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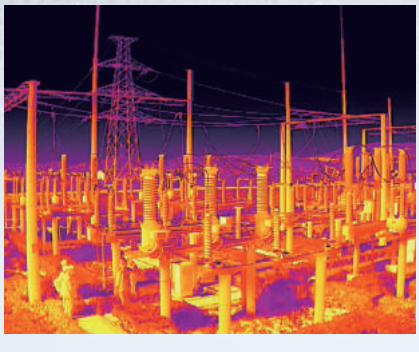

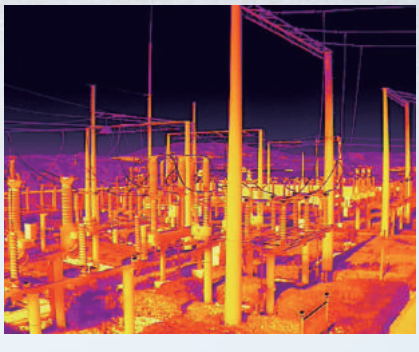

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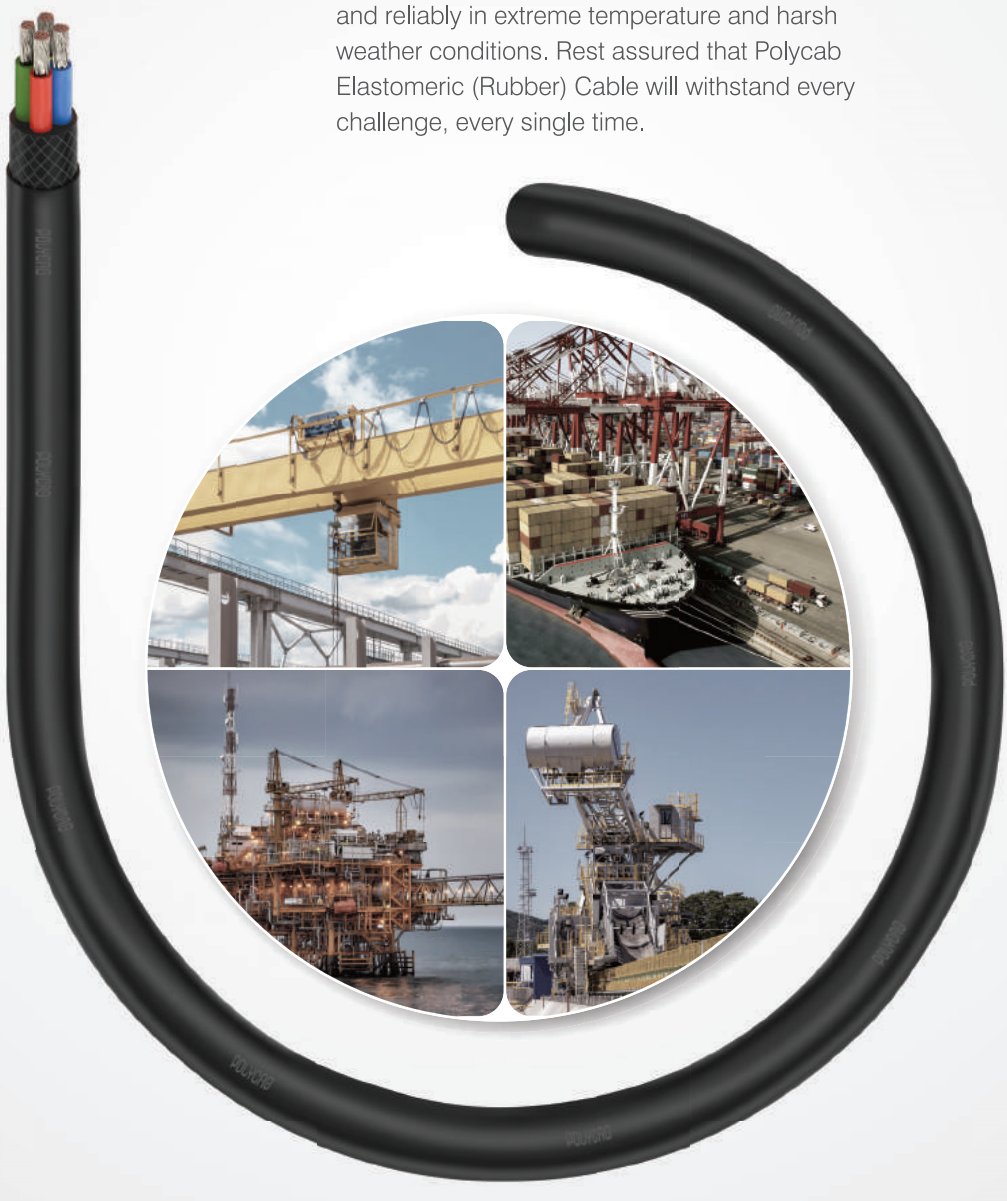

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IREDA signs MoU with TANGEDCO for green energy projects

Under this MoU, IREDA will extend its technical expertise to TANGEDCO for energy project development, bid process management and implementation support.

Indian Renewable Energy Development Agency Ltd. (IREDA) recently signed a Memorandum of Understanding with the Tamil Nadu Generation & Distribution Corporation Limited (TANGEDCO), for providing its technical expertise in developing Renewable Energy projects and fundraising.

Under this MoU, IREDA will extend its technical expertise to TANGEDCO for energy project development, bid process management, and implementation support. IREDA will also assist TANGEDCO in debt raising through developing financial models, assistance in the understanding market instrument, underwriting services for the proposed debt requirement, and conducting pre-market surveys, roadshows to generate interest amongst prospective investors.

The MoU was signed by Pradip Kumar Das, Chairman & Managing Director (CMD), IREDA and Rajesh Lakhoni, CMD, TANGEDCO in the presence of M K Stalin, the Chief Minister of Tamil Nadu and other dignitaries.

TANGEDCO is planning for 20000 MW of Solar Power Project, with adequate Battery Storage, 3000 MW of Pumped Storage Hydro Electric Project, and 2000 MW of Gas Based Power Plant for efficient Renewable integration. The estimated loan required for the above projects is about ₹ 1,32,500 crores approximately.

Ayana and Greenstat Hydrogen sign MoU for green hydrogen production

The collaboration between Ayana and Greenstat will accelerate the development of an Indian ecosystem for green hydrogen initiatives.

Ayana Renewable Power (Ayana) and Greenstat Hydrogen India, a Norwegian energy organisation, recently signed a Memorandum of Understanding (MoU) to accelerate the hydrogen technology development in India. The objective of this partnership is to collaborate on developing projects for production of green hydrogen.

The collaboration between Ayana and Greenstat will accelerate the development of an Indian ecosystem for green hydrogen initiatives. The MoU brings together the development and operating expertise of Ayana in India, along with the technical expertise of the Greenstat Group.

Speaking on the partnership, Shivanand Nimbargi, Managing Director and CEO, Ayana Renewable Power said, "Ayana is delighted to partner with Greenstat to accelerate the production of green hydrogen in India. For India, hydrogen presents a great potential opportunity as it will decrease reliance on fossil fuels and focus on sustainable sources of energy. We anticipate that our initiatives will support the National Hydrogen Mission, to fast-track India's decarbonisation of grid and providing energy storage solutions for industrial sector, and transportation sector over the next few years."

Sturle Pedersen, Chairman, Greenstat Hydrogen India, added, "Leading a broad representation of Norwegian cutting-edge expertise within the hydrogen sector, we are thrilled to be a part of this exciting journey together with Ayana Power, the Indian industry, R&D institutes and the Indian government. Hydrogen is already a dominant part of the energy value chain world-wide; the challenge now is to revert the energy ecosystem back into its natural evolution. Renewable energy must replace fossil fuels, to preserve our habitat, and to preserve our mobility.

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HPL Electric & Power expands its switchgear portfolio at 14th REI

HPL Electric and Power Limited adds three new DC Switch Disconnector of up to 1500V DC and 800V AC in 2, 3 & 4 Pole configurations, built particularly for PV applications.

HPL Electric & Power, one of the leading players in Electric and power sector, today launched three new switchgear products - DC Switch Disconnector up to 1500V DC and 800V AC in 2, 3 & 4 Pole configurations at 14th Edition of Renewable Energy Expo 2021. The new switchgear products were unveiled by Bhagwanth Khuba, Minister of State, New and Renewable Energy, Chemicals and Fertilizers, Government of India at the event.

The new DC Disconnectors are built particularly for PV applications and are very robust and long-lasting. They have a rated voltage of up to 1500VDC and can be utilised in PV power systems. They provide safe electrical isolation in presence of Arc Chutes to evade chances of hazards due to Arcs developed in DC Circuits. The switches make and break quickly under load conditions.

The load break switch is a high performance sturdy switch in a compact frame. It provides safe isolation even at low voltages and up to 800V AC. The isolator can perform equally well on either on roof or ground mount solar panel applications. Moreover, the switches have inbuilt safety measure to quench arcs within the mould with the help of Arc Chutes. It also gives efficiency that leads to the low power losses.

C. R. Kundu, Sr. Vice President, Switchgear, HPL Electric & Power, said, "We at HPL have been working towards creating new technology which itself paves ways for others to follow and out mark today's need in renewable energies. These best in class products offer the latest technology and innovative designs for long lasting durability. These products are compatible with solar/ PV applications as well as for traditional PV Applications."

For further information on HPL Electric & Power Limited see www.hplindia.com

BHEL commissions India's largest floating Solar PV plant

A major milestone towards self-reliance in floating solar technology.

Bharat Heavy Electricals Limited (BHEL) has successfully commissioned India's largest floating Solar PV plant. Located at NTPC Simhadri in Andhra Pradesh, the 25 MW floating SPV project covers an area of 100 acres, leading to the saving of valuable land resources and conserving water by reducing evaporation.

The unique state-of-the-art project is created by BHEL. Besides producing clean power, the project will also reduce water evaporation by providing shade to the covered area. It will also have a higher yield as compared to conventional ground-mounted projects due to the cooling effect. BHEL has designed the floating array to meet the unique requirement of anchoring the support structures without touching or loading, either the reservoir floor or the bund structure. This complex module array has been designed – for the first time in India to withstand gusts of wind up to 180 km/hr. In view of the coastal location of the project site that leads to severe corrosion, all the platform structures and other equipment have been made corrosion resistant.

BHEL's portfolio of floating SPV projects is of 45 MW projects commissioned and around 107 MW under execution. It is one of the leaders in EPC for the solar industry in India with an overall EPC portfolio of more than 1.2 GW. In addition to providing EPC solutions for space-grade solar panels and batteries for space applications, the company offers solutions for both grid-interactive and off-grid, ground-mounted, rooftop, floating and canal top solar plants. In addition to space-grade solar panels and batteries for space applications.

IMPROVE THE STABILITY OF THE GRID AND THE ENERGY SYSTEM

Automation of energy grids has many advantages. The advantages include the possibility of monitoring and remote control. WAGO has the right solutions.

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SMART SOLUTIONS IN ENERGY MANAGEMENT

Experts from the power sector and the energy management systems discussed the new developments in energy management and the evolving technologies for effective energy management.

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India is prepped up to have efficient energy management systems and solutions, and we already have numerous technology solutions are already available in India. When we talk about efficient energy management for transmission, distribution and generation with distributed energy resources, the generation is closer to the point of consumption. This ultimately reduce some technical losses, along with the other losses associated with transmission and distribution too are eliminated. Although we already have smart solutions and smart devices available, we might need to look at the policy to have some additional feature available like, smart price signals that can assist us in utilising smart devices in the energy management function for efficiency.

According to **Kumud Wadhwa, Senior General Manager–PMU, National Smart Grid Mission,** "Industry also should work towards interoperability in order to make some progress towards smart metering solutions, as the progress is still limited. Interoperability for smart metering can be achieved only when we have the same communication chip in all the meters, which is not something desirable in the long run. So, I think industries should come together and work out a solution that is truly interoperable, and we can get plug-in-play kind of modules for any communication technology, and for any communication service provider to fit in with any smart meter and then deliver the solution in an end-to-end manner."

Dealing with cyber security

It's imperative that we follow the standards and practices through techniques like PKI, encryption and other key deployment that are already available. But that won't suffice, as we still lack some practices or processes that can enhance the safety and security of our systems.

Recently, there was an incident in one of the states wherein a lot of meters got tripped because the processes were not well established and there was some inadvertent command which led to some

undesired tripping. Hence, there's a need to define the process and know the protocols for taking action. These are present in standard business processes, which are not smart; so adaptation towards smart processes are also required before delivering smart solutions in a cyber-secured manner.

Noting the vitalities of cyber security, Kumud agrees to the need to rework a little on the cyber security standards which are globally followed. She further adds, "We can get to know those standards by way of the numbers, from sources like NIST and others are already declared. Those standards are being referred in the CEA guidelines for smart metering and other such specifications as and when they are prepared. So cyber-security standards are there.

The challenge here is, how do we implement those standards; and how do we validate if they are being followed? People do declare that these are being followed, but do we have sufficient validation systems to really check whether those standards are really followed in spirit or not? As a result, validation and testing systems must be prepared to ensure that cyber security standards are included in the solutions.

Standards and guidelines are available globally and there are multiple options to it. But the issue is when it comes to energy management that will actually reach to the consumer premise, and interacting with devices that affect the consumer's life on a daily basis. Here, according to Hem P Thukral, Associate Vice President, EY India, "So, we need to tweak those standards and guidelines that are more general, because they add more depth to the power sector, and we need to define specific standards, applications and guidelines for energy management, focusing on consumer applications. That's the way that we, as a country need to move forward. It's probably a good action item for BIS as well to take into consideration."

Automation and digitalisation enabling security system

Explaining significance of automation and allied technologies Vineet Jain, Head – Automation Practices, WAGO India says "Field equipment is being connected directly into these automation systems and you can achieve all the data. So, you have got a lot of data which can be utilised and analysed, and take preventive actions for that. So it has also been a monitoring central location now, like in SCADA, as remotely it has been accessing this field equipment.

