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Publisher's letter

Gearing up to go digital!

The power sector in India is witness to a rapid transformation in technology, and we cannot deny the change that technology has brought to both the industry and our lives. The subjects and issues covered this month, focus on the technologies that continue to disrupt the way we function.

Especially regarding the power sector, we see the adoption of Internet of Things (IoT), Artificial Intelligence (AI), and Big data being leveraged to advance the way the industry functions. These factors have not only eased functioning in a highly competitive and technical market, but has also helped us deliver in a reliable, affordable and in a sustainable way to customers.

The overall demand for stringent guidelines and standards for coal and thermal based power plants brings us to understand the use and scope of Flue Gas Desulphurization (FGD) technology. Our article on FGD describes the various FGD technologies and the way forward for the Indian thermal power sector.

The Electrical India May issue will focus on the building blocks of a smart city addressed via the lens of the power sector. We will feature an exclusive analysis on the impact caused by the COVID-19 outbreak, especially with reference to the electrical and the power sector. Do stay connected and please write to me with your input.

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BEYOND THE LOCKDOWN

After four successive months of decline, the power sector in India witnessed a spike in the demand in February. Overall, around 11 per cent increase in power generation was recorded during the month primarily due to availability of coal stocks at power plants and improvement in renewable power generation led by solar power. Demand for electricity also increased in February largely due to a revival in industrial activity. However, that feeling of optimism didn't last long!

As the novel coronavirus, also known as COVID-19, spreads its wings worldwide, it started impacting the global economy. According to a latest UN trade report, the world economy will go into recession this year with a predicted loss of trillions of dollars of global income due to the coronavirus pandemic. India too could not remain safe from this deadly virus for long.

So far, more than 1,400 COVID-19 positive cases have been reported across the nation. After a "Janata (public) Curfew" observed on 22nd March, Prime Minister Narendra Modi called for a 21-day nation-wide complete lockdown starting midnight 24th March to intensify social distancing in order to mitigate the risk of contracting the infection through community spread. In the absence of any treatment or a vaccine, social distancing has emerged as the most suitable step to arrest the spread of highly contagious coronavirus. However, this will obviously have a deeper impact on the economy and businesses across the sectors are today biting the bullet of lockdown. On the first day of the lockdown, there was a steep fall of around 20 per cent in power demand. It is estimated that the COVID-19 lockdown will cost India around \$20 billion.

Well, behind every disaster, there is often a silver lining! On that note, the UN trade report has hinted 'possible exception of India' from the upcoming global economic recession. Therefore, at the end of the day, once the dust settles and normal economic activities resume, we see a truly bright future for Indian power sector. ■



Subhajit Roy
Group Editor

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Two Kudankulam NPP power units connected to India's power grid



The second Kudankulam NPP power unit is stably working after undergoing scheduled preventative maintenance on March 14, 2020.

“The scheduled preventative maintenance was completed ahead of schedule, which proves the fact that NPCIL and ASE specialists not only have a common language, but also can work together as a coordinated team,” noted Igor Korolchenko, Head of Technical Support Directorate for Blocks 1 and 2. “We were working against an approved schedule, but due to good mutual understanding have completed tasks ahead of schedule.”

Pursuant to the decision taken by the JCC the parties have organised a series of bilateral meetings where they have worked out and approved the schedule taking into account ASE's experience of doing similar jobs on other power units.

The scheduled preventative maintenance was started on December 15, 2019. In addition to works on the generator stator the scope of maintenance included metal stress control, components servicing, repairs and testing of main and auxiliary equipment of the power unit in accordance with the schedule. EI

India is 3rd largest producer of power in the world: R K Singh

As per the latest key world energy statistics published by the IEA in 2019, India is the 3rd largest producer of electricity in the world and it ranks 106th in terms of per capita consumption in 2017.

Stating this in a written reply in the Lok Sabha R K Singh, Power Minister stated that reforms in power sector are a continuous process due to changes in the situation. India has become power surplus from power deficit situation. Thus, power sector reforms now focus on supply of 24x7 quality power to consumers, higher standards of service, promotion of renewable

energy sources, development of hydro power, improving efficiency, especially in distribution sector, etc. Reforms linked distribution schemes and changes in tariff policy are some of the measures under consideration in this regard.

He further stated that generation from hydro power projects mainly depends on the availability of water. Power generation from hydro sources has registered a compound annual growth rate of 3.3 per cent from 0.121 BU in 2015-16 to 0.134 BU in 2018-19. Hydro power generation has not been lowered down as part of any policy. EI

GE Steam Power technology to help CPRI become India's highest capacity laboratory

GE Steam Power announced a deal worth USD 32 million for the supply of two 2500 MVA short circuit generator systems with Central Power Research Institute (CPRI) Bengaluru. This contract was awarded to GE Power Systems India Private Limited (GEPSIPL) by CPRI. CPRI is an autonomous society under Ministry of Power.

The scope of the project includes the supply, installation, commissioning and testing of two sets of 2500 MVA short circuit generators with super excitation, driving and auxiliary systems, ready for parallel operation in synchronisation with their existing 2500 MVA generator to yield short circuit powers of 2500 MVA, 5000 MVA and 7500MVA respectively. The generator will be manufactured at GE factory in

Sanand, Gujarat. The project is envisaged to be operational by 2022.

In order to meet the growing demand of the infrastructure development in the field of research and testing activities of power sector, CPRI is at the forefront of developing indigenous capabilities to enhance high power testing in India. The addition of the 2 x 2500 MVA Short Circuit Generators to the existing one in HPL, Bengaluru, will upgrade the capacity of the high power lab to 7500 MVA making it the highest capacity short circuit capacity laboratory in India.

The expanded power supply in CPRI high-power laboratory will be used to test new transformers, circuit breakers and other components for grids or super grids that transport high volumes of electricity across distances. EI

NTPC prepared to supply uninterrupted power amidst COVID 19 threat

National Thermal Power Corporation (NTPC) is prepared to supply uninterrupted power to the nation despite the widespread threat of COVID-19. To deal with the ongoing crisis, NTPC has issued suitable advisories for its employees posted at various units and offices in line with the advisory issued by the Government of India to deal with the epidemic. All employees have been advised to avoid face to face meetings and public gatherings to the extent feasible.

NTPC has ensured wide circulation of dos & don'ts with regards to COVID-19 in the townships, to all employees through different modes of extensive campaigning like films, posters, hoardings etc.

Officials have been advised to curtail visit to foreign countries to the extent feasible. Further, any person who has visited affected foreign countries in the recent past (last 14 days) is appropriately advised to report to the State Health Authorities.

All the trained healthcare staff at NTPC Townships is observing the Prevention and Control (IPC) guidelines and are using Protective Personal Equipment (PPE). NTPC has also ensured that visitors with essential business requirement 'only' are permitted to enter NTPC premises. 

BHEL wins order for electric buses

Bharat Heavy Electricals Limited (BHEL) has won the order for supply of state-of-the-art electric buses along with charging infrastructure of these buses for Gorakhpur City.

The order has been placed on BHEL by the Urban Transport Directorate (UTD), Lucknow. These low floor, disabled-friendly electric buses will be



deployed by UTD at the Gorakhpur airport.

This is in line with company's transformation initiative of expanding into new markets or businesses.

Further, as part of transformation journey, BHEL is consolidating and reinvigorating the initiatives taken in Defence & Aerospace, Water, E-mobility, Batteries, Renewables and Transportation business. 

KSB promotes FGD systems to reduce emission

KSB, one of the manufacturers of pumps and industrial valves, has reiterated its support towards government's efforts in reducing sulphur content in the flue gas emission by 30-35 per cent from 2005 level by 2030. This is agreed at COP 21 Summit (United Nations Framework Convention on Climate Change) in Paris. As part of the commitment, KSB has localised slurry recirculation pumps required for Flue Gas Desulphurisation (FGD) applications. The company has recently bagged total order worth Rs. 100 crore for the supply of slurry recirculation pumps in FGD plants to be installed across ten National Thermal Power Corporation (NTPC) sites in India. FGD systems will be installed in power plants having a total generation capacity of 166 GW in the coming years.

FGD process is aimed at reducing the SO₂ emission in the flue or stack gases from thermal power plants into the atmosphere. FGD plants are comparatively new to India and KSB Limited has continued its tradition of indigenising highly specialised products by adding the Slurry Recirculation Pumps required for FGD plants in



its portfolio for local manufacturing. Gigantic in size, these pumps handle the critical slurry application in FGD plant and have a special lining for high wear life for more running hours. KSB has bagged several orders in these types of plants and has localised the special lining technology. With a combination of Variable Frequency Drive (VFD), Motor and Gear Box in the test field, KSB has the flexibility to test the pumps in-house at the various operating conditions depending on customer requirements.

Rajeev Jain, Regional Executive Officer, West Asia and Managing Director, KSB India said, "Though the process is relatively new, the implementation of industrial pollution norms has been gaining momentum in India in the last few years. We have managed to bag orders for slurry recirculation pumps for a large number of power plants in a short span of time. We foresee a huge surge for slurry recirculation pumps for FGD systems in India up to 2022." 

OSRAM introduces innovative textile illumination technology in India

Workers, cyclists, runners, pedestrians, school children and more can step outside with visibility, safety and confidence thanks to active textile illumination from OSRAM.

Designed for use in garments and accessories, this innovative LED technology is ideal for brands looking to build extra visibility and smart safety features into workwear, sports and leisure clothing, plus outdoor equipment such as helmets, back-packs and school bags. The OSRAM LED modules are available in a variety of colours and configurations and powered by a power bank for up to eight hours of illumination. With the power bank removed, it can be washed within the garment at 60C and dried at 90C.

Avinder Singh, CEO – OSRAM Lighting India, said, “We live in a high-tech world, but it can still be difficult to spot people using few latest technologies while working on roads, sidewalks, trails and more in bad weather conditions or during hours of darkness. This poses major risks to personal safety.”

Reflectors, that react to only incident light, are effective till the time light falls on the reflectors. OSRAM has a smart solution for this – its active LED technology offers a way to be seen at a distance – and stay seen – with three times more visibility than retro-reflective products. 

Polycab launches Experience Centre & Branch Office in Kerala

Polycab India inaugurated Polycab Experience Centre and Branch Office at Trivandrum. Kunal Jaisinghani, Head - Agri Products, Polycab, inaugurated Polycab Experience Centre at Manalil Heights of Trivandrum in the presence of the senior management team members, several prominent business associates, influential and trade fraternity constituents.

Polycab Experience Centre showcases entire range of high quality, premium as well as value for money offerings. In Wires & Cables, Polycab has the widest range of power cables, control cables, instrumentation, building wires and industrial cables. The Experience Centre also showcases the company’s wide array of FMEG product portfolio. Polycab also intends to focus on street lighting with automated IoT based smart systems and other specialised products such

as domestic and agriculture pumps amongst others.

Manoj Verma, Executive President and Chief Operating Officer (FMEG), Polycab India, said, “It is our endeavour to add value to the customer experience through our products and offerings. Polycab Experience Centres is an attempt from our end to offer an exquisite experience to the customers who are planning to buy electrical equipment’s for their household needs.”

Kunal. Jaisinghani, Head Agri Products, Polycab India, said, “This will be the third Polycab Experience Centre. We have received great feedback from the customers and our retail partners about their experiences at the store. Polycab Experience Centre showcases the entire premium range of high-quality offerings, which are value for money in various categories such as Wires, Cables, innovative frame retardant products etc.” 

Signify brings power of lighting to five school playgrounds in Haryana

Signify recently illuminated five playgrounds in rural government schools in the Mewat district of Haryana under its CSR program called ‘Khel Jyoti’. These playgrounds have badminton courts that are illuminated using high-mast LED lighting, powered by solar energy. Under the Khel Jyoti program, Signify seeks to create opportunities for young and budding sports talent to play for longer hours. Signify has partnered with SRF Foundation for this project.

“There is a lot of potential for India to leverage its demographic advantage and create its mark in international sports in the future,” said Natasha Tandon, Head – Integrated Communications and CSR for Signify in India.

“We are delighted to facilitate Signify’s ‘Khel Jyoti’ Program as it enables our students to enhance their expertise and actualise their expanding potential in badminton,” said Dr Suresh Reddy, Director, SRF Foundation 

Tata Motors Lucknow plant on track to achieve 100% RE

Staying true to the Tata Group's core philosophy of adopting sustainable practices, Tata Motors Lucknow plant has minimised the use of energy in its functions and processes with its constructive and consistent efforts. The company's Lucknow plant has adopted an Energy Management System (EMS), which has ensured a substantial reduction of 38 per cent in specific energy consumption over the last four years, i.e. from 406 kWh or equivalent vehicle in FY2015-16 to 250 kWh or equivalent vehicle in FY2018-19. Tata Motors' Lucknow plant is moving swiftly towards improving its energy efficiency by leveraging innovation, optimising operations, implementing energy-efficient technologies, adoption of energy conservation measures, use of renewable sources of energy, and low-cost automation.

Pramod Choudhary, Plant Head, Tata Motors Lucknow, said, "We have set the action plans for carbon emission control, energy conservation, water conservation, and waste management. Our Lucknow plant has always been cognizant of the need for energy conservation and has been steadily making progress towards attaining 100 per cent renewable energy, sourcing for all its operations by 2030. We have increased the share of renewable energy to over 16 per cent in the last two years." 

Sterlite Power Announces Financial Closure of Lakadia Vadodara Transmission Project

Sterlite Power, a developer in power transmission, has achieved financial closure for its Lakadia Vadodara Transmission Project Ltd (LVTPL). This project is part of India's Green Energy Corridor (GEC) and will enable the country's renewable energy target of achieving 175 GW RE by 2022. The project has secured funds worth INR 2,024 crore from IndusInd Bank and L&T Infrastructure Finance.

Anuraag Srivastava, Group CFO, Sterlite Power said, "This project is aligned with our country's renewable energy target of 175 GW RE by 2022. As a developer in power transmission, Sterlite Power aims to deliver and execute large



scale renewable energy transmission projects across the country."

Sterlite Power had won this project (WRSS 21 – Part B) through tariff-based competitive bidding (TBCB) process that connects the wind energy zones of Bhuj in Gujarat to the load centres in Gujarat and Maharashtra. It involves laying of 330 kms of 765 kV double-circuit transmission line to connect 765/400 kV Lakadia substation to Vadodara substation in Gujarat, in an aggressive timeframe of 18 months. 

Schneider Electric joins Cybersecurity Tech Accord

Schneider Electric has joined the Cybersecurity Tech Accord, a watershed agreement among its signatories to enhance the cybersecurity ecosystem and to defend the digital economy from cyberattacks.

The Cybersecurity Tech Accord is a public commitment among 144 global companies to protect and empower civilians online and to improve the security, stability and resilience of cyberspace. Schneider Electric is committed to upholding the Accord's core principles and will continue to work closely with governments, customers, and partners to confront cybersecurity risks and challenges.

"We are facing a reality and geopolitical climate where malicious actors have unlimited time,

resources and funding to carry out cyberattacks. Taking on newer, more innovative and increasingly dangerous threats can't be limited to a single company, industry or region," said Christophe Blassiau, Senior Vice President, Digital Security and Global CISO, Schneider Electric. "In joining the Cybersecurity Tech Accord, we're proud to continue our collaboration with industry leaders to help detect, prevent and respond to cyberattacks." Schneider Electric and fellow Cybersecurity Tech Accord signatories, including partners such as Cisco and Microsoft, secure critical aspects of the world's online environment, including telecommunications, data centers and industrial control systems. 

Siemens unveils UK's first converted 'Electric Avenue'

Siemens has unveiled the UK's first avenue, which is over half a mile in length, that has been fully converted to cater for electric vehicle (EV) charging, coined 'Electric Avenue, W9'.

Sutherland Avenue is UK's first residential avenue fully converted to provide lamppost electric vehicle charging points. The project, in collaboration with ubitricity and Westminster City Council, has successfully converted 24 lampposts into EV charge points. Residents can now charge EVs at various locations along Sutherland Avenue in London.

The launch follows Siemens research showing over a third (36 per cent) of British motorists planned to buy a hybrid or electric vehicle as their next car, with two in five people (40 per cent) saying that a lack of charging points stopped them from doing so sooner. This makes it the biggest factor deterring motorists from purchasing an electric or hybrid vehicle.

'Electric Avenue, W9' showcases a shift in attitudes towards EVs that Britain's capital is experiencing. Data shows 80 per cent of motorists in central London believe it is 'very important' that air quality is improved, and 83 per cent have become more concerned about their carbon footprint in the past five years. Westminster has seen a 40 per cent growth in EVs charged in the borough during 2019. 

Rotork electro-hydraulic actuator installed at Spanish mountain range power plant

A Rotork electro-hydraulic actuator has been installed at an energy generation company's hydro-electric plant in the heart of a Spanish mountain range.

