industry from lens of an electrical engineer, the role is not just about circuits and chips. It's about representing the core of modern innovation. Electrical graduate actually acts as pioneer of semiconductor basics. Whether it's the transistor in a smartphone, the processor in a computer, or the power electronics in an electric vehicle, these components originate from concepts deeply rooted in electrical engineering.

In the journey of 4 years of technical education we learn diversified elements of technology from generation, transmission and distribution of high voltage power in terms of Megawatt and also to control, program, simulate and integration of analog, digital and power electronics circuits. This article highlights the shades of an electrical engineer in electronics industry.

We all are familiar about the AI and Electrical vehicles. The both fields are one of the most exploding fields in today's clock. These technologies are rapidly expanding the need for faster, more efficient, and compact semiconductor devices. As the backbone of electronic products, semiconductors are now seen as the new strategic resource—comparable to oil in the last century. The reason behind the electrical as backbone of semiconductors, is that the subjects we study in our technical education. Indeed, analog electronics, digital electronics, power electronics and network theory are four building blocks of electronics which is deeply rooted in veins of an electrical engineer. We talk about the surge in semiconductors, with this surge, the scope for innovation, research, design, and manufacturing in semiconductors has broadened significantly. Countries are investing billions to localize chip production and reduce reliance on imports, which has created a vast landscape of opportunities in chip design, fabrication, packaging, testing, and embedded systems development.

Surprise...! Here is the point where the main game arrives. Indeed, the chips are the new oil but why still almost every chip has written 'Made in Taiwan' or 'Made in South Korea' on it. This is because the kind of skilled professionals they have. India is the major consumer of chips but almost every chip we use is imported (around $20.7 billion in F.Y.2023-24), why aren't we manufacturing our own chips? India has the utmost demand of electronics but no supplies from its own land.

But no worries India is on the way to create its own Silicon Valley. There are lakhs of jobs for electrical and electronics professionals available in this semiconductor revolution but still why we're lacking the one? Why the silicon revolution is taking decades to make the impact? The very unfortunate answer is we have the demand of professionals but we don't have that level skilled professionals which the industry demands. The common electrical graduate from tier-2 or tier-3 college is totally unaware about this silicon revolution. By the time he knew about the embedded and microcontroller stuff he's already out of its learning phase.

Hence to boost this silicon revolution we first require the educational revolution. Along with core concepts, the flavors of industry-oriented semiconductors are must to be added in technical education. This is the golden era for Indian economy, more and more electronics start-ups are seeking for electrical interns but with having great command over basics of electronics. This is where the whole summary of this article accumulates, it is much easy to train an electrical graduate with good basics rather than electronics engineer.

I'm stating this statement while perusing electrical engineering. The level of electron rush we studied is beyond the visualization of an electronics engineer. The blend of core concepts, four building blocks of electronics and the industry flavored concepts is what makes you perfect to withstand firmly in this silicon revolution.

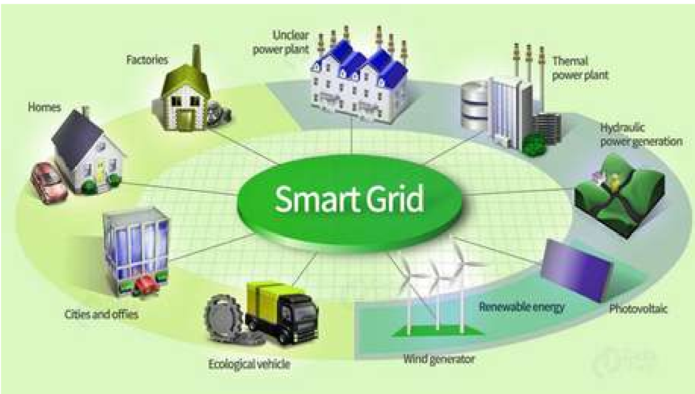
Concluding the article, just want to say that by the potential an electrical grad posse the ‘Electronics will be new Empire of Electricals’.

Dhiraj Pralhad Ravandale
Third Year Electrical Engineering

Smart Grids: Revolutionizing Power Distribution Systems

Introduction

The demand for electricity is growing rapidly with the rise of digital technologies, electric vehicles, and smart devices. However, traditional power grids are outdated and often struggle to meet modern energy needs efficiently. This has led to the emergence of Smart Grids - an intelligent and automated power distribution system that uses digital communication, sensors, and advanced control technologies. Smart grids are designed to improve the reliability, efficiency, and sustainability of electricity supply by enabling real-time monitoring, better load management, and seamless integration of renewable energy sources. They represent a significant shift in how energy is generated, distributed, and consumed, paving the way for a more connected and eco-friendly power system.