If there is some failure or fault, the equipment can be isolated from other systems to make them work without any hurdles or interruptions, and it can be that particular system that can be easily isolated and can be maintained. Furthermore, in the case of the smart grid, if there is an equipment or cable failure, it can be routed from different areas. As a result, consumer supplies are unaffected. Management becomes quite easy in that case with automation.

Topological challenges present an opportunity rather than a challenge to remotely perform activities and also not operate independently from the grid.

▶ *Hem P Thukral,*
Associate Vice President, EY India

We need to create more specific practices and processes to enhance the safety and security of our energy management systems.

▶ *Kumud Wadhwa,*
Senior General Manager–PMU,
National Smart Grid Mission

Many things are required for data analysis conversions like artificial intelligence, algorithm writing, and India is excelling at it.

▶ *Vineet Jain,*
Head – Automation Practices,
WAGO India

Dealing with geographical challenges for efficient distribution

Definitely typological and geographical challenges will also have a bearing. But, that's actually an opportunity, especially, where we physically can't go, where the DISCOMs cannot go and set up their systems. "We need to have appropriate communication infrastructure, where remotely, we can manage those buildings. And, I'll even go a step further, and say that those buildings, as I said, can operate like a micro grid", comments Hem. So, ideally, you don't need to connect with a grid, but there has to be a D-linkage with the utility. With this, the buildings or homes would have their own generation, local distribution, and storage facilities along with the DERs, to say. "Topological challenges present an opportunity rather than a challenge to remotely perform activities and also not operate independently from the grid," Hem adds.

Vineet on the other hand, talks about addressing topological challenges with automation. "For remote connections, where it is not possible to lay down communication cables, it is good to put things on the cloud, IoT, and GRSM; these are the things that utilities are preferring these days. They are putting compact substations near to these buildings and collecting all the data," he explains. It has become quite easy for the communication part for them to collect the data from these buildings and energy meters and everything they are doing.

Smart communication systems for energy management

India is too good in the case of IT. Now, many things are required for data analysis conversions like artificial intelligence, algorithm writing. These can be very good forms of setup. When it comes to cloud or IoT services, utilities are not at all comfortable designing these dashboards, where they can put the analysis online. So, this is what they can do. Cost-effective equipment can be manufactured by these start-ups to collect the data from the field.

Here, Vineet is of view that these utilities operate on a single protocol or/and tele-control protocols. He says, "These are the things which are quite good and we have got limited manufacturers. Most of this equipment is imported. Why not in India? So we have good future for this equipment manufacturing, as well as for functional IT. What we already have is very good."

Agreeing to Vineet's views on dashboards using the data analytics from IoT and other smart devices, Kumud suggests that we need to figure out how we can design and develop some low-cost communication chips. We are mostly dependent on imports when it comes to these. So, whether there can be a start-up or some initiative taken to have these communication chips, those communication chips can be based on 5G, radio frequency, or PLC, because PLC is also a very valid option for Indian systems.

"Recently, one of our pilots was struggling because the power line communication chip being imported from Israel was not available at the right price. That was a hurdle for him to move ahead, so maybe the start-ups can look into those areas as well. Also, we need look at designing a communication chip which is very cost-effective and deliver desired performance when there are new concentrations of latency requirements for various solutions," suggests Kumud.

As per Hem's views, "AI and ML portions of the value chain are where startups can come up and create/generate algorithms and solutions that can do the prediction with the least amount of error. I think that's where the goal is. And that led to a big impact on the sector."

The shortage of semiconductors has an impact on energy management solutions

Hem terms it as a pertinent challenge. When we talk to industry players, we also face similar issues. So, having chipsets being developed in India is a very novel idea, as we can get the silicon and possibly convert them into products and solutions. Perhaps looking at the bigger Smart City piece, although that's not the scope of this topic, but if we look we look at it, especially for India, where billions of sensors will be deployed, it will be worthwhile to have or consider having a semiconductor fabrication lab in India.

For the past eight to ten years, we've been hearing about big companies and industries trying to do this and trying to enter into this domain. But having a fab lab in India has also brought benefits from a security perspective. The chips and the silicon is prepared or manufactured in India, so there are no bugs but its a long shot today. It's not an easy thing. People have tried and have failed, but looking at an institution or governmental level, I think that's definitely one thing that can be taken up.

The final word

We touched upon how this sector is reforming from a smart meter to smart way, to smart solution perspective. And that we need to convert these technologies into products or solutions. We further highlighted how we can package solutions to get a better benefit and how the consumers will identify what they need or not. Therefore, monitoring only won't suffice. We need to extract value from the data, and if you look at smart meters today, most of the disciplines are doing that or they're doing remote collection of the data. They're just sending commands, but the true value will be realised once we extract value from the data, and that's where AI, ML and other novel technologies will come in.

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We believe in making energy solutions affordable and accessible

EESL is looking to augment demand side management with demand response through iot based feedback and controls.

Animesh Mishraa, Chief General Manager, Head (Sales & CCPR), EESL

In an interview with EPR Magazine, Animesh Mishraa, Chief General Manager, Head (Sales & CCPR), EESL, talks about Control & Automation as an effective tool for energy conservation and scouring the globe for best-in-class products and distributing them throughout the country.

How do you look at the importance of energy efficiency in the current scenario?

India's energy sector has undergone a sea of changes and adopting energy efficiency has become vital for the sector. The traditional centralised model is now no longer viable to meet the demands of modern energy landscape. With rapid industrialisation and urbanisation, the nature of energy demand has changed drastically. The rise in demand of renewable energy has also necessitated the need for smart electricity and a smarter, more flexible grid.

Smart metering is one of the most comprehensive tools in the Indian distribution sector's arsenal to usher in a new milieu of energy measurability. The Smart Meter National Programme, has seen over 16 lakh smart meters installed across the country, resulting in a large-scale reform of the sector. Smart meters are also making DISCOMs agile by offering lead indicators on demand and mitigating the need for manual checking. They enable auto collection of meters read over the air, reducing the need for manual intervention, remote connect/ disconnect and enabling digital payments of bills.

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How is technology evolving for energy saving and being efficient in generation, transmission, distribution?

The creation of a digitalised and interconnected energy ecosystem is a key imperative. We have already begun moving in this direction, with the advent of Advanced Metering Infrastructure (AMI). Smart metering is the first step towards the creation of a smart grid and great progress has been made in this regard.

These driving forces will change the way energy is managed, distributed and utlilised. With a smarter and digitalised grid, new touch-points will emerge across the value chain. The ability to track electricity usage will alter consumption habits, while the remote monitoring by DISCOMs will enable a more efficient distribution system. These two, when combined will streamline the energy system, leading to efficient usage and distribution, which would further germinate increased energy and monetary savings.

EESL functions with the belief that it is essential to adopt a market-led approach to make efficient and future ready technology solutions accessible, affordable, and available. The initiatives implemented by EESL are worthy of global recognition and replicability.

What are the trending design features that lead to efficiency in energy grids and distribution networks?

Delicensing, decentralisation, digitalisation and decarbonisation are the key game-changing disruptions that can modernise the power sector and help overcome the existing loopholes in the country's power system. These trends are paving the way for new models for improving customer service, based on digital disruption and customer centricity.

What are the digital and IoT solutions being developed for energy efficiency in renewable energy?

Smart meters enable DISCOMs to forecast energy demand cycles in real-time, and swiftly rebalance

the grid's energy sources, achieving renewable energy infusion. With smart meters, DISCOMS can record and anticipate fluctuations throughout the day, helping them explore 'Time of Use (ToU) tariffs' that accurately reflect energy prices.

Through the deployment of Smart Meters, consumers have access to a prepaid billing model, which is quite remarkable, as it enables the consumers to pay in accordance with their ability, convenience and helps rationalise electricity consumption.

EESL is implementing the Energy Efficient Pump Programme to distribute BEE five-star energy efficient agricultural pumps and ensures a minimum of 30 percent reduction in energy consumption with smart control panels which can be remotely operated to enhance the ease of operation of pumps by the farmers.

What are the latest developments in automation solutions for efficient energy management in residential and commercial buildings?

Monitoring, Control and Automation plays a very important role in energy management. Control & Automation is an effective tool for energy conservation and have improved quality of operations to a great level due to recent technological advancement. Theseare the various smart technologies that can improve the building operations:

- **HVAC-** EESL Energy Solutions had been retrofitting conventional buildings with energy efficient HVAC. A huge chunk of energy consumption in any industry is by the HVAC; hence it is necessary to ensure that the energy consumed for HVAC is optimised and efficient HVAC system use multiple sensors for monitoring and control. Smart HVAC controls can limit energy consumption in unoccupied building zones, detect and diagnose faults, and reduce HVAC usage, particularly during times of peak energy demand.

- **Energy Efficient Lighting –** EESL Energy Solutions Lighting wing is a expert in sustainable, energy-efficient LED lighting. We offer a broad spectrum of materials such as tube light, bulb, streetlights, panel lights and other LED lighting solutions for commercial and residential applications. We scour the globe for best-in-class LED lighting products and distribute them throughout the country. Energy efficient lighting LED provide twice the lumens per watt of electricity than legacy metal halide fixtures. Luminaire light level controls are rapidly developing and gaining market recognition.

- **Plug Loads -** In existing buildings, smart plug load controls consist of auto-controlled receptacles and power strips that rely on time scheduling, motion sensing, or load detection to completely cut off power to equipment that is not in use.

- **EESL's Super-Efficient AC Program (ESEAP) -** With the goal of integrating energy efficiency into India's cooling sector, EESL has initiated a first of its kind, Super-Efficient Air Conditioning programme.

Can you share some of the latest solutions from your company for energy efficiency?

With our vision to provide universal access to sustainable energy solutions and enable a low carbon future, along with delivering socio-economic impact, we always strive towards unlocking the energy efficiency market in India. EESL has been implementing the world's largest energy efficiency portfolio across sectors like lighting, buildings, smart metering, agriculture, etc. With the concerted efforts towards building a robust ecosystem for LED lighting in India UJALA & SLNP have brought a market transformation in energy efficiency sector.

Under UJALA scheme, LED Tube lights and Energy efficient fans have also been provided to domestic consumers for replacement of conventional and inefficient variant. As of date 36.77 Crore LED bulbs have been distributed and over 72.17 lakh LED tube lights and 23.58 lakh energy efficient fans under the program. Under SLNP, we have about 1.19 crore LED street lights across India. This has resulted in estimated energy savings of 8.01 billion kWh per year with avoided peak demand of 1,334 MW and estimated GHG emission reduction of 5.51 million tCO2 per year and estimated annual monetary savings of ₹ 5,605 crore in electricity bills of municipalities.

We are now replicating the revolution brought about by the LED programmes to our other initiatives like:

RAISE: EESL has taken up the mantle of retrofitting office air-conditioning and ventilation systems, as a part of its "Retrofit of Air-conditioning to improve Indoor air quality for Safety and Efficiency" initiative.

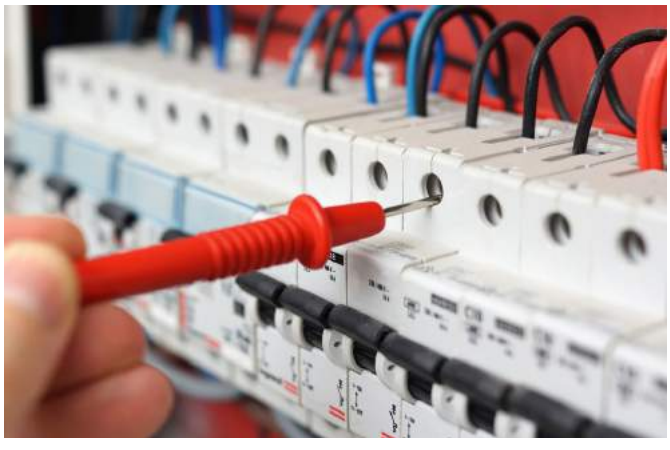
IEES: EESL is also providing an integrated Energy Efficiency Solutions (IEES) as a package for industries, commercial buildings and facilities. The package includes the following interventions:

- Energy Efficient LED Lighting System
- Energy Efficient Electric Motors (IE-3 Class)
- Super-Efficient Air-Conditioners (SEAC)
- Tri-Generation
- Green Transportation System (E-Vehicles)
- Improved Air-Quality System for Occupational Safety & Energy Efficiency – A COVID-19 mitigation initiative

Furthermore, EESL is aiming to soon venture into the provision of energy efficient and sustainable induction cooktop, brushless direct current fans, and invertor bulbs.

Embracing technology and innovations to enhance power sector's performance

This article touches upon various aspects of power sector, and analyses the impacts of automation and technologies.



Performance of Indian power sector has improved over the years. Indian power sector has successfully implemented various automated programmes like Automatic Meter Reading (AMR) and others. When we talk about enhancing power plants performance in India, there are various aspects that impact the overall performance of power plants. Even the government has been adopting various measures like increased implementation of automation and allied technologies to boost the performance of power plants and control the output.

Evolution of automation in power sector

In recent days, the governments around the globe pursuing renewable energy sources in response to global warming and abnormal weather events. Also this development is benefiting economic greatly. According to Mohit Kumawat, IIoT Sector Head, Advantech India, "While building power plants most of the SI or the contractor will confront with data collection, control and integration challenges. So there is in need to adopt data acquisition and management. The acquisition management system collects data and enables remote monitoring, control and management, for increasing plant's efficiency.The aim is to collect and integrate onsite data, giving administrators access to all important data on a single platform.

Technologies to enhance power plant performance

Operations and maintenance are termed as the two key pillars of power plants. Today's operations team faces challenges such as frequent changes in operation modes, plant cycling, frequency control, technical minimum, fast ramp-up and ramp-down, and so on, in order to get the best output from a plant. Such variations in operation mode cause additional demands on power plant components, making their upkeep equally vital for plant reliability, which is pursued by maintenance.