A Rotork Skilmatic actuator is being used to operate a critical butterfly valve installed on a pipeline feeding the power plant's turbine at the Repsol site, which is located high up in the Picos de Europa mountains.

The actuator has been installed on the Naranjo de Bulnes peak, which reaches a summit of 2,518 metres above sea level, in Camarmena, an area in the northern Spanish principality of Asturias.

The site's height and access difficulties made the installation tough but the hard work of Rotork's service engineers from the Spanish



office ensured that the installation was successful, demonstrating Rotork's versatility and ability to overcome challenges.

Rotork's SI actuators offer a reliable way to carry out analogue control for both quarter-turn and linear valves and dampers. The actuators combine the simplicity of electrical operation with hydraulic precision and the reliability of spring-return or accumulator fail-safe action. 

E.ON pledges social responsibility in corona crises

E.ON CEO Teyssen emphasises social and systemic significance of critical energy infrastructure in current crisis. He emphasised, "Energy utilities have a special significance for critical infrastructure in this crisis and thus, a special responsibility. We're Europe's biggest operator of energy networks. Their reliability and continuous availability is of paramount importance for healthcare, public order, and people everywhere. We will do everything in our power to ensure supply security, even in this situation. Despite the difficult times, more than 14,000 of our employees are working for our customers in our networks and

at our production facilities." Teyssen affirmed that the company would join other utilities to support the German Energy Association's pledge, until further notice, not to disconnect financially vulnerable customers.

Teyssen also addressed the corona crisis's possible implications for the company, "Overall, the energy industry doubtless won't be as hard hit as other industries. But will still expect the crisis to leave its mark on our bottomline. Industrial and commercial customers are consuming noticeably less energy. This will have a temporary impact our network and sales businesses." 

ABB acquires Chinese EV charging provider Chargedot

ABB is to acquire a majority stake of 67 per cent in Shanghai Chargedot New Energy Technology Chargedot, a leading Chinese e-mobility solution provider. The transaction is expected to be completed in the coming months and ABB has the possibility to increase its stake further in the next three years.

Shanghai-based Chargedot has made a significant contribution to the uptake of electric vehicles in China. Chargedot is a natural fit for ABB, which as a leader in sustainable transportation infrastructure. The acquisition will strengthen ABB's relationship with leading Chinese electric vehicle manufacturers and broaden the company's e-mobility portfolio with hardware and software developed specifically for local requirements.

"This investment is a further demonstration of ABB's commitment to enabling sustainable mobility," said Tarak Mehta, President of ABB's Electrification business. "With China forging ahead in the development of a comprehensive e-mobility ecosystem, this acquisition will give ABB a significant role in delivering growth, working closely with SAIC and other leading Chinese car manufacturers."

"Chargedot was one of the first high-tech enterprises in China to focus on new energy vehicle charging solutions. By joining with ABB, we will be positioned strongly to make the next big leap forward," said Mao Chunhua, CEO of Chargedot. E1

ENGIE refuels the world's first renewable hydrogen passenger train in test in Netherlands

ENGIE, a leader in the zero-carbon transition, successfully refuelled a hydrogen passenger train in a pilot test in the Northern Netherlands that took place between February 27 and March 11.

The testing of Coradia iLint, the world's first renewable hydrogen passenger train, is led by the Netherlands' province of Groningen, and jointly conducted with Alstom, a French multi-national in rail transport, Arriva, a local train operator, ProRail, a Dutch railway infrastructure agency, and DEKRA, an independent testing organisation.

The train is powered by a hydrogen fuel cell, which produces electrical power for traction. It emits only water and steam during operation, representing a clean alternative for the regional government looking to replace diesel fleets on non-electrified lines and meet their zero



carbon emission objectives. In the Netherlands, the rail network is about 1,000 km of non-electrified railway lines. Around 100 diesel trains are currently running on these lines daily. With the common goal to develop zero-carbon transport, this joint project aims to demonstrate that the hydrogen fuel cell is an ideal technology to achieve clean rail transport.

The train tests without passengers were conducted on the 55-km railway between Leeuwarden and Groningen, at up to 140 km per hour. During the test, ENGIE supplied renewable hydrogen and operated the mobile refuelling station. E2

Hannover Messe 2020 Cancelled

The world of industry will not be able to meet in Hannover this year. Comprehensive travel restrictions, bans on group gatherings and a prohibition decree in the Hannover region make it impossible to stage HANNOVER MESSE. At the same time, the corona crisis is affecting the economy, and the manufacturing industry – HANNOVER MESSE's core clientele – is already struggling with serious consequences of the pandemic. Demand and sales in German industry are declining, resulting in supply bottlenecks,

production stops and reduced working hours for employees.

"Given the dynamic development around Covid-19 and the extensive restrictions on public and economic life, HANNOVER MESSE cannot take place this year," says Dr. Jochen Köckler, Chairman of the Board of Management, Deutsche Messe AG. "Our exhibitors, partners and our entire team did everything they could to make it happen, but today we have to accept that in 2020 it will not be possible to host the world's most important industrial event." E3

Best Power Equipments appoints Girish Paralikar as AVP - Service Head



GM Girish Paralikar

Best Power Equipments (India) which provides end-to-end strategic power solutions, has appointed Girish Paralikar as Associate Vice President -

Service Head. As business unit head, Girish will take care of corporate relationship and developing new and existing business across industries. He will be based in Mumbai and look forward to enhancing the business in Maharashtra.

Girish brings with him rich industry experience of more than 25 years. Prior to joining Best Power Equipments (BPE), he was working with Schneider Electric as General Manager - Field Services. He was responsible for sales and partnerships wherein he achieved a milestone developing service business for APC and MG Brand.

According to Amitansu Satpathy, Managing Director, Best Power Equipments (BPE), "We are very pleased to welcome Girish Paralikar and look forward to working with him to enhance brand presence in Maharashtra." He further added that his appointment will further help BPE in expanding out horizons thus spreading our footprints."

Girish also had an opportunity to be associated with HCL, Canon India, Kingston Technology & Lexmark International thus, taking care as a head about service delivery, tech support & customer service thus maintaining operational excellence. 

Bhanu Pratap Yadav assumed charge of Chairman & Managing Director of IREDA



Bhanu Pratap Yadav

Bhanu Pratap Yadav, Joint Secretary, Ministry of New and Renewable Energy (MNRE), Government of India has assumed additional charge of Chairman & Managing Director, Indian Renewable Energy Development Agency (IREDA) from 6th January 2020. Yadav is an IAS Officer from 1992 batch. He is presently working as Joint Secretary, MNRE. He has done his B. Tech & M. Tech from IIT, Delhi and Executive MBA from ISB, Hyderabad. 

B C Tripathi joins as Non-Executive Chairman, Essar Exploration & Production



B C Tripathi

In a move to drive the strategy and growth of its energy investments, Essar Capital Ltd (ECL), the investment manager of Essar Global Fund Ltd (EGFL), has appointed B C Tripathi as the Non-Executive Chairman of Essar Exploration and Production Mauritius (EEPLM) and Board Member of Essar Oil UK Ltd (EOUKL).

EEPLM and EOUKL are key energy assets in ECL's investment portfolio, together accounting for a substantial part of EGFL's energy exposure. Tripathi's induction signals EGFL's renewed interest in the energy sector. He will drive

the investment strategy and play a key role in providing strategic direction to EGFL. Tripathi, who was the Chairman and Managing Director of GAIL (India) for over a decade, is one of the foremost energy strategists in the country. He is credited with transforming GAIL into a multi-asset multi-national portfolio company. "A person of Tripathi's calibre is an invaluable addition to our leadership team. His exemplary track record in India's energy sector will help EGFL grow and add significant value to our energy investments globally," said Prashant Ruia, Director-Essar Capital.

"EGFL is among the only Indian funds whose investments straddle the entire hydrocarbon value chain, comprising upstream exploration and production, midstream refining and downstream retail globally. I look forward to contributing to the future direction of India's oil and gas economy, in which Essar continues to be a key player," said Mr Tripathi on his appointment.

EGFL has invested significantly in conventional and non-conventional oil and gas fields across the world through EEPLM, which manages these investments as an early stage developer. It has participating interests in conventional oil & gas acreages in India, Vietnam and Nigeria, with an overall resource base of 3.4 bboe (barrels of oil equivalent).

EEPLM, through its subsidiary Essar Oil & Gas Exploration & Production Ltd (EOGEP), is India's largest operator of unconventional hydrocarbon acreages located across key sedimentary basins in the country. These acreages have a resource base of 15 TCF (Trillion Cubic Feet) and includes both CBM (Coal Bed Methane) and shale reserves. 

NTPC crowned as 'Champion of Champions' at PRCI Conclave

National Thermal Power Corporation, (NTPC), India's largest power generating company bagged 28 awards at Corporate Communication Excellence Awards 2020 and was conferred with the 'Champion of Champions Title' in a grand ceremony organised during the 14th Global Communication Conclave by Public Relations Council of India (PRCI) at Bengaluru recently.

Saptarshi Roy, Director (HR), NTPC received the PRCI Chanakya Award for Best Communicator and K M Prashanth, AGM (Corporate Communications) was also honoured and inducted to the PRCI Hall of Fame for the year 2019.

The awards ceremony was graced by Basavraj Bommai, Minister of Home, Government of Karnataka,



Justice H N Nagmohan Das, Former Justice of High Court of Karnataka, N Bhaskar Rao, Commissioner of Police, Bengaluru, Dr K R Vice Chancellor, Bengaluru University and M B Jayaram, Chief Mentor and Chairman Emeritus, PRCI.

NTPC won awards in the various categories ranging from CSR campaign, corporate brochure, public

affairs campaign, digital newsletter, films, crisis communications, public service advertisements, environmental communication, internal communication campaign, wall calendar etc. NTPC's stations Unchahar, Simhadri, Talcher Kaniha, WR-I HQs, Mouda, Gadarwara, Singrauli, Varanasi, Bongaigaon including corporate centre bagged awards in various categories. More than 70 companies (both private and public) had participated in the awards. 

Okaya crowned as India's most Desired Brand-2020 in TRA research report

Okaya wins prestigious crown of 'India's Most Desired Brand-2020' in Inverter Batteries category in TRA research report.

Okaya Power, a manufacturer of battery and power back up products, has won the prestigious crown of 'India's most desired brand-2020' in recently released Brand Trust Report- 2020 by brand analytics firm TRA Research. Okaya topped the TRA research ranking amongst the three foremost players in the industry in all India listings of this report.

TRA, which is brand intelligence and data insights major dedicated to understand and analyse stakeholder behaviour through globally acclaimed, proprietary matrices of Brand Trust and Brand Attractiveness, bestowed the esteemed recognition upon Okaya in the Inverter Batteries category. Undoubtedly, this achievement is another feather in Okaya's cap in view of its absolute commitment towards offering customised Energy Storage Solutions to promote solar power, electric vehicles, and their applications in India.

Arush Gupta, Director & CEO, Okaya Power said, "It's an extremely proud recognition which has boosted up our morale while we deliver high quality and well-expanded product portfolio. Brand Okaya has always believed in providing the best products to its customers with its focus on innovations, superior technology and after sales support. The acknowledgment is the outcome of the trust and relationship we created over the years which is our key brand factor quotient and it manifests in our relationship with our trade partners many of whom are there with us since the inception of brand Okaya."

With its excellent range of Lead Acid Batteries along with Lithium batteries, Okaya has set in motion another big revolution in power storage solutions. It has already achieved distinct technological advancements in cell structure with simultaneously commanding excellence in bringing various new innovations in module design of energy storage solutions. Okaya takes pride in delivering only the highest quality product line that exceeds customers' expectations. 



Microgrid Market worth \$47.4 bn by 2025

Rising demand for clean energy, increasing instances of cyberattacks on energy infrastructure, growing requirement for reliable and secure global power supply, and rising global deployment of microgrids for rural electrification are key factors driving the market growth.

According to MarketsandMarkets report, the Microgrid Market is projected to reach USD 47.4 billion by 2025 from USD 28.6 billion in 2020, at a CAGR of 10.6 per cent between 2020 and 2025. Rising demand for clean energy, increasing instances of cyberattacks on energy infrastructure, growing requirement for reliable and secure global power supply, and rising global deployment of microgrids for rural electrification are key factors driving the market growth. Furthermore, the expansion of renewable energy capacity of countries in APAC and governments' initiatives to encourage the development of microgrids are generating the opportunities for microgrid developers.

Grid-connected microgrid segment to grow at a higher CAGR during the forecast period

Grid-connected microgrids are connected to large utility grids. They are typically used to serve both small areas comprising a few houses and large areas such as military installations. In grid-connected microgrids, power transmission is dependent on the main grids; thus, any damage to these affects the overall power transmission networks.

Solar PV power technology is used mainly in grid-connected microgrids. The growth of this segment can be attributed to the expansion of utility-based grid networks, coupled with the large-scale use of renewable sources of energy such as offshore wind. Grid-connected microgrids offer grid resiliency and improved quality power. They have a low impact on the environment.

Power generators to hold the largest share of the hardware microgrid market during the forecast period

End-users worldwide are increasingly adopting microgrids to achieve energy goals such as improved reliability of electricity, fewer carbon emissions, reduced electricity costs, and generation of electricity from different sources of energy. The distributed generation of electricity is considered as the foundation stone of microgrids as it enables the use

of various sources of energy to generate electricity. These include renewable energy sources (solar, wind, PV cells, etc.) and non-renewable energy sources (fuel cells, diesel generators, CHP and micro-CHP, microturbines, etc.). The use of renewable sources of energy such as PV cells, wind turbines, and hydro turbines for power generation in microgrids is one of the prominent factors contributing to the growth of the microgrid hardware market globally. Other advantages of integrating renewable sources of energy with microgrids are reduced emissions of greenhouse gases, lower dependency on local or imported fuels, and increased requirement of energy security.

Microgrid market in APAC to grow at highest CAGR during the forecast period

The microgrid industry in APAC is projected to grow at the fastest CAGR during the forecast period. This growth can be attributed to the high rate of rural electrification in several economies such as India, Malaysia, and the Philippines. A large number of islands in Indonesia and the Philippines and the lack of proper electricity infrastructure in emerging economies led to the demand for cost-effective microgrids in the region as it has a large portion of unelectrified areas. This is expected to contribute to the growth of the microgrid market in APAC during the forecast period.

ABB (ABB, Switzerland), General Electric Company (GE, US), Siemens AG (Siemens, Germany), Eaton Corporation Inc. (Eaton, Ireland), Schneider Electric SE (Schneider Electric, France), Honeywell International Inc. (Honeywell, US), HOMER Energy LLC (Homer Energy, US), S&C Electric Company (S&C Electric, US), Power Analytics Corporation (Power Analytics, US), and Exelon Corporation (Exelon, US) are a few major players in the global microgrid market. 

Source: MarketsandMarkets

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THE DIGITAL POWER PLANT

Power sector is at the forefront of technology transformation. Here's an analysis on how disruptive digital technologies are changing today's power plants.

**By Subhajt Roy,
Group Editor**

The Indian power sector is at the cusp of a massive transformation. There are various factors that are driving the change in the sector such as rapid urbanisation, the addition of renewables, advent of electric vehicles, consumers becoming generator etc. – making it more complex than ever before. The digital transformation of energy management and automation lies at the core of this journey, enabling the emergence of a new landscape of energy, a paradigm shift for the industry, and a revolutionised experience.

“Digitisation in power plants fundamentally means combining technology such as IoT (Internet of Things), AI (Artificial Intelligence) and Big Data with advanced hardware to deliver reliability, affordability and sustainability. It can help to pull down costs, improve efficiencies, and lower carbon output of a power plant,” said Ponniah Sankarakumar, Director- Power Systems, Schneider Electric India.

Technology can enable fast ramp-up or ramp-down of thermal units, run them on part load and make their overall operations more efficient as well as reduce carbon emissions.

According to Gerd Deusser, Head of Gas and Power, Siemens Limited, advances in the energy sector will depend to a great extent on the degree to which we fully leverage the power of digitalisation. “By increasing automation and intelligence in the system, rich data can be translated into better and faster operational decisions and leverage major efficiency and safety gains across the entire value chain,” Gerd Deusser added.

Service digitalisation can provide seamless monitoring of real-time conditions for optimising the uptime and performance of an installation and extending the life of mission-critical equipment. It will enable the efficient running of equipment, improved life-cycle management and paves the way for predictive maintenance. Innovative approaches like these are critically important and are transforming the industry at a speed that was unimaginable just a few years ago.