How Smart Grids Differ from Traditional Grids

Traditional power grids operate in a one-way flow, where electricity is generated at central power stations and transmitted to consumers with limited communication or control. These systems are often slow to detect faults, inefficient in energy distribution, and unable to handle modern energy demands. In contrast, Smart Grids enable a two-way flow of electricity and data between utilities and consumers. They use real-time monitoring, automation, and digital communication technologies to optimize power delivery, quickly respond to issues, and integrate renewable energy sources like solar and wind. Smart Grids also empower consumers with detailed usage data through smart meters, encouraging energy efficiency. Overall, Smart Grids are more flexible, responsive, and sustainable than the outdated traditional grid systems.

Key Benefits of Smart Grids

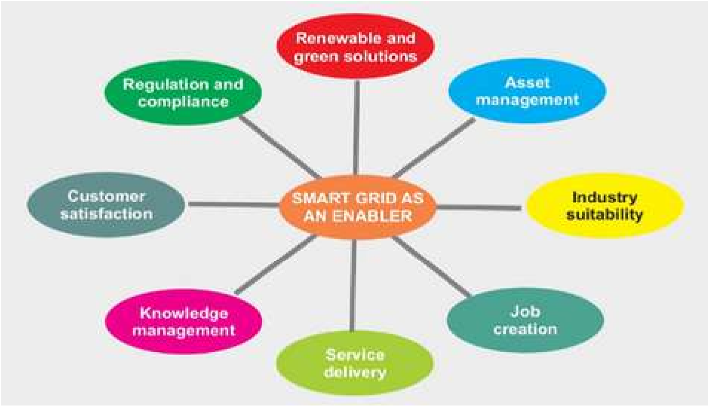
Smart Grids offer a wide range of benefits that improve the overall efficiency, reliability, and sustainability of power distribution systems. One of the most significant advantages is real-time monitoring and control, which allows utilities to detect and respond to faults or outages instantly, reducing downtime. Smart Grids also support demand-side management, enabling consumers to adjust their electricity usage based on price signals or peak demand periods, which leads to energy savings and cost reduction. Additionally, they facilitate the integration of renewable energy sources like solar and wind, helping reduce greenhouse gas emissions and reliance on fossil fuels. With automated systems and intelligent data analytics, Smart Grids optimize energy flow, reduce transmission losses, and improve the stability of the power network. Furthermore, consumers gain greater control and insight into their electricity consumption through smart meters, promoting more informed and efficient energy use.

Future Trends in Smart Grid Development

The evolution of Smart Grids is closely linked with advancements in emerging technologies. One major trend is the use of Artificial Intelligence (AI) and Machine Learning (ML) for predictive maintenance, demand forecasting, and autonomous decision-making in grid operations. Another key development is the rise of Edge Computing, which allows data to be processed locally at smart meters or sensors, reducing latency and enhancing real-time control. Blockchain technology is also gaining traction for secure, transparent energy transactions, especially in decentralized energy systems. In addition, vehicle-to-grid (V2G) technology is expected to grow, enabling electric vehicles to act as temporary energy storage units. With increasing focus on sustainability, net-zero energy communities and microgrids will play a bigger role in achieving energy independence and resilience. These trends are shaping the future of power systems to be more intelligent, adaptive, and consumer-focused.

Role of Electrical Engineers in Smart Grid Systems

Electrical engineers play a critical role in the planning, design, implementation, and maintenance of smart grid systems. They are responsible for developing intelligent control systems, integrating renewable energy sources, and designing robust communication networks that allow real-time data exchange across the grid. Electrical engineers also work on automation technologies, power electronics, and energy storage systems to improve grid stability and performance. In addition, they contribute to cybersecurity solutions that protect smart grids from digital threats.



As the grid becomes more data-driven, electrical engineers increasingly collaborate with IT specialists to apply data analytics and AI for smarter decision-making. Their expertise is essential in creating sustainable, efficient, and resilient energy infrastructures that meet modern demands.