Digitalisation can further enhance the power plant performance, here digitalisation refers monitoring and predictive maintenance of various equipment's involved in critical process. For example -

- Advanced analytics use sound monitors and trends to preemptively flag heat recovery steam generator tube leaks.
- Predictive/Preventive maintenance of valves by using smart meters.
- Combustion Monitoring system.
- Following are trending technologies and innovations in substation automation
- Situation room in power plant for management level as well as tracking of every big and small process in Power Plant with prioritised dashboard can reduce workload and enable better feet-level visibility.
- Self-Healing Smart Grid is most important and trending technology in energy sector as energy is basic need of humans. Self-healing in smart grid is 20 times faster than Manual switching.
- When it comes to digitalization than another disadvantage is cyber attacks so cyber security is another important technology in energy sector.

Automation addressing challenges in power sector

No visibility in demand and supply: to overcome from this issue, every step need to be monitored carefully from generation to supply at end user. To overcome this issue AI need to be implemented based on historical data.

Automation driving the future of power sector

As the world shifts in the direction of personalized digitized services, the energy sector is lagging behind. AI can help transform data collection, storage, and management, allowing the energy sector to catch up with the times. Despite how powerful and profitable this sector is, it still relies heavily on manual work. Energy companies have a lot of data to manage. With the help of AI, they can store, process, and manage data more time and cost-efficiently. Implementing innovative technology can help the energy industry get more competitive under the conditions of an unstable economy and develop better operational methods than those currently available. Moreover, AI data management can reveal new insights that can completely change how the industry works.

India intends to continue leading the path of Energy Transition

India is among one of the few countries globally which has kept to its Paris Climate Change (COP21) commitments along with an exponential increase in renewable energy capacity. Considering the pace of development in the energy sector, India is determined to not only achieve, but to exceed its NDC commitments well within the committed time frame. This was stated by RK Singh, Union Minister of Power and New & Renewable Energy, in his keynote address at the webinar on "A Multilateral Approach to Building a Global Hydrogen Economy". The event was recently organised by the Ministry of New and Renewable Energy (MNRE), Government of India and the Council on Energy, Environment and Water (CEEW).

Addressing the gathering virtually Singh said that India is world leader in Energy Transition. India's NDC is to increase the share of non-fossil fuels to 40 percentage of the total electricity generation capacity by 2030 but at the current rate we might be able to achieve almost 50 percent from non-fossil fuel by 2030.

"India is a world leader in Energy Transition and intends to continue leading the path. He added that we achieved milestone of 100 GW of installed Renewable Energy Capacity which is a matter of pride for us", Singh added. This not only marks an important milestone in India's journey towards its target of 450 GW by 2030, but also builds upon the confidence to achieve more and be among the leading countries embarking on a path towards energy transition globally.

The minister further apprised that India has been declared as the most attractive destination for investment in Renewable Energy by Bloomberg.

The minister also added that government is proposing to come out with mandates for green hydrogen purchase obligations in refining and fertilisers starting with 10 percent which will be increased later to 20-25 percent. With time by adding more and more volume the price will reduce and the mandate will no longer be required. He added that we are also proposing to come up with Viability Gap Funding (VGF) for green hydrogen in heavy mobility and are also eyeing other sectors such as steel.

Bhagwant Khuba, Minister of State for Ministry of New and Renewable Energy, Indu Shekhar Chaturvedi, Secretary MNRE were also present at the event. The webinar focussed on the multilateral effort required to build a global hydrogen economy via conducive international policies, technology co-development, pooled finances for demonstrations and investments to create markets and scale up deployment.

The webinar featured a "Country Conversation" amongst H. E. Juan Angulo, Ambassador of Chile to India, concurrent to Bangladesh, Sri Lanka, and Nepal; H. E. Martin Strandgaard, Deputy Head of Mission, Ambassador, The Royal Danish Embassy; Dr Steffen N. Koch, Minister and Head of Department for Economics & Global Affairs, Embassy of the Federal Republic of Germany; Natalie Toms, Economic, Climate and Development Counsellor, British High Commission, moderated by Dr. Arunabha Ghosh, CEO, CEEW.

Another session on "Corporate Conversation" saw Davide Cirelli, Country Manager and CEO, Snam India; Frank Wouters, Senior Vice-President - Energy Transition, Reliance Industries Ltd; and Alka Upadhyay, AVP and Lead, Environment and Sustainability, Tata Sustainability Group shared their key insights with the audience.

India is a Global Champion for Energy Transition for the UN High-Level Dialogue on Energy, which aims to promote the implementation of the energy-related goals of the 2030 Agenda for Sustainable Development. In this context, India invited four other Global Champions for Energy Transition - Chile, Denmark, Germany and the UK – to discuss industrial energy transition without compromising developmental goals, and the role of hydrogen in this transition. The participating corporates also shared their views and suggestions.

Artificial Intelligence and smart equipment will drive the sector's development

To succeed, products in the system overall need to become much more intelligent, and there needs to be total integration with a reduction of human interference.

Manish Walia, Head Automation, Delta Electronics

Delta Electronics India is one of India's fastest-growing product and solutions providers, with a vast array of innovative offerings in multiple verticals and a pan India presence. We spoke to Manish Walia, Head Automation Delta, a man who has been at the center of the automation revolution in India, on innovative automation and control solutions in power plants, substations, and distribution networks.

How are automation and control technologies evolving in the power sector?

The evolution of the power sector is being led by mass-scale digitisation and automation. The development of Smart Grids and automation software have been game-changers on this front. They are leading to the system becoming much more reliable and environment friendly. In addition, different parts of the equipment are evolving to communicate in real time with each other, leading to efficient monitoring and decision making using automation. The sector is also expanding with the increasing adoption of renewable sources of power. At Delta, we champion Green practices and cater to both conventional and renewable sources of energy.

What are the upcoming technologies for the enhanced power plant performance?

Connectivity will be the key and will lead to the interconnectivity of equipment, which will help to collect precious data. Sufficient analytics are getting built into the system to analyse this collected data, and it will help make predictions that include concerns or maintenance. We, at Delta, provide smart equipment used in power plants and down the line to substations to this end on the hardware front. Our SCADA software is a significant part of our automation solutions. We also have energy management systems. Renewable sources present the challenge of storing renewable energy. We provide several solutions, including our wind power solutions, Solar PV Inverters, other Power Conditioning systems, and other storage options to help store the power generated and its further usage in commercial or local grids.

What are the latest innovations in substation automation? What technologies are trending?

Substation automation is a critical process, and incremental changes are happening in it. A primary concern is to minimise outages for the consumer, and concentrated efforts are made in this direction. As a power solutions provider, our PLC, SCADA substation software, energy management systems to control energy guzzlers, and smarter power meters enhance and automate the process to this end. As intercommunication amongst

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different equipment is growing, real-time data tracking using Delta's video walls in control rooms is gaining importance. Real-time data will assist predictions and patterns and help warn and create better decision-making based on relevant information. Of course, with data being collected, AI will also be incorporated into the system, looking at historical data and at repetitions. All these innovations will lead to the operations running on a much smoother scale and far more efficiently and vastly improving the service being given to the consumer.

What are the key challenges faced in power distribution? How are automation and control technologies improving the distribution process?

Power loss during distribution and the ups and downs of demand are some of the major issues faced during power distribution. Currently, distribution losses are reducing with more intelligent and energy-efficient equipment, making distribution far more competent. In addition, automation is greatly helping resolve the issues of consistently changing demand by streamlining distribution processes with the SCADA substation software. Another issue is the rise of LEDs, UPS, and Inverter usage, which cause regular harmonic disturbances in the output that needs to be suppressed. At Delta, we have power factor compensation equipment and harmonic filter active components that help deal with this issue. We also need to look at the power quality which is affected by fluctuations and requires power quality equipment and Delta's Variable Frequency Drives at the load side.

What will drive the development of automation and control technologies in the future for the power sector?

The need for instruments and equipment to be communicative and interactive will drive future development. To succeed, products in the system overall need to become much more intelligent, and there needs to be total integration with a reduction of human interference. Without integration, it will become impossible to correctly measure the impact of each process's positives and negatives, which is fundamental as all functions are interlinked, and the efficiency of each process impacts the overall process. This will build overall productivity and efficiency in the system itself.

Smart Grids in India: An overview

This article examines the current smart grid scenario in India. It further elaborates on how technology trends have been impacting the grid stability and distribution aspects of the power sector.

When we talk about being "smart", it does not just mean being healthy or fit, but rather refers to being able to sense issues and take required actions. Being smart means being adaptive. For example, if we apply an analogy to our energy management solutions, they can monitor our energy system and then adaptively take appropriate actions to deal with the problems as they occur in our energy system. So, that will be a smart technology. In fact, it's an interesting part to know that we have progressed from technology to solutions. It's not just the technology which will make a difference, it's the entire holistic solution and the end-to-end solution which will make the transformation. That solution is not just limited to technology, but will also involve the associated changes in the business process, maybe people skills and policy level. Technology, people processes, and policy will all be part of smart solutions.

Constitution of smart grids in India

When we talk about the smart grid journey for India or smart solutions journey for India, it started long back in 2012, when India's smart grid taskforce and India's smart grid forum were constituted by the Ministry of Power to figure out how these advanced technologies, in the form of ICT amalgamation, with the power sector, could play a role in the upliftment of the sector. Since our transmission grid already had advanced or smart technologies deployed, we were able to manage one grid, one nation. Even the grid stability was managed with the help of advanced SCADA and other allied solutions.

Now we have progress from smart SCADA systems to lamps in the transmission sector. And there was absolutely no challenge. We are one of the pioneers globally in transmission system management. The sector where we were lagging was the distribution sector. So the thrust was at that time, in that place, on the smart grid journey for the distribution sector, and how smart grids can make a difference in the distribution sector.

When the two institutions were crafted, their role was to figure out the available smart technologies, what are the ICT solutions deployed globally, and how can we adapt those systems to our Indian systems? And lots of changes happened in the Indian power sector, especially during those times. There was a target of having 175 GW of renewable energy by 2022, of which a major part was from rooftop solar technology. The adoption of electric vehicles is also increasing. Then we have smart sensors which are there and also ICT solutions.

So, these are some of the disruptive changes that are changing the present scenario of power in India. With these disruptive changes in the power sector, there are certain challenges for distribution companies. They need to manage a mobile load in the form of electric vehicles, and they cannot really figure out what time and what place the electric vehicles will be put on charge. They also have to figure out the challenges associated with harmonics that will increase because of the increase in ICT solutions deployment as well as electric vehicle charging facility requirements.

At the same time, they are supposed to manage their financial positions as well. So how do they really manage these challenges? Also, the aggregate technical and commercial losses are increasing like anything.

So it remains to be seen whether these smart sensors or solutions can truly assist distribution companies in managing their financials. With that in mind, it was discovered that some pilots were developed and 11 pilots were sanctioned with 50 percent of the funding from the Ministry of Power. And in those pilots, one of the major components was the smart metre.

Why do we need smart meters? Because we need to sense what is happening at the last note of the power sector's value chain. If we are able to measure what exactly is happening at the class note and analyse what actions are required, then it will definitely help in improving the sector's health. In fact, the success story of pilots was really appreciated even at a global level and we realised many benefits. Some of them were a reduction in the AT&C losses.

Reducing AT&C losses

One of the outcomes was an increase in the collection efficiency. How that increased was because the smart metres had that connection and disconnection feature also in that meter, so the DISCOMs were in a better position to collect the news from their non-paying consumers. So in that way, we also realise better revenues. So that was a financial gain for the distribution companies.

Optimal asset utilisation was one of the benefits

We started measuring the percentile utilisation of the transformers and we found most of the time, maybe 20 percent of the time, only the transformers are utilised for 80 percent of their capacity. So, most of the assets in the pilot area were underutilised. So, can we replace these transformers by adequate capacity transformers so that we can reduce the technical losses? We can reduce the technical losses if we are able to manage the face balancing. So these were some of the solutions which were taken up at the pilot level. And the successful story was really very encouraging.

This is why the government of India has now decided to launch this revamped distribution scheme, of which smart metering will be an important component. So, all the consumers will be metered by smart metres in a progressive manner.

A lot of funding will be provided for the distribution companies to go for this smart metering. And once smart metering is deployed, we are able to analyse data, we can take proactive actions and corrective actions as and when required when required. So, this is how we are trying to manage the distribution sectors. Not just the adequacy of capacities managed by the smart solutions, but we are also trying to bring focus to the quality of power and service delivery for the end consumer by way of these smart energy management solutions.

These smart metres also have the capability of sending signals for low voltage or any other changes in the voltage condition of the consumer device. So, with those signals, utilities can take corrective action.

Beyond smart metres

With the increasing penetration of rooftop solar panels, we might need selective power support as well. Globally, smart inverters are getting deployed wherein inverters are also capable of providing reactive power support for voltage control for the end utility. These smart inverters are also equipped with communication systems which can autonomously take the trigger and act accordingly.

Casting is in high demand

This is one of the ICT solutions or the advanced Smart Grid solutions that has utility in managing the power portfolio for procurement. So, with these solutions, I think our energy management is becoming smarter. And if we go beyond the grids to the end consumer premises, then participation of the consumer in grid management is also being envisaged in the near future. How can your consumers participate? They can provide grid support for grid management by way of demand response. So, demand response is something wherein a consumer is sent to shift their load when they are in need of some event based on the congestion and stability requirements. So, whenever there is some power supply and demand mismatch, the utility may send some price signal to the end consumer based on which the consumer behaviour may change. That in turn brings about a win-win situation for the distribution company as well as the end consumer. These price signals can be in the form of time-of-view tariffs, which may be decided dynamically so that they are dependent on real conditions and are not fixed or seasonal only.

The way forward

For those demand response initiatives, some of the advanced load side equipments like smart ACS, smart washing machines, smart refrigerators, are also available which can be remotely controlled by the utility for the demand response, are now entering into the system. So, this is something from my side in terms of how smart grid solutions can help energy management for the country.

Expertise shared by
Kumud Wadhwa,
Sr. General Manager - Project Management Unit,
National Smart Grid Mission

Going green with efficient and sustainable switchgears

Experts from the electrical industry elaborates on how digitalisation, innovation and sustainable technologies are enabling switchgears go green.

Supported by the government's vision and the positive intent of the industry players to reap maximum benefits of the digital wave, India is ready to take giant leaps in the power sector. Switchgears play a critical part in the power transmission and distribution network of the country by monitoring, regulating, protecting and isolating electrical equipment throughout the grid.