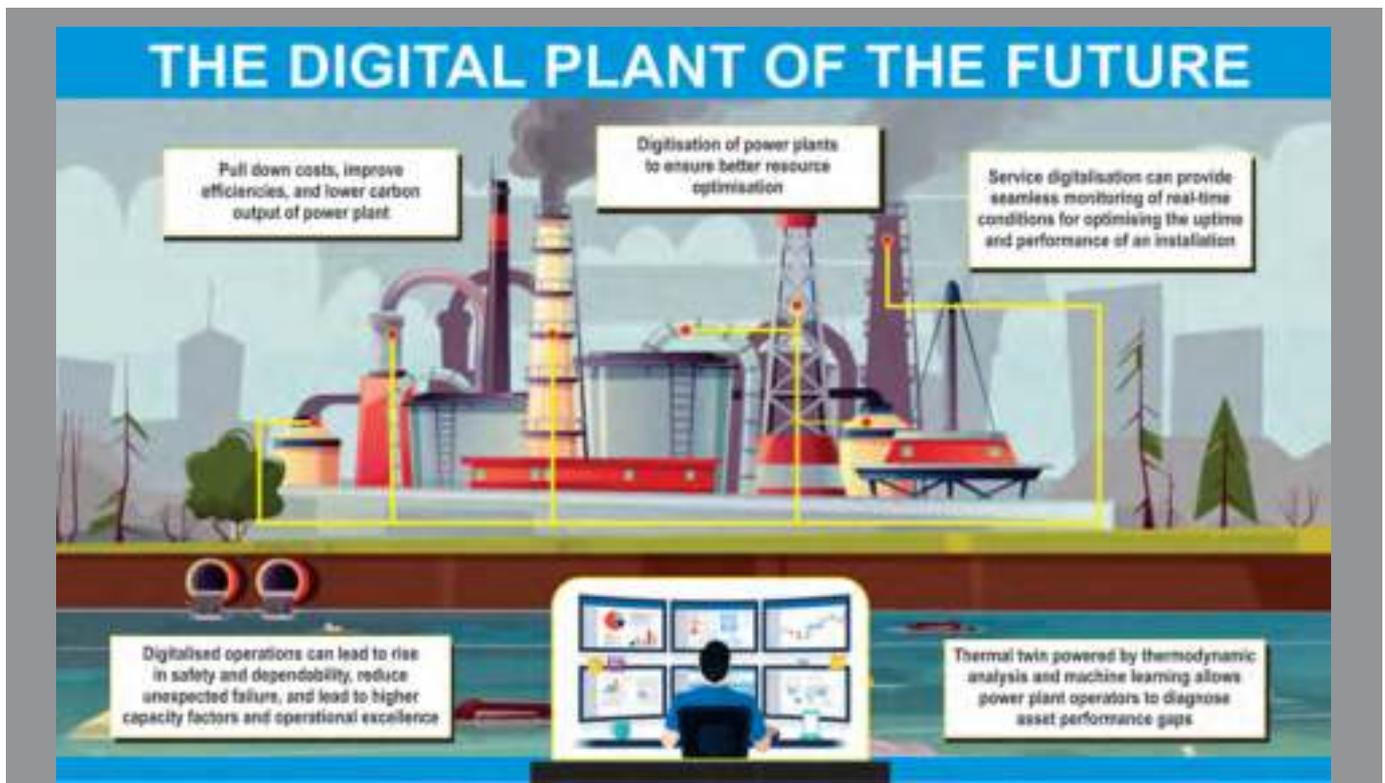


ADVANCES IN THE ENERGY SECTOR WILL DEPEND TO A GREAT EXTENT ON THE DEGREE TO WHICH WE FULLY LEVERAGE THE POWER OF DIGITALISATION.
GERD DEUSSER,
HEAD OF GAS AND POWER,
SIEMENS LIMITED

Similarly, a thermal twin powered by thermodynamic analysis and machine learning allows power plant operators to diagnose performance gaps for every asset in the cycle in real-time and provides

recommendations for improving performance, observed Gerd Deusser. He adds, “A co-creation approach, where OEM experts in close collaboration with plant operations team provide remote performance monitoring and diagnostics, can assist the plant team in identifying and rectifying performance gaps in a timely manner.”

Furthermore, digitalised operations can lead to rise in safety and dependability, reduce unexpected failure, and lead to higher capacity factors and operational excellence. Hence, in Sankarakumar’s opinion, digital solutions have the ability to fulfil India’s energy ambitions by maximising performance and efficiency across power plants. He adds, “As power plants adapt to digital technologies, it will not only enhance day-to-day operations but will also bring about the kind of disruption in the power sector.”



How companies are gearing up

Digitalisation, globalisation, urbanisation, demographics, and climate are the forces that are shaping our world – both currently and in the future. These forces also drive Siemens business strategy, which is working with our customers to develop solutions to navigate these significant shifts, based on our knowhow and experience, opines Gerd Deusser.

Siemens helps customers to meet the evolving demands of industries and societies – comprehensive portfolio for utilities, independent power producers, transmission system operators and the oil and gas industry. “Siemens is the only company able to support the entire energy value chain enable through accelerated collaboration and co-creation and strengthened collective know-how of our people,” Gerd Deusser claims. He adds, “Among the strengths of Siemens in the journey toward energy transition are installing technologies to optimise asset performance with digitalisation, improving supply chain with Additive Manufacturing to protecting assets through Cybersecurity and setting up application centers for co-creation and collaboration.”

On the other hand, Schneider Electric believes that digitisation of the power plants will ensure better optimisation of resources in the power sector. “We aim to strengthen our commitment through the digitisation of the power distribution thereby creating a ‘New World of Energy’ which is more efficient, sustainable, reliable and connected,” said Sankarakumar.

Storage technologies – a major trend

One of the major trends is



DIGITAL SOLUTIONS HAVE THE ABILITY TO FULFIL INDIA'S ENERGY AMBITIONS BY MAXIMISING PERFORMANCE AND EFFICIENCY ACROSS POWER PLANTS.

PONNIAH SANKARAKUMAR, DIRECTOR- POWER SYSTEMS, SCHNEIDER ELECTRIC INDIA

storage technologies such as grid-scale batteries and Power-to-X technologies - to help manage the complexities of the grid; improve and de-risk aging assets; and connect supply and demand. Siemens has technologies to produce, store and distribute hydrogen. Green hydrogen will be a major contributor towards a carbon neutral society. Recently, Siemens has introduced various digital applications for the power transmission industry like Sensformer and Sensgear which enable energy and power operators to have access to a Cloud-based platform that visualises collected data and enables a comprehensive overview of all assets and power grid's status in real time. “We are now taking the physical technologies the digital way and allow users to build the energy future in a way this will represent a digital twin of the entire grid where optimal operation can be achieved,” said Gerd Deusser.

Continuous monitoring and diagnostics of assets

Digitally linking the critical power units to utilities' monitoring stations can serve to analyse huge amounts of fleet data for continuous monitoring and diagnostics of these assets. This will enable proactive maintenance to help reduce unplanned outages, thereby, optimising costs and increasing availability of the utility's power assets. Siemens Digital Fleet Center Solutions provides maintenance and service support, enabled by digitalisation, to help ensure continued reliability and operational performance.

Digitisation of power plants will ensure better resource optimisation

Digital power plants need to be supported by efficient and optimised power evacuation. Also, it is equally important to ensure that the sustainability gains made in the power plant are not lost in distribution by embedding environmentally superior and compact distribution switchgear. Schneider Electric's EcoStruxure architecture with connected transformers and the connected SF6 free switchgear ensures this.

In small scale power plants, EcoStruxure Architecture supports with apps, analytics and services to enable operational decisions through a microgrid management software.

Lastly, it is equally important to enable real-time data through proper integration to the regional SCADA systems taking into account EV charging peaks and addition of large-scale energy storages. In pursuit of this, Schneider Electric's unified, IoT-enabled EcoStruxure Power architecture delivers innovation at every level, from connected products to edge control, apps, analytics, and services. 



KEC International aims 15% YoY revenue growth

KEC International Ltd., the flagship company of the RPG Group, is an Indian multinational infrastructure EPC major. In an interview with Subhajit Roy, KEC's President Neeraj Kumar Nanda gives an overview of the industry and the company's future roadmap.

Could you share a brief overview of the industry?

T&D industry is migrating to higher transmission voltages of upto 1,200 kV, new technologies for bulk power transmission are being worked upon, High Capacity Power Transmission Corridors (HCPTCs) are being developed. Monopoles and advanced conductor technologies like HTLS Conductors, Covered Conductors, etc., are playing a crucial role in resolving issues related to Right of Way (RoW). In Substations, advanced technologies like Gas Insulated Substations (GIS) are being embarked upon. On project execution front, there is greater emphasis on new/innovative designs, solutions and modern construction technologies involving a high degree of mechanisation and digitisation. Enhanced project management techniques are being implemented, right from



**Neeraj Kumar Nanda,
President,
KEC International**

project planning to execution/commissioning to attaining commercial closure. Public-private collaboration is gaining strong ground in coming years. The PPP model shall continue to enhance in central transmission schemes, while it is yet to be proven in states.

There is limited action in 765 kV category since the grids across regions are already integrated; however, with limited utilisation in terms of their capacities. As the government plans to enhance its renewable power installation base and along with requisite synergies, the market shall gain traction in near future.

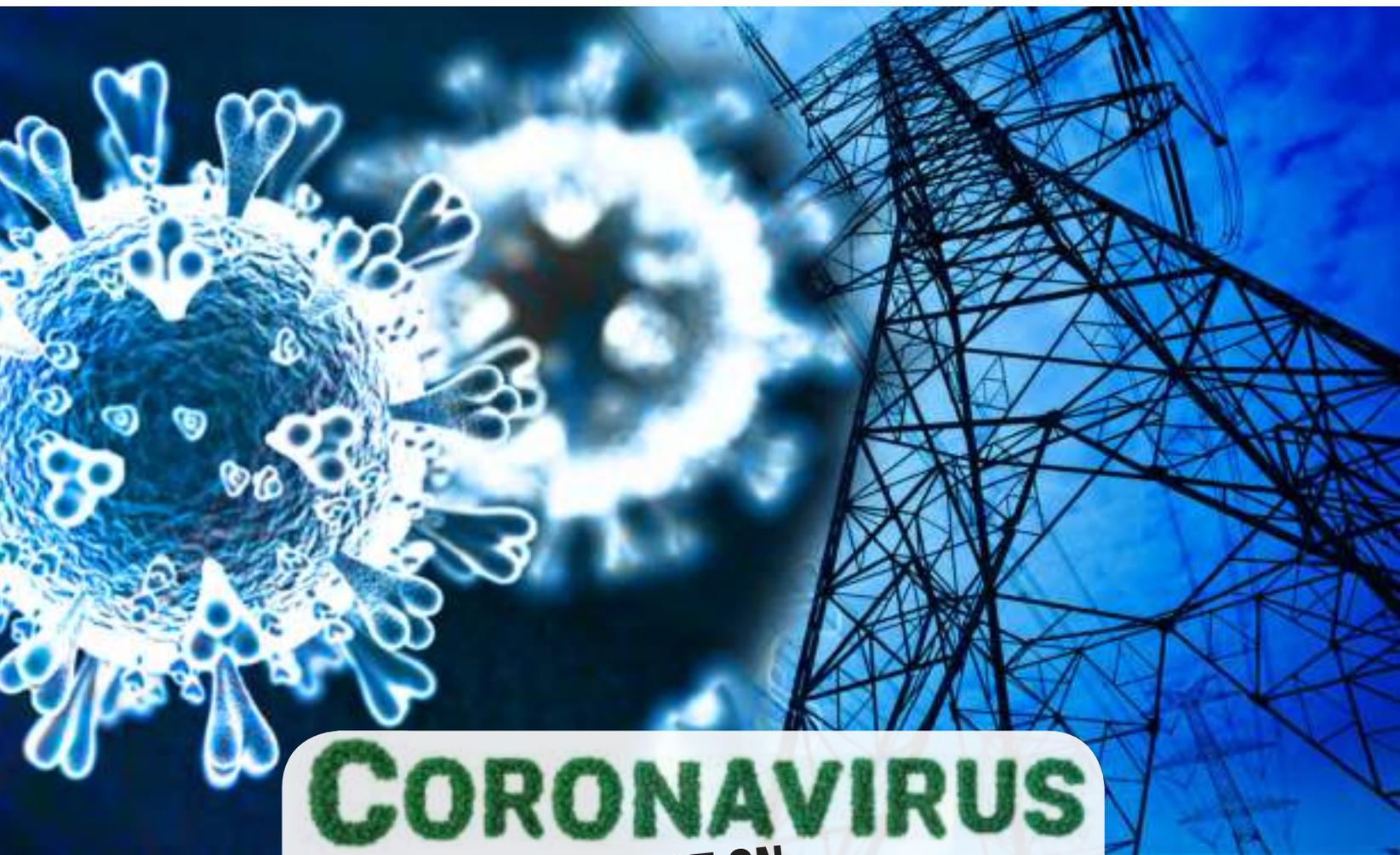
Renewable energy (RE), especially solar, will be a key driver for generation going forward. With the central government articulating its vision for reliable

and uninterrupted power supply to households in its second term, storage holds the key for providing on-demand electricity from wind and solar projects. At state level, there shall be huge uptake for transmission network required, which shall direct the emphasis on augmenting the infrastructure.

Smart grid initiative shall require focus on integration of localised/micro smart grids to the main grid. There is massive impetus on electric vehicle initiative towards zero emission mobility. With National Electric Mobility Mission Plan (NEMMP) in place and schemes like FAME powering the initiative, huge set-up of charging infrastructure is expected in next 1-2 years, thereby enhancing power demand. Technologies like wireless transmission would be seen taking more firm shape in time to come.

What's your future target?

KEC has been working and targeting a year-on-year revenue growth of around 15 per cent and we have been able to achieve that. The consistent growth in both revenue and profitability reflects a strong performance amidst global uncertainties owing to our robust and well diversified order book. 📌



CORONAVIRUS IMPACT ON INDIAN POWER SECTOR

The COVID-19 pandemic is expected to have an adverse impact on the Indian power sector due to slump in demand for power from industrial and commercial establishments being shut down due to lockdown across the nation.

- Supriya A Oundhakar,
Associate Editor

The Indian power sector has been facing challenging times right since 2018, with declining industrial activity leading to reduction in demand for power. The novel coronavirus disease COVID-19 has further worsened the situation not only in India but all across the globe spelling its doom on the global economy. India has so far around 2,100 active coronavirus positive cases (as on 3rd April), and around 70 people have lost their lives. Assessing the severe impact of coronavirus pandemic on the global economy, the latest UN trade report estimated that the

world economy will go into recession this year with loss of trillions of dollars of global income. India also cannot escape adverse impact of this crisis on its economy.

Moody's Investors Service says that the COVID-19 pandemic will cause an unprecedented shock to the global economy amid the 21-day nationwide lockdown to control the spread of the deadly coronavirus. It also cuts India's GDP growth for the calendar year 2020 to 2.5 per cent, from an earlier estimate of 5.3 per cent.

The COVID-19 pandemic is also expected to have an adverse impact on the Indian power sector. Already, large portions of the world are under lockdown, with most industrial and commercial establishments being shut down. This has led to a slump in demand for power. The freeze on rail travel has also led to a drastic reduction in electricity demand in India. Given the fact that electricity for railways is subsidised, the sharp decline in railways power consumption is expected to have a disproportional impact on the power sector. ICRA report notes that these segments constitute about 40 per cent of the all-India electricity demand. Additionally, with the central and state governments prioritising healthcare and relief measures, delays and deferment of subsidies are quite probable.

Meanwhile, the Union Power Ministry released a statement that consumers are unable to pay their dues to the distribution companies (discoms) due to the lockdown and this has affected the liquidity position of the discoms thereby, impairing their ability to pay to the generating and transmission companies.

As per the ICRA report, all-India electricity demand is expected to decline by 20-25 per cent on a year-on-year basis during the period of the lockdown. "The revenue deficit for the discoms is estimated to be about Rs 13,000 crore per month, on all India basis. This would in turn adversely impact the liquidity profile of the discoms, increase their subsidy requirement and lead to delays in payments to the power generation and transmission companies," informs Sabyasachi Majumdar, Group Head & Senior Vice President - Corporate Ratings, ICRA in its report. While this will adversely affect the revenue of discoms, the Ministry of Power has directed the Central Electricity Regulatory Commission (CERC) to offer discoms a moratorium of three months on payments to power generation and transmission companies and requested state governments to issue similar directions to State Electricity Regulatory Commissions (SERCs).

Further, the power generation companies are under financial distress due to delay in payments by discoms across majority of states, with payment dues of more than Rs. 85,000 crore as of November 2019 at all India level as per the data on PRAAPTI portal. The lockdown will inevitably result in further delays in payments, leading to lack of availability of adequate liquidity buffer in the form of debt service reserve and undrawn working capital limits. This will inevitably burden power generation companies.