Dhananjay Mali
Second Year Electrical Engineering

Fast & Efficient : Hybrid Wireless Charging System for Electric Vehicles

Are you thinking about getting a new car but worried about pollution? Electric vehicles (EVs) can help ease those concerns – they do not produce any emissions but their batteries still need to be recharged somewhere. What if your EV could recharge while parked or even without plugging in? So, let's talk about the Hybrid Wireless Charging System for Electric Vehicles. This setup combines traditional plug-in charging with inductive (wireless) so lets get see how could we make two charging in one EV.

The hybrid system integrates these two modes. An EV with hybrid charging has both a standard inlet (for cable) and built-in induction coil and electronics for wireless. The car's internal energy management system can switch between or even combine sources. This matters because drivers get flexibility: if a wireless pad is available (for example, in a garage floor or public parking spot), you can charge without plugging in; but if only a regular charger is at hand, you use the cable. In either case, the battery gets charged. Importantly, hybrid designs can also allow "top-up" charging anytime you stop, helping extend range – automated wireless charging means more frequent short charges, which can effectively extend driving range without planning long charging stops.

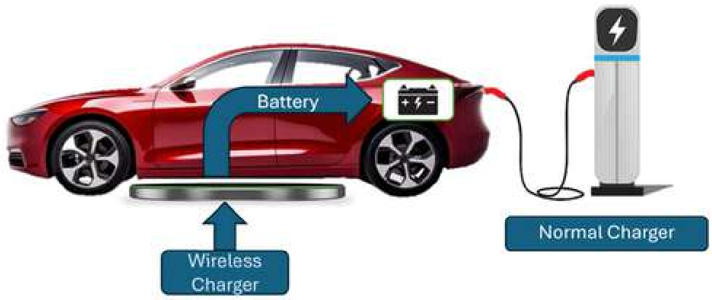


Figure 1 : A hybrid EV charging setup. The car (red) can charge from the wireless ground pad (left) or the normal cable charger (right). The blue arrows and battery icon show power flowing from both sources into the vehicle battery. The provided illustration shows how hybrid charging works in practice. A Car is parked above a wireless charger pad and also connected by cable to a normal charging station on the right. Both the pad and the F plug supply energy to the same battery pack inside the car. In the diagram, blue arrows point from the wireless pad and the charger to a battery icon. This means the vehicle's battery can receive electricity from either source. In one scenario, the wireless pad uses electromagnetic induction: its coil (primary) sends power to the car's coil (secondary) and on to the battery. In the other, conventional power flows through the cable into the car's onboard charger and then to the battery. The highlighted battery symbol indicates the common endpoint. In short, the image illustrates dual charging modes: both the corded charger and the induction pad feed the car's battery, so you can top up using whichever is available.

Why It Matters: Efficiency, Convenience, and Future Potential

- **Easy for Drivers:** With wireless charging, you just park your car and it starts charging on its own—no need to plug anything in. This is great in bad weather and saves time. Even short stops can help charge your car. You can still use a regular plug when you want, so you have more options.

- **Works Well:** New wireless chargers are nearly as good as plug-in chargers. The difference in energy loss is very small—just 10–20%. At normal charging speeds, wireless works just as fast as plugging in. Some systems even let you use both at once for faster charging. Also, wireless charging protects parts from damage because there are no exposed connectors.

- **Good for the Energy Grid:** Wireless charging can be smarter. Cars could charge when electricity is cheaper or when there's extra solar or wind power. A group of EVs using wireless pads could even help the grid by giving power back during busy times. This helps reduce stress on the power system. Charging in places like parking lots or traffic lights can also make good use of time when the car is just sitting.

- **Exciting Future:** Using both plug-in and wireless charging is a step toward new ideas—like roads that charge cars as they drive, or systems where cars and buildings share energy. Cars that support both methods are ready for these future upgrades. It also encourages more places to install smart chargers. All of this makes EVs more appealing and speeds up the move away from gas cars.

Saurabh Mahendra Bhirud
Second Year Electrical Engineering

PLCs and SCADA: The Automation Duo Redefining industrial control

In an era shaped by automation, data, and intelligent decision-making, two technologies continue to serve as the unsung heroes of modern industry, Programmable Logic Controllers (PLCs) and Supervisory Control and Data Acquisition (SCADA) systems. Together, they have not only transformed how industries operate but have become foundational to the global shift toward smart, connected, and resilient infrastructures.