Present market trends in switchgears

The Indian switchgear market is slated to grow at a CAGR of 6.7 percent by 2026 as per a report by 6Wresearch. As India gears up to ride the digital technology-led revolution powered by schemes like smart cities, UDAY, Power for All, electrification of rural areas, and the government's thrust on electric vehicles, smart grid technology would prove to be the backbone of the power supply value chain.

According to Latish Babu, Director, Power & Grid Segment, Schneider Electric India, "To fully channelise the advantages of smart-grid capabilities, we need digitally intelligent, smart switchgears that are compact, flexible, reliable, easy to install and able to endure harsh environments. Therefore, increased emphasis on smart grids would lead to an exponential growth of the Indian switchgear market." Growing commercial sector and large scale government investments in power utility projects would lead to the demand for medium and high voltage switchgear.

According to Gautam Seth, Joint Managing Director, HPL Electric & Power Ltd., "The ongoing covid-19 pandemic has impacted the switchgear market globally. If we talk about domestic LV switchgear market, 60 percent of switchgear revenue and business comes from projects in the industrial sector. Whereas, the MV switchgear business is project based and due to COVID-19, many industrial, residential and commercial projects are progressing at a slow pace which has affected the MV Switchgear market.

Making smart and efficient switchgear with Digitisation

We are rapidly pivoting towards Industry 4.0 with smarter and intelligent solutions to achieve maximum efficiency through digitalisation. The role of smart switchgears in smooth and efficient power transmission and distribution is invaluable. The ability to remotely monitor the smart switchgears increase safety and productivity. The enhanced connectivity and communication capability of these switchgears make it easier to monitor the flow of current, power consumption and quality in real-time.

"Smart switchgears have made it possible to harness the value of data in power supply. Through advanced data processing, they can prepare for any unforeseen irregularities and predict any shortcomings in the system. Supported by IoT, smart switchgears also play the role of a technological vigilante by spotting errors and malfunctions beforehand, thereby preventing system failure and minimising energy losses and cost," says **Babu**. Further, smart and intelligent switchgears free the customer of hassles around maintenance. With information just a click away, customers can plan their maintenance schedule well in advance.

Switchgears and control market is evolving digitally now-a-days. As switchgear need digital intelligence so utilities can view and measure what is going on with the network more frequently. This enables a greater degree of control. Digital intelligence is the major part that can help in remote controlling. The customers can track their usage pattern; start generating data

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medium-voltage switchgear at 11 kV consisting of 30 panels, the width can be reduced by around 7 percent and switchgear energy consumption can be reduced by approximately 300MWh during its lifetime.

Key challenges in the switchgears market

The lifespan of switchgear exceeds more than 25 years thereby increasing challenges around its maintenance, safety, productivity, and efficiency. Here, **Babu** tells us that ageing switchgear not only hampers the performance of the system but also impacts the financial viability of a facility. Outdated equipment negatively impacts the environment and that is a risk we cannot afford anymore. Further, the stringency of not upgrading the existing switchgear is a major challenge thwarting the growth of the energy industry.

Today, it is more important than ever to introduce sustainable practices in every sphere of our lifestyle. Industries are no exception either. "With advancements in technology, it has become easier to upgrade and retrofit existing electrical systems. Contrary to popular belief, the cost of upgrading to modern technology is quite feasible", adds **Babu**.

Seth, on the other hand underlines, the switchgear market dependence is primarily on the projects globally implemented and procured by the government agencies majorly followed by private sector. "The slow or non-allocation of funds impact the most. COVID-19 has undoubtedly impeded the growth market had in previous years. The increase in raw material cost has added another hurdle in progress along with fuel price increase affecting transportation," **Seth** adds.

Emerging opportunities for advanced switchgears

The dependence on SF6, a greenhouse gas for the production of switchgears poses a great threat to our environment. It possesses an atmospheric life span of 3,200 years and a global warming potential stronger than CO2 by 23,500 times. The latest UN report has sounded alarm bells for urgent action on climate change mitigation.

Adding focus to Schneider's products to this segment, **Babu** says, "In a bid to strengthen mankind's efforts in saving the planet, Schneider Electric has launched its range of SF6-free, **SM AirSeTTM** switchgear. This range presents a leap forward moment for sustainability and includes modular air-insulated switchgear to deliver enhanced efficiency and safety." We believe that the SF6 free switchgears would catalyse the process of decarbonisation and help us to collectively meet our climate goals.

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The right technology can smoothen the transition of the switchgear market towards sustainability with ease. Still, today we can find many systems around the world that are built using SF6 insulated switchgears. On average, typical switchgear contains 1 kg of SF6 inside it. Therefore, it is essential to safely dispose of the SF6 switchgears, without releasing the gas into the atmosphere as its toxic byproducts adversely impact human health.

Schneider Electric provides bold but scientific solutions to support the journey of its partners towards sustainability. Further emphasising on Schneider's offerings, **Babu** says "We offer safe removal and disposal of SF6 with proper certifications. Marking a shift from 'rip and replace' attitude, we provide retrofit solutions by upgrading the existing system with green-compliant components. Installing green premium products that embrace the values of circular economy, ensures that we move beyond the 'take, make and dispose' industrial model. This is Schneider Electric's three-pronged sustainability approach to paint the switchgear market green.

Noting the opportunities and challenges **Seth** explain us "Today the sector is leaning towards digitisation and smart technology. Smart switchgears offer advanced protection and high-end energy monitoring systems that can communicate with a local PC as well as Web-based Network to monitor energy consumption status." These energy management solutions are available with smart controllers having high-end features that are required for Intelligent Power distribution and energy management for Smart City.

Switchgear market is adopting IoT technologies in its upcoming products segments to cater to the evolving needs. Technologies such as IoT, Big data, cloud-based data management are playing a huge part in development of futuristic infrastructure that include the latest products in switchgear and control technology segment. "The industry is also seeing the emergence of new business models such as pay as you save (PAYS). The switchgear is turning intrinsically intelligent, allowing foreboding maintenance," comments **Seth**.

There will also be concurrence of switchgear devices, integrating intelligence and increased safety features. The devices will be merged into each other. This would result in the reduction in footprint of the switchboard resulting in space saving and energy saving.

Growth drivers for switchgears in the electrical and energy sector

Globally, India has the fifth largest installed capacity of renewable energy and this is only going to grow further. This will translate into the increased deployment of smart switchgear as the availability of real-time data would be critical. A report from Research and Markets predicts that the Indian switchgear industry is poised to reach $3.7 billion by 2022.

The role of smart switchgears would take precedence with the growing integration of renewable energy into the grid.

▶ *Latish Babu,*
Director, Power & Grid Segment,
Schneider Electric India

We are rapidly pivoting towards Industry 4.0 with smarter and intelligent solutions to achieve maximum efficiency through digitalisation.

▶ *Gautam Seth,*
Joint Managing Director,
HPL Electric & Power Ltd.

"The confluence of 'industry and information', along with heightened impetus on energy management for creating a sustainable future is rapidly transforming the electrical industry. Smart switchgear is a total game changer as it can understand the intricacies of the electrical system thereby improving its efficiency and safety. The role of smart switchgears would take precedence with the growing integration of renewable energy into the grid", notes **Babu**.

Further, the digitisation of the power supply chain offers countless benefits to the consumer. Smart switchgears increase the safety of the electrical system and significantly lower the power bills. They are easy to install and maintain. Switchgear modernisation translates to 30 percent in cost savings. Such incentives are bound to encourage the industry players to switch to smart switchgears and embrace the digital wave.

The way forward

The growing energy demands due to rapid urbanisation, infrastructure development, industrialisation, rural electrification are propelling the demand for switchgears. Specifically programmes like Power for All, Make in India, the Integrated Power Development Scheme and the Deendayal Upadhyaya Gram Jyoti Yojana are expected to increase the demand of power transmission and distribution (T&D) network equipments in the coming years, this will boost growth opportunities for switchgear manufacturers.

Increasing awareness about the benefits of switchgears would fuel its growth in the domestic segment. People are becoming more conscious about their safety. The ability of switchgears to avoid fire accidents and protect human life gives them an edge over conventional fuses. In India, the domestic segment is going to drive the demand for LV switchgears in years to come.

Drone-based inspection solution for wind turbine blades

Sulzer Schmid and ENERTRAG Betrieb improve wind turbine blade inspections with a new drone-based lightning protection system testing solution.

Sulzer Schmid and ENERTRAG Betrieb join hands to provide a new wind turbine blade inspection solution that integrates ENERTRAG Betrieb's innovative lightning protection systems (LPS) testing solution with Sulzer Schmid's UAV technology and digital inspection platform. This key innovation will enable LPS testing to be carried out at the same time as rotor blade inspections, saving operators and owner's time and money.

The two companies have co-developed a non-contact testing solution by mounting the LPS measuring equipment onto the DJI M300 RTK blade inspection drone and integrating the results within Sulzer Schmid's 3DX™ Blade Platform.

Tom Sulzer, Co-founder and CEO, Sulzer Schmid, stated. "We have a great working relationship with ENERTRAG Betrieb and we are delighted to be working on this very exciting project which develops a new ground-breaking use of our technology. With this new solution, ENERTRAG Betrieb customers can combine LPS testing and rotor blade inspections in one go using our autonomous drones and our software. This enables more efficient test and route planning, leading to downtime reduction which results in higher revenue for the owner of a wind farm. In addition, the cost savings by ENERTRAG Betrieb due to less travel time will be forwarded to the customer."

"Non-contact lightning protection measurement by drone will become the new norm for equipment inspection," explained Dr. Konrad Iffarth, the key driver of the LPS testing innovation at ENERTRAG Betrieb. "We were pleased to be able to work with a leader in the UAV turbine inspection field like Sulzer Schmid to bring our innovation to the market. It will now be possible to inspect many more wind turbines in succession.

HPL aims at developing customer specific products for better experience

Our new range of switchgears and DC Disconnectors are the first Make in India products which are going to be used under this category.

Shivesh Mishra, Deputy Manager, HPL Electric & Power Ltd.

Shivesh Mishra, Deputy Manager, HPL Electric & Power Ltd. walks us through their new additions to their switchgears profile and String Combiner Boxes, during the 14th Edition of Renewable energy India Expo, Noida.

What was your focus in the 14th Edition of REI?

This time, we have new range of products here in the 14th Edition of Renewable Energy India Expo. HPL Electric & Power has launched three products in switchgear category; one is in the String Combiner Box category, an updated version of the previous existing boxes. In switchgears, we have launched our new range of DC switches with category DC switches with 1000 volt DC and 1500 volt DC and one AC switch that is for 415 volt and 800 volt AC. All these products are to be used in government solar projects and rooftop solar projects as well. Earlier versions of combiner box, we used to get uses of 30 AMPS in our combiner boxes. And now we can provide fuses up to 60-65 AMPS, since our module capacity has gone up, that's why we had made this upgrade in our combiner box category. We also have three different type of lighting to our offerings which are all in one and are semi-integrated, which are used for boundary lighting of Solar farms.

What kind of product have you displayed here in REI expo?

HPL have displayed their complete range of BUS category, including String Combiner boxes, Monitoring Boxes, complete metering solutions, AC distribution boxes, AC combiner boxes, wires and cables and physical categories on all categories under 415 volts and 800 volt.

What be the uses and impacts of your products in the power and renewable energy sector?

The new products are under the Make in India project scheme launched by Prime Minister. So, these are all the switchgear that have been launched and manufactured in our Sonipat plant which is close to Delhi. So, all these products are to be used in the roof in the solar product which is being used at ground mounted solar projects. And this is the first Make in India product which is to be used in such categories. The same category of product which is being used as of now in industry is from the other countries. So this is new development under the make India scheme.

Can you throw some light on DC-3 switches and disconnectors?

For DC disconnectors, we have launched products in all three categories ranging from 100 AMPS to 630 AMPS. This is actually just a rough design that goes by client / customer requirements. These all are the electrical and mechanical parameters which are currently superior to the production level in the market at this very moment. So, that is the quality we maintain in all our products.

What are your market expectations from the solar sector and from ground mounted solar sector?

From the last two years we have been providing String Combiner box and LT Panel Category to the market. In this category, our growth has increased by more than 200 percent in last two years, and we are expecting another 500 percent of growth in next financial year.

What kind of responses have you seen for the launch?

We have received responses far beyond our expectation, we were expecting around 4000–5000 visitor, but it went beyond our expectations. Moreover, they were genuine customers as their queries were product related and with particular and specific requirements. So, I would say that

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the event brought us great responses from the customers / clients.

How do you evaluate the challenges and differences in the market amid COVID?

The pandemic impacts came to effect from March 2020. The impacts were not too immediate for us as our projects were on; also the marketing was active during the early 2020's. But there were challenges in terms of raw materials and their cost, supply chain challenges were also there; even imports are affected to a great extent. But we are glad that the market is now picking up and is slowly recovering from the losses. Moreover, I feel that all the new and old queries will be sorted we will work in a more efficient and strong manner soon after this exhibition ends.

How are pricing factors impacting the demands and growth, especially in a post COVID scenario?

Some products that are being manufactured by producing them in-house are made under make in India. So we have faced challenge for raw materials but somehow it has been managed. We are putting prices as per, customer expectation and we are getting good orders from our all the customers, so that's not an issue with us. As of now, there is no any issue with getting the orders and closes. So everything is sorted, and everything is fine.

What are your plans and projections for the coming 3 years?

In the coming years, we are planning to have more advanced products in our portfolio in system monitoring solutions, LT Panels. Also, we are planning to expand our reach into the solar projects. We may also get into solar projects by the end of this year also. We hope the COVID situation ends at the earliest so the businesses can regain their market position.

EATON's MOELLER LV Switchgear and MCCB products profile

Citroen Switchgears Pvt Ltd (CITROEN) is one of the leading authorised distributors for Premium Electrical Switchgears and allied products based in Mumbai.

- **AIR CIRCUIT BREAKERS - Type PSL/IZMX**
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Standardising security aspects to strengthen Smart Metering

Industry's leading smart metering providers share the benefits of adopting smart meters, along with the various aspects pertaining to cyber safety standards in India.

