

SDI-B

 *Pulse*

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EVENTS AND HAPPENINGS

30th June - 6th July : A developmental Programme "Drishtikon"

IOCL (WRO) conducted "Drishtikon" - A developmental Programme training of new entrant officers at SDI-B in which 34 non-executive officers of Indian Oil participated. This programme meant for non-executive employees of IOCL aims at developing awareness about IOCL as well other companies in the same field of service. Motivation and energetic approach at workplace resulting in effectiveness , action plan for personal and professional growth , safe workplace, Behaviour based safety (BBS), first aid training – all these formed parts of this programme. To connect with various kind of work culture, visit to Paradip Refinery has also been included.



10th – 11th July'24: Visit to NSDC, HSSC & Institutions

Shri Ranjan Bhowmick, CEO SDI-B, and Shri Rajesh Tripathy, COO SDI-B, visited to NSDC wherein they met CEO and the team at Kaushal Bhawan to discuss NSDC initiatives and future plans with SDI-B. Also paid a visit to the HSSC office, wherein they met with the CEO, HSSC, and the team and had a fruitful discussion on different agenda items. CEO and COO SDI-B also visited the ITI Pusa Campus and one of Delhi Skill University's campuses to explore the workshops and labs that has been set up there.



16th – 18th July'24 – Kaushalvardhanam Programme

A Two days programme called Kaushalvardhanam which is designed for non-executive employees of IOCL(NRO) conducted at SDI-B with 35 Nos. participants. It aims at developing awareness about IOCL as well other companies in the same field of service, it imparts training on

changing nature of workplace in view of industry 4.0, future challenges , utilization of AR/VR tools ethics in personal & professional life etc. formed part of this programme. Visit to IOCL's Paradip refinery aims at providing exposure to various kind of work culture.



Internship Programs

97 students from several institutions, including the Gregorian Institute of Technology in Kerala (28), Silicon Institute of Technology, Bhubaneswar, Gandhi Engineering College (12), and Gandhi Institute for Technology (GIFT) College (57), participated in the one-month Internship Programme at SDI-B from June-July'2024. Participants

covered a variety of topics i.e. IT/OT Integration, Process Automation, Siemens-PLC under Siemens CoE and topics like PLC, HMI, SCADA of Industrial Automation System under Schneider CoE. Participants also gained basic fundamental knowledge of Industrial Electrical Systems through training partner NTTF.



22nd July 2024: Commencement of Video Editor and HVAC Technician Course (first batch) at SDI-B.

Two new CoEs for Digital Media and HVAC have been set up at SDI-B as part of 'Skill India Centre (SIC)' initiative of NSDC. Shri Ranjan Bhowmik, CEO of SDI-B, inaugurated the commencement of two new courses: Video Editor and

HVAC Technician Course. Along with the inclusion, now three number of courses in media sector are being provided at SDI-B i.e. Digital Photography, Graphic Designer, Video Editor and one course in air-conditioning field



22nd July : Project Showcase by Industrial Electrician Batch

Two new projects on Musical Lights and Voice Controlled Scrolling LED Display are displayed by industrial electrical students. Both the projects are intended to give an overall insight into component wiring, code writing and a peep into IOT. CEO SDI-B, along with other officials and teachers, witnessed the presentation and urged students to participate in additional initiatives like this to improve hands-on training.



5th – 24th Aug'24: PLL Induction Program-GETs of Petronet LNG Limited

Twenty-two days fully residential management development program was organised for 26 newly recruited probationary officers of Petronet LNG Limited. Various topics including corporate etiquette, personal

grooming, effective leadership, project management, advanced excel etc were covered during MDP training by esteemed faculty & industry experts. Cost-effective quality MDP program was highly appreciated by the participants.



14th Aug'24: Blood Donation Camp in Association with the Indian Red Cross Society

In the spirit of giving back to our community and honoring our nation's 78th Independence Day Celebration a Mega Blood Donation Camp was organized by SDI-B inside the Campus in association with the Indian Red Cross Society, Bhubaneswar. The basic aim behind the Camp was to generate the values of selflessness and solidarity among the students and staff of this institute and at the same time to promote a culture of altruism that will contribute to the community's well-being. The Mega Blood Donation Camp

started at 10:00 am and continued up to 3:00 pm. The camp saw an impressive turnout with over 175 donors participating, exceeding the expected number. The grand success of the camp was well reflected by the overwhelming response of participants, positive feedback received from print and electronic media and overall, by the noticeable positive spirit that defines Independence Day. At the culmination The Red Cross Society presented Certificates of Appreciation to SDI-B & Volunteers.



15th Aug'24: 78th Independence Day Celebration

78th Independence Day was celebrated at SDI-B with patriotic fervor and grandeur, befitting to the occasion. To mark this significant day, apart from flag hoisting, a grand cultural programme was conducted at the auditorium by engaging the students, staff, family members and guests highlighting our nation's heritage, achievements, and values. The programme reminded us of the vision, courage and perseverance of our national heroes who paved the way for our sovereignty and self-governance. This occasion witnessed the



motivating speech by CEO, SDI-B Shri Ranjan Bhowmick followed by distribution of mementos to best student performers and felicitation to invited guests, alumni, dedicated and excellent performers of FMS, Security & Catering Staffs.



21st Aug'24: Visit of PMCTECH College, TamilNadu

Dean, Director, Registrar with other Professors of PMCTECH College (Perumal Manimekalai College of Engineering), Koneripalli, Tamil Nadu visited SDI-B campus

to see the facilities, labs, workshop and training being imparted to the students.



