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INSIDE

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Analysis: Dual certification, delayed payments hurting distribution transformer industry

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Editor: Venugopal Pillai

“Glory lies in the attempt to reach one’s goal and not in reaching it.”

— **Mahatma Gandhi**

Speedy reforms needed in power distribution

Aggregate financial losses by state power distribution utilities (discoms) reportedly stood at Rs.28,369 crore as of March 31, 2019, nearly doubling from the corresponding Rs.15,049 crore in 2018. After the launch of the UDAY scheme in 2015, there was a secular trend of decline in such losses during FY16 and FY17. The current reversal of trend is worrisome.

Several reasons are being provided for this debacle. State-owned discoms have dithered on tariff hikes, oftentimes for politically-motivated reasons. State government entities are delaying payments (as consumers) to discoms, adding to their financial woes. It is also felt that the steep increase in electrified households (under the Saubhagya scheme) has resulted in higher electricity consumption without commensurate revenue to the discoms.

The power distribution sector is in need of another round of reforms, and that too in good time. Firstly, the much awaited separation of carriage and content (also known as wire and supply) needs to be implemented soon. Once, the carriage (distribution network) is separated from the supply (the power supply business), the path for privatization of the supply business will become clear. When there are multiple operators in the power supply business, there will be competition, resulting in better customer service and of course, improved billing and revenue collection.

One more aspect of reform that needs serious attention is rationalization of tariffs. Today, industrial and commercial consumers are subsidizing the tariffs for the agriculture and, to some extent, the residential sectors. This cross-subsidy must go and a system of direct benefit transfer must be introduced. A widely debated point is that tariff rationalization should not be in the ambit of the power distribution company. In other words, why should the discom decide on who is entitled to subsidy? This evaluation should fall under the government’s purview. The discom can then focus on its core job which is to maintain the distribution network and supply quality power at reasonable rates.

Like any other business, power distribution should be a profitable business. For a country like India where electricity consumption is poised to grow exponentially, it is very ironic to see the power distribution industry in a financial mess.

Given that the private distribution franchisee model has not seen much success, it is imperative that the proposed carriage and content separation be carried out at the earliest. This could be a very optimum first step in the long journey of reforms ahead.

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Chugh takes over as IEEMA President

Indian Electrical & Electronics Manufacturers' Association (IEEMA), apex association of the Indian electrical equipment manufacturing industry, has announced that R K Chugh has been appointed as President, IEEMA for 2019-20. Chugh took over coveted post during the IEEMA Annual Convention held on September 17, 2019 themed as 'Transformational Reforms'.

Talking about the priority areas to focus on in his new role as President IEEMA, Chugh said, "It is my privilege and honor to be at the helm of affairs at IEEMA and look forward to your full support. At the present juncture, when state of economy in India and globally is not all that good, it presents to us challenges as well as opportunities to address the same. All of us



individually and collectively can make a big difference towards bringing about a turnaround in our own areas of work, thereby contributing to a substantial change at macro level. Increase in

productivity together with creation of more jobs in our set ups should be a priority to increase consumption level in the country. Thrust on exports to newer markets and countries with quality products and services can ensure much higher capacity utilization in our factories & of course Power will play a very important role in achieving these ambitions. IEEMA has a well-oiled machinery and infrastructure to help us achieving our business goals and align with larger goals of the nation. Our association and all of us have a responsibility and a role in Transformation."

New Vice Presidents: Vipul Ray, Managing Director, Elmex Controls Pvt Ltd and Rohit Pathak, CEO and President, Aditya Birla Insulators also took over as Vice Presidents for the year 2019-20. ■

Tata Power DDL in pact with Havells for circuit protection devices

Tata Power Delhi Distribution Ltd and Havells India have signed an MoU to strengthen the distribution of electrical protection devices in North Delhi.

Both companies have also planned an extensive awareness and training program to encourage adoption of proper installation of circuit protection devices – ELCB (earth leakage circuit breaker) and MCB (miniature circuit breaker). The synergy between a prominent power distribution company and a leading electrical equipment brand in the country shall ensure safety from electricity hazards, a release from Tata Power DDL said. The association will help us sensitize consumers on the need to incorporate best in class protection devices in their homes, the release noted.

ELCBs are extremely critical in ensuring human safety as they protect us from current leakage. Today, we are surrounded by electrical devices and most of us are not aware about the hazards that come along, due to lack of proper protection devices not being used. As per reports, Delhi has recorded maximum electricity related fatalities over the last decade. Deploying Miniature Circuit Breakers (MCB) is the most common practice that is followed to ensure protection of electrical devices from short circuit and



TATA Power-DDL and Havells India signed an MoU to ensure consumer safety. The MoU was signed in the presence of Sanjay Banga, CEO, Tata Power-DDL (extreme left) and Saurabh Goel, President, Havells India Ltd (extreme right).

overload. However, MCB does not ensure safety of the users when it comes to current leakage.

As per the Regulatory Guidelines (DERC) ELCBs are a must as no new connection will be energized in Delhi unless a suitable earth leakage protection device has been installed at consumer premises.

Havells is understood to be the only company which provides a six-year warranty on MCBs, ELCBs and RCCBs, if used along with Havells distribution board.

Havells plans to reach out to the 6,000 consumers applying for new connections every month on an average along with 17 lakh residential and industrial users of Tata Power-

DDL. The primary focus of Havells lies on human safety devices which includes residual current circuit breaker (ELCB/RCCB), socket residual-current device (RCD) and portable residual current device (PRCD). The electrical leakage circuit breaker (ELCB) will be made available across all 12 Tata Power-DDL Customer Care Centers at subsidized price from October 1, 2019 onwards. Generally electrical problems are caused due to short circuits, overload, current leakage and voltage fluctuations. Necessary precautions such as ELCB/RCCB of 30mA sensitivity must be taken so that human life is not harmed from any such threats, the release added. ■



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We are expecting growth in all cable segments

— **Anil Gupta**, Chairman & Managing Director,
KEI Industries Ltd



Established in 1968 as a partnership firm, KEI Industries has today grown into a globally-acclaimed supplier of holistic solutions catering to a wide range of low, medium and even extra-high voltage cables. KEI is also growing in stature in the EPC services domain. In this exchange with T&D India, we have Anil Gupta discussing KEI's business drivers and growth plans. Gupta asserts that his company is steadfastly committed to support the national agenda of infrastructure development.

We understand that KEI is very bullish about the growth in its LT cables & house wire segment. Tell us more.

The segment comprising of LT, HT cables and house wires is driven by the three pillars of trust and quality, brand awareness and customer service. Increase in this segment is pivotal to delivering our growth strategy. Concentrating

on the segment and seeing the growing market, we have taken steps towards capacity expansion for LT, HT cables and house wires. Our four plants can cumulatively produce 94,000 km of LT cables and 8,17,000 km of winding, flexible and house wires put together.

We are definitely optimistic about the growth of this particular segment as the demand for cables has been

on a steady rise. Furthermore, the government's focus on Power for All, rural electrification, improving infrastructure, robust spur in the number of households, improved lifestyles and new opportunities are propelling the demand of LT cables as well as domestic wires.

Please discuss the recent capacity expansions that you have carried out at Pathredi, Silvassa, and possibly other locations.

With strong changes underway in the real estate, infrastructure and power sector, we are working towards capitalizing on upcoming opportunities. We have completed the expansion of LT & HT facilities at Chopanki and Pathredi, Rajasthan. Additionally, we are also augmenting our manufacturing capacity of house wires through a new unit at Chinchpada (Silvassa). The first phase of production phase is slated to begin by the end of 2019-20.

The number of electricity connections in India has grown tremendously thanks to Centrally-



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sponsored village and household electrification schemes. Do you see growth in your LT cable & house wire business from tier-2 cities, towns, etc., or would you focus more on metro and tier-1 cities?

The government has been on an active mission of electrifying the villages with multiple electrification schemes. With schemes like Deen Upadhaya Gram Jyoti Yojana (DDUGJY), Power for All and UDAY, rural electrification has got that necessary boost. We are confident that the demands for cables and wires will increase, resulting in phenomenal growth of our business.

Kindly discuss the growth in your pan-India dealership, especially for house wires.

The company has a significant pan-India presence in the retail division and has achieved phenomenal progress in this segment over the past few years. We are optimistic about the growing market of house wires as they are energy-efficient and meet the highest level of safety standards for domestic and commercial usage. Our focus has been on strengthening our presence pan-India. We have increased our distribution strength to 1,450 channel partners from 1,284 in the previous year and the company's retail sales have grown to almost 43 per cent of their turnover in terms of its total sales. By persistently pursuing our dealer expansion strategy, we have been able to transform our identity in the minds of the consumers.

Tell us in brief about the safety (fire hazard prevention) features in your house wires.

We offer three wires under our segment of house wires namely; Homecab-FR, Conflame-FRLS and Banfire-ZHFR. All these wires have been specially designed to prevent fire hazards.

Homecab-FR is flame retardant,



EHV cables by KEI

PVC insulated single core copper cable. It has specially formulated insulation with a high oxygen and temperature index, enabling the wire to withstand overloads, preventing electric mishaps.

Conflame-FRLS is also flame retardant, low smoke PVC insulated single core copper cable. It is shielded by a specially formulated flame retardant PVC compound. During fire, ordinary PVC emits black and toxic smoke, which is acidic in nature. This impairs visibility and hampers rescue operations. Conflame insulation retards spread of fire and emits minimum smoke and toxic gases.

Banfire-ZHFR is a zero halogen flame retardant insulated single core copper cable. The insulation is of superior quality, 100 per cent PVC free and eco-friendly. In case of a fire, Banfire does not emit toxic or poisonous fumes, enabling safe evacuation.

Do you think that property owners are conscious enough of the safety aspect?