Reserve Bank of India (RBI) notification has allowed borrowers to not pay any equated monthly instalments or EMIs for any loans until 30 June. ICRA report states that

expected moderation in the interest rate cycle would be a source of comfort in the near term. However, the timely approval of the moratorium by the boards of the banks and financial institutions remains crucial, states the ICRA report.

While revenues for power generation companies having long-term power purchase agreements (PPAs) with the state distribution utilities (discoms) will be protected by the provision for capacity charges linked to plant availability in case of thermal and large hydro power projects and "must run" status in case of nuclear and renewable power projects.

"While the GoI has now notified electricity including generation, transmission and distribution along with coal transportation as an essential service and has exempted these activities from the lockdown, the effective implementation of this exemption at the state level remains important," states Girishkumar Kadam, Sector Head & Vice President, ICRA Ratings. While taking note of the impact of corona outbreak, he adds, "Average monthly thermal PLF would further dip to 50-52 per cent against 63 per cent in the corresponding period of previous year, due to a considerable drop in demand and consequently, power generation companies especially those without any long-term PPAs would be adversely impacted given the weakening of the power tariffs in the short-term or power exchange market."

According to the report, the revenue for the power transmission companies is supported by the presence of availability linked payment mechanism. Nonetheless,

the operations for power generation projects could be affected because of disruption in movement of manpower, fuel, water and other materials.

“Planned capital construction, shutdowns and turnarounds will be impacted as a large congregation of construction personnel will be avoided. This will impact EPC firms and their contractual obligations signed with operating companies,” adds Muthuraman Ramasamy, Industry Director, Industrial Practice, Frost & Sullivan.

India is dependent on China for solar cells or modules. The country sources around 80 per cent of solar cells and modules from China. Due to outbreak of coronavirus, the Indian solar sector is reeling under distress. Nearly 3 GW of under-construction solar power projects, worth Rs 16,000 crore (\$2.16 billion), are at risk of delays when they miss their scheduled commercial operation dates. However, Renewable Energy Minister R K Singh said that India’s solar power industry was under no compulsion to import solar cells or modules from China following the coronavirus outbreak. They are to meet their requirements either from the domestic market or alternative sources. “Renewable energy will also be hit, as the majority of raw materials (solar PV) are sourced from China.

Even though China is inching back to recovery, operators may violate the contract and choose alternate or local suppliers,” states Ramasamy from Frost & Sullivan.

Returning to normalcy will take time

Obviously, the biggest task facing the world right now is to stop the spread of the coronavirus. However, R K Chugh, President, Indian Electrical & Electronics Manufacturers’ Association (IEEMA) observes, “Even when the global public health crisis comes under control and global supply chain disruptions end, business will not return to normal for couple of quarters. As is true for industry in general, power sector also is facing issues of all kinds.” He said that it is too early to assess the complete impact on production and revenue etc.

Sharing his views on the impact of novel coronavirus outbreak on electrical industry, Dinesh Aggarwal, Joint Managing Director, Panasonic Life Solutions India said, “In view of the COVID-19 outbreak, we have been severely impacted. The manufacturing of electrical products has been completely stopped and all our plants are non-operational.” He believes that the business will be affected for a long time after the country opens up post full control of the epidemic.

Opportunity in difficulty

While the deadly coronavirus spreads around the world, there is a huge demand of power backup (UPS) amongst the healthcare industry. With hospitals making test benches for coronavirus testing, it is critical to support the healthcare sector. UPS manufacturers are joining hands with hospitals and supplying UPS on urgent demand. Best Power Equipments (BPE) has recently installed more than 25 UPS of 3KVA to reputed hospitals in Delhi.

With this fight against coronavirus, there is a massive overload of hospitals of patients. To guarantee service continuity and quality, we are making efforts in spite of lockdown to meet the huge demand for power back-up, informed Amitansu Satpathy, Managing Director, BPE.

Conclusion

Over the short- to medium-term, it is expected distress at all stages of the power cycle – from production to transmission and distribution, with corresponding impact of reduced demand for manufacturing and service industries supporting the power companies. It is to be hoped that the government will take note of the critically important nature of the power sector and offer timely support and relief. **EI**

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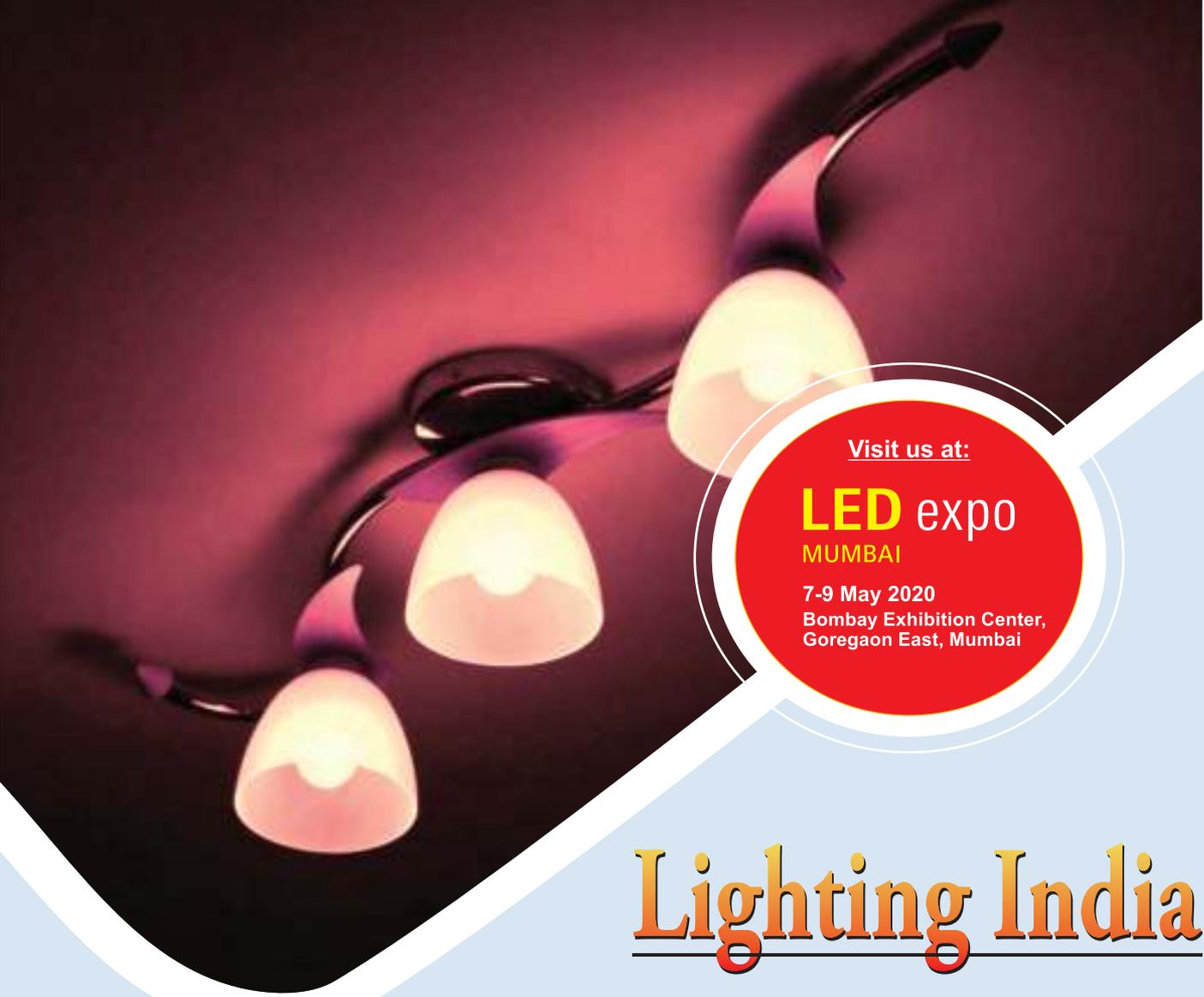
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FGD TECHNOLOGY FOR THERMAL POWER

The article gives a glimpse of need for Flue Gas Desulphurisation (FGD) implementation to curb greenhouse gases in thermal power generation. Further, it discusses various FGD technologies.

India's dependency on coal for meeting its energy needs has resulted in the generation of huge quantities of SO₂, NO_x and ash over the years. Out of the total installed capacity of over 350 GW, nearly 60 per cent is coal based, the majority of which comprises of domestic coal with a high ash content of 30 – 35 per cent. Recognising the central role thermal power plays in worsening air quality, the Ministry of Environment, Forest & Climate Change (MoEF&CC) in its latest amendment issued in December 2015 tighter standards for coal-based thermal power plants. The new standards aim to drastically

cut emissions of particulate matter (PM), sulphur dioxide (SO₂), oxides of nitrogen (NO_x) and mercury. In addition, the new norms also require power plants to sharply curtail freshwater use and to improve the fly ash utilisation.

The MoEF&CC has notified the revised standards for coal-based thermal power plants in the country, with the primary aim of minimising pollution. Ministry announced tighter standards for coal-based thermal power plants. These standards are proposed to be implemented in a phased manner. Thermal power plants are categorised into 3 categories, namely those (i)

Installed before 31st December, 2003
(ii) Installed after 2003 up to 31st December, 2016 and (iii) Installed after 31st December, 2016.

The new standards are aimed at reducing emission of PM₁₀ (0.98 kg/MWh), sulphur dioxide (7.3 Kg/MWh) and oxide of nitrogen (4.8 kg/MWh), which will in turn help in bringing about an improvement in the ambient air quality in and around thermal power plants. The technology employed for the control of the proposed limit of SO₂ and NO_x will also help in control of mercury emission as a co-benefit. Limiting the use of water in thermal power plant will lead

to water conservation as thermal power plant is a water-intensive industry. This will also lead to a reduction in energy requirement for drawl of water. As per the new amendment, the thermal power plants across India from 2017 will have to cut particulate matter emissions by as much as 40 per cent and reduce their water consumption by nearly one third.

With a view to reduce greenhouse gas emission, harnessing of renewable resources to the extent possible, enhancing efficiency of the existing power plants and introduction of new technologies for power generation for enhancing efficiency and demand side management are being pursued. Since coal will continue to dominate power generation in future, Super Critical Technology has been introduced for reduction of greenhouse gases.

Need of FGD technology

SO₂ is a corrosive gas created by the oxidation of sulphur-bearing materials such as coal, oil, and natural gas. SO₂ emission is a particularly acute problem in the power generation industry. Sulphur oxides are generated as a result of oxidation of the sulphur present in the coal at the combustion zone. To minimise the adverse effects of sulphur oxides (SO₂ and SO₃) on the environment, many power plants and industrial facilities use Flue Gas Desulphurisation (FGD) scrubbers to remove SO₂ and SO₃ from combustion gases.

The SO₂ emission levels would vary depending on the sulphur content and the composition of the coal fired. The weighted average of sulphur content in the coal is varying from 0.30 per cent to 0.55 per cent and the corresponding estimated SO₂ levels works out to be around 1254 to 1650 mg/Nm³ at 6 per cent (dry basis

of flue gas) therefore, the sulphur content in the coal of particular power plant is the main consideration for FGD design.

FGD is a set of technologies used to remove sulphur dioxide from exhaust flue gases of fossil fuel power plants, and from the emissions of other sulphur oxide emitting processes. It is a control device that absorbs and react using the alkaline reagent to produce a solid compound. In this system, equipment such as absorber towers, demister supports, gas outlets, recycle and process piping, process tanks, and agitators are highly exposed to corrosive and abrasive environments. Rubber linings have fundamental advantages so that neither the physical nor chemical properties of the scrubbing liquid have any major effect upon its service life.

FGD Technology selection

Different technologies are commercially available for reduction of SO₂ emission in dry flue gas. Following prevalent technologies are widely used in power plants to control the SO₂ emission.

- Wet limestone FGD
- Sea-water based FGD
- Ammonia based FGD
- Dry FGD.

These technologies are commercially available with proven nature and abundantly available reagents for the plants. Some of the other technologies such as dry sorbent injection, ammonia-based scrubbing, regenerative type, circulating fluidised bed type FGD systems etc. having lower efficiency are not commercially viable. Selection of appropriate FGD technology mainly depends on technical, economic and commercial factors that mainly involve sulphur removal

ability, reliability, space requirements and reagent availability. Economical factors like capital cost and operating cost also considered while selecting the FGD technology for particular thermal power plant. Details of the above technologies are as follows.

Wet limestone FGD

The main components used in this process are wet absorber, gas to gas heater, limestone slurry preparation system, waste water treatment system and gypsum handling system. In this technology, SO₂ removes in wet phase using wet absorber. Limestone is used as reagent that is ground in the mill and added with water to make slurry and sprayed on the absorber through nozzles. The flue gas coming out from the ID fan is led to absorber where it reacts and forms gypsum. The cleaned flue gas is fed to the chimney. The system is a once-through, wet type in which the SO₂ gas is permanently bound by the absorbent which must be disposed of as a by-product, gypsum. The by-product is produced is wet in nature, and flue gas leaving the absorber is saturated with moisture. The by-product gypsum is further processed to remove moisture in vacuum belt filters and disposed of as solid gypsum cakes (CASO₄H₂O) with minimum moisture up to 10 per cent. In this process, the desulfurisation is completed in four stages like absorption, neutralization, oxidation and crystallisation.

Wet limestone technology can be used to control SO₂ for wide range of sulphur in fuel and have high SO₂ removal efficiency. In this process, limestone used as reagent is easily available. This technology has high capital cost and high auxiliary consumption.

Sea-water based FGD

The main components used in this process are wet absorber, gas to gas heater and oxidation basin. Wet absorber is the zone where the flue gas is scrubbed against the flow of seawater. SO₂ gets converted into liquid state and is collected at the bottom of the absorber. The purpose of gas to gas heater is to transfer the heat from hot flue gas to the scrubbed gas to ensure the temperature of gas at stack is greater than ADP temperature. The function of oxidation or aeration basin is to remove the CO₂ produced during the scrubbing and maintain the pH of the system to ensure the optimum operability of the system.

In this technology, seawater is used as absorbent and removes SO₂ in wet phase using wet scrubber and discharge the liquid waste seawater containing sulfate. In this system, flue gas is scrubbed with seawater in absorber. The flue gas from the ID fan outlet is led to the absorber where the sea water is sprayed through nozzles. The absorption of SO₂ takes place in the absorber, where seawater and flue gas are brought into close contact in a counter-current flow.

Sea water contains significant amounts of HCO₃ and other alkaline compounds that help sulfur dioxide in flue gas to dissolve in water. The scrubber effluent flows to the treatment plant where it is combined with raw seawater and then aerated to recover pH value and reduce chemical oxygen demand before being discharged to the sea. Thus, the absorbed SO₂ is converted into sulfate before discharge. The sulfate is completely dissolved in seawater, so as a result there is no waste product to dispose.

The main advantage of this technology is less capital cost and auxiliary consumption however, no reagent is required and no formation of byproduct.

Ammonia based FGD

This technology uses anhydrous ammonia as reagent. The anhydrous ammonia is diluted with process water to achieve the desired concentration. The diluted ammonia solution is sprayed in an absorber or scrubber through which flue gas is passed. The solution captures the SO₂ in the flue gas to form ammonium sulfate which is then oxidised to ammonium sulfate solution by introduction of air into the absorber. The ammonium sulfate solution becomes concentrated and partially crystallised during the gas contact, forming slurry which is pumped to a hydrocyclone is then dehydrated in a centrifuge and dryer to generate ammonium sulphate pellets with negligible water content. The byproduct ammonia sulfate is further packed and processed into product bags by packing machine. The byproduct ammonia sulfate is commonly used as a fertilizer and has other uses. This method has lower water consumption and auxiliary power consumption.

Dry type FGD

This technology use lime slurry used as reagent. The main components in this process are dry scrubber, ESP/fabric filter, reagent slurry preparation system, by-product collection and recirculation system and by-product handling system. The lime stone is mixed with water at a controlled rate to maintain a high slaking temperature that helps to generate fine hydrates of lime with high surface area. Process

makeup water is added to the slacker to produce solid slurry. The slurry is fed to the absorber by reagent feed pump. The reagent slurry is atomised through rotary cup spray atomisers or through dual fluid nozzles. The flue gas post air preheater enters the spray dryer absorber where gas stream is cooled by the reagent slurry spray. The mixture then passes through the fabric filter for removal of particulate before entering the ID fan. A portion un-reacted lime, gypsum and the other reaction products collected in the fabric filter is mixed with water and returned to the process as high solid slurry. The remaining solids are directed to a storage silo for by-product. The by-product is semi-dry/dry in nature and flue gas leaving the absorber is not saturated with moisture. This technology of desulphurization requires less capital cost for smaller capacity units. It has lower water consumption and auxiliary power consumption. There is no visible moisture plume in stack, as the flue gas leaving absorber is not saturated with moisture.