Smart metering has been in India since last two years, and owing to lack in awareness on the concept of smart energy metering, it won't widely accepted by the consumers / energy providers. Recently the government of India has announced of replacing all conventional energy meters with smart meters by 2022. While the government is focusing on the prepaid meters, several states have started evaluating their need to pursue more adoption of smart energy meters. This will technically offer both options to the consumers and will let them
choose.

Present scenario in installation of smart energy meters

According to Gautam Seth, JMD, HPL Electric & Power, "India's smart meter programme aims to replace 250 million conventional meters to help raise annual revenues of debt-laden electricity distribution companies. HPL manufacturing capabilities are supported by a large sales and distribution network with a Pan-India presence. The company's portfolio of meters includes single phase, three phase and LTCT/HT energy meters, smart meters, panel meters, prepayment meters (whereby a monetary limit can be set on the electricity to be supplied to a particular consumer), net metering solutions and transformer metering solutions remote communication facilities. HPL aims to widen its smart meter portfolio, and further strengthen its market penetration domestically too.

According to Hem P Thukral, Associate Vice President, EY India, "There are about 2 million smart meters have been installed till date, and according to the new scheme and the policy push, millions of meters are yet to be installed. As a country, perhaps you can save on certain additional infrastructure costs, because we already have reached the consumer premise through smart meters, I can remotely send signals and can get the data. With that I can perform various sorts of ANML calculations and other techniques, but the key is to you reuse that communication infrastructure where I can reach the consumer."

Adoption of smart meters in India

"Smart metering has been in use in India for more than two years, but it is still in its infancy. Initially, there was a problem with consumer acceptance in several states, but things have started to improve," says Seth. Various institutions have placed more than 2 million smart metres across the country. IntelliSmart and EESL have installed nearly 1.7 million in six states and union territories, with the rest being installed by other agencies.

Hem is of view that smart meters are one of the very basic features of smart energy management, and every smart energy meter is designed with the features of energy management. "Its adoption will be useful for the consumers because with the energy management features we can use the load curtailment functionality, wherein, we can curtail the load at the consumers premise by simply sending a command to the meter" he explains.

Government Promoting smart meters

The Indian government is pushing hard for the adoption of smart meters in order to build a strong power industry. The finance minister asked states and union territories to replace all traditional power meters with prepaid smart meters within the next three years in the Union Budget 2020-21.

Following that, in the Union Budget for FY 2021-22, ₹ 3.05 Lakh Crore was set aside for a smart metering plan. Also, the Union Power Ministry recently issued an advice for all central ministries and government agencies to prioritise the switchover to prepaid smart meters in organisations under their administrative authority.

Challenges in adopting smart meters

Several case studies from various nations imply that smart metering programmes may encounter customer adoption issues without sufficient consumer interaction. As a result, DISCOMs must invest in consumer engagement in order to build trust in these new systems and verify that the software built to operate these meters has been well vetted. SERCs, for their part, can protect customers by updating their regulations to include detailed specifics on smart meters performance standards.

The lack of choice in terms of payment methods may contribute to consumers' concerns. When using a post-paid connection, smart meters can be programmed to disconnect customers if bills are not paid on time. Consumers with prepaid connections will also be disconnected if their recharge credit limit is exhausted.

Data security is another threat/concern. Data from smart meters can provide personal information that can be deduced from electricity usage habits. The ministry of power should develop a framework for handling smart meters data and finalise it in conjunction with stakeholders ahead of India's personal data protection act. Noting the same Seth suggests "Regulators should establish a set of laws that address various areas of data-sharing procedures, goals, grievance resolution, and security, among other things. To ensure that consumers' privacy is protected, DISCOMs should designate data protection officers. Consumer rights must be protected."

Whereas, Hem explains that standards and guidelines are available globally and there are multiple options to it. But the issue is when it comes to energy management that will actually reach to the consumer premise, and interacting with devices that affect the consumer's life on a daily basis.

We can go a step further towards the module that has been installed in the meter for communicating with the DISCOMs.

▶ *Hem P Thukra, Associate Vice President, EY India*

HPL aims to widen its smart meter portfolio, and further strengthen its market penetration domestically.

▶ *Gautam Seth, Joint Managing Director, HPL Electric & Power*

Benefits for DISCOMs

Smart meters may be exactly what India's dormant energy distribution firms (DISCOMs) require. The smart meters programme has gotten off to a solid start, which is wonderful news. "It has the ability to boost DISCOM's finances by automatically generating bills and assuring timely payment through deterrence through remote disconnections of defaulters. This is one of the several initiatives launched by the Ministry of Public Health to address the sector's multiple long-standing difficulties, which have been aggravated by the ongoing pandemic," Seth explains.

"When we talk about benefits of Smart Meters, the technical committees have crafted options with which we can have an additional module that can talk to the devices present in the home/premises" says Hem. Also, we can go a step further towards the module that has been installed in the meter for communicating with the DISCOMs, perhaps that can also be used within the building. So, there are multiple options, we need to see in which direction we need to go, but definitely the use of this inference is one good way to go.

Last note

Even the DISCOMs are advocating smart metres as they would help them recover the incurred losses. As they would lose their finances and efforts in manual inspection of the existing meters. Hence, adoption and promotion of smart meters will allow them lose a considerable amount of money due to the time-consuming manual inspection of metres, while smart metres would allow for remote metre reading.

India ready to embrace energy storage systems

This article is a short analysis of the industry experts on the efforts initiated by the government and the industry to amplify implementation and usage of energy storage systems and storage solutions in India.

Energy storage is expected to play a key role in India's power sector. A recent analysis report by US National Renewable Energy Laboratory said India could potentially have a storage capacity of 50 GW to 120 GW by 2030.

Over the past five years, the concept of energy storage has been definitely gaining visible momentum in India. This is in large part due to the government's realisation of the need to have better energy security, spinning reserves and a general framework for energy self-sufficiency in India.

How is the concept of energy storage gaining traction in India?

The increased momentum of energy storage has also been due to the decrease in prices of Li-ion batteries and an increase in their performance. There are also a lot more sectors in which energy storage systems can be applied. For example, the telecom sector and other data centers have been the largest adopters of Li-ion batteries. On this note, **Ketan Chitnis, VP Stationary BU, Nexcharge,** said "This is because of their higher cyclic life and higher energy density. They also help to drastically reduce carbon footprint and their weight is less than half that of conventional batteries. Solar rooftops and residential energy storage is also seeing a migration from lead acid batteries to Li-ion ones."

Highlighting few latest developments on the energy storage front, **Kashish Shah, Research Analyst, Institute for Energy Economics and Financial Analysis (IEEFA)** mentioned about Tata Power's 10MW/10MWh (1-hour storage) battery in its Delhi distribution network that has been the only grid-scale battery currently operating in India. In a recent visit to Tata's battery storage facility, Delhi's Power Minister talked about a plan to create a storage capacity of 600MW in Delhi in the form of 'power banks'. This would be a huge step-up from the existing 10MW/10MWh battery storage capacity.

"India's state-owned entities too have now come into the fold for facilitating grid-scale battery storage development. In the last couple of months, the Solar Energy Corporation of India (SECI) and NTPC have rolled out tenders for developing 2,000MWh and 1,000MWh battery storage capacity, respectively", adds **Shah**.

SECI and NTPC have built a strong record for being credible counter parties in the last few years by enabling renewable energy capacity development more than of 40GW. IEEFA deems the involvement of credible government-owned counter parties extremely vital to allow capital deployment in battery storage development. There are also substantial developments on the battery manufacturing front.

Reportedly, Indian automotive electrical components manufacturer Lucas TVS and U.S.-based 24M Technologies in a joint venture plan to set up a ₹ 2,500 crore (US$340m) battery manufacturing plant near Chennai for lithium-ion (Li-ion) battery cells based on SemiSolid platform technology.

Energy storage solutions suitable for India

India is an extremely price sensitive market and there are two factors that drive a product's viability: The economy of a solution and the CAPEX expenditure. The economy of a solution is always addressed by better performance and if you look at any recent market outputs, performance based business models are gaining more traction. People in India would like to pay for the kWh per hour that they use rather than the CAPEX expenditure incurred. "Over the past five years, Li-ion batteries have had improved life cycles, better performance, and increased safety and efficiency", says **Chitnis.** All of this has made for a strong case for financing Li-ion battery-driven storage solutions for a market like India. Also, for those making CAPEX expenditures, insurance cover and other opportunities for financing have opened up.

Currently, in India, energy storage solutions are being deployed to protect large scale commercial installations in urban locales. While in rural areas, ESS is more limited to residential uses. But overall, the market has experienced the technology and it is ready to embrace ESS.

Continuing the discussion, **Shah** adds, "Lithium-ion battery storage system is commercially the most effective storage system to provide

fast and accurate grid services across the globe. Currently, these storage systems are capable of providing 1 to 4 hour storage capacity that help in shaving off peak loads store during sunny hours of the day and dispatch during the evening peak load hours)."

Also, Pumped Hydro Storage (PHS) is a key resource that could provide storage and grid services; although PHS development in India has been very challenging due to various geological, social and commercial reasons.

Challenges in setting up effective energy storage system

"One of the biggest challenges that remain in the Indian market is the lack of benchmarking of various applications. This leads to customers not having a clear idea of what they want because they haven't logged in any data in connection to their requirements", explains **Chitnis.** For example, solar farms have a minimum energy commitment that they're required to produce; hence, most plants are oversized so that they can meet this standard minimum. "In the process, they end up generating excess levels of energy during peak cycles that cannot be exported because there is a cap on export.

"In order to utilise this excess energy, there needs to be an optimised energy storage capacity. However, if customers aren't aware of benchmarks, then they aren't sure of what micro level data to collect' adds **Chitnis.** Due to this insufficiency of data points, it is hard to design optimised solutions. In developed countries, this benchmarking process has already been done. Thus in India, it is challenging to build optimised solutions and data driven business models.

On the other side, **Shah** is of view that "For batteries, India's lack a domestic value-chain that include manufacturing, value-added services, deployment and recycling. On the policy side, there needs to be a 'time-of-day' differentiated price signal for batteries to be commercially viable."

Policy initiatives for energy storage

Currently, the government has realised that when it comes to economic growth and the GDP, energy independence is a crucially important parameter. On this note, **Chitnis** feels that energy independence cannot just be born out of producing a lot of energy but instead it has to come from having robust additional pools of energy at our disposal. This realisation has led to the government deploying battery storage solutions in various sectors.

Also, the government's latest Production Linked Incentive (PLI) Scheme 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage' in order to achieve a manufacturing capacity of 50 GWh of ACC and 5 GWh of "Niche" ACC with an outlay of ₹ 18,100 crore is another promising and encouraging announcement.

We can sense the government's urgency in developing India's energy sector and bringing it at par with international markets.

▶ *Ketan Chitnis, VP Stationary BU, Nexcharge*

India's market potential aided by government's ambition and policy support are driving a momentum in battery manufacturing in India.

▶ *Kashish Shah, Research Analyst, Institute for Energy Economics and Financial Analysis (IEEFA)*

The government is also planning to alter the national grid code and there is an upcoming amendment in deviation settlement mechanism (DSM), both will encourage more deployment of battery-driven energy storage solutions. Thus we can anticipate a lot of investments coming through in the future.

The manufacturing of battery, an important segment of the battery value-chain, is now aided by the government's production-linked incentive (PLI) scheme. "The scheme is focused at creating battery capacity for electric vehicles (EVs) by incentivising domestic value addition. This would lay foundation for developing other segments of batteries including grid-scale batteries. This will value the speed and accuracy of grid balancing services that batteries and PHS could provide at competitive market prices, allowing a clear revenue stream for the asset owners these storage systems", **Shah** higlhights.

Also similar to solar and wind assets, inter-state transmission charges have been waived off for battery storage and PHS systems commissioned before June 2025. This will allow the storage systems to viably operate to support interstate grid networks. "India's market potential aided by government's ambition and policy support are driving a momentum in battery manufacturing in India" adds **Shah.**

Future of energy Storage in India

The future of energy storage in India hinges on its qualifications for the economically viable OPEX model. There is also going to be a lot of investment into R&D. And as more large players jump onto the energy storage market, there will be more resources that go into refining systems technically and refining business models economically. All of this will make the market more organised and there will be better business propositions for customers.

Safety control: efficiency in machine safety

The primary goal when designing a machine has always been to make its automation process as efficient and cost-effective as possible to complete a task. Now safety controls, with their more stringent requirements, are being held to similar expectations when being integrated into the machine controls. Safety control devices have evolved over the years and now play a crucial role in the interaction of man and machine.

What was once an afterthought, safety aspects can be seen implemented during the design phase by machine builders, and added to older existing machines by end-users. The challenge with implementing safety at any stage of a machine lifecycle is making sure the safety system is effective and efficient as possible.

The automation process behind the scenes of a mid to large size machine can be intricate while providing a simple means to operate the machine via a Human Machine Interface, or HMI. This allows a complex automation process to be seamless and user friendly. Safety too can be seamless and as user friendly. The first approach would be to minimize hazards by design. If feasible for the machine and its application this may reduce the cost on safety since less safety components may be required.

If, as in many situations, a hazard cannot be reduced or eliminated purely by design, or if further action is required, then safety devices can be integrated. These could include guard monitoring devices that will prevent a machine cycle while a guard is open, or presence sensing devices such as light curtains or safety mats that will detect an operator. Once a risk analysis is completed to determine what hazards need to be guarded and to which degree of circuit reliability, the question then turns to how to integrate the safety efficiently? As stated earlier, the automation design may be complex throughout the machine with many components requiring communication with each other to assure the process run smoothly. In many instances this communication takes place in the form of a network protocol that allows data packages to be exchanged throughout the system and can even be visually displayed on a control panel. Safety devices have evolved where they too can be placed on such a network. Knowing immediate information such as which guard door is open, which E-STOP has been actuated, and which safety device has faulted out can drastically decrease downtime and thus increase productivity. An added advantage to most electronic safety devices is that they can be wired in series without reducing the integrity of the safety circuit.