23rd Aug'24: Quarterly Fire and Safety Training

A quarterly fire and safety training session was held outside the Academic Building towards the Workshop, wherein all students and staff attended the session to gain basic knowledge on the subject.



27th Aug'24: Placement Drive by M/s TATA Project Ltd.

M/s Tata Projects Limited conducted a placement drive for trainees in the Industrial Welder, Fitter Fabrication and Pipe Fitter (City Gas Distribution) trades. All candidates were obliged to take the written test.



29th – 30th Aug'24: Experiential Outbound Training for IOCL QRC officers

Corporate Office, IOCL conducted outbound training program for officers of Quality Reassurance Cell (QRC). 20 officers across marketing division of IOCL participated during the program. Ashwani Dua (CGM, QRC), Sanjay Yadav (GM, QRC), Ranjan Bhowmick (CEO-SDI B) graced the inaugural function of the meeting in which different Q&Q aspects of marketing division were discussed.



31st Aug'24: Placement Drive by M/s Makeen Energy

M/s Makeen Energy conducted a placement drive for trainees in the Industrial Electrical & Technician Instrumentation trades.



2nd Sep'24: Mass Plantation Drive of one week at SDI-Bhubaneswar

SDI-B is spearheading a significant mass plantation drive starting from 02.09.2024. Over the course of one week, more than 500 saplings has been planted on the campus as part of the institute's commitment to environmental sustainability and achieving net zero emissions. Sri. Ranjan Bhowmick, CEO, SDI-B, planted a sapling as a symbolic gesture to mark the beginning of the mass plantation drive followed by the plantation by other employees. This inaugural activity marks the beginning of a collaborative effort involving employees, faculty, and students from SDI-B.



5th Sep'24: Thanksgiving Program on the occasion of Teachers' Day

On the occasion of Teacher's Day, a heartfelt thanksgiving program was organized at the Guest House of SDI-B. Sri Ranjan Bhowmick, CEO addressed the gathering and took the opportunity to recognize and honor the significant contributions made by the faculty members in driving the growth and success of SDI-B. During his address, CEO emphasized the pivotal role that the faculty plays in shaping not only the institution's educational outcomes but also its overall trajectory. He praised their unwavering commitment to excellence in teaching, mentoring, and guiding the students towards success, which has in turn helped SDI-B achieve new milestones in its journey.

CEO also interacted with the newly joined faculty members, welcoming them into the SDI-B family and engaging them in a discussion about their vision for elevating the institution. He encouraged them to bring fresh perspectives and innovative ideas to further enhance SDI-B's growth and impact in the coming years. The program concluded with a delightful cake-cutting ceremony, marking a moment of celebration and camaraderie among the faculty and leadership.



6th Sep'24: Industrial visit of Industrial Electrician trainees to OPTCL

23 Nos. Industrial Electrician trainees and their faculty members visited the Mendhashala 400/220/132/33 KV substation grid near Khordha for field training sessions. They learn about the grid control system, the scada, the transformer feeder line, and the entire LT, MV, and HT switchgear system. It was a good learning experience for all of the trainees.



7th Sep'24: Ganesh Puja Celebration at SDI-B

Like every year, Ganesh Puja was celebrated with great enthusiasm at SDI-B. The vibrant, beautifully crafted idol of Lord Ganesh, installed at Hall-4, Workshop, is a sight to behold, adorned with colorful flowers, intricate decorations, and glimmering lights. The rhythmic chants of prayers, the sound of cymbals, and the sweet aroma of incense create a serene and spiritual atmosphere. As the devotees gather around, offering their prayers and seeking blessings from Lord Ganesh for prosperity, wisdom, and removal of obstacles, there's a palpable sense of unity and joy.



9th – 13th Sep'24: VRIDDHI - An Experiential Training Program for IOCL Officers of ERO

Eastern Region Office, IOCL conducted VRIDDHI: An Experiential Training Program for IOCL officers of ERO in which nineteen officers across IOCL marketing division locations of eastern region participated. Pankaj Kumar (ED, Regional Service, ERO), Indrani Maji (GM, HR, ERO) & Ranjan Bhowmik (CEO-SDI B) graced the inaugural function of the meeting. Training was given to the participating officers on various technical aspects like welding, PLC, automation etc. by SDI-B training partners.



13th Sep'24: Seminar on "Application of CNC Machines in Aerospace Industries

SDI-B training partner FutureTech Design Solutions on behalf of Siemens CoE organised an industrial seminar on Application of CNC Machines in Aerospace Industries at SDI-B auditorium. Shri Prabhat Kumar Bhanja, Head Mfg. Engineering & Production, JEI Aerospace graced the seminar as guest of honour and esteemed speaker. The speaker shared his vast 20 years of experience and expertise of aerospace industry to make our students and other participants aware about use of CNC technology in smart manufacturing of high-tech aerospace industry. The seminar was a grand success with participation of approx. 320 candidates.



13th – 14th Sep'24: Faculty Support System (FSS) - Residential conference for Tata Community Initiative Trust

Tata STRIVE recently organized the Faculty Support System (FSS) training program, held at SDI-B campus for 21 Zonal Change Leaders (ZCLs) across Odisha. This initiative was facilitated by the Design and Incubation Team of Tata STRIVE, who provided comprehensive guidance to the ZCLs. These ZCLs will now take the lead in orienting Tata STRIVE Change Leaders throughout Odisha, ensuring that they are equipped with the necessary skills and methodologies to enhance the quality of training sessions for ITI learners across the state. This initiative aims to further improve the learning outcomes and employability skills of ITI students, contributing to the overall development of vocational training in Odisha.