Yes, nowadays the consumers are extremely critical about the safety aspect. They understand the negative consequences of using

cheap wires and hence, invest accordingly in wires that can ensure safety and security of residents.

We understand that you recently renewed your technical collaboration with Brugg for EHV cables. Tell us more.

EHV cables offer considerable advantages over conventional overhead lines for sub-transmission and distribution of power. Anticipating this in advance, we commenced the manufacturing of EHV cables of up to 220kV in technological collaboration with Switzerland-based Brugg Kable. This collaboration was extended to 400kV in 2016. This strategic partnership empowers us to provide high-end designs and process backups benchmarked to the highest standards of global excellence. We completed the installation of a new 400kV EHV cables production line, at our Chopanki plant last year, to address the ever-increasing demands.

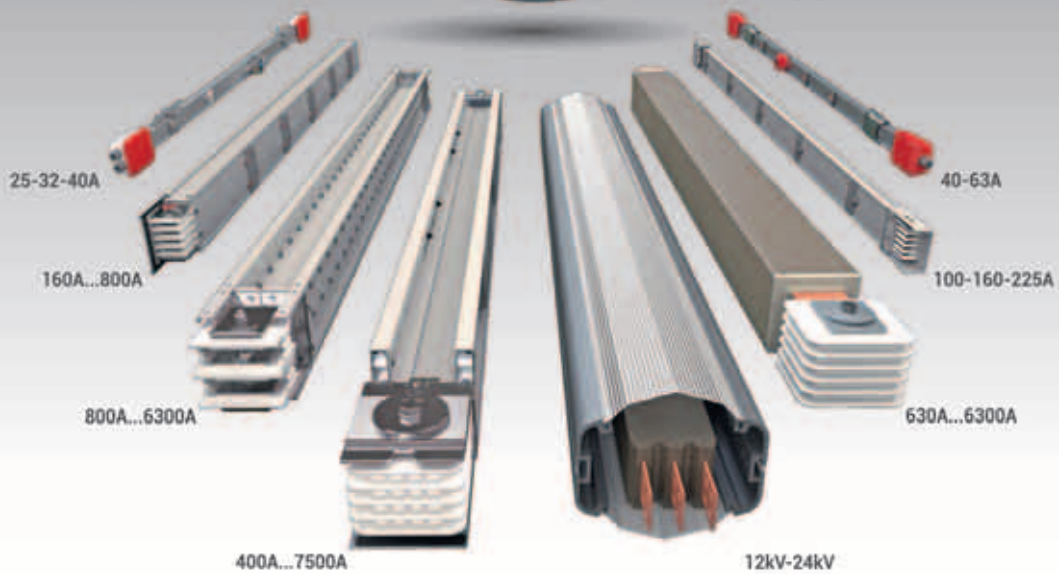
What is the current manufacturing competency of KEI in terms of kV rating of EHV cables?

Our four state-of-the-art plants located at Bhiwadi, Chopanki, Silvassa and Patheri have a cumulative annual capacity of 900km EHV cables, up to 400kV.

How do you see the road ahead for KEI Industries? Please discuss how your corporate growth will be driven by the broad segments — LT, HT and EHV cables.

As the country is spearheading towards growth in all the sectors, we remain steadfast to participate in full measure towards the national agenda of infrastructural development. We remain committed to drive increase in sales and profitability by extending the reach of our offerings. All our verticals offer exciting growth opportunities and we expect that we will see growth across segments of LT, HT and EHV cables. ■





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Solution developed after inspection of 90,000 km of power lines

Terra Drone launches UAV AI-based solution for power asset inspection



The solution was developed after inspection of over 90,000 km of power lines

Terra Drone Corporation, the world's largest provider of industrial drone solutions, has launched a new UAV and AI-based solution set for the maintenance of power transmission and distribution equipment. The solution was developed based on the market gaps identified after inspecting over 90,000 km of power lines.

Acquired data is automatically processed and analyzed by artificial intelligence algorithms which are trained to detect crossovers at the bottom of transmission lines, buildings and construction machinery.

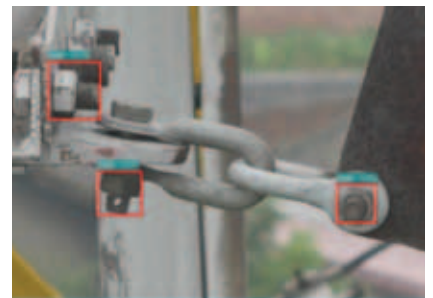
The system identifies rust on bolts, loosening and missing tower parts, bird's nest, vegetation encroachment, etc and generates a smart report, highlighting the

areas that require action. The error (identified anomaly) detection system is accurate up to 92.5 per cent. The algorithm is developed through a process identifying anomalies in a training data set of approximately 1,500 images, this allows for a custom solution to be created for the end client where all pertinent anomalies are identified and reported. The development and training of the algorithm only needs to be completed once for a particular type of asset and can be implemented easily at different locations on similar assets.

With such a high-precision algorithm, the productivity of AI processing allows for fast actionable results to be provided to clientele. Clients also have the ability to identify the appropriate security

protocols for data storage in either a cloud-based or on-premises storage environment. These protocols can then be implemented in a custom client specific solution.

Power transmission and distribution companies must conduct periodic inspections of power line infrastructure to ensure reliable electric power distribution, although the conventional methods of deploying ground staff or low-flying helicopters to complete the inspections, they are typically cost prohibitive. Conventional



Loosening and missing parts identified by high-accuracy detection system

helicopter and boots-on-the-ground service also pose HSE concerns with low flying helicopters and people working in the field. UAV service and AI inspection can aid in minimizing HSE concerns by reducing the number of workers in the field and eliminate low level manned helicopter missions.

This solution has been built from ground up with the aim to simplify and streamline the maintenance work for transmission and distribution facilities. ■



(Key to abbreviations:
AI = Artificial Intelligence,
UAV = Unmanned Aerial Vehicle,
HSE = Health, Safety and Environment)

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We aim to provide India's industry with customized solutions

— **Binayak Das**, General Manager, Elkem Silicones India and South Asia



Founded in 1904, Elkem is one of the world's leading suppliers of silicon-based advanced materials with operations throughout the value chain from quartz to specialty silicones, as well as attractive market positions in specialty ferrosilicon alloys and carbon materials. Elkem consists of four business areas: Silicones, Silicon Materials, Foundry Products and Carbon. In this exchange, Binayak Das discusses Elkem's specialized silicone rubber compounds used for safer insulation of wire & cables. Elkem Silicones that has been serving India for 30 years aims to come closer to the Indian customer with a new Mix & Fix™ Centre and application lab, notes Das

The Elkem Silicones division, as we understand, produces compounds that are used in the insulation of electric wires and cables. What are the brands under which these products are marketed?

With more than 60 years expertise,

Bluesil™ and Mix & Fix™ brands for rubber combine easy-to-use products, as well as clean and safe processing. Our Bluesil™ rubber are high quality products, custom-made complying with the most demanding standards.

As you know, silicone rubber compounds are used in a vast range of applications, from industrial processing to consumer products. Customers often require tailor-made solutions. The design and production of these custom compounds must be done quickly and accurately, and then delivered in the format and quantities that suit customer procurement and production processes.

Our Mix & Fix™ Centres, the Elkem Silicones compounding network, are located in the heart of major elastomer and rubber producing regions to closely respond to customer needs. Besides supplying master batches, they advise customers and provide them with custom-made formulations from Bluesil™ HCR (high consistency rubber) range with very short lead times that meet their specifications and are compatible with their manufacturing requirements.

We are about to open a new Mix & Fix™ centre in India in Q4 of



"The need of the hour is to provide suitable silicone solutions that can protect occupants by providing a ceramic layer over a wire exposed in live fire."



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2019 to localize our Mix and Fix™ service close to Indian customers.

We presume that these compounds are supplied to wire & cable manufacturers who in turn use it as “original equipment” in their cables. Please discuss how it works.

Wire and cable manufacturers must make products that conduct electricity properly, are well insulated and perform in even the most hazardous conditions, withstanding extreme heat and cold, corrosion, moisture, ozone and fire hazards.

Silicones offer reliable insulation, avoiding any type of electricity leakage and providing mechanical performance at a low weight and in different hardness. We thus provide them high consistency rubber elastomers (silicones) that are made from reactive linear silicone gums and special additives that enhance the inherent properties of silicones.

It is now established that during an electric fire, much damage to human life is caused not by the fire per se but by the accompanying smoke. Please elaborate on this point.

Cable manufacturers and installers know that, to ensure people's safety in places that are hard to reach or difficult to evacuate, they need highly resistant cables that produce reduced emissions of smoke and effluent gasses in case of fire. Silicone rubber insulators make it easier for rescue teams to do their work and save human lives.

Researchers have designed silicone rubber cables offering better safety for people and goods by lowering fire propagation, but also collateral effects like smoke opacity and gas toxicity.

Tell us how products by Elkem Silicones can limit the damage caused by smoke in an electric fire.

The Bluesil™ line of HCR (High Consistency Rubber) elastomers, more resistant and safer than thermal plastics and organic elastomers, are custom designed for all wire and cable applications to protect sensitive electrical installations.

HCR elastomers (silicones) are made from reactive linear silicone gums and special additives which can sustain heat and present fire resistance with low smoke emissions and non-corrosive and

non-toxic combustion gasses.

In India, halogen-free cables are being popularized as they curtail the smoke-related damage. How do Elkem silicones compare with halogen-free insulation compounds?

We have developed customized silicone rubber insulator formulations for cables in public areas that blend master batches, fire resistant additives and respect Low Smoke Zero Halogen classification. Our well-known Bluesil™ MF 8465 HCR has been widely used by cable manufacturers for many years and our new generation Bluesil™ FRC 8470 provides even greater performance levels. All these products are available as ready to use compounds in range in a variety of shapes and colors through our Mix&Fix™ Centre, the Elkem Silicones compounding network.