Many manufactures of safety devices have the ability to allow their devices to communicate on dedicated protocols such as PROFINET, EtherNet, CANopen and DeviceNet, just to name a few. In some instances a manufacturer may require a gateway that will convert their proprietary form of communication to one of

the common industrial protocols, allowing a uniform data stream of safe and non-safe information.

Another available protocol to use is the Actuator Sensor Interface, or AS-i protocol. One of AS-i key features is that this protocol is an open language allowing machine builders and end users to easily mix and match different manufacturer's AS-I devices and components to meet their various application needs. Another advantage of an AS-I system is its easy wiring which only requires a 4 pin snap-on along any point of its flat cable, greatly reducing the costs in installation time.

With these types of technology, safety components no longer need to be completely isolated from the automation system. As an interlock device triggers a safe shutdown it can send information through a PLC to bring a machine tool to a home position, all while showing its activity in a graphical representation on an easy-to-read screen at an operator station.

The increased efficiency in trouble- shooting can easily be seen when this technology is compared with that of conventional electromechanical devices on mid to large sized machines. When using electromechanical devices, each access guard needs to be examined individually to determine which is preventing a machine restart. Use of

some of the advanced electronic safety devices can quickly and easily inform the operator of a specific fault through integrated LED lights and serial diagnostic signals.

Properly designed and installed safety systems within a machine are no longer seen as a hindrance to the overall process. Education in safety provides a greater understanding and appreciation for its use and technological advancements makes safety implementation easier. The current capabilities of safety devices allow them to be used both effectively and efficiently.

2.8MW solar power plant at Funai- Nigeria

Delta Energy Storage Systems integrates bi-directional power conditioning & battery devices, site controllers, and cloud management system for residential, commercial and utility applications.

The Federal Government of Nigeria and the Rural Electrification Agency of Nigeria conceived and implemented a unique initiative referred to as the 'Energizing Education Programme. This was in response to the key challenge of providing clean, economical and abundant energy for the education sector. For decades the non-availability of reliable power, a weak electricity grid, reliance on diesel generator sets, and mounting costs of traditional energy systems resulted in a non-sustainable, non-renewable energy model which is expensive, unfeasible and a major source of pollution. This initiative envisions powering educational institutions and medical training facilities with a source of clean and plentiful renewable energy using Delta's core solar energy technologies

Our Solution

Delta Electronics, India, in association with our India's leading EPC partner, focused on developing an off-grid, dedicated and Independent power plant to supply clean and reliable power to 37 federal universities and 7 affiliated university teaching hospitals (FUNAI). This customized solution involved creation of a 2.8 MW hybrid plant which is Nigeria's first-ever solar-storage hybrid project. At the heart of the solution is Delta's PCS Micro Grid Controller (Energy Management System) including 1MW Power Conditioning System and Delcen1000 - 1MW Solar Inverters.

Outcomes Delivered

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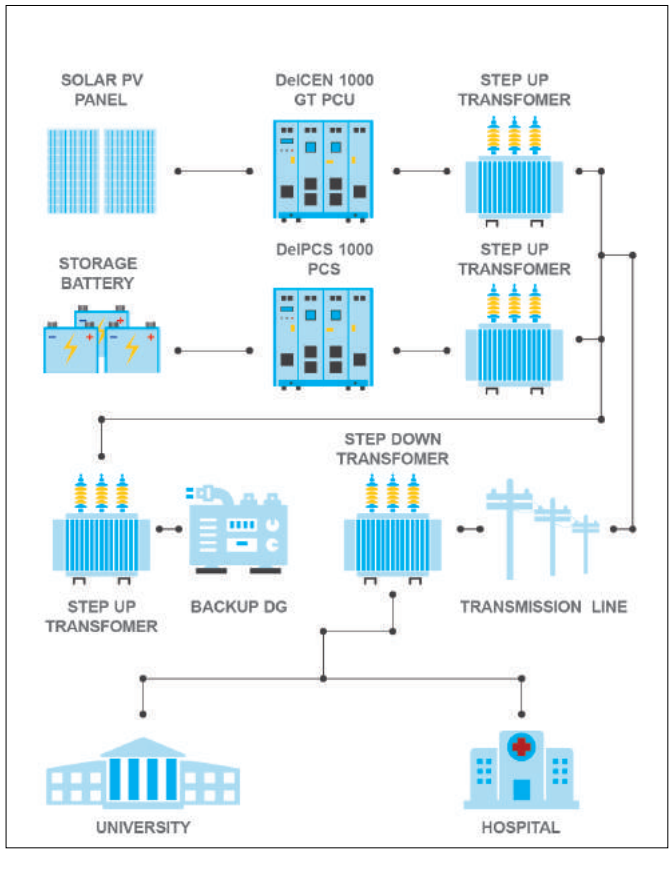
Outcomes Delivered

Due to the building and activation of Delta's solution, 7,700 FUNAI students and 1,819 teaching staff now have access to clean, reliable energy from the solar hybrid power plant. The plant supports 7.5 KM of solar-powered street lights for illumination and safety, as well as a world-class renewables training center while also reducing carbon dioxide emissions by more than 80,000 KG per year. Furthermore it has resulted in significant economic savings due to the shift away from diesel power.

The newly installed system will deliver annual savings of more than $55,000 per year, with accumulated savings of more than $1.5 million across the life of the system. The overall outcome will help future generations of Nigerians to have higher standards of effective learning, greater opportunities for the future, improved institutional operations and student residency.



Schneider launches "Partnerships of the future fuelling sustainability and efficiency"

Schneider aims to empower its robust network of partners with high-paced, built to demand, supportive and simplified products complete with native connectivity.

To address the global urgency of climate change and the 21st century's most significant challenges of the accelerating energy transition and growing demand for energy, Schneider electric is launching Partnerships of the Future. It is committed to enabling a green recovery whilst supporting the mega trends of mass digitisation, greater electrification, along with the increasing role of natively connected digital products and software in a bid to ensure sustainability and energy efficiency at scale.

In its quest to strengthen global efforts of designing a more resilient, sustainable electric world, Schneider Electric, the leader of the digital transformation of energy management and automation, has showcased pioneering energy management innovations and partner programs during its "Partnerships of the Future Fueling Sustainability and Efficiency" LinkedIn Live event.

Schneider call this vision an 'All-Electric, All Digital New Electric World', powered by abundant clean energy, or Electricity 4.0. As the electric and digital solutions are becoming more complex, Schneider aims to empower its robust network of partners with high-paced, built to demand, supportive and simplified products complete with native connectivity, making sustainable and electrical safety goals achievable.

Rohan Kelkar, Executive Vice-President of Power Products, said "The convergence of IT & OT, combined with the increasingly digital and electric world, allows us to offer smart interoperable solutions, systems and products that do not cost more to build and commission while bringing substantial cost efficiencies and operational synergies to the marketplace. Digital technologies are a catalyst for business growth. Yet, the inherent complexities that digital transformation projects bring with them may cause decision paralysis and implementation delays. This is why our goal is to face up to the digital challenge and enable the market through 'Partnerships of the Future' by equipping our partners with strategies, solutions, and services for increased sustainability and efficiency."

Explaining further about the launch, Nikhil Pathak, VP – Central Offer Marketing & BD, Schneider Electric India said "Schneider Electric has consistently endeavored to bring innovation to the forefront while redefining and disrupting trends with offerings that hinge on simplicity. We envisage a future that is driven by solutions that delight, empower and build a resilient ecosystem for our partners, stakeholders and businesses alike. Our open platforms empower collaboration and foster increased support to build state-of-the-art infrastructures and scalable mechanisms. Our digital solutions will help in pivoting businesses not only at CapEx but also through OpEx."

Partnerships of the Future: simplified, open and digital

- Enabling business growth through knowledge transfers, collaboration and innovative natively digital and connected products
- Supporting digital transformation, enabling sustainability and efficiency in the new electric world
- Revealing the next generation of pioneering energy management innovations including BlokSeT™ and Okken™ LV switchboards, unveils the new and improved iconic TeSys™ Giga
- Boosting EcoStruxure™ Power to protect critical industry, buildings and infrastructure facilities from damage caused by short circuits, ground faults or overload faults

Increased digitisation and industry innovation makes simplified, open standard solutions, training and knowledge transfers available to our partners as we look to leverage meaningful Partnerships of the Future to Enable the New Electric World. We want our partners to openly collaborate with one another, to share and learn for mutual benefit and, by extension, the benefit of their customers.

With more than 650,000 members, 300 apps and 100-plus communities, our open ecosystem is a robust resource for all players involved. It enables collaboration with other electrical contractors and peers, access to a state-of-the-art technology portfolio, the opportunity to stay up to date with the rapid evolution of the markets in order to help generate new sales leads.

MySchneider Partner Program encourages transformative and collaborative solutions within Schneider Electric's energy management ecosystem with curated content for partners.

We need to create ecosystem for local solar PV manufacturers

We are setting up a Greenfield manufacturing project in Gandhidham, Gujarat, to build a fully integrated renewable energy cluster

Prashant Mathur, CEO, Saatvik Green Energy (P) Ltd.

Prashant Mathur, CEO, Saatvik Green Energy (P) Ltd., in an interaction with EPR magazine, talks about various factors impacting the Solar PV manufacturers in India.

Kindly walk us through your company's profile

Saatvik is one of India's largest model manufacturers, and our current capacity is 500 MW. We are adding another 300 MW in Ambala and then another 1.2 GW in Gujarat, with this our capacity will be 2 GW by the end of March 2022. We manufacture Poly, Mono-PERC, half-cut modules, and high efficiency solar modules. We have been manufacturing solar modules for over five years now.

Market trends are impacting demand for solar PV modules and PV cells

Of course, there are impacts, especially due to policy changes, increased dependence on China, and constant price rises for the last one and a half years are impacting demand in a way for many projects. 30-40 GW of projects have been dead or successful, but at tariffs where current prices are not sustainable for them to install the projects. Because of these high prices, ground installations are not happening, which again affects the market demand. Manufacturers are also on the fence, waiting for market policies to stabilise before increasing production quantities.

Manufacturing facilities are being increased and new players are also sitting on the fence because of the increase in prices in terms of government policies. Like GST, which has suddenly increased from 5 to 12 percent, there is also BCD, which is going to come into effect in April 2022. There is no duty currently in place to protect us against an onslaught. Market demands are constantly fluctuating and there is no consistency.

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India has a domestic manufacturing capacity of 3GW when it comes to solar cells and 15 GW for solar modules. How can PV manufacturers utilise this opportunity to promote solar PV?

Out of this 3GW cell capacity, the actual capacity utilisation is not very high. Presently, the capacity utilisation is only about 50 percent to 60 percent of cell capacities and 50 percent to 60 percent of module capacities as well. Despite the fact that installed capacities range between 3 and 15 GW, actual capacity utilisation is only 50 percent to 60 percent. I think the market needs to be protected, and we must reduce our dependency on Chinese imports. We must create an ecosystem within which manufacturers have consistency in terms of policies and market demand, so that they can backward integrate and setup wafer and energy and poly-silicon. In terms of demand, India has consistent demand and solar has arrived in terms of cost, as the unit cost of power is low, and the government wants to have 450 GW of renewable energy by 2030. So, there is no dearth of demand in the market. The only problem is that there is inconsistent demand and policies. Once these things start coming in, the manufacturers will automatically expand capacities, backward and forward integrate, and stand on their own rather than be dependent on China.

The government has taken good initiatives like BCD coming from April; PLI is also a good initiative which will bring in integrated manufacturing-based incentives. Though it is very small in terms of PLI, which will begin at about ₹ 4500 crores, but at least it's a start. Once that happens, people will definitely move towards solar. In terms of rooftops, when you say residential and commercial rooftops, that option will increase when we have consistency, as every state has different policies which keep on changing. Some states have 500 kilowatts and others are not doing it as it is difficult to get early approvals. This is further slowing down the adoption of solar and the rooftop market as well.

Challenges in terms of pricing and delivering quality products

So, apart from wafers, most of the products are now

manufactured in India. So ancillaries are developed in India. So, EV batteries, glass, junction boxes and ribbons are already being manufactured in India, which are not as efficient in terms of quality, but we are getting them every day. If we talk about quality, then what we receive from China and what is being made in India is similar. If a sizable manufacturer comes up with poly-silicon and wafer manufacturing in India, we can decrease our dependence on China. That will help scale this industry. Firstly, Chinese imports and its fluctuation not only affect the manufacturing but also the prices because you have various fluctuations. Because, China has a monopoly on the market, so, globally, they determine the prices. Secondly, dollar fluctuation and freight logistics have become a big headache nowadays with rising logistic costs.

So the only way it can get solved is to make in India and to develop local manufacturing for Solar PV because the market is already there, when ancillaries will come and we will not be dependent on China.

What are your key offerings?

We recently launched high-efficiency half-cut multiples bars of solar modules with 610 watt panels at the 14th edition of the Renewable Energy India (REI) Exhibition. These products are top of the line and the highest efficiency modules available globally. We have also entirely rebranded ourselves, and have created a new brand logo wherein we have dropped Saatvik Green Energy and become a group brand that denotes our commitment to renewable energy with fresh ideas and high ambitions.

We are setting up a Greenfield manufacturing project in Gandhidham, Gujarat which is of 52 acre land, wherein we will be building a fully integrated renewable energy cluster. To start with, we'll be doing 2GW of solar module integration, but in the future we want to develop it as a renewable energy cluster wherein we want to do batteries and also inverters and other products related to renewable energy.

We are also looking for some technology partners wherein we can scale it up and bring in backward integration in terms of forward integration. Also, we're looking at getting into the EPC and IPC business.

Megger and IPS Group announce strategic partnership

The partnership with Megger extends the reach of IPS's technical excellence and brings improved market access as well as new opportunities in commercial and strategic innovation.

Megger Group and IPS Group have recently reached a definitive agreement to work together as strategic partners combining both their experience and product lines to create new value for the electrical supply industry. The agreement includes Megger taking an equity stake in IPS.

IPS is one of the leading providers of Enterprise Asset Management (EAM), Asset Performance Management (APM), Network Model Management (NMM), Outage Management (OMS), Enterprise Protection Information (EPIS) and Mobile Software Solutions (WFM) for the electrical supply industry.