17th Sep'24: Celebration of Viswakarma Puja at SDI-B

Like every year, Viswakarma Puja was celebrated with great enthusiasm at SDI-B. The occasion was filled with joy and reverence, as students, faculty, and staff gathered to honor Lord Viswakarma, the divine architect and patron deity of all craftsmen, engineers, and workers. The vibrant and beautifully crafted idol of Lord Viswakarma, installed at Hall-4, Workshop, was a sight to behold. Adorned with colorful

flowers, intricate decorations, and glimmering lights, the idol radiated a sense of devotion and celebration. Viswakarma Puja holds a special significance at SDI-B as it aligns with the institute's mission of fostering craftsmanship, innovation, and skill excellence. It serves as a reminder of the vital role that craftsmanship and skill development play in building a prosperous future.



18th – 19th Sep'24: LPG DSO conference

HSE, Eastern Region Office, IOCL conducted DSO (LPG) Capability Building 2024-25 training program for designated safety officers of LPG locations under eastern region. Nineteen DSO officers across eastern region LPG locations participated in the program. Rabindra Nath Barik (GM I/C HS&E) & Ranjan Bhowmik (CEO, SDI-B) graced the inaugural function of the meeting. During the training program, various safety aspects of LPG plants were discussed. Participants also visited LPG bottling plant & LPG cylinder manufacturer at Khordha for hands on exposure.

23rd – 28th Sep'24: Mid-Career Development Intervention for non-executives of ERO

Eastern Region Office, IOCL conducted Mid-Career Development Intervention program for IOCL non-executives of ERO at SDI-B in which 30 non-executives across marketing division locations of eastern region participated. Pankaj Kumar (ED, Regional Service, ERO), Indrani Maji (GM, HR, ERO) & Ranjan Bhowmik (CEO-SDI B) graced the inaugural function of the meeting. During the training program, various topics like team building, communication skill, vigilance awareness, digital skill, finance & sales were discussed. The program concluded with one-day site visit to Paradeep Refinery.



CYBER SECURITY FOR EVERYONE

Cyber Security refers to the practice of protecting computers, networks, programs, and data from unauthorized access, attacks, or damage. With the growing reliance on technology, it has become essential to safeguard sensitive information from cyber threats. These threats can come in various forms, such as malware, phishing attacks, ransomware, or even brute force attacks. Organizations use various tools and techniques like firewalls, encryption, and authentication protocols to defend against such attacks.

One common cyber threat is phishing, where attackers send fraudulent emails or messages, pretending to be legitimate entities, to trick individuals into providing personal information such as usernames, passwords, or credit card details. Another type of attack is a Denial of Service (DoS), which overwhelms a system with excessive traffic, making it unavailable to users.

A crucial aspect of cyber security is encryption, which converts data into an unreadable format for unauthorized users. Encryption ensures that even if data is intercepted, it cannot be understood without the correct decryption key. Additionally, two-factor authentication (2FA) enhances security by requiring not just a password but a second method of verification, such as a code sent to a mobile device, to access an account.

Now that we've covered some essential concepts, let's test your understanding with some questions!

CYBER SECURITY QUIZ ?

1. What is the primary goal of cyber security?

- a) To boost the performance of computers
- b) To protect systems and data from cyber attacks
- c) To remove unnecessary files from the computer
- d) To make the internet faster

2. Which of the following is a common method used by attackers to steal sensitive information?

- a) Encryption
- b) Phishing
- c) Firewall
- d) Two-factor authentication

3. What is the purpose of a firewall in cyber security?

- a) To allow all traffic into the network
- b) To block unauthorized access and monitor network traffic
- c) To convert data into a secret code
- d) To create a backup of the system

4. Which type of attack involves sending excessive traffic to a server to make it unavailable to users?

- a) Brute force attack
- b) Denial of Service (DoS) attack
- c) Phishing
- d) Trojan horse

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5. What does encryption do to data?

- a) Deletes it permanently
- b) Compresses it to save space
- c) Converts it into a code to prevent unauthorized access
- d) Sends it to another system for processing

7. Which of the following enhances account security by requiring a second form of verification?

- a) Encryption
- b) Two-factor authentication (2FA)
- c) Firewall
- d) Malware

9. How does a Denial of Service (DoS) attack affect a system?

- a) It encrypts all data on the system
- b) It overwhelms the system with traffic, making it unavailable to users
- c) It steals passwords and sensitive information
- d) It allows unauthorized access to the system

6. What is phishing?

- a) A method of encrypting data
- b) A technique used by attackers to steal personal information via fake messages or emails
- c) A type of firewall used to protect networks
- d) A way to store passwords securely

8. Which of these is an example of malware?

- a) Antivirus software
- b) Encryption keys
- c) Trojan horse
- d) Two-factor authentication

10. What is the primary role of two-factor authentication (2FA)?

- a) To improve system performance
- b) To require two methods of authentication, enhancing account security
- c) To block phishing emails
- d) To encrypt data