Beside the advantages, cost of lime storage is higher. The technology is limited to low sulphur fuel because of high reagent cost. It has limited reagent utilisation.

Recommendations

With regulatory changes and technology developments, SO₂ emission management has evolved significantly over the years and continues to improve. FGD technologies such as dry type and wet type systems improve the overall efficiency of plants and provide monetary benefits to operators. They also help operators conform to emission regulations and standards. Based on the Indian coal quality generally available for thermal power

stations and bring down the SO₂ emission level less than the norms, Dry type FGD and Wet limestone type FGD could be feasible. Through, the capital cost of dry FGDs are lower when compared to wet limestone FGD, based on the lifecycle cost comparison, the wet limestone FGD has lesser operating cost. The dry type FGD systems have a lesser water requirement in the absorber as compared to wet limestone FGD. However, the high cost of expensive slaked/quick lime required as reagent in dry FGDs significantly increases operating cost of the systems. Hence, wet limestone FGD has been found to be optimum technology.

Initiatives and way forward

The Ministry of Power (MoP) has outlined certain initiatives to

monitor the SO₂ emission from thermal power plants and ensure compliance with environmental directives. To this end, the thermal power plants are required to upload the details of SO₂ emission available with them on monthly basis. A quarterly report of this data needs to be also submitted to NITI Aayog, Central Electricity Authority (CEA) has also provided tentative cost estimate for FGD.

Conclusion

Government has notified the key performance standards for power stations to ensure environmental protection. The government yet to take concrete steps to actually implement these standards due to lack of resources that might assist in performing their functions

most notably, enough professional staff and appropriate information technology systems. In order to maintain the revised environmental norms, the government is required to develop a strong monitoring mechanism and strengthen the regulatory bodies to monitor these norms. For maintaining the revised environmental norms, substantial capital investment needs to be required by the power companies. The regulators are required to take care in this regard. 



Ashok Upadhyay,

Dy. Director (Generation),
M.P. Electricity
Regulatory Commission,
Bhopal

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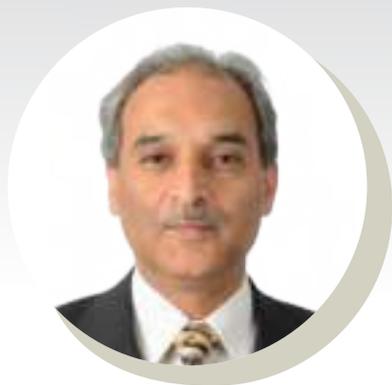
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WAGO's Vadodara plant to be operational in Q3 of 2020

Tell us more about WAGO India's current business and the future roadmap.

Overall the business was similar as last year. While we did not significantly increase our revenue, we did see certain improvement in key strategic segments which is very encouraging for us. We also saw an increase in our exports by 4 per cent. We are nicely placed with our strategies that we planned for further investments in India.

Can you update us on your upcoming facility in Vadodara?

Yes, as updated lately, we are coming up with a large factory in Vadodara and the construction is still on. Approximately one-third construction is already over. The factory should be operational in third quarter of 2020. We will manufacture products to cater to domestic demand as well as exports.

Is there any cut in your investment plan?

Investment in the manufacturing capacity expansion is a strategic decision. This factory will serve the Indian as well as the global market and we do not see the temporary slump as a roadblock that will affect our future growth plans.



In the phase one, we expect an investment of Rs 250 crore... Further investments will take shape during phase 2 and 3 that will of course be dependent on market outlook.
Alok Kishore,
CEO, WAGO India

What are the products which will be manufactured in this new factory? Tell us about the capacity volume...

Currently the plan which is discussed between Germany and India is that the entire Noida operation will be shifted to Vadodara. We have to first stabilise the operation and based on the planned gestation period; the product lines will be shifted from Germany. Exports from India to Germany and China have already

picked up and we are looking at 100 per cent growth. That will also be taken to Vadodara depending upon the final decision.

How does it feel when you supply 'Made in India' products to Germany?

We as a company policy follow same standards of production across global manufacturing units to maintain standardisation of quality irrespective of location of production. Certain products are earmarked to a certain factory. The products manufactured in India will go to all location whether in China, Germany or any other country. This enables us to achieve high standards of quality.

How do you see the acceptance of your products in India?

We have grown approximately double in the last five years. This proves that acceptance of our product is definitely there in the market.

What is the total CAPEX for the Vadodara facility?

In the phase one, we expect an investment of Rs 250 crore. With the machines put together it may exceed. Further investments will take shape during phase 2 and 3 that will of course be dependent on market outlook. E



In conversation: Introducing Infra 4.0 – smart infrastructure and digitised solutions

Tell us about the focus Siemens lays on Smart Infrastructure – Infra 4.0 and its perspective on smart cities and building automation?

Siemens is focused on Smart Infrastructure in terms of bringing together Smart Buildings and Smart Grid. Infra 4.0 is a concept that we have developed, and it enables companies who are moving towards Industry 4.0. The concept can be achieved by having a smart grid connected to smart buildings and a smart environment that will help set-up Infra 4.0. We have a concept where we explain the digital twin for smart grids or anything to do with clean energy storage. On the industry side, we have airports, metro stations and other projects where we focus on reducing energy consumption. After this, we pick up some items which will help reduce energy as it makes operations efficient without the need to build something new. Based on the present feedback our customers are also excited.

In what direction is the market in India heading? What's Siemens' perspective on energy efficiency, and energy savings?

The market in India is working in

**Robert Demann,
Head - Smart
Infrastructure,
Siemens Limited
speaks on smart
infrastructure and
digitised solutions as
enablers to the
power sector
By Ranjana Konatt,
Editor – Brand
Positioning**

line with the call made towards energy efficiency, and Siemens is there to push things forward from an industry perspective. We have several solutions one of them being smart street lighting systems that helps cut energy consumption. When you look at street lights, we have energy-efficient smart drives that work for industrial applications. Also, when compared to other installations that offer an energy saving ranging from 15 to 20 per cent, our concept of smart buildings has cut energy consumption considerably where the Return on Investment (ROI) happens in two years. It is straightforward and there is little risk for customers. We have been getting a positive result and

feedback. Also, our Demand Flow solution - that provides a holistic approach to optimizing both chilled water and air distribution systems without sacrificing savings or building comfort, has worked very well not only in the hospitality industry but in several industries where you have office spaces.

How are smart solutions an enabler and a value addition in the broader scope of things?

India has new cities that are developing and with this comes new airports and other infrastructure. The focus is to have quick and pragmatic solutions that are frugal, and these are typical areas where-in if you are building a new airport you are expected to be competitive. The idea is to have value-adding solutions where we have automation and can digitise technology to optimise the use of infrastructure. For instance, cities where you have traffic congestion, you can use smart solutions which help optimize traffic congestion by using traffic data and ingesting data from the internet with the learning solution to predict how traffic lights should be switched to optimize the flow of traffic.



ELECTRICAL DISTRIBUTION SYSTEM:

OVERHEAD VS UNDERGROUND CABLES

The article talks about how the cable technology, both for overhead and underground transmission of electrical power has gained increased attention in recent times due to changed perception of the electrical power system from the point of view of reliability, safety and economic aspects.

The prominence of electrical energy is felt in almost every sector of a common man's daily activities. The electrical power system is generally segmented into generation, transmission, distribution and utilisation. A distribution network is one of the key parts of an electrical power system which is generally directly connected to the load center. The generated and then transmitted electrical energy is distributed to customers through a utility's electrical distribution network. The distribution system network consists of electrical distribution substations which step-down the transmission

line voltage levels between 69 kV and 765 kV to distribution voltage levels, usually 35 kV or less. As per Indian standards, the level of stepped down voltage is generally 33 kV/11 kV. Distribution networks can consist of overhead electrical lines, as well as underground cable systems. Voltages at utility customer delivery points may require further reduction or stepping-down, either by utility transformers or customer owned and operated transformers to a level of 400 V (three phase) or 230 V (single phase).

After the concept of integrating both renewable and distributed

energy sources at the distribution level is conceived, the distribution system design and operation is currently of great interest for power system engineers. The demand from the end users of electricity in terms of electrical power quality and the improved reliability of the services has further made the distribution system operation more interesting and challenging. As per one of the reports of World Bank, India loses 4 per cent of its GDP due to inefficiency in power distribution, ranking it 80th among 137 economies in terms of reliability of power supply. India has the dubious distinction of losing 20 per cent of electricity in transmission and distribution, one of the highest in the world which amounts to be somewhere around Rs 8,500 crore per annum. The changing paradigm in the field of electrical distribution system has resulted in many novel practices being adopted for the overall improvement of the system efficiency and reliability of the power supply. The issue of T&D losses can be addressed by proper transformations and implementation of novel technological innovations.

Electric power can be distributed either by overhead transmission systems or by underground cables. Hence, proper selection of the cables in the distribution network is crucial so as to assure required level of operational reliability with due consideration of the cost aspect.

Cables and their selection

Cables are different from the bare overhead conductors in the way that the cables are provided with insulation. Hence, the relative safety aspect can be assured. The design of the cables is generally based on the requirement. The cables used for the transmission and distribution of the power are referred to as power cables which is an assembly of one or more individually insulated electrical conductors, usually held together with an overall sheath. These power cables may be commissioned as permanent wiring within buildings, buried in the ground and run overhead or exposed to the atmosphere. The portable devices, mobile tools, and machineries make use of flexible power cables. The design and manufacture of these cable is as per the rated voltage, current, maximum operating temperature and purpose of applications desired by the customer.

Construction of power cables

Generally, a typical power cable consists of the following:

- Conductor
- Insulation

- Beading
- Armoring (optional)
- Outer sheath

Figure 1 shows a typical power cable. Conductors happen to be power carrying part of the cable. Though the conductors can be made of different materials copper and aluminum-based conductors are quite common due to their excellent properties conducive for better

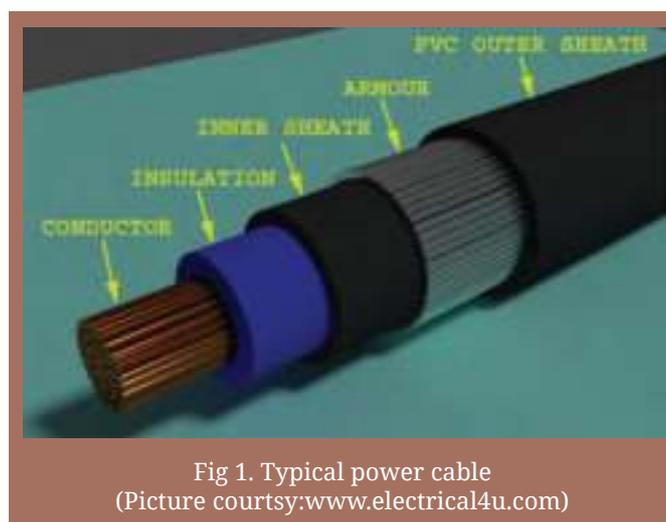


Fig 1. Typical power cable
(Picture courtesy:www.electrical4u.com)

conductivity. Due to the advancements in the field of material science, several other materials like cadmium – copper alloys, phosphor bronze, galvanised steel, steel core copper and steel core aluminum are also being used as conductors in the recent times. Generally, the conductor resistance determines the conductor size. The conductors can be further classified as solid, flexible, extra flexible, and stranded conductors based on the requirement of the end application.

Insulation

The different insulating materials used in cable are selected based on the operating temperature and also the voltage and current rating of the cable.

Behading

Beading is the process by means of which a cable is provided with more mechanical strength. Sometimes, the beading is also used for earthing purpose.

Armoring

Armoring is a process by which the earthing shield to the current carrying conductors is provided. Armoring is also used for earthing purpose of the cable for safety purpose. If the cable is properly earthed, the fault current gets

Cables

enough paths to flow through the armor in case of any insulation failure in the conductor.

Outer Sheath

This is the outermost cover of the cable which provides the cable, mechanical, weather, chemical and electrical protection. The outer sheath is normally made of PVC (Poly Vinyl Chloride), Rubber (Various Types of Rubber).

Underground and overhead cables

The general understanding is that the underground cables are laid beneath the ground and the overhead cables are visible overhead. But apart from this, there are many significant features of both the types of these cables from the perspectives of electrical power transmission or distribution. In the changed scenario of the power system design, particularly, the distribution system, the cables and their characteristics have become highly selective and the technological advancements have also made the selection of cable for a particular application more flexible.

Overhead cables

Traditionally, the overhead cables or the bare conductors have been used for the transmission of electrical power and even for the distribution. These are simple in configuration and are usually commissioned using the towers or poles. The bare wire conductors on the line are generally made of aluminum (either plain or reinforced



Fig 4. Different cable types (Courtesy: Universal Cables Limited, Satna)

Table I: Comparison of underground and overhead cables		
Parameters	Overhead	Underground
System cost	Low	High
Safety	Less safe	More safe
Possibility of expansion	Easy	Difficult
Size of the conductor for the same capacity	Small	Large
Fault detection	Easy	Difficult
Suitability for long distance	Yes	No
Prominent line parameter	Inductance	Capacitance
Appearance	Non aesthetic	Aesthetic

with steel or composite materials such as carbon and glass fiber), yet, some copper wires are used in medium-voltage distribution and low-voltage connections to customer premises.

As the conductors are constantly exposed to the open atmosphere, there are several concerns related to the safety of the system and also reliability. The adverse conditions like heavy rain, wind, snowfall, humid and salty contents in the air could deteriorate the lifespan of these conductors and raise serious electrical safety concerns. Nevertheless, the most unique advantages like less cost of conductors due to less insulation levels required, ease of fault detection due to clear visibility of the conductors, relatively less cost of installation, and ease of expansion are some of the general advantages of the overhead conductors. These advantages are backed up by several other technical advantages as well like being independent of proximity effect, relatively smaller size of conductors, relatively higher life expectancy. However,



Fig 2: A typical overhead line



Fig 3: Size comparison of overhead and underground cables

the changed perception of looking at the different premises from the point of view of aesthetic nature and the recent developments in the cable technology have made the deployment underground cables for the power distribution and even transmission more attractive in the recent times. This is also due to some of the critical limitations of the overhead cables apart from their non-aesthetic appearance. The overhead cables often cause the radio interference due to corona discharge. Overhead high voltage lines emit hiss or hum noises.

Underground cables

The underground cables provide the uninterruptable power supply which is not possible with the overhead lines due to the limitations mentioned earlier. However, there are other technical factors which also have made the underground cable to have an edge over the overhead cables which include reduced risks of fault due to external factors like rain, wind and adverse climatic conditions. The underground cables are also free from radio interference. The transmission towers are not required except for the local transformers in the system without considerable height of the tower. However, the underground cables are not free from limitations. Damage to underground cable is difficult to locate, and restoration of the system once the faults are located might take considerably long time. For underground cable system, a large number of cables is required for the same capacity of the overhead counterpart. The construction mechanism of the underground cable involving duct bank, vaults, splices and terminations not only increase the overall cost but also might reduce the overall system reliability. This problem further might increase with the increased line length with the additional necessity of the intermediate equipment. Due to the concealed operating conditions, the heat dissipation from the underground system can also be one of the major bottlenecks for the successful operation of the system. Summarizing all these points, the following table gives a brief comparison between underground and overhead cables.

Recent developments in the cable technology

As the underground cable system is becoming more relevant and popular, there have been some tremendous technological novelties developed to overcome the different shortcomings of the underground cables. The major areas of concentration of these technological novelties

are voltage grade and insulation. The developments in the field material science have resulted in the better-quality polymers to achieve desirable electrical and mechanical properties of the cables. Teflon cables can withstand the temperatures up to 250C against conventional PVC cable which can generally withstand up to only 70C. The alternative conductors against the copper which suffers from high cost have already been explored. Concurrently, the operating voltage levels have also increased significantly in the range of 220 kV to 400 kV. These developments can definitely take the cable technology to the new technical dimension and make them more deployed in the transmission and distribution networks. Having mentioned about the recent technological trends in the underground cable manufacturing technology, the similar kinds of advancements have taken place even in the overhead cables. Based on the requirement of conductor types like ACSR (Aluminum Conductor Steel Reinforced), AAAC (All Aluminum Alloy Conductor), ACAR (Aluminum Conductor Alloy Reinforced), AACSR (Aluminum Alloy Conductor Steel Reinforced), AAC (All Aluminum Conductors), operating Temperature Conductors, operating voltage levels, Voltage (132 kV to 220 kV, 221 kV to 660 kV, > 660 kV), Rated Strength (High Strength (10 kN to 75 kN), Extra High Strength (76 kN to 150 kN), Ultra High Strength (> 150 kN), type of the current (HVAC, HVDC) and type of Application (High Tension, Extra High Tension, Ultra High Tension) several cable manufacturers have launched their products in the market as per the requirement of the system.