We have worked hard over many years to improve the performance levels of our silicone rubber (HCR) compounds to produce Low Smoke Zero Halogen cables that have high mechanical properties, thermal resistance up to 300°C, high resistance to climatic conditions (bad weather, UV radiation, ozone, salts corrosion, etc.) and, thanks to addition of our high performance additives, it exhibits very high ash cohesion capacities in case of fire, thus protecting cables and producing low smoke and effluent emissions.

Tell us about the current scale of operations of Elkem Silicones in India. How do you plan to market your products to wire and cable manufacturers?

With a presence in India for more than 30 years and a dedicated silicones team in our Mumbai commercial office since 2013, we have witnessed the dynamism and desire for growth of the Indian industry! In a major step to accompany our customers, we are



Distribution Transformer is a Vital Asset for Nation Building

According to Leonardo Energy – Transformers Report, 2005, the global transmission and distribution network losses will lead to global economic loss of more than US\$61 billion annually and annual greenhouse gas emissions of more than 700 million tons. In general, it is estimated that one-third of network losses occur in transformers, and of these transformer losses, 70 per cent occur in distribution transformers. The report estimates that the total electricity lost on utility networks around the world in 2005 was approximately 1,279 TWh, and of that, distribution transformers consumed 298.4 TWh.

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High consistency rubber elastomers are more resistant and safer than thermal plastics and organic elastomers

opening a new Mix & Fix™ Centre and application lab in Chakan near Pune in Maharashtra. With this new capability, we aim to provide India's industry with customized solutions, local technical support and agile product development.

Our technical, R&D and formulation team is now ready to offer tailor-made silicone rubber solutions to our regional customers in automotive, energy, construction & cable industries, helping them to deliver their potential.

The insulation and low smoke emission properties of cables in transportation and public spaces are a matter of public healthcare. Elkem Silicones not only provides cables that meet international regulations and have proven to be efficient in such cases, but we also have ranges of other silicone-based material that improve our public transports.

To name a few examples: train seats made with silicone foam are safe for people and are also very flexible and supple; cars parts have more and more silicones (airbags, batteries, interior design, LED, etc); in aeronautics, silicones help

encapsulate critical components. We are proud to say that Elkem Silicones keeps people moving around the world in a safe and efficient way!

How do you view the overall consciousness of the Indian wire and cable market, with respect to fire-related safety?

The Indian wire & cable industry is very innovative and always looking for products which can make places safe in case of any eventuality. With rapid urbanization, the need of the hour is to provide suitable silicone solutions which can protect occupants by providing a ceramic layer over a wire exposed in live fire which can be due to multiple reasons such as short circuit etc.

Just as a digression, we understand that Elkem also makes dielectric fluid that can be used as a coolant for transformers. Tell us in brief about this product.

Silicones are extremely efficient as insulation and cooling materials for electrical transformers and power distribution equipment, such as switch boxes, chokes, capacitors

and resistors. They are especially reliable in sensitive environments like public places, densely-populated areas, hard-to-reach locations, etc where they play a critical role in protecting people and property because they offer thermal stability, higher flash and ignition points and less heat and smoke emissions in case of fire.

Elkem Silicones has developed a full range of ingredients and formulations, including Bluesil™ oil for submerged transformers, to insulate and cool high and medium-voltage electrical equipment.

How do you view the overall Indian market for Elkem Silicones division, in particular?

Indian market demand is gradually increasing and Elkem Silicones sees the setup of the Mix & Fix™ centre as a first step of our ambitious plan to localize and customize Elkem Silicones solutions. We will set up a stronger manufacturing platform and even develop technical assistance and technical sales in order to accompany the evolution towards higher end silicones solutions in India. ■



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- **Kalpataru Power Transmission Ltd** and its international subsidiary have secured new orders/notification of award of approximately Rs. 775 crores in power T&D business from government and private clients, KPTL said in a stock exchange filing. With these orders, details of which were not disclosed, the total inflows in FY20 have crossed Rs.4,300 crore, the company said. In addition, the company is in L1 position in approximately Rs.2,000 crore worth of orders.
- **Bharat Heavy Electricals Ltd** has secured an order for emission control equipment for the 2x250-mw Bhilai Expansion power project in Chhattisgarh. Valued at around Rs.450 crore, the order has been placed on BHEL by NTPC-SAIL Power Company Ltd (A JV of NTPC Ltd and Steel Authority of India Ltd). The order involves supply and installation of flue gas desulphurization (FGD) system. BHEL's scope of work includes design, engineering, civil works, supply, erection and commissioning of wet FGD system along with auxiliaries including limestone and gypsum handling system and wet stack on turnkey basis.
- **Maharashtra State Electricity Distribution Company Ltd** has awarded to Ravindra Energy Ltd the "Empanelment and Rate Contract", covering inter-alia design, manufacture, supply, transport, installation, testing and commissioning of off-grid DC solar photovoltaic water pumping systems at the project sites of identified farmers in Maharashtra with comprehensive maintenance contract for five years on a single point responsibility, "Turnkey Contract" under the Mukhyamantri Sour Krishi Pump Yojna Scheme for a quantity of 30,600 pumps. Accordingly, the total amount of revenue that would be generated from the above projects aggregates to Rs. 565.98 crores. However the quantity and value indicated above are tentative and liable to change as per site conditions and consumer requirement, Ravindra Energy said in a stock exchange filing.
- **Bharat Heavy Electricals Ltd** has bagged a Rs.1,600-crore order for the turbine generator (TG) and associated packages for the greenfield 2x660-mw Khurja Super Thermal Power Project in Bulandshahr district of Uttar Pradesh. The order has been placed on BHEL by THDC India Ltd.

Leadership in FGD units

BHEL, in a statement, said that it booked orders worth Rs.23,859 crore during FY19 despite a subdued business environment and increased competitive intensity. Significantly, BHEL has firmly established itself as a leader in the domestic emission control equipment market for thermal power plants with more than 40 per cent market share, by securing orders for 32 FGD packages and 11 SCR packages. During FY19, 5,903 mw of generating capacity was commissioned/synchronised. With this, the worldwide installed base of power generating equipment supplied by BHEL has exceeded 185 GW. During FY19, BHEL built thermal sets in India generated an all-time high of 610 billion kwh, accounting for 60 per cent of the total thermal power generated in the country.

BHEL's scope of work in the contract includes design, engineering, manufacture, supply, erection, testing and commissioning of the TG and associated packages for the 2x660-mw Khurja supercritical power project. Significantly, BHEL envisages indigenous manufacturing and sourcing of both the turbine-generator sets for this project, a release from BHEL noted.

Tata Power commissions its first ISTS-based solar project

Tata Power Renewable Energy Ltd, a wholly-owned subsidiary of Tata Power, has commissioned 150 mw solar capacity in Village Chhayan, Tehsil Pokharan, Rajasthan. With this, the overall operating renewable capacity of TPREL now stands at 2,628 mw in India.

The company had won this project with a tariff bid of Rs.2.72 per kwh in a solar auction by Maharashtra State Electricity Distribution Co. Ltd (MSEDCL) in May 2018. Power from this solar plant will be sold to MSEDCL under a 25-year PPA.

The project is connected at 220kV to PGCIL's Bhadla substation making it the company's first ISTS (interstate transmission scheme) solar project.

TPREL is currently developing 500 mw of renewable capacity across the country including 100 mw under PPA signed with UPPCL and NPCL in Uttar Pradesh, 100 mw under a PPA signed with Gujarat Urja Vikas Nigam Ltd at Raghnesda solar park and 250 mw at Dholera solar park.

Exits South African JV: Khopoli Investments Ltd, a wholly owned subsidiary of Tata Power, announced the execution of a share purchase agreement with Exxaro Resources Ltd for divestment of the Tata Power's entire 50 per cent stake in Cennergi, a South African joint venture, for an amount of around \$106 million. The agreement will be subject to normal regulatory approvals.

Cennergi (Pty) Ltd is a 50:50 JV between

Exxaro Resources Ltd (a South Africa-based coal producer) and Khopoli Investments Ltd, a wholly owned subsidiary of Tata Power.

Under the agreement, which is likely to be completed by Q3FY20, Exxaro will acquire the entire 50 per cent shareholding of Khopoli Investments Ltd, thereby getting 100 per cent ownership of Cennergi.

Cennergi owns two wind farms in South Africa - Amakhala Emoyeni (with a generation capacity of 134.4 mw and 95 per cent shareholding) and Tsitsikamma Community Wind Farm (with a generation capacity of 95.3 mw and 75 per cent shareholding). Each project has a 20-year power purchase agreement (PPA) with the state power utility Eskom.

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The role of HVDC is expected to grow in importance

— **Marcus Häusler**, Principal Lead Engineer HVDC, Siemens



*High voltage direct current (HVDC) transmission is gaining significance in India as it suits the country's typical requirement of very long-distance transmission lines with limited right-of-way. Siemens has been a longstanding partner in India's HVDC's pursuits, having supplied four such systems so far. We have **Marcus Häusler** taking us through the finer aspects of HVDC technology including its application areas and technical complexities. Häusler asserts that HVDC technology is expected to gain importance not just in India but world over as well. An interaction by **Venugopal Pillai**.*

HVDC transmission has gained a lot of traction in recent years. Let's start by understanding what HVDC transmission is and the typical situations where it scores over conventional AC transmission.

High-voltage direct current (HVDC) transmission is generally understood as the transmission of electrical energy between two AC grids via a direct current transmission line at high voltage

levels (up to +/- 1,100 kV). At both ends of the HVDC transmission line, converter stations are required for inverting and rectifying the current flow: in other words, converting AC to DC and vice versa.