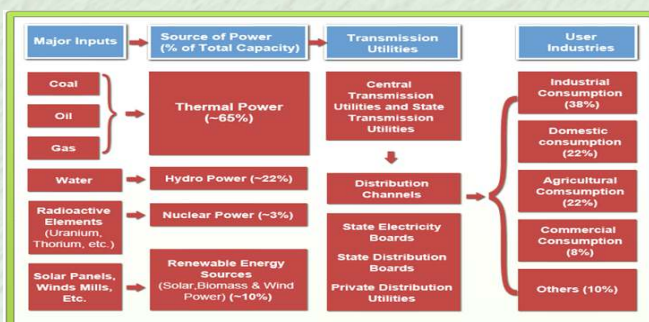
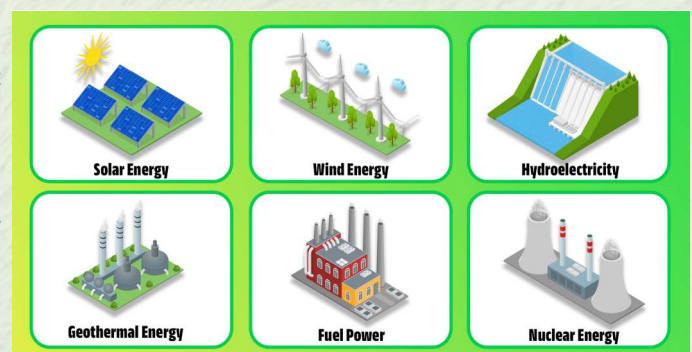
AN OVERVIEW ON INDIAN ELECTRICAL INDUSTRY

1. Introduction to the Indian Electrical Industry

The Indian electrical industry is a vast and dynamic sector, playing a pivotal role in the country's economic development. It encompasses a wide range of products and services, from power generation and transmission to electrical equipment manufacturing and distribution.

Market Size: The Indian electrical industry is one of the largest in the world, with a market size estimated to be in the hundreds of billions of dollars. It has experienced significant growth in recent years, driven by factors such as increasing urbanization, industrialization, and government initiatives to improve power infrastructure.

The industry relies on a mix of traditional sources like thermal power (coal, oil, gas) and renewable energy (solar, wind, hydro).



Transmission and Distribution utilities play a crucial role in delivering electricity to various regions. Distribution channels, including state electricity boards and private utilities, ensure last-mile connectivity.

End-User Consumption includes the primary sectors that consume electricity: industrial, domestic, agricultural, commercial, and others.

Growth Rate: The industry has consistently demonstrated robust growth, outpacing the overall Indian economy. This growth is attributed to factors like rising demand for electricity, government investments in power infrastructure, and technological advancements in the sector.

As of 2023, the market size of the Indian electrical industry was estimated to be **USD 6550.3 million**, and it is anticipated to grow at a **CAGR of 13.82%** during the forecast period (2023-2031).

Key Players

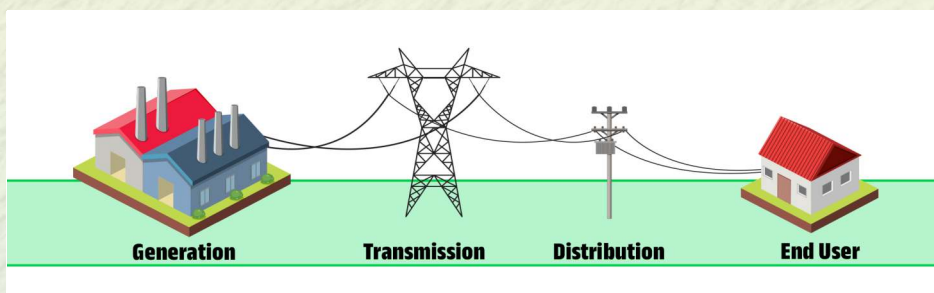
The Indian electrical industry is characterized by a diverse landscape of players, including:

- **Public Sector Undertakings (PSUs):** State-owned companies such as Power Grid Corporation of India, NTPC Limited, and BHEL play a significant role in the industry.
- **Private Sector Companies:** Tata Power, Reliance Power, and Adani Power continue to be major players, expanding their operations and investing in renewable energy.
- **Foreign Investors:** International companies like ABB, Siemens, and Schneider Electric have established a strong presence in the Indian market.
- **Small and Medium Enterprises (SMEs):** SMEs form a crucial part of the industry, specializing in various segments such as electrical equipment manufacturing, distribution, and services.

Industry Structure

The Indian electrical industry can be broadly divided into the following segments:

- **Power Generation:** Generation of electricity through various sources such as thermal, hydro, renewable, and nuclear power.
- **Power Transmission and Distribution:** Transmission of electricity from generation sites to consumers through a network of transmission lines and distribution grids.
- **Electrical Equipment Manufacturing:** Manufacturing of various electrical equipment, including transformers, switchgear, cables, and meters.
- **Electrical Services:** Providing various services such as electrical installation, maintenance, and repair.



The Indian electrical industry is a complex and interconnected ecosystem, with each segment playing a vital role in the country's power supply and economic development.

2. Latest Technological Advancements:

I. Smart Grids and Energy Management Systems

Smart Grids and Energy Management Systems represent a significant technological advancement in the electrical industry. These systems leverage cutting-edge technologies like **Internet of Things (IoT)**, **Artificial Intelligence (AI)**, and **Automation** to revolutionize the way electricity is generated, transmitted, distributed, and consumed.

IoT in Smart Grids

- **Real-time monitoring:** IoT devices, such as smart meters and sensors, collect data on power consumption, grid conditions, and equipment health in real-time.
- **Remote control:** IoT-enabled devices allow for remote control and management of grid assets, enabling efficient operations and quick response to faults.



- **Distributed energy resources (DERs):** IoT facilitates the integration of DERs, including solar panels, wind turbines, and energy storage systems, into the grid.