Conclusion

The cable technology, both for overhead and underground transmission of electrical power has gained increased attention in the recent times due to the changed perception of the electrical power system from the point of view of reliability, safety and economic aspects. Each type has its own advantages and limitations. However, the judicious selection of each type in the power system depends on the specific requirements and also based on the safety of the system. (B)



Shravankumar Nayak,

Faculty, Department of Electrical and Electronics Engineering, SDM College of Engineering and Technology, Dharwad



Kyoritsu makes entry into electrical safety market

Could you give us a brief overview of Kyoritsu in India?

This year is the 80th year of company being formed in Japan. Kyoritsu India was born in 2016 though in India we have been there for past 35-plus years. From 2016, we started building Pan India sales network, after-sales services and calibration support for the Indian consumers, including the local availability of stocks, marketing and everything that we can localise. That is the 'mantra' as we aspire to become the choice of electrical professionals.

How has the journey been for 4 years and what kind of footprint you have as of now?

The journey has been interesting. The journey has been from Kyoritsu being a brand which built on word of mouth as the quality of the product was very good and thus grew at a slower pace, to now, where we have spent more time on structuring our market access and reach. We made easy access for the older user or the brand loyal customer and then built a very aggressive marketing around the brand and the value it brings to the customers. And that is the way we are acquiring this new



We have partnered with few of the pioneering Japanese companies who are into voltage sensing, fall arrest and electrical monitoring systems along with safety tools for electrical and facility construction.

**Sunil Kapoor,
Managing Director,
Kyoritsu India**

set of customers while we keep the older brand loyal customers with us. So, make it easy for the older, get the new ones in, and give them the same kind of experience and take them along in this India growth journey.

How has ELECRAMA 2020 been for you and what sort of innovations or partnering

solution have you bought here in this market?

This ELECRAMA was very exciting as Indian electrical professionals make their journey from under maintained to predictive maintenance and Kyoritsu India has the right tools for the industry. As we assist building the right electrical maintenance practices and build the maintenance thought process, we feel the same way for electrical safety too.

Electrical safety is a subject which is close to us. Our electrical maintenance products have been safe for users as per the applicable IEC Standards and now we have entered into electrical safety in a bigger way. We have created a Safety Division under Kyoritsu India. We have partnered with few of the pioneering Japanese companies who are into voltage sensing, fall arrest and electrical monitoring systems along with safety tools for electrical and facility construction.

We feel that safety as a critical subject will go through transition in India. Today safety currently is a word which is good to have not must-have and that is why we feel this change will happen

sooner than expected. We are very optimistic about India market. This market has made shift from 'Chalta hai' on quality to 'Quality is Must' and all of us have been witness to that shift. Similarly, we are very optimistic and we know that we will move from 'Ok to have safety' to 'Must have safety' soon too. We know Indian consumers change pace cautiously and we want to be with them as the change happens so that by the time it builds to a level where people say this is 'Must-have' we will be in a place to serve them and bring these best of line solutions which are doing well in many other developed economies.

Could you name the Japanese companies with whom you have recently partnered?

HASEGAWA is one of the electric safety companies we represent now under our Safety Division was established in 1925 so one can understand how knowledgeable on the subject of electrical safety, voltage detection, phase measurements and full gamut of electrical safety products they will be. Very focused, large manufacturing, state-of-the-art testing facility and consumer centric R&D and that is why they are No. 1 in markets they serve. They have almost 60 per cent market share in Japan which is a country

which takes electrical safety very seriously.

NAGAKI is another brand who are into transmission laying tools. They have around 100 per cent market share in Japan and have been around in this dominant position since 1946.

Sanko is into personal safety systems. Again, a very old and large manufacturer. So, for us it is important whatever we bring to India in safety, we have to take it seriously first. I don't know how the journey and learnings for these companies will be but I am very sure that we have got the best into India. Now it is the consumer to select the best for their 'best' which is their 'people'. 



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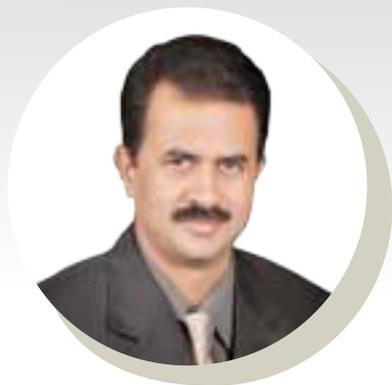
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— Supporting —





Elmeasure gets ready to launch smart meters

Tell us more on Elmeasure's business and the industry performance.

Elmeasure is a 15 years old company. We are into energy management and that's our core business, IoT platform being our key point. We are number one in the metering sector. We manufacture 50,000 meters every month. We provide our customers with products and solutions that meet the highest quality standards for performance and value.

Smart metering is the talk of the town as the government is also putting lots of emphasis on it. How are you going to encash such opportunities?

Even before smart meters came to India, we came up with prepaid meters in the year 2012. We have a very good amount of business in the private sectors. Our prepaid meters are also IS 13779-1584 certified. We had received smart meter projects sometime back. Even though we didn't have the product with us, we were interested in providing the solution. That's how we came up with smart meters on single-phase and three-phase, which are in the certification stage and ready to launch. In



We can accommodate maybe one lakh pieces per month while we are also considering channel partners who have infrastructure, calibration and assembly.

**Babu TK,
CEO,
Elmeasure India**

three months from now we will have the certification for it.

What kind of business do you see coming in from smart metering?

So far, we have been doing business with only private sectors while for smart meters we require a utility of its own. When it comes to technology, Elmeasure is always in the front-end. In regards to smart meters we are looking out for channel partners in the front-end and would like to do business with their support.

Government plans to install 240 million of smart meters. Are you ready for this initiative?

Our facility does not generate that kind of volume, but definitely in terms of technology we are number one. We would like to help anybody who is in the front-end with facilities. We can accommodate maybe one lakh pieces per month while we are also considering channel partners who have infrastructure, calibration and assembly. Several companies have taken initiative and spoken to us regarding smart meters. We lead in terms of technology which has been attracting companies to collaborate.

What is the roadmap of Elmeasure?

Presently our capacity is very low, our capacity is to produce around 5,000 meters in a month; we can produce higher volumes with an added infrastructure. It could be a duplication of what we have in multiple places. We have a place of 75,000 sq ft out of which 40,000 sq. ft. is kept for expansion at our existing facility. There are 5000-10,000 meters of prepaid meters as well as 50,000 meters of parallel meters. Half the place is vacant. So, we have plans to double the size. E



Hartek enters automation business

Simarpreet, could you enlighten our readers on the journey of Hartek Group?

Founded in 1991 as an electrical trading house, the Hartek Group has come a long way today. A diversified conglomerate with business interests across the power sector value chain, the Hartek Group has five strategic business divisions — Power Systems, Rooftop Solar, Power Distribution Products, Smart Cities and Fuel Services.

We are among the leading EPC companies for setting up substations, both high voltage and extra-high voltage, a venture we started in 2007. We entered the solar EPC business in 2012 by connecting one of India's first solar projects in Amritsar to the grid, and since then there has been no looking back. Of India's total installed solar capacity of 33 GW, we have constructed substations for 2-GW solar projects. And, of course, we are among the leaders in rooftop solar as well through Hartek Solar, which we had founded in 2017.

We also have a manufacturing division, Hartek India, which makes a complete range of power distribution equipment like LT panels, catering to the needs of the industry and utilities. Also, into



Realising that it is very easy to sell a product but equally difficult to maintain it and give world-class services, we have formed a separate automation team to deliver better operation and maintenance services to our customers.

**Simarpreet Singh,
Director,
Hartek Group**

Smart Cities, the Hartek Group faced a clear mandate that no city can be smart unless the grid is smart. So, this is how we entered smart grids, and the business that will be a turning point for us this decade is the automation business. Realising that it is very easy to sell a product but equally difficult to maintain it and give world-class services, we have

formed a separate automation team to deliver better operation and maintenance services to our customers. We have carved a niche for ourselves by catering to preventive maintenance.

What exactly is your focus on automation?

It's going to be a 360-degree approach. After all, we live in a digital world. We have been installing automated devices and plan to take up process automation and substation automation in a big way. To derive more out of our annual maintenance contracts, we have also introduced a new concept called grid doctor. It's a van with testing equipment which provides a one-stop solution to clients' problems. The idea is to get to know customers better and work more closely with them.

Are India's renewable energy targets feasible?

Today, India has an installed solar capacity of 33 GW and our EPC business is also involved in a lot of projects. I look at it from the point of view of our contribution. Our focus is on contributing towards nation building through creation of sustainable power infrastructure, and if all companies start thinking on these lines, no target is unachievable. 



WHEN SMALL IS BIG

How portable small nuclear reactor can be useful for supplying power to remote places

Power supply to remote locations like Antarctica, Alaska, Ladakh, remote islands, strategic defence locations, remote mining sites, natural disaster site etc. have historically relied on diesel power which is quite expensive. If the supply chain of diesel is interrupted, there will be no electricity. With proper safeguards, 1 to 10 MWe mobile reactor system could provide robust, self-contained and long-term power. Heat pipe reactors are ideally suited for application in remote areas, because they have characteristics such as self-regulation and high reliability.

These reactors cost about \$ 25 - 30 million each. These small reactors are well suited for transportation to and installation at remote site where they can provide heat and electricity for years at a time without refuelling. They are capable of operating independently of external electricity grids that could be vulnerable to threats, natural and otherwise. The obvious drawback is that each kWh of electricity costs between 20 per cent - 70 per cent more than a kWh of electricity produced in the conventional way.

These nano nuclear generators are powered by standard nuclear fission that would generate the heat which is recovered with the help of heat pipes. As the Uranium inside the reactor breaks apart naturally, it generates heat and sends neutrons (tiny particles that exist in the nucleus of atoms) blasting out. If those neutrons hit other Uranium atoms they break apart as well, creating even more heat and more neutrons. Many modern nuclear facilities moderate the reaction with control rods that, when inserted into the nuclear fuel, slow down and moderate the reaction. Hence chain reaction cannot go faster than the designed rate.

Heat Pipe

Heat pipes are one of the most efficient ways to move heat from one point to another. These devices are sealed vessels that are evacuated and backfilled with a working fluid in small quantity. The pipes use a combination of evaporation and condensation of this working fluid to transfer heat in an extremely efficient way. Its cross section is generally cylindrical, with a wick on the inner diameter (Fig. 1 and 2). Cold working fluid moves through the wick from the colder side (condenser) to the hotter side (evaporator) where it vaporizes. This vapor then moves to the condenser's heat sink, releasing its

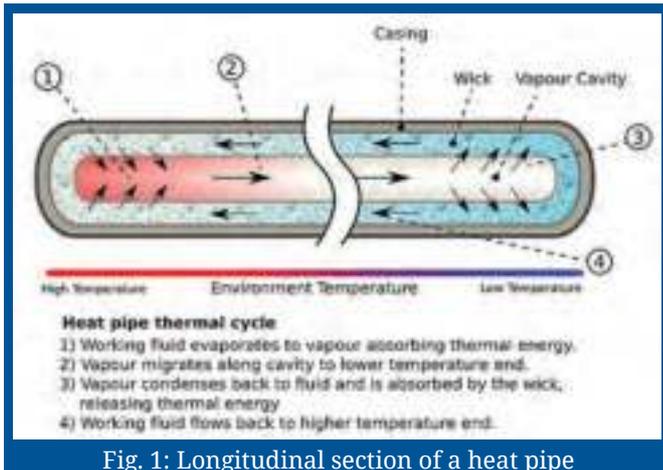


Fig. 1: Longitudinal section of a heat pipe

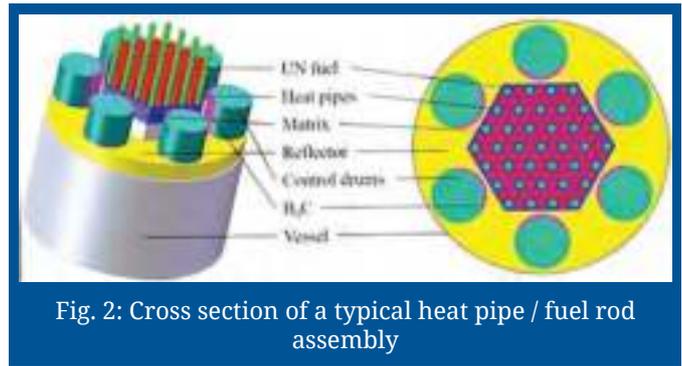


Fig. 2: Cross section of a typical heat pipe / fuel rod assembly

latent heat in the condenser, and then repeats the cycle to continuously remove heat from the part of the system. Capillary action moves the condensed liquid back to the evaporator through the wick structure. The temperature drop in the system is minimal due to the very high heat transfer coefficients during boiling and condensation. The flow circulation in the heat pipe will continue as long as there is large temperature difference between the evaporator and condenser sections. The fluid stops moving if there is no temperature difference. No power source other than heat is needed.

Design concept of the reactor

The basic system of a portable reactor is substantially different from other power reactor systems. Basic features are:

- A typical reactor of 5 MW thermal will have ~ 2 MWe - i.e. electric.
- No water is used. It is heat pipe cooled.
- Low enriched ~ 19.75 per cent enriched UO₂ fuel is used.
- Stainless steel monolith to contain UO₂ pellets and heat pipes, is provided.
- No moving parts, valves, pumps or very high-pressure systems are necessary.

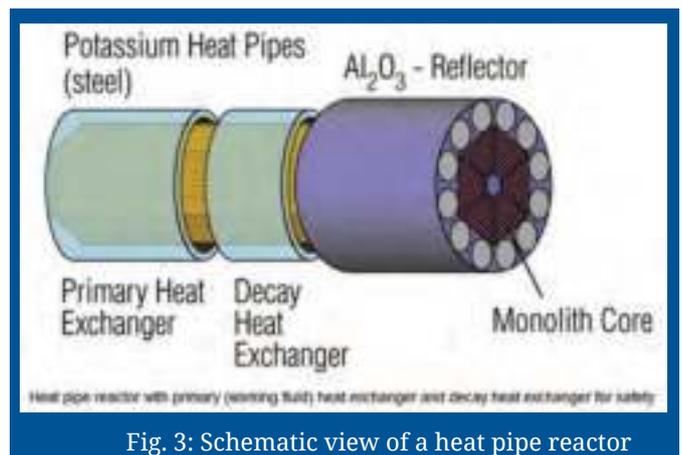


Fig. 3: Schematic view of a heat pipe reactor

Nuclear

- Self-regulating law of physics in the core regulates the active control system.
- There is passive decay heat removal.

A typical portable reactor with 5 MWe thermal capacity can generate around 2 MWe for 5 years with less than 2 per cent U235 depletion. As shown in Fig 3, the unique core design is built around a solid steel monolith of mass ~ 2.6 MT, with channels for both heat pipes and fuel pellets housed in 6 blocks of 60 deg. sector wedges. The heat pipes remove heat from the block as the potassium metal in liquid form inside the heat pipe is vaporized. For the ease of manufacture, the monolith core is fabricated in 6 identical segments forming a hexagon with two emergency shutdown control rods. There are about 352 fuel holes and 204 HP holes per block. This means there are total 3336 drilled holes serving all 6 sectors in a monolith core. Type 316 stainless steel is used for the construction of monolith structure, which contains 5.22 MT of uranium oxide (UO₂) fuel pins and liquid metal potassium (K) suitable for operating heat pipes at 675 deg C. Corrosion is not a significant issue. Number of fuel rods in core are ~2112. Fuel rod height ~ 1.5 metres and fuel channel hole dia is ~ 14 mm. The monolith acts as a structural support for the fuel pellets and a containment barrier to fuel fission product gases. Solid monolithic core prevents voids in the core. This eliminates issues with positive reactivity being introduced by voids. There is no dedicated or conventional fuel cladding. The heat pipes remove the heat from the monolith core as the potassium liquid in the heat pipes is vaporized; no valves or pumps are necessary. The total potassium mass in all the heat pipes is about 123 kg and has no impact on reactivity. About 1,224 nos of heat pipes (dia. about 15.7 mm) will be required to transfer all the heat of core fission to a power conversion heat exchanger. The heat is subsequently transferred to the condenser region of the heat pipes. The condenser region can be sized to accommodate multiple heat exchangers, like one primary heat exchanger for power conversion and one or two additional heat exchangers for redundant decay heat removal. The reactor uses an alumina (Al₂O₃) neutron side reflector, with 12 embedded control drums that contain an arc of boron carbide (B₄C) poison for reactivity control. The outer diameter of the Al₂O₃ reflector is 1.5 metres. Heat pipe reactors can be physically smaller than the other advanced reactor concepts. Enrichment of the fuel to nearly 20 per cent,

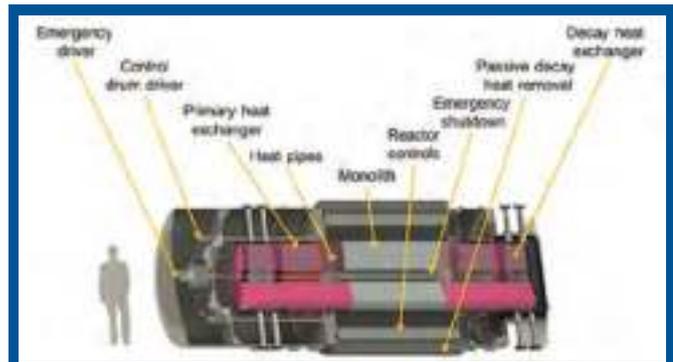


Fig. 4: Exploded view of a portable nuclear station

the use of a fast neutron spectrum and the use of a highly reflected core allow for a very small reactor core and weight. Heat pipes will remove heat effectively including decay heat in any orientation and this characteristic is a must for safe transportation of the reactor.