Typical application examples of HVDC solutions include:

- Long-distance power transmission, like the Siemens Pugalur-Trichur HVDC project

- Grid access for offshore energy generation
- Interconnectors
- Cable applications (especially distances over about 80 km)
- Connecting asynchronous grids and grids with different frequencies

Please discuss the efficiency of HVDC transmission systems compared with conventional AC ones.

Electrical energy supply grids usually operate using three-phase systems – also known as alternating current systems – which basically require the additional installation of a reactive power compensation system due to the inductance and capacitance of electrical lines. In the operation of comparable direct-current transmission lines, there's no reactive power flow in the circuit and therefore there are significantly lower transmission losses.

With today's large changes in transmission systems, with a growing share of renewable



Interior view of a converter station

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Converter stations at the ends of HVDC transmission lines invert and rectify the current flow by converting AC to DC and vice versa

generation, there are fewer thermal generation plants and thereby a loss of inertia and controllability – so more advanced solutions are required to ensure the security of supply. HVDC systems answer these challenges thanks to their very fast controllability in terms of both active and reactive power. HVDC is also well-suited for stabilizing AC systems during system contingencies, and so the need to invest in additional devices is lesser.

In addition, HVDC enables efficient inter-area power transmission over long distances and therefore provides the capability of sharing expensive spinning reserves between independent AC systems. It also balances volatile renewable generation and consumption through an efficient connection of larger power systems.

The environmental impact of transmission projects is becoming a more and more critical success factor. HVDC lines require much less space than AC lines with the same power transfer capacity. A line/corridor width of less than 30 percent of what's required for AC lines is used to transmit the same amount of power.

Along with efficiency also comes the technical complexity of HVDC systems. Tell us more.

The complexity of HVDC starts with the design and construction of power electronics-based HVDC converters rated for several hundred kilovolts, which allow power transmission up to 10 GW in a single connection. Besides the HVDC converters, more high-voltage equipment like converter transformers needs to be designed for DC applications.

The basic principle of controlling the DC power by defining the DC voltage in one station and the DC current in the other station is quite simple. However, because it's based on power electronics control and protection, this has always been a complex topic for which no manufacturer-independent standard is available.

Former HVDC links were mainly dedicated to power transmission and interconnection between neighboring AC grids. Today and in the future, HVDC systems fulfill major tasks within AC systems. One example is offshore wind farms that are connected via HVDC to the onshore AC system. The HVDC offshore converters are part of an isolated offshore AC system for the safe and reliable operation of the wind farm. Generally, the AC system ancillary services for HVDC systems are becoming more important, beginning with grid restoration of AC systems

via HVDC links to grid-forming behavior that compensates the decreasing amount of conventional power generation in AC systems.

What's the role of converter stations in an HVDC transmission system?

An HVDC converter station is responsible for steady-state and dynamic AC voltage control independently in each station, which stabilizes the AC network. The newest generation of HVDC converters can generate or consume reactive power independent of active power, which is useful in unbalanced AC networks or when the transmission line is out of service.

In weak AC network situations – for example, when the AC transmission network needs to be restored after a blackout – the newest HVDC system technology can provide system recovery ancillary service. Its black-start capability can restart a collapsed network. The necessary active power is drawn from the AC network at the transmission end of the link.

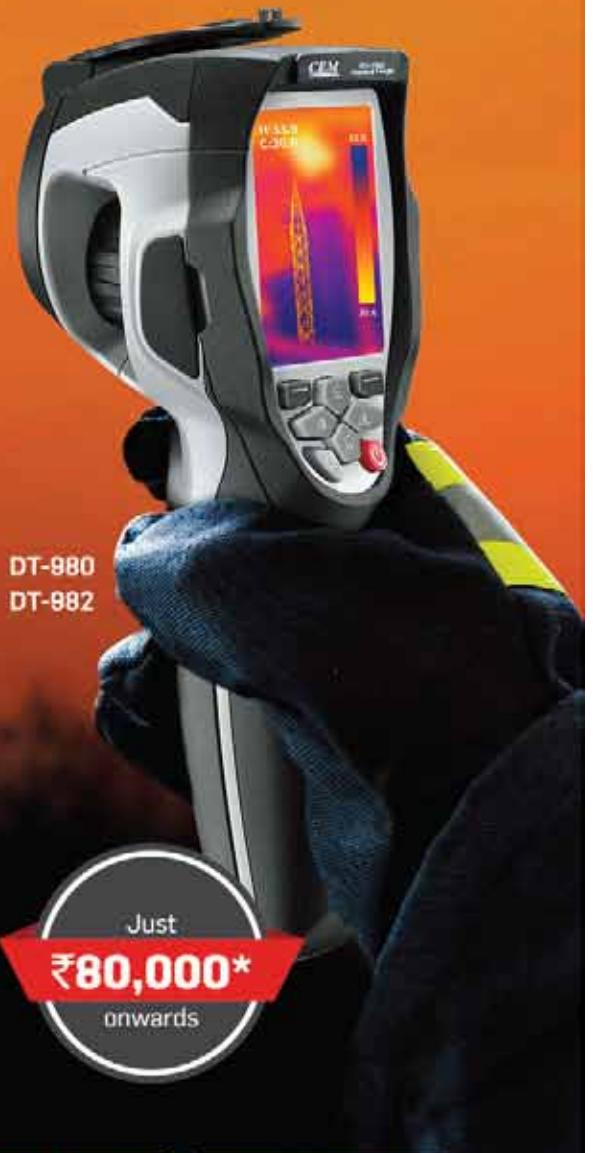
What's Siemens' overall capability with respect to HVDC transmission systems?

Among other things, the HVDC project business is characterized by high project costs, technical complexity, high volatility (from the market perspective), and long-term initiatives (from concept to commissioning may take up to 10 years). This means that working with a reliable partner is a key success factor. Siemens has proven its capability in this domain many times.

We're clearly market-oriented and therefore our goal is to understand and improve our customers' business and to make them successful in their markets. That's why we work closely with our customers from the first project concept along the entire value

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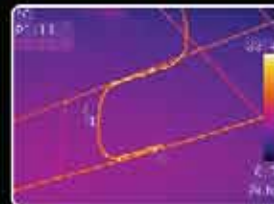


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To create the high-voltage direct-current link between the Chinese cities Changji and Guquan, Siemens delivered the world's first +/- 1,100kV DC converter-transformer

chain until the end of the lifecycle. Our customers can rely on our unique expertise and experience, today and tomorrow.

Siemens has been involved with HVDC lines in India, having constructed India's first private-sector HVDC line in 2012 (for Adani Power). Please summarize Siemens' achievements in India with respect to HVDC power transmission.

The Mundra-Haryana HVDC project for Adani Power Limited (APL) is our third HVDC system in India. Currently, the PK2000 project is the fourth HVDC system delivered by Siemens and the first HVDC PLUS system (based on voltage-sourced converter technology) in India.

We're very grateful for all opportunities to support India's initiative "24 x 7 Power for all" and to continuously add value to their society in a sustainable manner. Our best achievements are the satisfied customers and employees who are very motivated to address India's energy supply challenges.

List of Siemens' HVDC system references in India:

- East-South Interconnector II and

upgrade in operation since 2003 with 2,500 MW, +/- 500-kV DC, HVDC Classic

- Ballia – Bhiwadi in operation since 2010 with 2,500 MW, +/- 500-kV DC, HVDC Classic
- Mundra – Haryana in operation since 2012 with 2,500 MW, +/- 500-kV DC, HVDC Classic
- PK2000 with scheduled operation in 2020 with 2x 1,000 MW, +/- 320-kV DC, HVDC PLUS

What's the highest voltage level of HVDC transmission lines globally? What are the technical complexities that emerge when the voltage level increases?

HVDC systems with line-commutated converters (LCC) tend to be designed with nominal voltages up to +/- 800kV and current ratings over 5,000A. HVDC systems with voltage-sourced converters (VSC) are currently planned to operate in the range of +/-525 kV at 2,000 A. The corresponding nominal transmission capacities are typically in the range of 2 GW. Research and development trends for HVDC with VSC technology move step by step into the same direction like for the LCC technology, i.e. higher ratings and voltage levels. This includes transmission capacities up to

+/-1,100kV that are being realized in Chinese UHV DC projects: for example, the connection between Changji and Guquan, for which Siemens delivered the world's first +/-1,100kV DC converter transformer.

Increased voltage levels cause technical complexities to emerge in several areas, including technical feasibility, right of way, and financing. Voltages in the UHV range are already feasible, but they place high mechanical and electrical requirements on the operating materials. Underground solutions via power cables are currently available for voltages up to 600 kV. The increase in voltage (and distance) is of course accompanied by an increase in required space for transmission lines and converter stations, whose required permits must be obtained from governmental, regional, local, and private entities.

We understand that Siemens has also developed equipment to support HVDC transmission: for example, GIS substations for DC applications. Tell us more.

Space hasn't been much of an issue with traditional HVDC systems. In new applications like offshore wind farms and HVDC systems for supplying power to densely populated areas, however, space usually is at an absolute premium. One of the most space-saving technologies in high-voltage power transmission is gas-insulated switchgear (GIS), instead of air-insulated switchgear (AIS).

That's why Siemens has spared no effort to make the advantages of GIS available for HVDC transmission. Thanks to the company's intensive research and development work, it's now possible to adapt the insulation system of Siemens' proven 8DQ1 gas-insulated AC switchgear technology for use with high-voltage DC applications of up to +/-550kV and currents of up to 5,000A.