AI in Energy Management

- **Predictive analytics:** AI algorithms analyze vast amounts of data to predict equipment failures, optimize grid operations, and forecast energy demand.
- **Demand response:** AI-powered systems can manage demand-side response programs, encouraging consumers to adjust their energy consumption patterns to match supply.
- **Optimization:** AI can optimize energy distribution and minimize losses by identifying the most efficient routes for power flow.

Automation in Smart Grids

- **Automated fault detection and isolation:** Automation systems can quickly detect and isolate faults, minimizing disruptions to power supply.
- **Automated grid restoration:** Automated systems can restore power supply after outages, reducing downtime and improving reliability.
- **Automated meter reading:** Automated meter reading systems eliminate the need for manual meter readings, improving accuracy and efficiency.

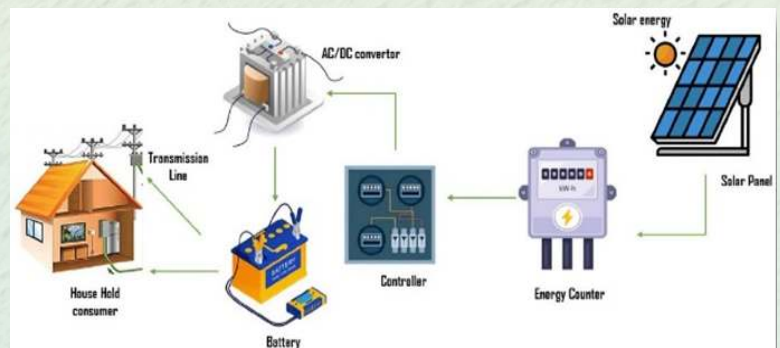
By combining IoT, AI, and Automation, smart grids and energy management systems offer numerous benefits, including improved reliability, efficiency, and sustainability. These technologies are essential for meeting the growing demand for electricity while addressing the challenges of grid modernization and climate change.

ii. Renewable Energy Integration

Renewable energy integration is another critical area of technological advancement in the electrical industry. As the world transitions towards cleaner and more sustainable energy sources, the integration of renewable energy sources like solar, wind, and hydropower into the existing electrical grid is becoming increasingly important.

Key Challenges and Solutions

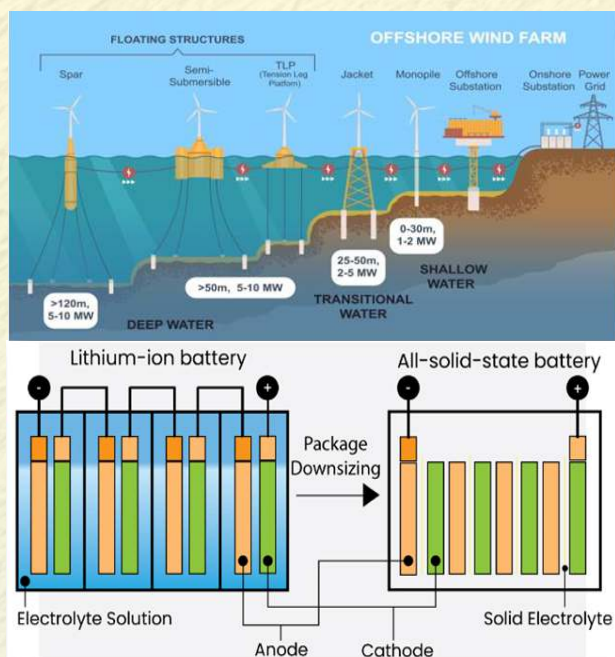
- **Intermittency:** Renewable energy sources are often intermittent, meaning their output can fluctuate depending on weather conditions. To address this, advanced energy storage systems, such as batteries and pumped hydro storage, are being developed to store excess energy during peak production periods and release it during periods of low production.
- **Grid stability:** Integrating large amounts of renewable energy into the grid can pose challenges to grid stability. Grid modernization initiatives, including the deployment of smart grid technologies and advanced control systems, are essential for ensuring the seamless integration of renewable energy.
- **Cost reduction:** While renewable energy costs have decreased significantly in recent years, further cost reduction is necessary to make them more competitive with traditional energy sources. Technological advancements in renewable energy generation and storage, along with economies of scale, are driving down costs.



Recent Developments

- **Advancements in solar technology:** High-efficiency solar panels and innovative solar tracking systems are improving the efficiency and cost-effectiveness of solar power generation.
- **Offshore wind development:** Offshore wind farms are becoming increasingly popular, offering the potential for large-scale renewable energy generation.
- **Energy storage solutions:** Battery technology is rapidly evolving, with advancements in lithium-ion batteries and emerging technologies like flow batteries and solid-state batteries.

By addressing the challenges and leveraging recent technological advancements, the integration of renewable energy into the electrical grid is becoming a reality, contributing to a cleaner and more sustainable energy future.