Use of heat pipes addresses some of the most difficult reactor safety issues and reliability concerns, particularly loss of primary coolant. Heat pipes operate in a passive mode at relatively low pressures, less than an atmospheric pressure using simple law of physics like capillary action, boiling and condensation. No pumps are used, hence less chance of failure. The failure of multiple heat pipes is quite low. Each heat pipe contains a small amount of about 100 gm working fluid encased in a sealed pipe. The relatively uniform temperature distribution throughout the core and relatively small temperature drop from the fuel pin to heat pipe makes the heat transfer from the core without any problem, even if some heat pipes fail. The high thermal conductivity of the steel monolith ensures efficient heat conduction to the heat pipes. But it has to be ensured that the webbings between fuel and heat pipe channels have sufficient factor of safety. Decay heat can also be removed by the heat pipes with the decay heat exchanger during shut down or emergency condition. The core contains no moderating material. Exploded view of a portable nuclear station is shown in Fig 4.

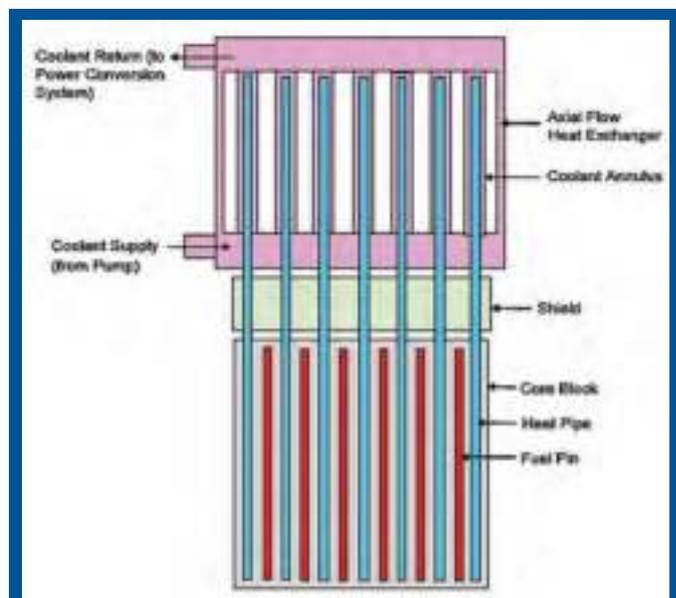
Any transient power excursions would be mitigated quickly by the negative temperature feedback. The strong negative reactivity feedback, the use of control drums and the relatively high beta effective of U235 provide easy control of the reactor power under both normal and accident conditions. These reactors are self-regulating and load following as they are controlled by thermal expansion and subsequent negative reactivity

feedback. Thermal feedback will lower the reactor power if less heat is extracted by the power conversion system. This makes the system more tolerant to power conversion failure.

Heat pipe reactors operate at ambient pressure which eliminates issues with high pressure as might occur in a high-pressure system such as gas cooled reactor design. Depressurisation accidents are a major concern for high pressure system.

Heat Exchanger

Most power producing reactors pass a fluid through the reactor core and then transfer the heat to a working fluid. As shown in Fig 5, primary heat exchanger is of shell and tube type built over the condenser end of heat pipes which is situated outside the core. Here at no stage the working fluid is in direct contact with the core. Hence less chance of contamination with radioactive material. Primary heat exchanger is used for heating the working fluid i.e. air that produces energy. Heat exchange is done by air convection over heat pipes. With this configuration the heat transfer to the working fluid (air) takes place outside the core. So, chance of contamination is less. Power conversion system uses open air Brayton cycle. Heat pipe length - evaporator in - core is 1.5 metres and condenser ex - core is 2.5 metres. HP total length is 4 metres. HP material is SS 316 and its thickness is



Note: air is the coolant pumped by air compressor of power generation section

Fig. 5: Schematic arrangement of heat pipe and heat exchanger

~ 2 mm. HP isothermal temp is 675 deg C, whereas monolith maximum temperature is 700 deg C.

Neutron Reflectors

A neutron reflector reflects neutron back into the fuel rod thereby making an otherwise subcritical mass of fissile material critical, or increase the amount of nuclear fission that a critical mass will undergo. It is made of alumina and installed like a ring round the monolith core. Reactivity control system consists of 6 to 12 numbers of rotatable control drums with arc of boron carbide strategically embedded in the reflector region and operating in banks. It provides overall reactor power level and excess reactivity control during normal operation. It reduces the non-uniformity of the power distribution in the peripheral fuel assemblies and reduces neutron leakage. By reducing neutron leakage, the reflector increases reactivity of the core and reduces the amount of fuel necessary to maintain the reactor critical for a long period. The neutron reflectors also serve as a thermal and radiation shield of a reactor core.

Salient features are:

- Side reflector material - Alumina (Al_2O_3)
- Side reflector outer diameter - 1560 mm
- Side reflector radial thickness - 250 mm
- Radial reflector length - 2000 mm
- Mass of side reflector - 8.4 MT,
- Top and bottom reflector material - SS 316 + BeO (above and below fuel).

Control Drum

The best method to control and tame the wild nuclear power is the use of control drums. The control drum material should have heavy absorption capacity for neutrons and also should not start fission reaction despite the heavy absorption of neutrons.

Salient features are:

- Number of control drums - 6 to 12, located inside reflector
- Drum OD -250 mm
- Drum axial length - 2000 mm
- Control material is B4C with Boron - 10 enrichment of 90 per cent.

Emergency Control Rod

The reactor core includes shutdown systems consisting of two numbers of shutdown rod along with its driving mechanism. While there is a need to have

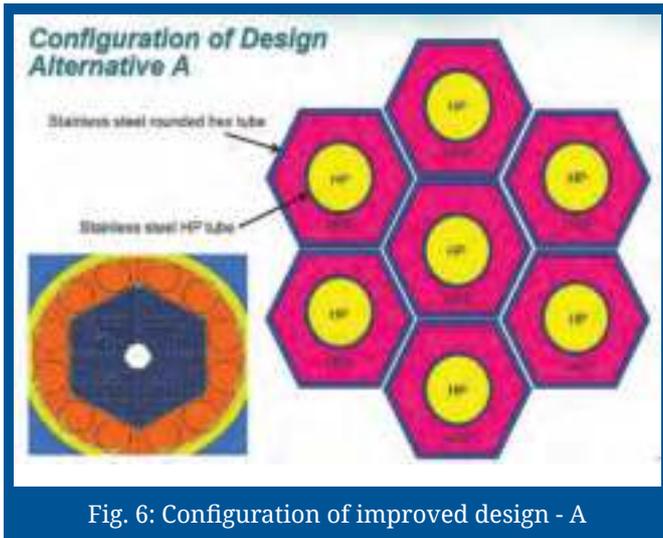


Fig. 6: Configuration of improved design - A

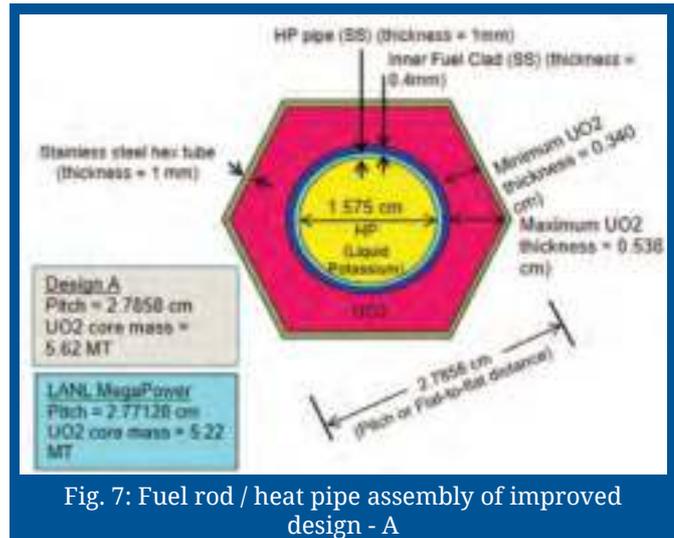


Fig. 7: Fuel rod / heat pipe assembly of improved design - A

rapid emergency shutdown they are independently and adequately activated.

Salient features are:

- Number of emergency control rods (of diameter 56 mm encased in a tube) are 2. They are located inside core hexagon volume.
- Control material is B4C with 90 per cent enriched Boron – 10.
- Length – 2,000 mm.

Improved Design

The aforesaid design concept might have the following weak points:

- There is no fuel cladding, inclusion of which might give additional safety.
- The maximum calculated thermal stress in the thin 1.75 mm steel monolith webbing between some fuel pin channels at ~ 700 deg C operating temp may cross the allowable limit of 29 MPa and may cause web failure.
- Single heat pipe failure may happen due to thermal stress and localised high temperature of monolith.
- Making drilling holes in the 1,500 mm long solid monolith block is very difficult. However, for ease of manufacturing, if the webbing thickness is increased, then there would be severe core reactivity penalty.

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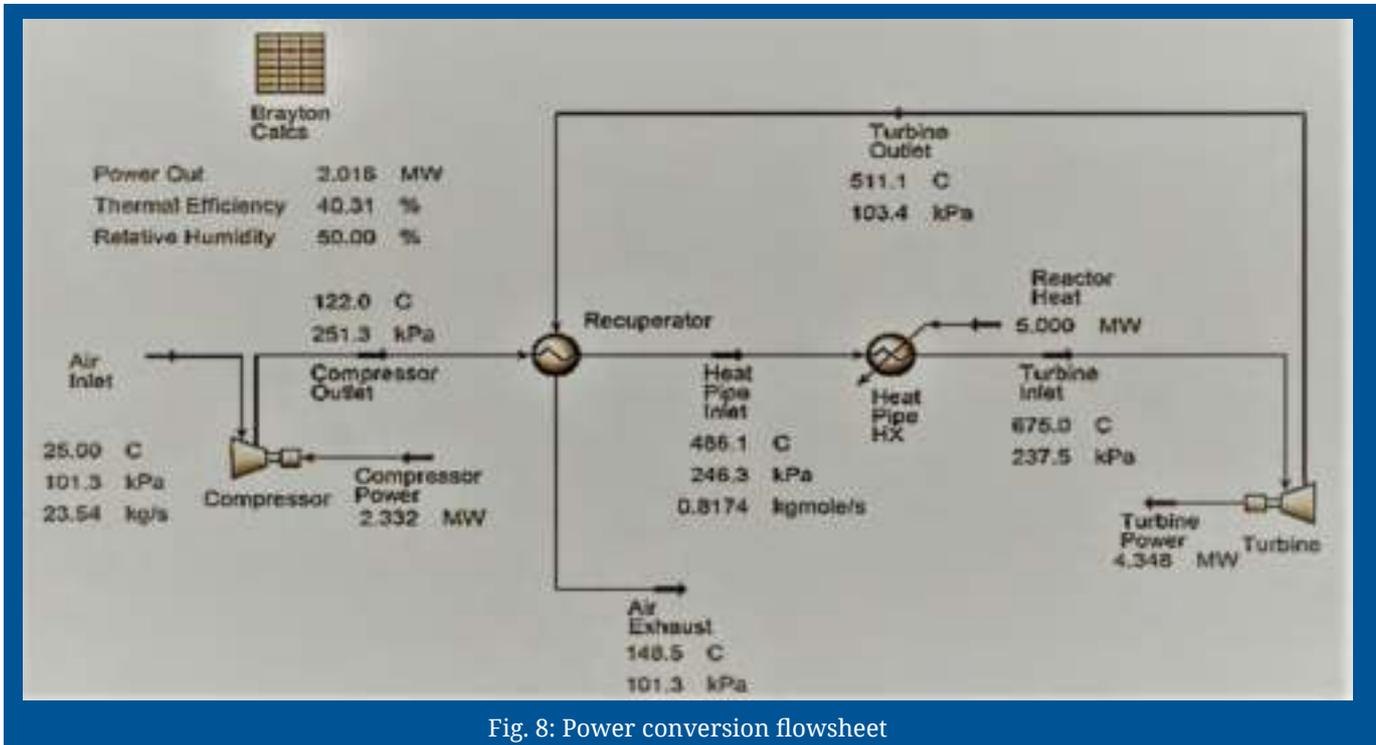


Fig. 8: Power conversion flowsheet

In order to plug these loop holes, a new improved design alternative - A has been envisaged and is under development. In this design concept - A, no stainless-steel monolith would be used. Pre-fab HPs and pre-fab clad fuel elements in hexagonal tubes as shown in Fig - 6 would be installed in a stainless-steel tank. There would be double tank containment. The improved fuel pin has a volume of 435 cc and can accommodate more UO₂. HP cascade failure will also be reduced. HP with bigger diameter can be used. Configuration of heat pipe/ fuel rod assembly in design Alternative - A is shown Fig - 7.

Power Conversion Unit

The flowsheet of the power conversion process is shown in Fig - 8. For power generation optimal heat recuperated air Bryton cycle with compressor and turbine isentropic efficiencies of 90 per cent has been envisaged. The isentropic efficiency has a strong impact on thermal efficiency. The thermal efficiency drops to 34 per cent at 85 per cent isentropic efficiency compared to 40 per cent at 90 per cent isentropic efficiency. So, it is important to use turbines and compressors that have high isentropic efficiencies. From heat pipe heat exchanger hot air at 675 deg. C, 237 kPa enters the turbine where it expands and does the work that generates electricity. After doing the work, exhaust air at 511 deg. C, 103 kPa from the turbine exhaust enters the recuperator where its residual heat is utilised for preheating the compressed air supplied by the air compressor to 486 deg. C, 246 kPa. It then enters the HP heat exchanger where it is heated to 675 deg. C by reactor heat and then again fed to the turbine for power generation.

Conclusion

Portable power reactor using heat pipes developed by Los Alamos National Laboratory, USA is passively safe in operation and it is self-contained. It provides readymade plug-and-go power supply. This route of energy production has potential applications at strategic defence locations, theatres of battle, emergency locations and remote communities living in the mountainous barren terrains. Another big advantage is that, being very light and small in size they can be easily transported by truck. Although cost of generation is higher than conventional mode, but there are so many added advantages. Unlike conventional nuclear power plants, it eliminates severe accident possibilities due to loss of forced-cooling plus the large number of in-core-heat pipes provide lot of safety margin in the event of a few heat pipe failures. It can provide round the clock electricity even under adverse weather conditions for at least 5 years. It is not susceptible to vagaries of fuel supply as in DG set. India's mountainous regions have lot of barren lands as well as snow fed rivers where greenhouse can be constructed and its climate control and irrigation system can be powered by this system. As the production from greenhouses under controlled condition is ~ 8-10 times more than conventional farming it will bring prosperity to the local people. E

(Image/diagram courtesy: Author)



Rathindra Nath Biswas,
Head (Retired),
MECON, Durgapur, West Bengal

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BASEC looks to expand footprint in India

British Approvals Service for Cables or BASEC is an independent accredited certification body headquartered in Milton Keynes, United Kingdom. When it comes to safe electric cables, how do you compare the British Standards with the different Standards being followed in India?

When it comes to safety, the British Standards (BS) is still the strongest because the cables used are in projects that require the utmost public safety considerations, including the underground metro, airport projects, and high-rise buildings. When it comes to stringent requirements, the BS is referred. It widely known that the Indian standards were developed from the original British counterparts. In India, the IS standards have been guided by the International IEC standards so far.

It is often a misconception that BASEC is only offering testing and certification to the BS and nothing more. Let me help to dispel this myth, the BASEC team are the



BASEC has a growing number of companies interested in expanding their product approval ranges or to get onboard as an approved manufacturer for their core export products.