IPS was founded by Dr Zeljko Schreiner in 2004. Since then, it has grown to be a leading provider of APM data analytics to the electrical power industry, enabling electrical utilities to increase network reliability while reducing both maintenance costs and customer minutes lost, as well as providing insight to Asset Investment Planning. The partnership with Megger extends the reach of IPS's technical excellence and brings improved market access as well as new opportunities in commercial and strategic innovation. Megger will benefit from IPS's data analytics capability, cyber security and digitalisation expertise.

Against this background, both parties expressed their anticipation for future cooperation:

Jim Fairbairn, CEO of Megger, stated "We are thrilled to announce our partnership with IPS and are excited about the opportunities of working together on a global basis. The Megger team has been very impressed with IPS and in particular the quality of the team at IPS. This move is aligned to the Megger strategy of extending our leadership in electrical test & measurement to include online condition monitoring equipment and services and enabling Asset Performance Management critical data flow and related prescriptive insights to electrical power systems through advanced analytic capabilities".

Dr Zeljko Schreiner, Founder and CEO of IPS, commented "I'm very happy to have Megger as our strategic partner who will help us take the business to the next level. We have already identified many opportunities to work together to increase the value for our customers. The IPS Team is looking forward to co-operating with Megger over the coming years".

Underloading of distribution transformers a concern for indian power utilities?

With the world's urban area growing rapidly, the demand for energy to fuel economic activity is expected to rise as well. When compared to developed countries, India's energy demand is almost certain to accelerate considering the growing population and per capita energy consumption.

Foreseeing this demand, the power utilities had to ensure that the demand is met and supply is uninterrupted. To tackle this demand, power utilities planned and built substations with increased load capacity on the distribution side.

Typically, a new substation's load is projected and estimated for a decade or two in advance. Based on the current population and electricity use, a power consumption pattern was identified. As a result, installed transformers in a substation work near optimally. However, this is not the case. The demand did not rise as expected, causing distribution utilities to incurring losses.

Factors that have contributed to the decrease in demand include:

- Concerns about global warming prompted the development of energy-efficient solutions such as LEDs, which have replaced traditional bulbs and CFLs in both indoor and outdoor lighting. On the industry side, the worldwide push for sustainability demanded even more efficiency and energy optimisation.

- Coal and gas were the only ways to generate electricity back then. However, the widespread use of solar rooftops and renewable energy has turned customers into prosumers. This has further lowered customers' reliance on power utilities, resulting in lower energy demand.

- Furthermore, many places did not urbanise as planned.

- What makes this a source of worry for distribution utilities?

- Underloaded transformer: Ideally, at no load, the losses are low and efficiency is high. In reality, transformers running at underload hampers its longevity and efficiency. When a transformer is not correctly sized, the underloaded condition would result in high harmonic currents. This may also cause heating in the transformers. All of this sum up to cause poor performance of the transformer.

- The graph above depicts an underloaded distribution transformer functioning at 20 percent of the rated load for the month of August? 2021. The live data is extracted from MOT-WARE. It depicts the urgent need of optimising the operations.

- Uneconomical operation and maintenance: The substation necessitates frequent maintenance, which adds to the expense. A power utility's performance will suffer if many transformers are under loaded and poorly utilised. Also, it adds to manpower cost. There has been a growing fleet of such transformers in utilities that demand immediate action.

- The Solution - Remote Monitoring of Transformer Parameters and Optimisation of Operations

The Internet of Things has made monitoring transformer parameters more convenient. Modern technology enables solutions that leverage AI and analytics to evaluate transformer condition.

So instead of running multiple underloaded transformers, utilities could identify and shift load to a single one. As a result, transformers are more efficient, resulting in lower operating costs and more productivity.

Remote monitoring reduces the costs involved with on-site monitoring of transformer parameters. Also, the new artificial intelligence-powered technologies help them develop a strategy to meet changing consumer demands.

Motwane's IoTx device for Transformer Monitoring via MOT-WARE

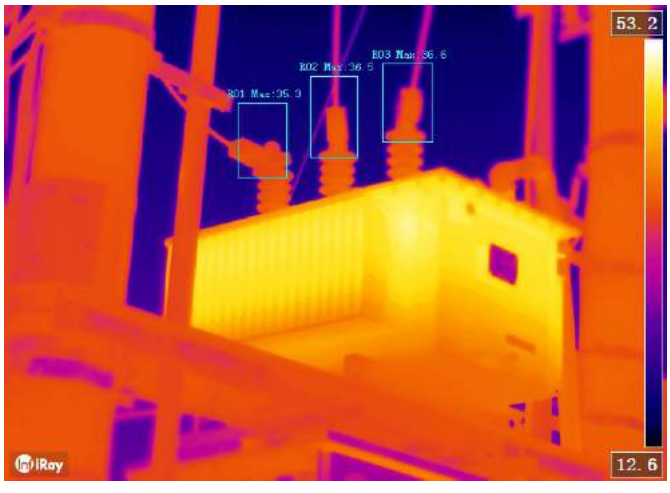
IoTx is Motwane's state-of-the-art Transformer Monitoring Technology that enables any transformer to become a 'Smart Transformer'. Our technology is designed to be a plug & play solution for transformers to measure its vital parameters detect anomaly using big data analytics.

It empowers the utility engineers to use the open-architecture system of MOT-WARE platform that seamlessly integrates with any Test & Measurement equipment as well for better decision making.

Know more about the capabilities of our innovative IoTx device for transformers here:
Visit our site https://motwane.com/product_category/iotx/, now!

Why infrared thermal imagers are essential for electricity detection?

Infiray is committed to providing global customers with professional and competitive infrared thermal imaging products and solutions.



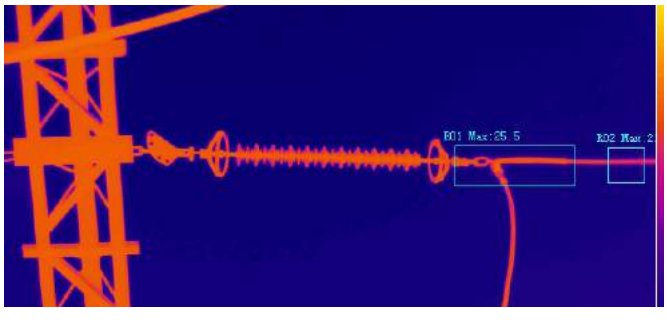
Yantai IRay Technology Co., Ltd is one of the leading manufacturer of uncooled VOx thermal sensors. The company is headquarterd in Yantai city, Shandong province, China with over 1500 employees in their factory, and more than 48 percent staff members are from R&D section and engineers.

InfiRay released the first one 8um 1920x1080 pixels uncooled thermal detector in the world. InfiRay® concentrates on developing infrared thermal imaging technologies and manufacturing relevant products, with completely independent intellectual property rights. The company is committed to providing global customers with professional and competitive infrared thermal imaging products and solutions. Main products include VOx uncooled thermal detectors, thermal modules, and finished thermal cameras.

Thermal cameras produced by InfiRay® have been applied in various fields, including epidemic prevention and control, industrial thermography, security surveillance, fire alarm and prevention, outdoor and hunting, ADAS, AI, UAV, and machine vision etc.

InfiRay provides various products for different application scenarios in the power sector to meet the multi-scenario requirements in power plants, substation, power distribution and transmission. By virtue of infrared temperature measurement devices, it helps maintenance team to enchance inspection efficiency and reduce operational risks. Since infrared thermal imagers adopt non-contact temperature measurement we can measure the temperature of eletricity components at a safe distance.

- Though there are varied categories of electric device faults, heat is produced in most faults. Thermal cameras can help to efficiently locate and eliminate thermal defects in the power grid
- In power systems, our products are applied in thermal defect detection for the transformer devices, voltage transformer, current transformer, coupling capacitor, surge arrester, switch device, reactive power compensation device, and other power transformation device, power transmission lines, power distribution device, and so on.
- Defect detection on the cable clamp and cable connector: Detecting the wire clamp heating. The thermal camera can help you measure the temperature to discover potential defects in advance for defect pre-warning, notifying staff for troubleshooting.
- Power transmission line: Dirt and rupture on the surface; if these problems are severe in nature, the insulation performance will degrade, causing zero-value self-breakage, greatly hampering the operating reliability of the power transmission line.
- Insulator defect detection: Detecting and discovering the dirt, dampness, and degradation on the surface at an early time for prompt handling.
- Transformer: Detecting various types of thermal defects in the transformer, oil tank, bushing, cooler, control circuit, etc.
- Circuit breaker: Detecting poor outer contact, poor moving contact, poor fixed contact, poor middle contact, partial discharge, mutual inductor defects, etc.
- Electric reactor: Detecting the internal and external contact heat, turn-to-turn short circuit, metal accessory heat, and post insulator heat.
- Disconnector: Detecting whether the disconnector contact is over-heated.



For more details about Infiray visit - www.infiray.com.
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Sales Enquiry: sales@infiray.com

Electrical protective devices – An overview

Deteriorated quality of supply due to unforeseen faults like short circuits, over-voltages, and phase failures may lead to a reduction in performance, operational efficiency of equipment, or complete shutdown

Introduction:

With the increasing electrical demand, it is essential to have a continuous healthy electrical power supply in any industry, where interruption of this power results in interruptions in industrial process with huge commercial impact. This interruption is not necessarily due to the power outage. But it mostly happens due to various faults that occur in the system. Deteriorated quality of supply due to unforeseen faults like shortcircuits, over-voltages, and phase failures may lead to a reduction in performance, operational efficiency of equipment, or complete shutdown. Thus, it is crucial to implement necessary measures to prevent the occurrence of these faults in the system. However, if the faults still occur, it is critical to provide electrical safety and minimise the potential damage to life, equipment, and property.

"Basic Protection Relays are specially designed to safeguard an electrical system from abnormal events"

Types of Faults:

Different faults that occur in the system are under-voltage, over-voltage, undercurrent, over current, phase unbalance, phase failure, and neutral failure.

- Over and Under Voltage fault - An under-voltage is a condition when the system voltage goes below the equipment nominal working voltage resulting in equipment failure e.g. motors. This means when system voltage goes below nominal rating, the load current will increase and power carrying capacity of the system decrease. An over-voltage is a condition when the system voltage goes above transformer, capacitor, motor, generator, or reactor voltage rating.

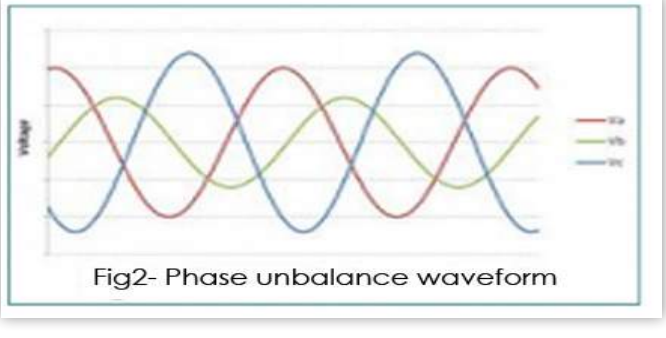

Fig2- Phase unbalance waveform

- Over-voltages can lead to equipment failure, such as failure of a load tap changer controller resulting in a sudden disconnection of consumer load. These faults mostly occur due to sudden loss of load, failure in voltage regulators, and increase in system capacitance.

- Phase failure and phase unbalance - Phase unbalance is the condition when the voltage across the three phases is not equal. In this case, current through the equipment increases which may lead to failure of equipment, generally in case of balanced loads like 3-phase motors. On the other hand, Phase Failure may occur due to a blown fuse, a mechanical failure of the switching equipment, or due to single phasing.

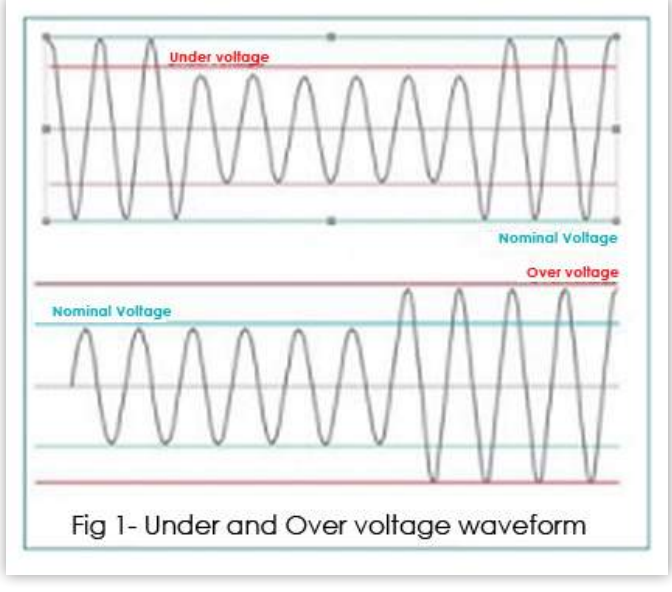

Fig 1- Under and Over voltage waveform

- For e.g. If one phase gets disconnected in a 3-phase, 3-wire, or 4-wire system, it is identified as a loss of phase or single phasing condition.

- Under-current and Over-current Fault - Undercurrent can occur if there is a fault with the power supply, or if aloaded motor becomes unloaded. Under-current relay trips the supply connection when the load current goes below the set-point value. Often an over-voltage situation will cause under-current which causes damage to the load equipment. Over-current can be caused by either the load or the supply such as a sudden increasein load due to faulty electronic or physical load on a motor. Additionally, a voltage drop could also cause anover-current situation. Over-current relay trips the supply when the load current crosses the set-point limit of the connected load.