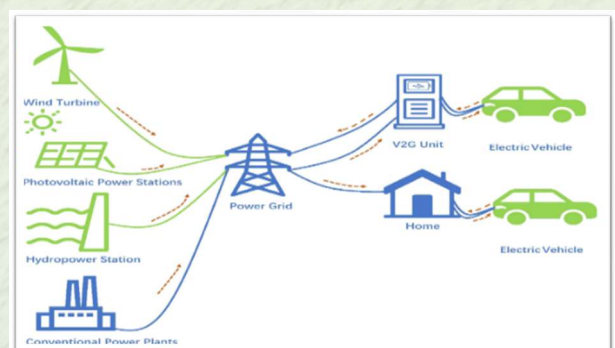
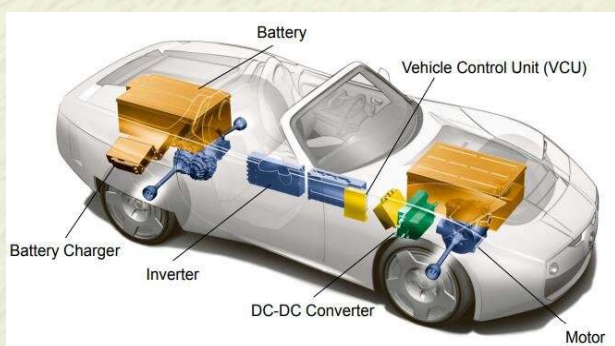


iii. Electric Vehicles

Electric vehicles (EVs) have gained significant traction in recent years, driven by concerns about climate change, rising fuel prices, and advancements in battery technology. The integration of EVs into the electrical grid presents both opportunities and challenges.

Key Trends

- **Rapid growth:** The global market for EVs is experiencing rapid growth, with a wide range of models available from major automakers.
- **Battery technology:** Advancements in battery technology, including increased energy density and faster charging times, are driving the adoption of EVs.
- **Charging infrastructure:** The development of a robust charging infrastructure is crucial for widespread EV adoption. Governments and private companies are investing in charging stations to support EV drivers.
- **Grid integration:** The increasing number of EVs can impact the electrical grid, especially during peak charging times. Smart charging technologies and grid management strategies are being developed to address these challenges.



Benefits of Evs

- **Environmental benefits:** EVs produce zero tailpipe emissions, contributing to cleaner air and reduced greenhouse gas emissions.
- **Economic benefits:** EVs can reduce operating costs compared to traditional vehicles, thanks to lower fuel consumption and maintenance requirements.



- **Technological advancements:** EVs are driving innovation in battery technology, electric motors, and other related technologies.

Challenges and Opportunities

- **Range anxiety:** Concerns about limited driving range remain a barrier for some consumers. Advancements in battery technology and the expansion of charging infrastructure are helping to address this issue.
- **Cost:** While EV prices have been declining, they are still generally higher than traditional vehicles. Government incentives and economies of scale can help to make EVs more affordable.
- **Infrastructure:** The development of a sufficient charging infrastructure is essential for widespread EV adoption. Governments and private companies are investing in charging stations to meet the growing demand.

Future Outlook in Evs:

Battery swapping technology

Battery swapping is a new technology that allows electric vehicle (EV) owners to swap out their dead or dying batteries for fully charged ones in a matter of minutes. This innovation has the potential to revolutionize the EV industry, making long-range travel easier and more convenient for drivers.



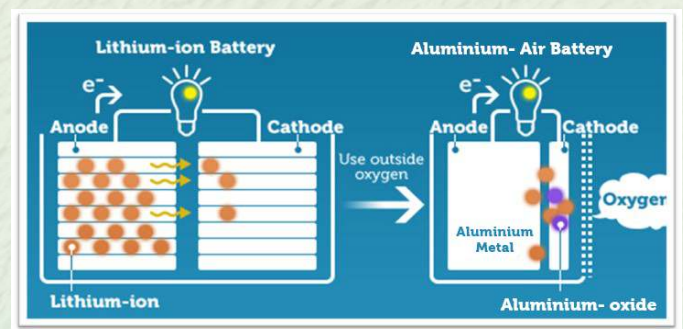
The Benefits of Battery Swapping

- Battery swapping provides a fast and convenient way to recharge electric vehicles.
- Swapping batteries is much faster than charging, meaning that drivers can get back on the road more quickly.
- The technology also eliminates range anxiety, as drivers no longer have to worry about running out of charge.
- Battery swapping is a more efficient use of resources, as it allows for the reuse of batteries rather than discarding them after a single use.
- The technology also has the potential to lower costs, as battery swapping stations could be built cheaply and easily replicated.

Aluminium air battery technology

The Aluminium Air Battery – an EV battery that does not require charging and provides long-range lightweight, cost-efficient recyclable, and ethically sourced batteries, is arguably the holy grail of the EV market.

Aluminium air batteries generate electricity by reacting oxygen in the air with aluminium.



The formula is quite simple: Aluminium + Air = Power

Advantages of aluminium-Air Battery

1. Aluminium Air Batteries do not require electricity as they do not require charging and thus are the biggest blessing for electric vehicles and their users.
2. The aluminium hydroxide solution generated in the used battery can be sent to a recycling unit to get 100% aluminium back. Aluminium air batteries are 100% recyclable and thus safe for the environment.

- Aluminium air battery technology is safer because it uses only a water-based electrolyte that is free of toxins, as opposed to lithium-ion technology which uses highly flammable organic toxins-based electrolytes. and as a result, Aluminium air batteries are EV Thermal Friendly.

As EV technology continues to evolve and charging infrastructure improves, they are poised to play a significant role in the transition to a cleaner and more sustainable transportation sector.

iv. Digital Twins in Electrical Systems

Digital twins are virtual replicas of physical assets or systems. In the electrical industry, digital twins can be used to model power plants, transmission lines, distribution grids, and other electrical infrastructure. These digital replicas provide valuable insights into system performance, enabling more efficient operations and maintenance.