**Harold D ' Souza,
Regional Commercial
Manager-India,
BASEC**

experts in cable testing and certification, we are specialist in fire testing and offer testing to local or domestic compliance requirements. As an authority in the market, many regulatory bodies and authorities look to BASEC for guidance on how

to adapt or respond to market needs and demands.

How do you see the standardisation of electric cables in India?

In India, the biggest problem in terms of standardisation is that often quality is compromised in favour of a lower cost. If you choose a cable based on a more attractive or lower the price, if the price is too good, you should immediately see this as a risk factor at the product selection stage. When it comes to BASEC product certification, on-going product surveillance is conducted throughout a three-year validity period. During each year, the BASEC team of auditors conducts three audits, the first two of the audits are pre-planned and the third audit is an unannounced random audit. The idea of the unannounced audit is that it is designed to catch the manufacturers off guard to ensure that product quality is always the same, even when the factory is not expecting an audit visit. The audit is made up of two core activities, assessment of processes and systems and the selection of product samples.

In order to make an assessment of product quality in the market, BASEC works closely with industry to collect samples of cable products from the supply chain and, when necessary we will work with end-users who encounter product faults to help them understand where a problem occurred in the product's lifecycle up until the point of failure. Continuous validation is fundamental. It is here that BASEC contributes to the safety standards, commitment to on-going verification the product quality is never forgotten. Validity is checked and checked again,

ensuring that the certification is still current, rather than reliance on a verification made years and years ago.

If we consider the number of fire-related incidents in India, the majority of the fires are caused as a result of short-circuit faults. BASEC has therefore opened an office in India to promote and enhance awareness of compliance to cable standards and to highlight the importance of being in critical applications and infrastructure uses, such as at the power utilities, in underground metros, airports and across the oil and gas sectors where reliability and product quality are key.

What is your India market strategy?

BASEC has a growing number of companies interested in expanding their product approval ranges or to get onboard as an approved manufacturer for their core export products. We work very closely with Polycab India Ltd, RR Kabel, Paramount Cable and Havells India. In obtaining BASEC approval on their products, these companies have been able to evidence the levels of quality and safety that their products meet and more and more trust and opportunity is arising for them within the country as well as in the overseas markets.

Frontec
Heat Shrink

Jointing Kits, End Terminations and Tap-Off Connectors for LT, 11K and 33 KV

Clockwise from Top Left:

1. Frontec Silicon MVT
2. Frontec Porcelain MVT
3. Frontec Termination installed at Gateway Towers
4. Frontec MV Tapoff
5. Frontec End Termination

Frontec
 manufactures Heat Shrink items from the granules stage. Some of the products in our range are:
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MV STRAIGHT JOINTS
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HEAT SHRINK TUBING
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JEMC: Delivering Quality for Over 50 Years

What's your comment on the voltage stabilisers industry in India?

Jindal is more than 50 years old manufacturing company of electrical equipment for industrial application. We are the largest manufacturer for high rating AVC (automatic voltage controller) above 200 KVA and have largest installation in Pan India.

The voltage regulator is most important part of AVC and two type of technology of voltage regulators are functional all over world - dimmer type (toroidal) and linear type (vertical).

In 1990, we developed linear voltage regulator first time in India for industrial application suitable for high rating AVC i.e. 200 KVA to 3,500 KVA. The working life of our linear type voltage regulator is more than 10-15 years and losses are less than 0.5 per cent in running condition. During these 30 years we have introduced this linear type technology to customers and sold more than 10,000 AVCs to different type of industries almost in every district of India and many South Asian countries.

How do you see the scopes of AVC in Indian market?

The scope of AVC line is very bright in rural/urban area, but



The working life of our linear type voltage regulator is more than 10-15 years and losses are less than 0.5 per cent in running condition.
Rajender Sharma,
GM (Admin), Jindal Electric & Machinery Corporation (JEMC)

other manufacturers seldom create the awareness about it. It is the requirement of all power consumers whose units are running 24 hours and facing breakdown, higher power consumption bill, increased MDI and inferior quality/rejection of material of end product due to low/high voltage.

What are the unique features of your Automatic Voltage Controller?

The unique features of our manufactured AVC are the trouble-free working life is 15-20

years with 99.5% efficiency on full load running condition and payback period is very less i.e. 6-24 months depending upon the voltage variation and running hours of the unit.

What are your future expansion plans?

We have increased our production capacity by automation/outsourcing and standardisation in design. We can manufacture 10 times than the present production. This happens due to our staff, engineers, technicians, are associated with us from long time – every staff/engineer/technician has at-least 25-30 years or more. Now we are planning to increase our sales by joining all India panel and automatic voltage controller manufacturers, electrical contractors, electrical dealers etc. as our channel partner. **EI**

Benefits of JEMC's AVCs

- Reduction in breakdown of electrical equipment up to 80%
- Energy saving on lighting load upto 5%
- Improvement in power factor & reduction in MDI upto 15%
- Better efficiency of plant due to lesser breakdown
- Depreciation @40% as per the Income Tax Act

igus guarantees 5 mn cycles at a low price with slim control cables

New chainflex M control cables have a 20 per cent thinner structure and save space in the energy chain



Our customers benefit from this because the cables have a smaller bend radius and take up less space in the energy chain. The user can save costs in this way,” explains Rainer Rössel, head of chainflex cables at igus GmbH. The new chainflex M cable series is now available as control cables with PVC (CF880/CF881) or igusPUR outer jacket (CF890/CF891) with or without shield. The cables are very suitable for short travels on simple classic machines such as stone, paper or wood processing, for example.

Reliability guaranteed at cost-effective price

With its advanced chainflex M cable series, igus now proves that quality and low price are not mutually exclusive. After four years of research, the motion cable specialist presented the new control cables CF880/CF881 and CF890/CF891 at SPS. An up to 20 per cent thinner cable structure ensures lower bend radii. This allows the user to save installation space inside the energy chain and they are costs effective. The chainflex M series has a tested service life of five million cycles and comes with a 36-month guarantee.

A good e-chain cable at a small price! That was and still is the promise that drives the chainflex M series of cables, which igus introduced for the first time in 2013. Since

then a lot has happened not only in mechanical engineering but also in cable development. Due to the increasing automation in the industry, faster and faster machines are called for. Accordingly, the development of lighter and smaller cables is required to reduce high accelerated masses. That is why igus is keen on further developing its cost-effective cable series without increasing costs. The first breakthrough came in 2015: instead of one million guaranteed cycles, the manufacturer promises a service life of over five million cycles, and all at the same price. Just in time for SPS, igus presented its next development success: “Thanks to a new structural design, we can produce chainflex M control cables that are up to 20 per cent thinner.

For more than 25 years, igus has been a specialist in the development of cables intended for use in the energy chain. The company tests its products under realistic conditions in the company’s own 3,800 square metre test laboratory in Cologne - and these tests go on all the way until they fail completely. igus has been investing in the further development and long-term testing of its established chainflex M cable series for four years. The laboratory tests have shown that the cables can easily handle five million cycles. On all cables, including the optimised chainflex M series, igus issues a unique guarantee of 36 months worldwide based on its test data. 

For more details, visit www.igus.in



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3 YEARS	18	2000.00	2900.00	3500.00	2000.00	3900.00	4500.00
5 YEARS	30	3000.00	4500.00	5500.00	3000.00	6000.00	7000.00
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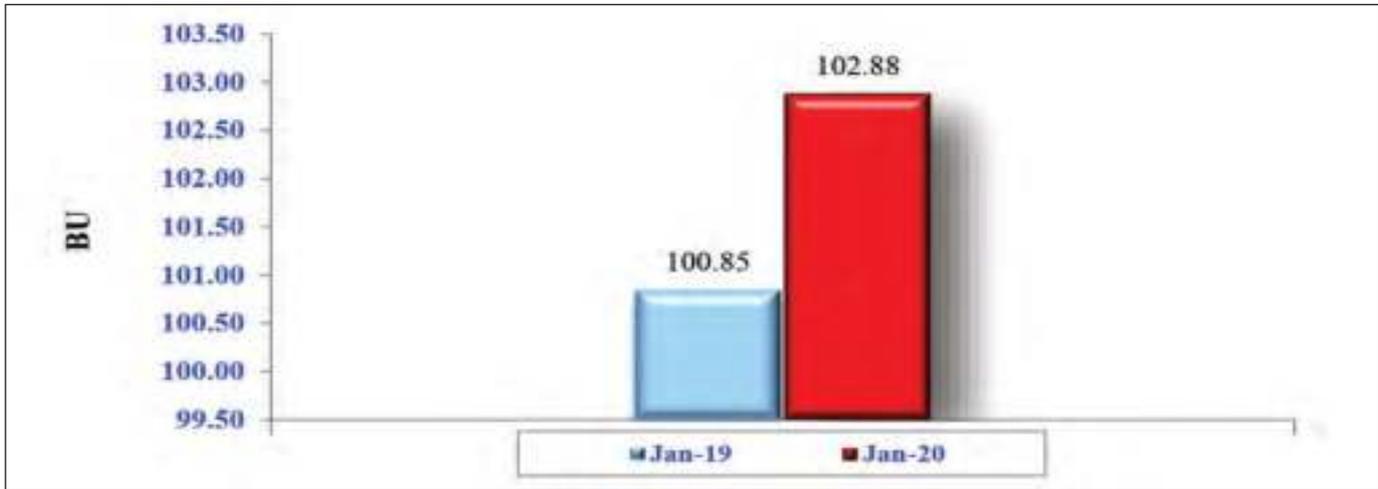
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Electricity Generation for Jan-2020 (BU)

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Thermal	90.349	97.623	90.758	0.45
Nuclear	3.120	4.070	3.358	7.63
Hydro	7.366	6.971	8.621	17.04
Bhutan Import	0.012	0.337	0.140	1066.67
All India	100.85	109.00	102.88	2.01



Electricity Generation During Apr-18 to Jan-19 & Apr-19 to Jan-20 (BU)

Type	Apr-18 to Jan-19	Apr-19 to Jan-20	% Change w.r.t Apr-18 to Jan-19
Thermal	895.782	870.590	-2.81
Nuclear	31.577	39.166	24.03
Hydro	119.086	138.199	16.05
Bhutan Import	4.334	5.655	30.48
All India	1,050.78	1,053.61	0.27



Generating Capacity Addition for Jan-2020 (MW)				
Type	Achievement	Targets	Achievement	% Achievement w.r.t. Jan-2019
	Jan-19	Jan-20		
Thermal	0	270	0	NA
Hydro	0	93	0	NA
Nuclear	0	0	0	NA
All India	0	363	0	NA

NA -Not Applicable

Generating Capacity Addition during Apr-18 to Jan-19 & Apr-19 to Jan-20			
Type	Apr-18 to Jan-19	Apr-18 to Jan-19	% Change w.r.t Previous Year
Thermal	2129.755	5445	155.7
Hydro	140.000	0	-100.0
Nuclear	0.000	0	NA
All India	2269.755	5445	NA

NA -Not Applicable

All India Installed Capacity (MW) Region-wise as on 31-01-2020									
Region	Thermal					Nuclear	Hydro	RES**	Grand Total
	Coal	Lignite	Gas	Diesel	Total				
Northern	52989.79	1580.00	5781.26	0.00	60351.05	1620.00	20010.77	16752.71	98734.53
Western	72275.12	1540.00	10806.49	0.00	84621.61	1840.00	7547.50	25526.09	119535.20
Southern	44514.52	3640.00	6491.80	433.66	55079.99	3320.00	11774.83	42162.88	112337.70
Eastern	27415.05	0.00	100.00	0.00	27515.05	0.00	4639.12	1496.97	33651.13
North-East	770.02	0.00	1775.81	36.00	2581.83	0.00	1427.00	364.20	4373.02
Islands	0.00	0.00	0.00	40.05	40.05	0.00	0.00	18.19	58.24
All India	197964.50	6760.00	24955.36	509.71	230189.57	6780.00	45399.22	86321.03	368689.82



Source: CEI

THE DIARY

16 - 17 June 2020

RenewX
HITEX Exhibition Center, Hyderabad

17 - 19 June 2020

Intersolar Europe
Munich, Germany



26 - 28 June 2020

ELECXPO
Chennai Trade Centre, Chennai

26 - 28 June 2020

Solar South
Chennai Trade Centre, Chennai



07 - 09 July 2020

Solar India
Pragati Maidan, New Delhi

07 August 2020

SolarRoofs Chandigarh, Punjab
Chandigarh



16 - 18 August 2020

Guangzhou International Solar
Photovoltaic Exhibition
Guangzhou, China

21 - 23 August 2020

World Renewable Energy Technology
Congress & Expo (WRETC & Expo)
Convention Centre-NDCC, New Delhi



IN THE MAY 2020 ISSUE

SMART CITY SPECIAL

**E-Mobility, Smart Meters,
Smart Grid**

**Switchgears, Switches,
Cable & Accessories, Street Lights**

Company Name	Page No.
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Frontier Technologies Pvt Ltd	49
H.D Wires Pvt Ltd	7
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Jindal Electric & Machinery Corporation	57
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Tests on Transformer Oil & their Significance

- Break Down Voltage (BDV)**
Indicators conductive present in the oil such as particle, free water.
- Moisture Content**
Indicates the total dissolved water in the oil.
- Interfacial Tension (IFT)**
Indicators the presence of sludge and excessive polar contaminants from the cellulosic materials.
- Neutralization Number (Acidity)**
Indicates the acid contents in the oil.
- Dielectric Dissipation Factor (Tan Delta)**
Indicates the presence of soluble varnish, resins and other polar contaminants and Ageing of Oil.
- Resistivity (Specific Resistance)**
Indicates the fitness of the oil.
- Flash Point**
Indicates the presence of lower hydro-carbons.
- Sludge / Sediments**
Indicates deposition of fibrous particles, dust, contaminants etc.
- Dissolved Gas Analysis (DGA)**
(a) Methane (b) Ethane (c) Ethylene (d) Acetylene (e) Carbon Dioxide (f) Carbon Mono-oxide (g) Hydrogen (h) Total gas contents Monitors internal condition of the transformer.
- Furan Analysis**
Periodical evaluation of Furan compounds in transformer oil help to know the condition of solid insulation.
- Kinematic Viscosity**
Indicates heat removal efficiency of oil.
- Pour Point**
Indicates freezing points of oil.
- Density**
Indicates heat dissipation characteristic.

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IEEE Standard 998

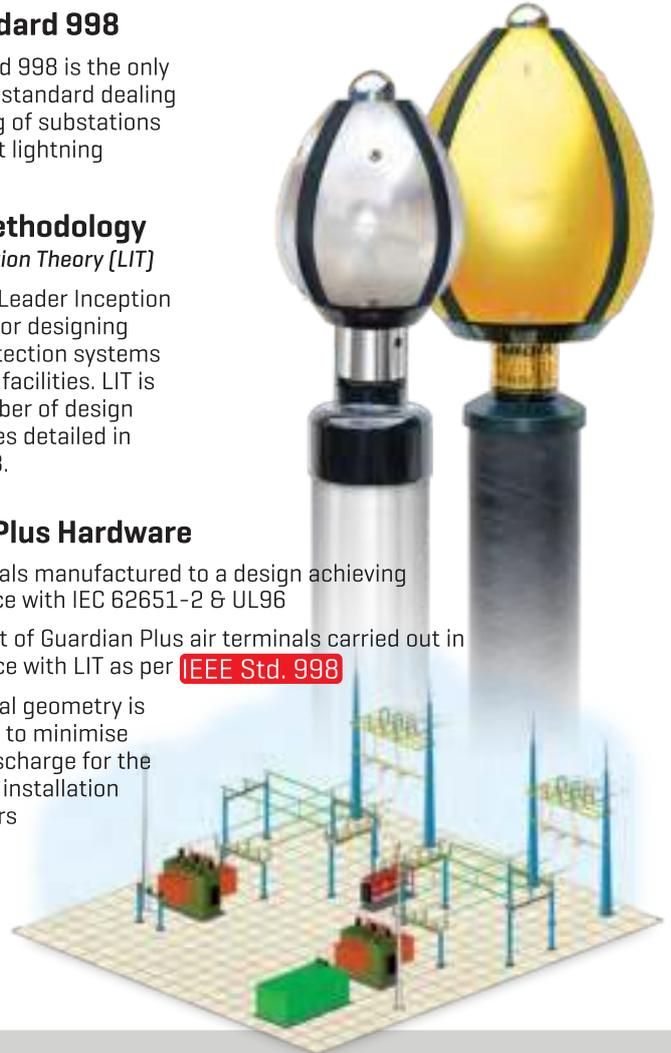
IEEE Standard 998 is the only international standard dealing with shielding of substations against direct lightning strikes.

Design Methodology Leader Inception Theory (LIT)

LPI uses the Leader Inception Theory (LIT) for designing lightning protection systems for HV power facilities. LIT is one of a number of design methodologies detailed in IEEE Std. 998.

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