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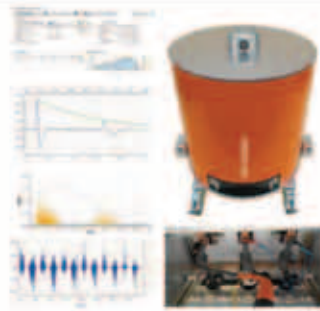
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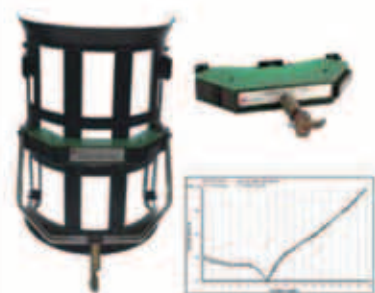
AC/DC, VLF HIPOT TEST SETS



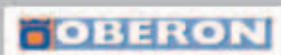
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DC GIS helps to significantly reduce the size of HVDC transmission and converter stations. In fact, the room volume for the switchyard can be reduced by up to 95 percent. And just like AC GIS, the modular and compact 8DQ1 DC switchgear can be installed either in a container or underground to conceal the switchyard, in order to build the stations right in the load center.

There's a comprehensive range of standardized modules that make it possible to flexibly implement even complex arrangements and switchyard layouts—while requiring only the absolute minimum in interface engineering to connect other equipment like control and protection devices.

On demand, DC GIS can be delivered prefabricated and pretested in modular containers. This is especially practical whenever technical requirements like extreme environmental conditions require a housing, when the visual impact of the transmission system needs to be kept to a minimum, and when time is at a premium.

Please explain the relevance of HVDC transmission for renewable energy, especially offshore wind farms.

The challenge in connecting renewable energy sources to the grid is that their energy generation fluctuates because they're dependent on external circumstances like wind, water, and sun. Flexible transmission solutions are needed to integrate these energy sources in the grid.

Siemens HVDC PLUS solutions are the most efficient option. This flexible HVDC technology is based on voltage-sourced converters that can deal with fluctuating generation.

AC submarine connections aren't technically feasible – especially for offshore wind farms, which are more than 80 km away from shore – because reactive power compensation can't be installed along the power line.

HVDC PLUS technology enables the space-saving installation of converter stations on offshore platforms, which guarantees efficient power transmission to

the shore. This is an important contribution to the ongoing decarbonization of the energy system and to guaranteeing grid stability during the increasing integration of renewable energy sources.

What countries/regions will be the biggest markets for Siemens' HVDC solutions in the coming years?

Siemens has so far installed HVDC transmission systems with a capacity of over 80 GW in more than 50 projects onshore and offshore worldwide. Whether it's interconnectors, back-to-back systems, refurbishments, or offshore platforms, Siemens has successfully supplied a wide range of innovative and reliable HVDC solutions in almost every geographical region of the world. Due among other things to the significant changes in the worldwide energy system, the role of HVDC is expected to remain vital and even grow in importance in both India and the rest of the world. ■

INNOVATION

Nynas introduces the world's first bio-based transformer fluid

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A key advantage of this new fluid is that it offers exceptionally good cooling thanks to its ultra-low viscosity. The transformer's winding hot spot temperature can be significantly



reduced. Initial studies show up to 10 degrees improvement compared to average mineral oils and around 20 degrees lower compared to ester liquids. There is huge potential for thermal design optimization as well as improved overloading capability.

According to Carl Wolmarans, Technical Advisor Electrical Industry at Nynas, NYTRO BIO 300X is also the only product in the world that combines ready biodegradability with superior oxidation stability. Just like all the other Nynas products for the electrical industry, NYTRO BIO 300X is fully recyclable.

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Power T&D: New thinking, new frontiers



Dignitaries at the IEEMA Annual Convention 2019 themed "Transformative Reforms"

VENUGOPAL PILLAI

Apex industry body IEEMA (India Electrical & Electronics Manufacturers' Association) recently held its Annual Convention 2019 in Mumbai. The event, themed "Transformative Reforms," saw the confluence of path breaking ideas coming from an erudite set of speakers and panelists. This story is based on insights gained during individual presentations and the panel discussion.

AFFORDABILITY OF POWER

During the panel discussion at the IEEMA Convention, the point of affordability of power was raised.

This issue was pertinent in view of the fact that with nationwide household electrification underway, it was important to make electricity affordable. A number of interesting points emerged from the discussion.

Dr Ajoy Mehta* was of the view that to begin with "affordability" was a term defined by the political setup and not by the actual consumer per se. Mehta explained that affordability should be seen from the social perspective. For instance, "we cannot have electricity so expensive that a poor man's child cannot study," he observed. The distribution of electricity must be such that every must be able to access it, and a person should be

able to improve his present living condition by its use. "Every citizen needs some amount of electricity to maintain a basic standard of living. This electricity should be affordable in the present source of income," observed Mehta.

Mehta also made an interesting observation. He argued that electricity is perhaps the only subject where there is a "backward" calculation. The total cost of electricity is defined first and then it is distributed to individual consumers. Hence, the tariffs paid by the consumers, and the element of affordability, depend on the cost of power generation that is not in the hands of the consumer.

Rahul Tongia brought about some

* See end-note on page 35 for designations of all personalities quoted in this story.

radical points and established that affordability is closely linked to the subject of social welfare distribution, which unfortunately has not been handled well by the government. "We have genuine concerns but we are using wrong instruments and mechanism to address them," Tongia felt.

Tongia argued that that thanks to energy efficiency in power consumption, for instance through the use of LED lamps, the quantum of electricity required for meeting a "lifeline" level is actually going down. Technocrats and policy makers alike have generally felt that 15 to 20 units (kwh) of electricity per month is quite reasonable for households in the first rung of the energy ladder. It also turns out that this quantum can be easily delivered by the existing grid. Secondly, even at Rs.4 per kwh and adding fixed costs, the electricity bill would come to Rs.100 per month. For a large section of the population that is termed as "poor," this is a cost that can be borne by the consumer. For those who cannot, it is such a small quantum, even in aggregate, that the situation can easily be handled using social redistribution mechanisms.

NEW FRONTIERS

Elaborating on "Transformation", the theme of the panel discussion, the eminent panelists suggested



S.C. Garg, Secretary, Ministry of Power, Government of India, delivering his keynote address

various solutions, mainly to do with bringing commercial efficiency to power distribution companies. All panelists agreed that problems of "yesterday" like energy deficit, non-electrification of households, etc. have been duly addressed over the years. It is time to now think of issues of "tomorrow".

Rerouting of subsidy: In Delhi, for instance, residential consumers are given a subsidy if their monthly electricity consumption is below 400 kwh. With the result, 95 per cent of consumers get subsidized on an average of six months in a year. Such subsidy is rather ineffective. Instead, this amount could be used to subsidize ultra energy-efficient appliances and devices that could lead to energy savings and thus a flattening of the peak demand curve.

Reforms in the offing

INTERACTING with the media on the sidelines of the IEEMA Convention, S.C. Garg, Secretary, Ministry of Power, Government of India, responded to a query by T&D India regarding the pace of privatization in the power distribution sector. Garg noted that it was not just about the pace but the entire process of power distribution privatization needed proper structuring. Under the proposed reforms in the power distribution sector, there are plans to link privatization to incentives such as investment support. The ideology here is that state-owned discoms will be offered investment support linked to their success in privatization of distribution circles. Further, the power ministry has plans to structure privatization under various models, including the popular distribution franchisee model. Of course, separation of carriage and content (also known as wire and supply) will be a critical part of the reforms process. While the power ministry is serious about its intent of reforms in the distribution sector, Garg admitted "the tough part is going to be implementation by the states."

Direct benefit transfer (DBT):

Currently, some classes of consumers like residential and agricultural are entitled to lower tariffs. However, in almost all cases, this is achieved through cross-subsidisation, which is to say that industrial consumers are paying a higher tariff to offset the lower rates applicable to certain classes of consumers. There are two points that came up for discussion in this context.

Firstly, it should not be the responsibility of the discom to decide who should be receiving subsidy. This is the job of the government. The discom's primary responsibility is to procure quality power at reasonable rates, supply it to consumers and generate revenues. The government can very easily provide subsidy to consumers that it deems fit, by means such as direct benefit transfer. In such mechanism, the subsidy reaches the bank account of the consumer directly. It could also so happen that the subsidy received by the consumer is not really used for paying for the next electricity bill. In such a case, digital mechanisms in "kind," such as entitlement of certain units (kwh) of electricity can be worked out.

Commercial viability: The power sector must be made viable. Discoms should be able to generate more revenue than its costs. Losses are not going to be in anybody's interest; the power distribution industry can get potentially sick. Under the UDAY scheme, the state governments will bear some of the discom losses. There is a limit up to which states can sustain these. Ultimately, the burden will fall on the Central government. Only when the power distribution activity is commercial viable will there be a scope for more privatization. More privatization will result in more investments, creating a positive virtuous cycle.

New demand avenues: Various Central government schemes



Energy storage is widely regarded as the next big business opportunity in the power T&D sector

like DDUGJY and Saubhagya had resulted in high demand for medium- and low-voltage equipment like distribution transformers, overhead conductors, household wires, etc. However, with these schemes now coming close to meeting their stated objectives, the demand for electrical equipment has turned subdued over the past 5-6 months.

The panelists, while agreeing to this, foresaw newer avenues that would generate demand for equipment. Smart meters was one such. India has a demand for 25 crore smart meters (under the assumption that all connections would be so equipped) against which there are barely 1 crore smart meters installed as of today. The potential for smart meters and associated services is obviously immense.

There is this much awaited proposal of separating the "wire" and "supply" business in the power distribution sector. Once this takes place, the "supply" side can

be privatized and this is expected to make the supply business commercially profitable, thereby attracting investment in upgrade of power distribution infrastructure. Energy storage is an area where substantial investments could flow in, felt some panelists.

INVESTMENT IN R&D IS A MUST

In her address, Ms Anu Madgavkar, observed that there are some don'ts for companies, especially in times of an economic slowdown. Madgavkar stressed that in time of stress, companies should never arbitrarily cut down their expenses



Rooftop solar is concentrated in the commercial and industrial (C&I) sector

on research and development (R&D) as well as business development. Companies should also refrain from unsustainable pricing of their products, which simply kills market economics. "It is a lose-lose situation for everybody even when the growth cycle in the economy is back," she observed.