Benefits of Digital Twins in Electrical Systems

- Enhanced operational efficiency:** Digital twins can be used to optimize system performance, identify bottlenecks, and reduce energy losses.
- Predictive maintenance:** By analyzing data from sensors and other sources, digital twins can predict equipment failures and schedule maintenance proactively, reducing downtime and costs.
- Scenario testing:** Digital twins can be used to simulate various scenarios, such as equipment failures, extreme weather events, or changes in demand, allowing for testing different operational strategies and identifying potential risks.
- Remote monitoring and control:** Digital twins can enable remote monitoring and control of electrical systems, improving operational efficiency and reducing the need for on-site personnel.

Implementation of Digital Twins in Power Plants

- Data collection:** Sensors and other devices are installed throughout the power plant to collect data on various parameters, such as temperature, pressure, vibration, and energy consumption.
- Model creation:** A digital twin of the power plant is created using advanced modelling techniques, incorporating data from the physical asset.
- Simulation and analysis:** The digital twin can be used to simulate different operating conditions, analyze system performance, and identify potential issues.
- Optimization:** Based on the insights gained from the digital twin, operational strategies can be optimized to improve efficiency and reduce costs.

Digital twins are a powerful tool for improving the efficiency and reliability of electrical systems. By leveraging data-driven insights and advanced modelling techniques, digital twins can help to address the challenges of grid modernization and ensure a sustainable energy future.

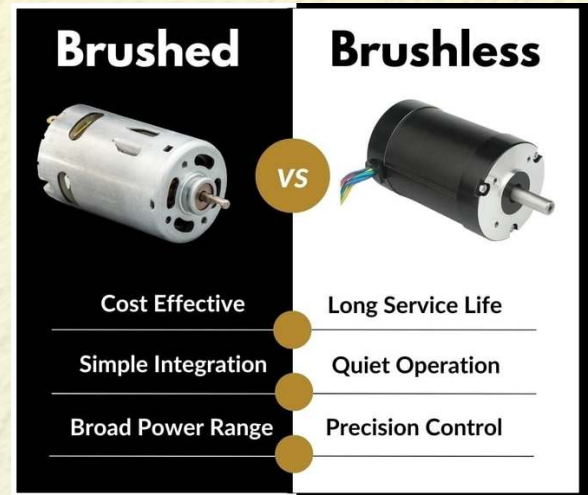


V. BLDC Technology: A Modern Electric Motor

Brushless DC (BLDC) motors have emerged as a popular choice in various applications due to their superior performance and efficiency compared to traditional brushed DC motors. BLDC motors are characterized by the absence of mechanical brushes, which reduces friction, improves efficiency, and extends motor life.

Key Features and Benefits of BLDC Motors

- **High efficiency:** BLDC motors offer higher efficiency than brushed DC motors, resulting in lower energy consumption and reduced operating costs.
- **Torque density:** BLDC motors can produce high torque over a wide speed range, making them suitable for demanding applications.
- **Long lifespan:** The absence of mechanical brushes eliminates the need for frequent brush replacement, extending the motor's lifespan.
- **Quiet operation:** BLDC motors operate more quietly than brushed DC motors due to the lack of brush friction.
- **Precise control:** BLDC motors can be precisely controlled using electronic commutation, enabling accurate speed and torque regulation.



Applications of BLDC Motors

BLDC motors are widely used in various industries, including:

- **Automotive:** Electric vehicles, hybrid vehicles, and power steering systems
- **Industrial automation:** Robotics, conveyor systems, and machine tools
- **Home appliances:** Washing machines, dryers, and vacuum cleaners
- **Consumer electronics:** Power tools, drones, and RC vehicles
- **Medical equipment:** Ventilators, pumps, and surgical tools

Technological Advancements in BLDC Motors

- **High-temperature operation:** BLDC motors are being developed to operate in high-temperature environments, expanding their potential applications.
- **Sensorless control:** Sensorless BLDC motors eliminate the need for mechanical sensors, reducing costs and improving reliability.
- **High-speed operation:** BLDC motors are capable of operating at high speeds, making them suitable for applications such as high-speed spindles and turbines.
- **Integration with power electronics:** BLDC motors are often integrated with power electronic drives for efficient control and operation.

As BLDC motor technology continues to evolve, they are expected to play an even more significant role in various industries, driving energy efficiency and improving performance.

3. Challenges and Opportunities in the Indian Electrical Industry Challenges

- **Regulatory Framework:** Complex and evolving regulatory landscape can pose challenges for industry players, especially for smaller businesses.
- **Infrastructure Development:** Despite significant progress, challenges remain in terms of grid infrastructure, especially in rural areas, which can hinder the growth of the industry.

- **Competition:** Intense competition from both domestic and international players can put pressure on margins and market share.
- ****Skill Gap:** A significant challenge facing the Indian electrical industry is a shortage of skilled professionals, particularly in emerging areas like renewable energy, smart grids, and electric vehicles. This skill gap can hinder the industry's ability to meet the growing demand for innovative solutions and technologies.
- **Supply Chain Disruptions:** Global supply chain disruptions, such as those caused by the COVID-19 pandemic, can impact the availability of raw materials and components.

Opportunities

- **Renewable Energy Growth:** The government's strong focus on renewable energy presents significant opportunities for the electrical industry, including the development of solar, wind, and hydropower projects.
- **Infrastructure Development:** The ongoing infrastructure development initiatives, such as the National Electricity Plan, offer opportunities for the electrical industry to participate in projects related to power generation, transmission, and distribution.
- **Energy Efficiency:** Increasing focus on energy efficiency presents opportunities for the industry to develop and market energy-efficient products and solutions.
- **Smart Grid Technology:** The deployment of smart grid technologies offers opportunities for the industry to develop and implement advanced solutions for grid management and integration of renewable energy.
- **Electric Vehicles:** The growing adoption of electric vehicles presents opportunities for the industry to participate in the development of charging infrastructure and related technologies.