PLCs operate as the "Brains" at the machine level. Designed for speed, reliability, and robustness, these digital computers are responsible for executing logical decisions in real-time, managing tasks such as motor operations, process sequencing, interlocks, and alarms. Initially introduced in the automotive sector to replace complex relay logic systems, PLCs have now become ubiquitous across industries from packaging to pharmaceuticals. SCADA, on the other hand, forms the supervisory layer monitoring and visualizing data from various sensors and controllers, issuing commands, logging system performance, and enabling remote access to distributed assets. While PLCs do the groundwork, SCADA provides context, turning raw data into actionable insights. When integrated, PLCs and SCADA create an intelligent ecosystem that empowers operators and engineers to control entire industrial landscapes from a single interface. This collaboration ensures real-time responsiveness, minimizes manual intervention, and enhances overall system efficiency.

The influence of PLC-SCADA integration spans across a wide spectrum of applications. In manufacturing plants, they optimize assembly lines, monitor equipment health, and reduce waste through precision control and predictive maintenance. In power systems, they automate substation monitoring, enable smart grid management, and support real-time load balancing and blackout prevention. Water and wastewater management benefits from consistent water quality control, regulated pump operations, leak management, and energy conservation. In oil and gas industries, they enhance safety through gas leak detection, automate drilling and refining processes, and monitor pipeline integrity remotely. Even in smart cities, PLC-SCADA systems are the backbone of dynamic traffic control, automated lighting, and intelligent energy metering making urban environments more sustainable and efficient. One of the most exciting developments in this field is the rise of digital twin's virtual replicas of physical systems that mirror real-time operations using data collected from PLC-SCADA networks. These digital counterparts allow engineers to simulate scenarios, test changes, and predict failures before they occur. Combined with edge computing, decisions can now be made closer to the source of data, reducing latency and improving responsiveness in critical systems. Furthermore, the integration with artificial intelligence and machine learning is revolutionizing control logic. Instead of relying solely on pre-defined instructions, modern systems can learn from historical data, recognize patterns, and adapt to dynamic conditions. For example, AI-enabled SCADA platforms can detect anomalies in energy consumption or motor behaviour and alert operators to perform proactive maintenance significantly reducing downtime and operational costs.

As industrial systems become more connected, they also become more vulnerable. PLC-SCADA networks were traditionally isolated, but the advent of IoT and cloud connectivity has exposed them to potential cyber threats. Attacks like Stuxnet have shown how critical infrastructure can be manipulated through malware targeting PLCs. Today, securing automation systems involves more than firewalls it requires multi-layered strategies including encryption, authentication protocols, role-based access control, real-time anomaly detection, and continuous patch management. Cyber-resilient automation is now a cornerstone of modern industrial design, making cyber security knowledge an essential skill for today's electrical engineers.

The growing complexity of industrial systems calls for a new generation of engineers individuals who are not only proficient in electrical principles but also fluent in automation software, data analytics, and network security. Educational institutions must evolve by integrating hands-on training with PLCs, SCADA simulators, and industrial communication protocols such as Modbus, Profibus, and OPC UA. Soft skills are also key, critical thinking, system-level design, and the ability to bridge engineering with business goals. In a world where machines talk to machines, it is the human mind that must design, oversee, and improve these conversations. The fusion of automation with intelligence is driving us toward a world that is not only more efficient but also more sustainable, adaptable, and resilient. With climate change, resource scarcity, and urban growth becoming pressing challenges, PLC-SCADA technologies offer solutions that go beyond profit, they serve the planet. Imagine buildings that optimize their own energy use, factories that minimize emissions autonomously, grids that self-heal after disturbances, and cities that anticipate and respond to the needs of their citizens in real-time. This is not science fiction. This is the future we are engineering one smart sensor, one programmable controller, and one SCADA dashboard at a time.

For students, professionals, and innovators alike, understanding the synergy between PLCs and SCADA is not just about mastering tools it's about embracing a mind-set that values automation, intelligence, and sustainability. The industrial revolution of our time is not defined by steam or electricity it is defined by information, interconnection, and intelligence. So, whether you aspire to work in automation, energy, aerospace, or infrastructure, one truth remains: the future belongs to those who can control, connect, and create with systems that think.

Dipali Dhirendra Potdar
Third Year Electrical Engineering

The Role of AI in Electrical Load Forecasting

In the ever-evolving world of electrical engineering and energy systems, one of the most critical and foundational tasks is load forecasting—the process of predicting the future demand for electricity. Load forecasting is vital to ensure that power generation and distribution align with actual consumption needs. It enables grid operators to plan and balance electricity supply in real time, avoid power shortages or wastage, and reduce operational costs. In the past, forecasting methods primarily relied on statistical models that analyzed historical data to predict future trends. While effective in stable environments, these methods are increasingly inadequate in today's complex and dynamic energy landscape, which is shaped by factors like climate variability, fluctuating demand, increasing population, and the integration of renewable energy sources. To address these limitations, Artificial Intelligence (AI) has emerged as a powerful tool that is transforming how we forecast electrical loads—bringing greater accuracy, adaptability, and efficiency to the process.