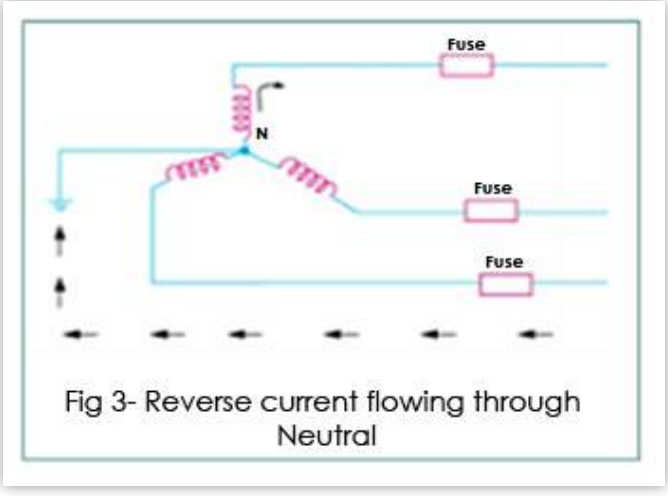

Fig 3- Reverse current flowing through Neutral

- Neutral Failure - If the neutral conductor is open or damaged either at load or source side, it loses its reference ground point. This condition, called floating neutral, can cause voltages to reach maximum RMS phase voltages subjecting to unbalanced


Fig4 16A MCB

load condition. Neutral failure occurs due to poor installation at three-phase distribution transformer, broken neutral conductor, High earth resistance of a neutral conductor, or overloading of neutral.

Protection devices:

System protection is the art and science of detecting problems with power system components and isolating them from the rest of the healthy system during the fault occurrence. There are different protection devices like Fuse, Circuit Breaker (MCB, MCCB, and ACB), and Protection Relays. But these devices have different nature of operation.

- Fuse - Fuse is used against the over-current protection. It consists of a metal strip, which melts down when an over-current condition occurs. Every time user has to replace the fuse wire to connect the load to the supply.

- Circuit breaker - CB is used to provide protection against short circuit current or from the over current. It basically disconnects or trips the supply connection once the fault occurred in the system. Unlike a fuse, a circuit breaker can operate automatically as well as manually to restart the supply. The circuit breaker senses the signal from the relay and then trips the supply. Circuit breakers are instantaneous operating devices. Depending on the type of application circuit breakers are categorised as MCB, MCCB, RCCB, ACB, and VCB.

- Protection Relay - Protection relay does not break the supply connections directly. It simply monitors the abnormal condition of the system and sends a tripping signal to the circuit breaker. Further, the circuit breaker trips the connections and this is how protection is provided by a relay. There are different types of relays for the system protection like Voltage Relay, Current Relay, Line Monitoring Relay, Earth Fault Relay, Earth Leakage Relay, and Motor Protection Relays. Relay detects unhealthy system lines, apparatus/equipment and then initiates the appropriate control circuit action. They have inbuilt electro-mechanical or electronic circuitry for protection function. Relays are of different types e.g. Definite Time Relays and Inverse Definite Time (IDMT) Relays. Relays use in substations is IDMT type that is an inverse definite time, whereas in LT panels definite time relay are preferred.

Rishabh Contribution:

Rishabh basket includes programmable digital as well as static type protection relays that monitor the system to protect it against various types of faults mentioned previously. Rish Relay V and VR protect the system from Over and under voltage fault condition along with phase failure, phase unbalance, incorrect phase sequence, and neutral failure. Similarly, Rish Relay I and AR protect the system against over

Fig 4- a) Rish Relay VR, b) Rish Relay I
c) Rish Relay PHR, d) Rish Relay LVM

and under current fault along with current unbalance. Rish Relay PHR protects the system from phase failure, phase unbalance, and the incorrect phase sequence.

Application areas of these relays are in below industries:

- Automotive industry
- HVACR (Air conditioning and compressors)
- Food and chemical industry
- AMF / MCC panels
- Lighting and control

(This technical write has been authored by Rahul Pansare, Business Promoter – Digital Expertise, Rishabh Instruments Pvt. Ltd.)

E-mobility will be primary mode of transportation

Given the supply chain challenges existed during the pandemic, there is an evident need to focus on 100 percent home-grown EV solutions.

Anmol Bohre, Managing Director and Co-founder, Enigma Automobiles Private Limited

Kindly walk us through your company's profile

Enigma Automobiles Private Limited was established in the year 2015. The tenets of the company are grounded in quality and matchless technology. We aim to bring attractive electric models onto the road at affordable prices and help India make a breakthrough. We have our own manufacturing units at Mandideep, Bhopal, and Uppal in Hyderabad, spanning over 60,000 sq. ft. in aggregate, manufacturing over 60,000 vehicles per annum. Our current streamlined product portfolio includes several successful models–Ambier, Crink, GT 450–with tailored specifications for end consumers such as customisable batteries and regenerative braking. The GT450 and Crink models have been the best-sellers in India, thanks to several first-time timer technologies such as longer battery life and a larger range. The company aims to expand across Asia, Europe and Latin America by the calendar year 2022.

How do you evaluate the demand for EVs in India in the present scenario?

The EV sales in India have been rapidly growing. The electric two-wheelers are the highest selling in the entire segment, even for the last fiscal. The early implantation of state-level policy has assisted in creating a larger ecosystem in the country and helped the industry to grow at a much faster pace. Currently, the state government policies are focused on demand generation for an initial period to help get more volumes on the road. To support this, the government and the private sector (Corporate) are focusing on building the charging infrastructure.

On the current trend, EV sales have seen a spike in demand because of rising fuel prices, while the EV market has many existing automakers and new entrants focusing on EV solutions, which has led to building the affordability factor. For Enigma, our demand has grown to the extent that we have sold as many vehicles in August as we have sold in the entire year, and we are looking to repeat the same in September and October. The whole scenario seems very promising.

With the growing demand and supply of EVs, how are we going to deal with the infrastructural requirement for charging stations?

Geographically India is vast and this is where it's going to be the most challenging task. With the FAME II strategy, India outlined its goal of being the world's electric vehicle hub by 2030. This spike in electric vehicle sales demands a significant uptick in EV charging infrastructure. The government has set aside a sum of ₹ 10,000 Crores to develop the charging stations infrastructure. There are already a set of charging stations alongside primary cities like Mumbai and Bangalore. These are the cities that have a higher adoption rate for new technology too. Once the consumer perception sets in, there shall be a snowball effect into strata shift, and we shall see rapid changes in the scenario within no time. But from my point of view, it will take around 2-3 years at the minimum.

What are the opportunities and challenges for EVs in cities other than Tier-II, Tier-III cities?

From the perspective of an EV manufacturer, Tier-III cities are the easiest to get into. The customer has a daily run of 20-30km, and at max 50km, the electricity is free or very cheap in most places. Therefore, (because of the low battery capacity), the purchase cost is less and due to the conditions, the running cost is

EPR

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9th ANNIVERSARY

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IN ELECTRICAL AND POWER SECTOR

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as good as free. The challenge is the time taken to repair an accidental vehicle and the unavailability of financing options for consumers. Tier 2 cities have seen tremendous adoption of electric two-wheelers. Consumers don't shy away from buying in cash, and readily available different modes of transport allow us to make the service available in the shortest period of time. The challenge here is to break the stereotypes about electric vehicles.

What are your views on having more localisation and homegrown li-Ion batteries for EVs?

India is fully dependent on China, Taiwan and neighboring locations for batteries and several other raw materials for EV manufacturing. Given the supply chain, freight and several other challenges we faced during the pandemic, there is an evident need to focus on 100 percent homegrown EV solutions. We, at Enigma, are among few of the companies that have started our research on factors and affordable technology to manufacture a lithium cell in the country. Localisations of the batteries is already happening as we speak, many companies are spending a lot of effort to bring on prismatic and LFP cell technology to the consumers.

With the government's aim to have a major shift to EVs in the coming decades, how do you see the future of the Indian automobile sector?

India is still at a very nascent stage. The coming years will see electric mobility triumph over every other mode of transportation. Low running costs are always a factor, but with government-sponsored schemes such as FAME-II, there is also a low cost of ownership.

What are your plans and projections to boost your business? What kind of additions can we expect to your EV offerings?

Enigma already has three successful models launched in India. In the next three months, we shall be launching three more two-wheelers. We are also super excited about our flagship scooter, due out in March 2022. Much effort has gone into its R & D and product development. This launch shall also be paired with India's first electric motorcycle, which will have a top speed of 136 kmph. Along with expanding our product line, we plan to expand our presence in new regions such as Karnataka and Telangana, in addition to Tamil Nadu, Madhya Pradesh, Chandigarh and Kerala.

Jakson launches EnerPack, for uninterrupted power supply

The new storage system EnerPack has the intelligence of combining grid power, solar power, wind power and DG power supply.

Jakson Group takes a step forward towards mitigating climate change by launching EnerPack, its new Battery Energy Storage System (B.E.S.S). This product provides carbon-free clean power and enables an uninterrupted silent power supply while significantly reducing costs.

Equipped with a hybrid inverter, lithium-ion batteries and intelligent energy management system, it has the intelligence of combining grid power, solar power, wind power and DG power supply.

Its compact design makes it easy to transport and install, while fast-charge capability and low-system energy consumption makes it practical and pocket–friendly. BESS's uninterrupted power supply ensures zero production losses without disruption in operations.

Speaking on the launch, Sameer Gupta, Chairman & Managing Director, Jakson Group, said, "As an environmental friendly company, we are excited to introduce the Smart Battery Energy Storage System which is going to bring about a revolution in the Distributed Energy space. This product is powered by an in-house design energy management system patented by Jakson and is capable of synchronisation with various power sources. It is designed to optimise power and maximise renewable energy usage that will reduce energy costs for our end customers. With this launch of Battery Energy Storage Systems, Jakson Group takes another step towards mission 'Aatmanirbhar Bharat' and reaffirms its commitment to mitigate climate change".

The BESS commences from a 5KW range, can be customised and further scaled up to meet commercial, defence, healthcare, residential and other industrial applications. It also provides power backup for over 500 hours, reducing industry revenue loss due to power cuts. It requires a maximum of 2 hrs of charging and can be remotely monitored with encrypted data lagging. The product doesn't require civil work and has in–house smart EMS for optimal performance and efficiency.

Rish Insu 5Dx+ Digital Insulation Tester from TMI portfolio

Rishabh Insulation Tester: Ideal for testing insulation of a transformer

Rishabh Insulation Tester Rish Insu 5Dx+ is a Digital Insulation Tester with selectable test voltage upto 5kV and Insulation Resistance measurement upto 10 TΩ. It is designed to perform at power utilities where induction field is very high. Its high noise immunity and user selectable digital filters makes it most robust and reliable instrument with user selectable test voltages. Also, it is used for testing the electrical insulation of cables, motors, generators, transformers, etc. at power generation plants, utilities, distribution.

Its advance features like Bluetooth connectivity, audio read out, touch screen TFT color display makes it never before user friendly. It can store the data on its inbuilt memory with real time stamp. Data can be transferred to computer for future analysis purpose. It performs tests like Polarization Index, Dielectric Absorption Ratio, Dielectric Discharge, Ramp Diagnostic Test, Step voltage test.

Ad Index

REI Expo 2021 enables renewable energy industry to rebound

The 14th REI Expo witnessed a footfall of 12,987 buyers. A virtual platform was also enabled for international visitors from UK, Germany, and European Union pavilion.

The 14th Edition of Renewable Energy India (REI) Expo, inaugurated by Guest of Honour Bhagwanth Khuba, Union Minister of State, New and Renewable Energy, Chemicals and Fertilisers, was successfully concluded at the India Expo Center, Greater Noida, by Informa Markets in India, India's leading B2B exhibition organizer. The event witnessed footfall of visitors from cross-sections of RE sector comprising manufacturing, supply and trading industries. The expo was the 1st Renewable Energy Show in the world to go live with 100 percent physical attendees in the new normal.

The Expo was marked by the presence of top league high profile dignitaries, from ministers, to ambassadors, Best-in-class CXO's and media, all under one roof. It had over 12987 Buyers from various locations, along with fully occupied buyer seller meets, house full conference welcoming more than 70+ speakers and + 500 plus delegates. Some highlights of the conference included a power packed CEO Roundtable Conclave and the financial leader's forum with representation from World Bank, London Stock Exchange and many more. The event saw more than 170 brands being represented including a UK, German, and European Union pavilion. The expo also featured an online dedicated EU Virtual Zone which was set up to support the European participants.

Speaking at the inauguration of REI Expo 2021, Bhagwanth Khuba, Honourable Union Minister of State, New and Renewable Energy, Chemicals and Fertilisers, Government of India congratulated Informa Markets in India for hosting the event and said, "India's participation in the Renewable Energy sector since the last 7 has grown manifold. India is running the world's largest clean energy programme to achieve 175 GW of renewable capacity, including 100GW of solar power by 2022 and 450 GW by 2030. It was a moment of immense pride for the ministry when the achievement of the target of 101 GW renewable capacity was announced on Independence Day this year. We have a focused approach towards turning our vision into reality. With the announcement of the National Hydrogen Mission, the aim is to make the country a global hub for the production and export of green hydrogen. Our country is also a massive producer of biomass -- close to 756 million tonnes, out of which 266 million tonnes is utilized in the manufacture of briquettes and pellets. Our efforts are also dedicated towards decarbonisation of heavy industries like steel, cement and textile industries. In the coming years, the Government will be working on this aspect."

Speaking at the successful conclusion of REI 2021, Yogesh Mudras, Managing Director, Informa Markets in India said, "This year has been remarkable as the expo returned in its physical format after a gap of 2 years. With REI Expo 2021, Informa Markets in India reinforced the bond amongst the industry, Government & Investors. The expo stands by the Indian Government's endeavours of a quantum growth in the renewable energy sector by serving as an Industry catalyst, bringing in the domestic and International RE fraternity, including investors and technological experts all under one roof."

Gaurav Kedia, Chairman, Indian Biogas Association was glad about his organization's decision to participate in the expo this year and said, "It is one of the most crucial events in the renewable energy sector especially after COVID-19. The need of the hour is the push-pull concept, wherein you need proper push from many ends and pull has to come from the market. REI with its expo in physical form is bringing the pull in terms of visitors, exhibitors, and buyers. Till the time, physical events were on hold virtual ones did take place, but the eye-to-eye contact and interpersonal communication play a huge role in building strong business relationships. The turnaround of serious buyers is much greater in this expo and people are coming forward leaving their apprehensions behind seeking some opportunities which has given them result-oriented outcome."

For more information,visit –https://www.informamarkets.com/en/regions/asia/India.html

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