To address the skill gap, the industry and educational institutions must collaborate to:

- **Develop relevant training programs:** Curricula should be updated to reflect the latest technological advancements and industry trends.
- **Promote vocational training:** Vocational training can provide practical skills and hands-on experience to meet industry needs.
- **Foster industry-academia partnerships:** Collaborations between industry and academic institutions can help bridge the gap between theoretical knowledge and practical application.
- **Offer apprenticeship and internship programs:** These programs can provide valuable on-the-job training and experience for students.
- **Invest in upskilling and reskilling:** Existing employees can benefit from upskilling and reskilling programs to acquire the necessary skills for emerging technologies.
- By addressing the skill gap, the Indian electrical industry can ensure a sustainable future and meet the growing challenges and opportunities presented by the evolving landscape.

4. Future Outlook: Industry Predictions

The Indian electrical industry is poised for continued growth, driven by factors such as increasing urbanization, industrialization, and government initiatives to improve power infrastructure. Here are some key predictions for the future:

- **Power Requirements for AI-Enabled Technology:** The power consumption of AI-enabled systems is expected to grow exponentially in the coming years. As AI models become more complex and capable, they will require increasingly powerful hardware to operate. Data centers, which house the servers and infrastructure needed for AI applications, are already major consumers of electricity. With the increasing reliance on cloud computing, the demand for data center capacity is likely to continue growing, further driving up power consumption.
- **Renewable Energy Growth:** The Indian government has ambitious targets for renewable energy adoption, and the industry is expected to see significant growth in solar, wind, and other renewable energy sources. By 2030, renewable energy is projected to account for **500 GW** of India's total installed capacity.
- **Smart Grid Development:** Investments in smart grid technologies will continue to grow, enabling better grid management, integration of renewable energy, and improved energy efficiency. By 2025, it is estimated that **50%** of India's electricity distribution network will be upgraded to smart grids.
- **Electric Vehicle Adoption:** The government's push for electric vehicles is expected to drive demand for related infrastructure, including charging stations and battery storage systems. By 2030, it is projected that **10 million** electric vehicles will be on Indian roads.
- **Technological Advancements:** The industry will continue to witness technological advancements in areas such as energy storage, power electronics, and automation. These advancements will improve efficiency, reduce costs, and enhance the reliability of electrical systems.
- **Increased Focus on Sustainability:** There will be a growing emphasis on sustainability and environmental responsibility in the electrical industry. This will drive the adoption of green technologies, energy-efficient solutions, and sustainable practices.

Overall, the Indian electrical industry is well-positioned for growth and innovation. By addressing the challenges and capitalizing on the opportunities, the industry can play a vital role in India's economic development and transition to a cleaner and more sustainable energy future.

5. SDI-B: A Catalyst for Bridging the Electrical Industry Skill Gap

The Skill Development Institute, Bhubaneswar (SDI-B), has taken a significant step towards addressing the critical skill gap in India's electrical industry. Through its partnership with Schneider Electric, a global leader in energy management and automation, SDI-B has established a state-of-the-art Center of Excellence (CoE) in these areas.

A Comprehensive Training Hub

The CoE boasts ten specialized labs, covering a wide range of electrical technologies, including home automation, industrial automation, building management systems, power quality, and renewable energy. This comprehensive infrastructure enables SDI-B to offer a diverse range of training programs tailored to meet the evolving needs of the industry. Labs are - **Building & Home Automation Lab** (Home Automation Systems); **Industrial Automation Lab** (PLC & HMI Stations); **Building Management System Lab** (HVAC Control Panels); **Home & Building Installation Lab** (Model Installation Units); **Assembly Line & Industry 4.0 Lab** (Assembly line 4.0 systems); **Power Quality & Medium Voltage Lab** (Energy Ventilation kits); **Industrial Installation Controls & Drives Lab** (Industrial Drive Units); **SCADA Lab** (SCADA systems); **EV Charging stations**; **Solar Lab** (AC Microgrid systems).



As a member of the International Solar Alliance, Schneider Electric has established a Solar Technology Application Resource Center (STAR-C) within the CoE. This center provides training in solar technology, further strengthening SDI-B's position as a leading provider of vocational education in the electrical industry.

Key Training Programs

SDI-B offers the following courses, utilizing the advanced facilities at the Schneider CoE:

- **Advanced Diploma in Automation:** A comprehensive program covering various aspects of automation technologies.
- **Building Automation Specialist:** A specialized program focused on designing and implementing building automation systems.
- **Building Automation Technician:** A hands-on program for technicians working in building automation.
- **Electrical Operation & Maintenance Engineer :** A program designed to train professionals in energy efficiency and management.
- **Industrial Automation Specialist:** A program focused on industrial automation systems and processes.
- **Solar PV Installer:** A program for individuals seeking to become certified solar PV installers..

Impact and Results

To date, 442 students have successfully completed Schneider CoE-related courses, demonstrating the program's effectiveness. The institute has also achieved a commendable placement rate of 94%, highlighting the value of its training programs in preparing graduates for the job market.

Answers to Cyber Security Quiz

1. b) 2. b) 3. b) 4. b) 5. c) 6. b) 7. b) 8. c) 9. b) 10. b)



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