Artificial Intelligence, and more specifically its branches of Machine Learning (ML) and Deep Learning (DL), provides an advanced approach to analyzing and interpreting massive volumes of data from various sources. These include past electricity consumption records, real-time weather data, seasonal patterns, holidays, time-of-day variables, economic activity, and even social behavior trends. AI algorithms can identify hidden patterns and nonlinear relationships among these diverse inputs that traditional models often fail to detect. For instance, while a conventional statistical method might struggle to account for sudden changes in load due to an unexpected weather event, an AI model trained on similar past occurrences can quickly adapt and make accurate predictions. The key strength of AI lies in its ability to learn and evolve with time. As more data becomes available, AI systems refine their internal models, continuously improving their forecasting accuracy without needing manual recalibration.

One of the most successful implementations of AI in load forecasting involves the use of Neural Networks.

Artificial Neural Networks (ANNs) mimic the way the human brain processes information by forming connections between different data points and adjusting these connections based on feedback. Among them, Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks are especially effective for time-series data, which is essential in forecasting electricity loads over different time horizons. These models can remember patterns and sequences over time, enabling them to forecast not just the overall trend, but also specific fluctuations throughout the day or week. As a result, they are highly valuable for short-term forecasting, such as hour-ahead or day-ahead predictions, which are critical for operational planning and demand response in modern power grids.

The practical applications of AI-based load forecasting are already evident in many parts of the world. For instance, ISO New England, a major regional grid operator in the United States, uses machine learning techniques to predict electricity demand with high accuracy, allowing them to schedule generation resources more efficiently. In the UK, Google's DeepMind partnered with the National Grid to explore AI models capable of predicting power demand and supply patterns to enhance grid balancing. Closer to home, several Indian utilities and smart cities are adopting AI for load forecasting to reduce power outages, manage peak demand, and ensure the efficient use of renewable energy. These initiatives show that AI is not just a futuristic concept but a practical solution already reshaping how electricity is managed and delivered.

The advantages of AI-based forecasting are both technical and economic. Firstly, AI improves the precision of load predictions, reducing errors that could lead to over- or under-production of electricity. This, in turn, helps prevent blackouts and optimizes the operation of power plants. Secondly, AI models are self-learning—they improve their performance over time without human intervention. This makes them highly adaptable to changing conditions such as sudden temperature shifts or consumption spikes. Additionally, AI systems are scalable; they can handle vast amounts of data from smart meters, sensors, and IoT devices spread across large geographical areas. This scalability is essential as countries expand their smart grid infrastructure. Economically, better forecasting translates into lower fuel consumption, reduced dependency on standby generators, and overall operational savings for power producers. It also supports the development of demand-side management programs, where consumers are incentivized to reduce or shift their electricity use during peak periods based on predictive analytics, thereby contributing to a more balanced and efficient energy system.

However, despite its potential, the implementation of AI in load forecasting is not without challenges. One of the major obstacles is data quality and availability. AI models require large amounts of clean, accurate, and timely data to function optimally. In regions where such data infrastructure is lacking, the effectiveness of AI can be limited. Another challenge is the interpretability of AI models, especially complex deep learning systems that operate as "black boxes," making it difficult to understand how they arrive at specific predictions. There are also concerns around cybersecurity and data privacy, especially as power systems become more digital and interconnected.

In conclusion, the application of Artificial Intelligence in electrical load forecasting marks a significant technological shift in the energy sector. By delivering greater accuracy, adaptability, and insight, AI empowers utility providers to make smarter decisions, reduce environmental impact, and enhance energy security. It is not just improving how we predict electricity usage—it is transforming how we generate, distribute, and consume power. As engineers, researchers, and future professionals in this field, understanding and embracing the role of AI in load forecasting will be essential to driving innovation and sustainability in the global energy system.