Companies that adopt a long-term mindset end up performing better over long periods of time. Citing an example, Madgavkar observed that a company like Tesla Inc increased its expenditure on R&D in a time of financial stress. In fact, the company opened a \$5-billion electric vehicle facility in China at a time when economic stress in that country was forcing to withdraw support even to local players.

Big private companies, as Anu Madgavkar noted in her presentation, will play a major role in bringing about the real transformation in India. Citing the example of China, Anu Madgavkar observed that in China overall growth in GDP came from large companies, particularly those in the private sector. There is always a long tail of tiny companies, which are good for "inclusion" or "equity" but don't really drive the productivity growth that large companies are capable of. In China, private sector companies raised their share in corporate revenue from 27 per cent to 65 per cent. They also showed better returns on assets and equity. With the result, the entire economy was boosted.

India can learn from the experience of emerging markets. Over the past few years, the Indian government has put in place an ambitious set of reforms. This is a good starting point. The next phase of reforms should double-down on those that can kick-start growth. Real estate and infrastructure play a huge part in the Indian economy, because of the linkages and multipliers. Driving affordable housing will be an important aspect.

In the manufacturing sector, India would need to create 5-6 large zones with a "CEO like" mentality that would be accountable for output and the investment. India should reincentivize R&D, without which India could lose her competitive edge in the global market.

The agenda does not stop with government or policy. There is a big agenda that companies can independently pursue. It starts with the mindset of long-term growth; it is the ability to "look through the noise" and establish where in the value chain the company wants to dominate and excel. Companies should think long-term. Companies could be late in the game when the growth has already kicked in. Long-term mindset goes along with a tight focus on operational excellence that includes making operations cost-effective and flexible.

SYSTEMIC CHANGES

In India, there has been a traditional belief that all government-related services are free. Thus, services like roads, water and even electricity are services that need not be paid for. Even as this belief is now fading away, much needs to be done. For example, the modern mobile telecom industry does not have problems of under recoveries as the industry does not have legacy issues (of non-payment culture)



India has pledged to equip all its 25 million electricity connections with smart meters



Whatever be the economic cycle, investment in key areas like R&D and business development should never be curtailed, noted Ms Anu Madgavkar

as in the case of the power sector. In fact, most mobile telephone connections are of the prepaid type and therefore there is very little scope of non-payment of services availed. Industry experts feel that for the power distribution sector to become profitable, it should go the

mobile telecom way.

Secondly, power distribution has largely been an area that was in the complete control of the state government. One panelists at the IEEMA Convention felt, "Whenever there is a monopoly that is headed by the government that secures the job of its employees no matter what you do, there are bound to be problems." Much like typical government-owned companies, the business and profitability aspect of the corporate entity was never looked into seriously.

Changes in the power distribution sector need to be systemic. Gradual privatization of the supply business could be a good starting point. Secondly, there also needs to be social reforms where power theft, willful non-payment of electricity dues and other malpractices are seen as social offences. ■

Why solar rooftops are not picking up

THE panelists at the IEEMA Convention also deliberated on the issue of why solar rooftop installations were not picking up. As against the original target of 40 GW (by 2022), the current installation base is just about 4 GW. Further around 70 per cent of the installations are from the commercial and industrial (C&I) sector with barely 30 per cent coming from residential and the government office sector. Throwing light on the situation was Ashish Khanna, President-Renewables, Tata Power, who explained that due the inverted tariff structure, the electricity rates for the C&I sector are much higher than those for the residential sector. Hence, the savings on electricity bills for the C&I sector are effectively higher. This is also because these rooftops come with a "net metering" arrangement with the distribution utility. The payback period was only 4-5 years, which also acts like an incentive. Khanna also explained that residential consumers are putting rooftops for further saving in their electricity bills. These are typically residential consumers with high electricity bills. Ironically therefore, solar rooftops can take away a discom's best residential customers, noted Khanna.

Note: The various personalities quoted in this story are: Subhash Chandra Garg, Secretary, Ministry of Power, Government of India; Dr Ajoy Mehta, Chief Secretary, Government of Maharashtra; Ms Anu Madgavkar, Partner, McKinsey & Company; Rahul Tongia, Fellow, Brookings India; Ashish Khanna, President-Renewables, Tata Power.

ERDA is now recognized by several foreign utilities

— **Hitesh Karandikar**, Director,
ERDA



Electrical Research & Development Association, popularly known as ERDA, is India's premier testing house serving the electrical equipment industry for over 40 years. In this interaction with T&D India, we have Hitesh Karandikar expounding on ERDA's current capabilities and future plans in the field of transformers. Though ERDA has several facilities already in place, Karandikar is hopeful that ERDA's cherished project—a medium voltage short-circuit testing lab for transformers and switchgear—would soon see light of day.

What are the typical tests that power and distribution transformers need to undergo?

As per requirement of national and international standards, routine tests, type tests and special tests are required to be conducted to ascertain quality of transformers.

Routine tests include measurement of winding resistance, measurement of voltage ratio, measurement of short circuit impedance and load loss, measurement of no-load loss and current, Induced over voltage test, separate source voltage withstand test, pressure test and vacuum test.

Type tests on transformers are conducted to verify the design parameters. These include lightning impulse voltage withstand test, temperature rise test, etc.

Special tests on transformers are also conducted as per manufacturer's or customer's requirement like short-circuit withstand test, determination of sound level, paint adhesion test, BDV (breakdown voltage) and moisture content of oil, etc.

Please summarize the various types of tests that ERDA is equipped to perform on power and distribution transformers.

ERDA's transformer test facilities are recognized by BIS, NABL and various utilities for testing of distribution transformers according to IS:1180, IS:2026 and IEC:60076.

At ERDA, impulse test on power and distribution transformers is possible up to 100 MVA, 400kV class; short circuit test on distribution transformers is possible up to 4 MVA, 33/11kV class; routine test and temperature rise test is possible up to 2500 kVA distribution transformers.



ERDA is equipped with three short-circuit testing facilities in Vadodara—two are in the Makarpura Complex while the other is at Salvi Complex. ERDA also has two routine test facilities for distribution transformers— one at Rabale (Navi Mumbai) with up to 200kVA capacity; and six bays at Makarpura, Vadodara with up to 2500kVA capacity. ERDA also has the capacity to do complete type-testing of 2,000 distribution transformers per year, apart from conducting regular routine tests.

ERDA labs have been carrying out transformer testing for over 40 years. These tests include various routine, type and special tests as specified in the standards. As per Quality Control Order on IS:1180-2014 promulgated by Government of India in 2015, ISI marking has become mandatory for oil-filled distribution transformers up to 2.5 MVA. Our laboratory has been actively engaged in evaluating distribution transformers as per IS:1180-2014 within the framework of the Quality Control Order of



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2015 of the Department of Heavy Industries, GoI for mandatory BIS certification of distribution transformers. ERDA has tested approximately 75 per cent of the total distribution transformers in India as per this Quality Control Order, and has thus contributed significant to make this quality control order a success.

ERDA can also carry out various routine and temperature rise tests on power transformers up to 100 MVA, 220/33kV at manufacturing locations by using ERDA's calibrated equipment and is NABL-accredited for the said service. This facility and accreditation of ERDA is unique in India.

What is the latest status on the high-voltage partial discharge laboratory that ERDA had proposed to set up? In what way will this serve the transformer industry?

The 600kV partial discharges laboratory, partially financed with grant from Government of Gujarat, was commissioned in June 2018, and is now fully operational. In this laboratory, various products like bushings, cable, current transformers, potential transformer, hybrid GIS etc. up to 245kV can be tested, in the first phase. Subsequently, this facility will be upgraded to carry out testing of 400kV products also.

Partial discharge test on dry-type

transformers in this laboratory is already under planning; this would be ready within one year.

Similarly, what is the progress on the medium-voltage short-circuit laboratory that was to conduct short-circuit testing of power transformers?

Medium-voltage short-circuit testing laboratory is the need of the hour. This will provide small-rating power transformers and MV switchgear panels manufacturers an opportunity to develop, improve the quality of their product and finally test and certify their products as per global standards. This will boost the export potential of electrical equipment manufactured in India. This will also support the proliferation and growth of a strong MSME vendor support base to the large electrical equipment industry.

We are fully prepared with the land and the detailed design of this project. The market survey, DPR preparation and preliminary technical design preparation from globally reputed agencies are already completed.

However, this laboratory requires huge capital expenditure, which is beyond the means of ERDA alone. We need generous government support (both Central and State), as grant, to execute this project. Unfortunately, we have yet to receive such support.

Do you see any financial support forthcoming?

Yes, recently, on September 14, 2019, Hon'ble Union Minister of Finance Ms Nirmala Sitharaman announced various measures to boost economic growth. Herein, she emphasized on setting up "affordable testing and certification infrastructure". Under this initiative, she proposed that such infrastructure will be adequately expanded and developed in PPP mode to enable exporters to get all internationally accepted tests and certification done within India. Going by this, we are optimistic to get government support if this scheme is properly implemented.

Tell us in brief about transformer oil testing. Why should transformer oil be tested and what are the facilities currently offered by ERDA in this field?

Transformer oil is used for insulation and cooling of oil-filled transformers. Testing of transformer oil is the easiest and sure way to assess health of the transformer. Mostly, specially-treated mineral oil is used as transformer oil, but nowadays natural or synthetic ester oils are also being used as an environment-friendly alternative.

ERDA has routine-test facilities for both new mineral transformer oil (as per IS:335) and used mineral transformer oil (IS:1886). ERDA also has dissolved gas analysis (DGA) and Furan testing on transformer oils through world-class automated state-of-art equipment. Mineral oil testing facilities are available at ERDA's labs at Vadodara, Rabale, Gurugram and Rajahmundry. ERDA, Vadodara, is also equipped with natural and synthetic ester oil testing facilities.