Gayatri Vijay Chaudhari
Third Year Electrical Engineering

How Electric Vehicles are Reshaping the Power Industry

One of the most life changing alterations in transport in recent years has with the development of technology have come in the form of Electric vehicles (EVs).Initially, they were an environmentalist's answer to fuel combusting cars but now they have taken the world by storm as it not only transforms the automobile sector but also the energy industry. This transition, which is primarily because of improvement in battery technology, policies, and eco-friendly initiatives, changes how we consume, generate, and distribute electricity.

1. Increase in Energy Consumption

Electric cars are becoming more affordable, which increases the number of people purchasing them. This comes with an increase in electricity consumption because unlike traditional cars powered through fuel, EVs require electricity to charge. The reliance on a shared grid and its corresponding infrastructure has resulted in an energy crisis at peak charging times. A lot of utilities are changing their policies and models to adapt to heightened stimuli. Demand-side management systems and smart grid systems go along way to address the energy crisis.

2. Self Driving Cars and Demand Integration

EVs can change from a dull vehicle that passively takes orders and uses up energy, but to value-adding grid participants and a dynamic entity that actively helps with its management. In lower demand times, consumers can have their cars plug into the grid, which allows the system to manage their appliance usage. V2G or vehicle to grid technology going beyond charging cars: they can charge them and use the stored energy to aid with peak times.

3. The Joined Benefits of Renewable Energy

The integration of renewable sources of energy and electric vehicles is one of the primary advantages of EVs. Solar and wind are renewables, but their production is intermittent. Electric vehicles can act as a buffer and capture excess electricity during peak periods of renewables output and discharge it when it is needed. This permits a more responsive energy system. This integration speeds up the changeover to a low-carbon energy economy.

4. The Consequences to the Fuel Consumption and Emission Levels

The adoption of EVs leads to decreased oil dependency and reduction of greenhouse gases. This change is beneficial towards climate change, but the impact on is also seen in the global energy markets, refining the competition for fuel, stabilizing fuel prices, and reducing geopolitical conflicts centered on oil dependency. There is increased investment into electricity generation from renewable resources grounded on the new profile of energy required for transportation.

5. Opportunities and Challenges within the Infrastructure

A complete overhaul of the charging infrastructure is required alongside the adoption of EVs. These include public fast-charging stations, home-based chargers, and numerous other avenues that need to be put in place or upgraded to form a reliable system. This gap has given rise to new innovations and business models as well as public-private collaborations targeted at fast-tracking infrastructure improvement.

6. Future Outlook

As the technology surrounding EVs improves and their costs drop, it is predicted that a good percentage of vehicles on the roads will be electric by 2030. Their adoption would require even further integration between auto manufacturers, utilities, and government. Artificial Intelligence, The Internet of Things (IoT), and big data will need to be incorporated into power systems in order to control the dynamics of supply and demand with respect to an electrified transportation infrastructure.

Conclusion

Electric vehicles offer a more environmentally friendly alternative to internal combustion engine cars. But their impact stretches far and wide, fundamentally transforming the power sector. Fostering energy consumption changes and enabling advanced sustainable resilient grids development, EVs are aiding the transition toward a carbon neutral electrified future. From a student or professional's perspective, these transitions mark the dawn of radical development opportunities in their propelling technologies, energy, and driving innovation across entire industries.

Spandan Pravin Patil
Third Year Electrical Engineering

Art Section

🎨 Welcome to the **Art Section** of our Departmental magazine! 🖌️

Art is not just about colors on a canvas or lines on a page; it's about expressing the depths of our imagination, emotions, and perspectives. In this section, we celebrate creativity in its myriad forms – from traditional paintings to digital art, from sculpture to photography, and everything in between.

Through the strokes of our brushes, the clicks of our cameras, and the chiseling of our sculptures, we aim to captivate, inspire, and provoke thought. Each piece featured here tells a story, reflects a moment, or expresses an idea unique to its creator.

Art has the power to transcend boundaries, ignite conversations, and evoke profound emotions. So, immerse yourself in the world of creativity, let your imagination roam free, and join us on a journey through the boundless realms of artistic expression.

We invite you to explore, appreciate, and engage with the works showcased in this section. Let the colors, shapes, and textures speak to you, and may they inspire you to discover your own artistic voice.

Enjoy the journey!

Priyanka Chavan

Sakshi Rajput

Maaz Mirza

Maaz Mirza

Maaz Mirza

Yukta Badgujar

Dipali Potdar

Yukta Badgujar

Dipali Potdar

Umesh Mahajan

Umesh Mahajan

Om Sonawane

Khushee Bagal

Khushee Bagal