Please discuss your collaborative efforts with foreign labs with respect to transformer testing.

ERDA has a long association with Intertek (ASTA) UK as their accredited laboratory in India.

Intertek (ASTA) has tested various equipment like switchgear panel, Bus-duct, transformer etc. at ERDA labs, for their certification programme. Presently discussions are going on with some world renowned laboratory for cooperation with ERDA. The discussions are in an advanced stage. However, I cannot divulge more details at this point in time. Hopefully, you can expect some good news in the near future!

Over the years, how has ERDA helped reduce dependency on foreign laboratories in terms of transformer testing? In the years ahead, how will this reduce even further?

ERDA now has direct recognition from various foreign utilities e.g. DEWA, Dubai; SEWA, Sharjah; ADWEA, Abu Dhabi; DCRP, Oman; TNB, Malaysia etc. Transformers tested at ERDA labs are accepted



by these foreign utilities. Hence, Indian or other countries transformer manufacturers can use ERDA for testing of their transformers instead of other foreign laboratories.

We are presently working for approval from other SAARC countries for acceptance of ERDA test report. Approvals from other countries

or cooperation with international laboratories are also being pursued. We hope in a near future ERDA will be recognized as a world-class laboratory and that Indian manufacturers will not need to go to foreign laboratories for testing of their product for export market. This is our mission and ultimate objective.

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 IGBT RECTIFIERS

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 UPTO 10MVA 11/33KV CLASS
 UPTP 150KVA BOTH 11 & 33KV CLASS
 UPTO 40 MVA 66KV CLASS
 UPTP 20MVA OLTC 33KV CLASS
 UPTO 10MVA 33 KV CLASS
 UPTO 5MVA 33KV CLASS
 UPTO 2MVA 11KV CLASS
 UPTO 10MVA 11KV CLASS
 UPTO 5MVA LOW VOLTAGE CLASS
 UPTO 7000 KVA FOR LOW VOLTAGE CLASS
 UPTO 20,000DC AMPS

UPTO 15000AMPS

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(24KV-36KV/11KV+1%) at
Hashima Foods, Dhaka

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Control Panel

2000kVA H.T AVR at
BPCL Noida

Rectifiers installed at Hema
Springs, Aaragabad

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Renewable energy and Railways are the new growth drivers

— **Jitendra U. Mamtora**, Chairman,
Transformers & Rectifiers (India) Ltd



Founded in 1994, Transformers & Rectifiers (India) Ltd, popularly referred to as T&R or TRIL, is a leading Indian transformer manufacturer catering to both the domestic as well as international markets, equipped with three ultra modern manufacturing facilities in Gujarat. We have Jitendra U. Mamtora discussing recent trends at TRIL in this exclusive interaction with Venugopal Pillai. Mamtora observes that renewable energy and railways are emerging as new business drivers, which will dictate TRIL's growth in the coming years.

We understand that TRIL recorded its highest sales turnover during FY19. Please discuss the main factors that contributed to this performance.

Well, it is a continuous process in T&R to grow turnover wise, Current financial year is further expected to increase numbers. Main factors for highest numbers are that we are

continuously working to improve operational efficiency.

TRIL, as we observe, has been doing very well on the exports front with major orders landed in Bangladesh, Zambia, Australia, etc. Tell us more on TRIL's export performance in recent history.

Yes, TRIL executed successfully

biggest ever export order for 300 40-MVA power transformers supplied to Algeria. We are today exporting to more than 50 countries and still counting! Recently, we exported the biggest ever rating of 220 MVA to Australia.

What have been recent achievements at TRIL with respect to supplying transformers to renewable energy projects? Would you consider renewable energy as a growth driver for TRIL?

Very recently, TRIL has added Soft Bank Energy to its renewable energy customers portfolio. Yes, renewable energy is working as a growth driver for TRIL as well other power T&D sector industries at the time when core sectors like cement, paper and steel are not doing well. We expect this drive to continue for next five years or so.

Do you perceive a general slowdown in offtake of T&D equipment (including transformers) from the power



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big boost to infrastructure as well T&D players. TRIL is appearing as one of the biggest and preferred supplier for transformers in this sector. We are expecting more than Rs.100 crore revenues in next one year from this sector.

TRIL has supplied, as we understand, India's first "green" (ester oil-filled) shunt reactor. Tell us more. Was there a technical collaboration for this equipment?

TRIL is capable to execute orders of ester oil-filled transformers and reactors indigenously. In India it is at very initial stage. It has a long way to go but we are prepared to accept the change as well as the challenge.

How has been TRIL's recent performance with respect to 765kV equipment for PGCIL?

Very good! TRIL is a preferred vendor in PGCIL today. As such TRIL takes utmost care regarding quality of transformers. We have three state-of-art manufacturing and testing facilities — Moraiya, Changodar and Odhav — at Ahmedabad. They are amongst the best in world.

What is your current order book and its break-up with respect to domestic and overseas orders?

Our order book is ever increasing. Currently, TRIL has an order book of around Rs.1,000 crore with an overseas component of around 20 per cent. We are working with special focus on exports and expected to get more international business in the coming years.

In the domestic market, if we consider utility, industry, renewable energy and railways as TRIL's major customer segments, what will drive growth in FY20?

Renewable energy and Railways will drive growth, followed by utility and TBCB business. The core industry may take up some time to pick up. ■

utility sector?

No, in fact it is the other way round. Government of India has increased spending in the power T&D sector to compensate for the general industrial slowdown. A large number of projects are being awarded and executed under the tariff-based competitive bidding (TBCB) mechanism. These projects are being executed by PGCIL and few private sector players like Adani Power and Sterlite Power. Further, as TBCB projects are time-bound, there is no slowdown in offtake.

Having cleared short-circuit tests of traction transformers by Indian

Railways, how do you see emerging opportunities for TRIL? With massive railway electrification on the cards, how do rate business prospects from Indian Railways?

There are tremendous opportunities in Indian Railways and metro rail projects. The Government of India's initiative to electrify all routes (targeted within five years) is a



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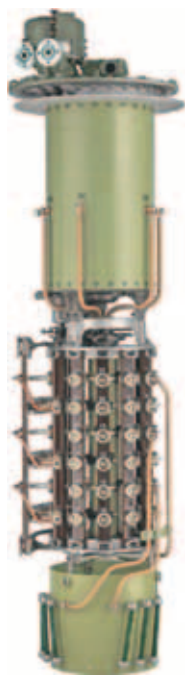
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DVtest – On-Load Tap Changer Analysis using DV Power Instruments



The TWA40D instruments enable simultaneous OLTC testing of all three phases in a single pass through the tap positions. In this manner, the total OLTC testing time is greatly reduced, by two thirds in comparison with the classic methods. This test procedure also enables observing the synchronization problems between the different phases.

The Quick YN test is a unique DV Power proprietary measurement method which enables performing the measurements of three winding resistances on a tap changer in YN configuration at the same time, and measuring the resistances in all tap positions in all three phases with a single pass through the tap positions. TWA40D is the only instrument in the market with this capability, which can significantly reduce the time required for a full winding resistance test.

The static resistance measurement provides winding resistance values at every tap position for each of the three phases. There is no need to discharge the transformer between the measurements in different tap positions. The DV-Win software creates the static resistance graph from the results of the resistance measurement in different positions, as well as the automatic recalculation of the measured values to a reference temperature value. The shape of the static resistance graph depends on the winding regulation mode.

The dynamic resistance measurement (DVtest) feature enables measuring and recording the test current at high sampling rate during the tap changer transition. The variation of the current represents the change of the resistance in the circuit during the change of tap positions. Tap changer



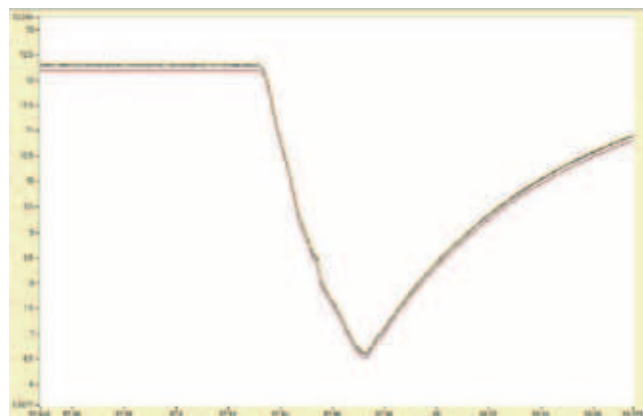
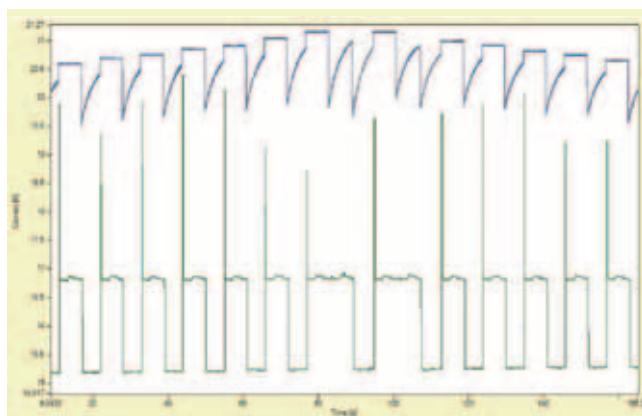
verification can be performed with the DV-Win software or by stand-alone TWA40D or RMO-T instruments. The stand-alone instruments detect any open circuit during the tap changer operation.

The dynamic resistance measurement graph is unique, powerful tool providing condition assessment of an OLTC regarding the mechanism itself and its contact wear. It is recorded by the DV-Win software.

The graph analysis tools enable detection of:

- High resistance contacts in the tap selector
- Loose contacts in the tap selector
- Burned, loose contacts in the diverter switch
- Broken resistors in the diverter switch
- Abnormal arcing
- Misaligned contacts
- Contact bounce
- Mechanical and motor problems
- Phase synchronization problems

The AC current monitoring channel enables monitoring and recording the OLTC mechanical-drive motor current during the tap changer operation. The motor-current waveform is also printed on the same DV-Win-generated graph, and can help in detecting OLTC mechanical problems. ■





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Natural Ester Fluid: A Promising Solution

Rajaram Shinde, Dielectric Fluid-PowerGen Cargill, Pune; indiaenvirotemp@cargill.com

Abstract: One of the greatest risks is a transformer in electrical system. Its failure results into fire. which is a disastrous, destructive incident under most circumstances & destroy electric system. Insulation play and vital role in Safety of transformer. Natural ester dielectric FR3™ fluids is one of the best solution to address these problems. As Per IEC 60076:2013 Part 14, table C.2 Natural ester dielectric fluid is high thermal class insulation, provides high fire safety as well as prevent thermal ageing. It helps to improve the load capacity without changing design of transformer. Also, As Per IEC 16039: 2008, FR3™ fluid is K- class fluid. Means it has the highest fire-point than any insulating fluid i.e. 360°C, it is certified by Underwriters Laboratory and approved by FM Global. This fluid made up of natural sources hence it is biodegradable. Properties unique to certain seed oils help to slow the insulation aging rate, reduce noise level and to stabilize the electrical performance of the transformer.

INTRODUCTION

The increased migration of people from rural settings to suburban/urban homes and workplaces continues to drive higher demand on power distribution systems. Compounding the situation for the utilities is the fact that city dwellers also tend to be higher per-capita energy users. There are more users, and they each require relatively more power. Our urban areas were originally electrified many decades ago. Like the water and sewer infrastructure, the power distribution network is showing its age. In coming years, utilities must devote increased attention to updating or replacing many elements of their urban grids to meet the growing demand and ensure availability.

Transmitting and distributing electrical energy within urban areas presents a many special challenges that manufacturers are eager to solve. Whether installing new substations or maintaining existing locations, today's energy companies are using technology with features and functions able to address the unique

needs of urban power users. Some of this technology represents step-wise enhancements to familiar equipment, while other devices represent functional leaps that require new ways of thinking. This paper will outline following special challenges faced by urban utilities: safety, overload capacity, safety and reliability. In addition, noise is a major constraint. FR3™ dielectric fluid properties are explain as bellow,

A. Fire Safety

Fire point play an important role in fire safety of transformer. to understand what it takes for a fire to start in a transformer:

- If a fault does happen in a transformer, most of the energy vaporizes molecules generating combustible gases, while a small amount starts to heat the fluid.
- If there is a crack in the transformer tank, the gases escape and are exposed to oxygen. If there is a source of ignition, the combustible gases will be ignited.
- And, if the fluid is at or near its fire point, a pool fire would result.

As, FR3 fluid is a FM Global Approved®, UL certified K-class fluid. It's 360°C fire point is the highest of any dielectric fluid more than twice that of mineral oil (150 to 160°C) and 50°C higher than synthetic esters (310°C). Figure. (1) show the Comparison of fire and flash points of mineral oil and natural ester.

From Figure (1) we conclude that,

- This high fire point provides safer, more reliable transformer performance particularly in heavily populated areas such as restaurants, malls, and urban communities.
- Logically FR3 would never have pool fire & also inside a transformer, it would require a high temperature fault lasting many minutes to raise FR3 fluids from operating temperature to its fire point by the time it reaches to that stage everything in entire grid would have been collapse.
- And If there were a 'combustible gas' flame outside

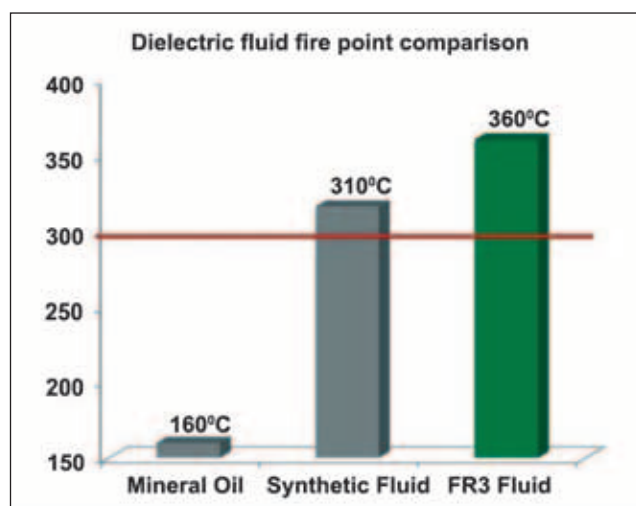


Figure. (1) Comparison of fire and flash points of mineral oil synthetic ester fluid and natural ester

the breached tank, the gas flame would extinguish because FR3 fluid wouldn't be anywhere near its fire point and no pool fire would occur.

- Increased worker safety during routine maintenance.
- Increased first responder safety during an emergency.

With this improved fire safety, there are other advantage for utilities i.e.

- It Reduce clearances to buildings and equipment.
- Eliminate the need for more costly fire mitigation systems
- Potentially reduce insurance premiums and liability reserves.

B. Improve thermal capability of insulating paper.

The common failure mode of an electrical transformer is caused by the degradation of the solid insulating system (cellulose paper). Subsequently, the (temperature) operating limits of a transformer are constrained by the thermal capabilities of the insulating system within each design. Transformers filled with Envirotemp FR3 fluid can operate 20°C warmer than the mineral oil equivalent while maintaining the same life expectancy.

Figure 2. shows comparison of mineral oil at the same operating temperature, Envirotemp FR3 fluid protects the insulating paper upto 8 times longer than mineral oil.

This high temperature capability enables:

- Increased load capability up to 20%.
- For space, constrained locations, utilities can increase capacity without having to change their transformers (Retro-fill).
- For growing population areas, utilities can increase load capability and maintain performance reliability.
- Design smaller, more efficient transformers that could use up to 15% less fluid and up to 3% less construction materials.

As per IEC 60076-14 brings the following table 1.3.1 in Annex C.2 ,It is clearly stated that when paper is impregnated with Natural Esters it will increase of the thermal class of paper.

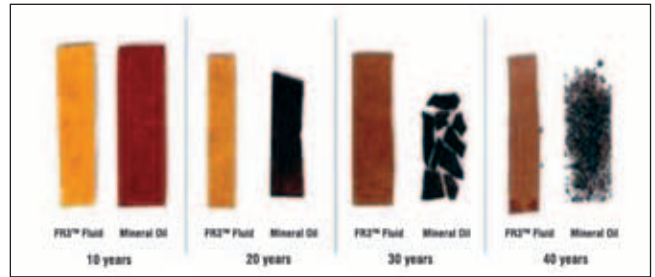


Figure 2: Sealed tube test on insulation paper with Mineral oil and with Envirotemp FR3 Fluid

TABLE 1.3.1 ANNEX - C.2 - COMPARING OF AGEING RESULT				
	Constant a	Temperature I °C	Thermal index	Thermal class
IEEE mineral oil/thermally upgraded paper	9,80 x10 ⁻¹⁸	110.0	110	120
Natural ester liquid/thermally upgraded paper	7,25 x 10 ⁻¹⁷	130.6	130	140
IEEE mineral oil/kraft paper	2,00 x 10 ⁻¹⁸	95.1	95	105
Natural ester liquid/kraft paper	1,06 x 10 ⁻¹⁷	110.8	110	120

C. Transformer life extension

Natural ester fluid has the unique ability to draw out moisture from insulation paper and absorb upto 15 times more water driven off from paper. This property of natural ester fluid results in impregnated paper comparatively drier as compared to mineral oil impregnated paper. Due to this, the paper insulation life gets enhanced by as much as 5 – 8 times than conventional insulation system. These properties can result in increased load-ability and/or longer transformer insulation life, resulting in both lower life cycle cost and delayed asset replacement.

CONCLUSIONS

Applying Natural ester Envirotemp FR3 fluid in the transformer results insure fire safety and improvement of insulation system because of its higher fire point, less flammable and improved thermal capability of insulation paper. It directly improved loading on transformer, source material sustainability, environmental friendliness, and asset life extension. ■

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Proactive repair: Giving a new lease of life to legacy distribution transformers



www.tndindia.com

Distribution Transformer (DT) is the heart of distribution network. It is essential to monitor its health as it is one of the high CAPEX assets for DISCOMs. For overall DISCOM viability, it is important that each individual DT is turned into a profit center. It is estimated that of 24 per cent national average AT&C losses, at least 3-4 per cent comes from Technical losses in DTs alone, and it can be brought down to 0.5 per cent and below. Restructured Accelerated Power Development and Reforms Programme (R-APDRP) has envisaged utilities to carry out an energy audit of a DT for monitoring losses (at least on a sampling basis) but unfortunately, this keeps missing the attention, add to the extent that DT technical losses are not even measured till it breaks down. And only broken-down DTs are sent for repair, and there is minimum to none pro-active approach to DT renovation, repair towards modernisation and O&M.

This article presents a repair concept called 'Proactive Repair' using winding compensation only, with no change to the healthy core. Proactive repair was conducted in field at Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited (MPPKVVCL), Indore on Aluminum wound legacy DTs (100kVA and 200kVA) with high technical losses, with winding compensation carried out through copper winding replacement. Results revealed significant technical loss reduction, reliability improvement and kVA enhancement of the repaired DTs thereby

breathing new life in them.

The proposed proactive repair can be developed as an easy replicable DT repair technique, and DISCOMs can selectively apply it to high technical loss-making legacy DTs that will yield shorter payback period. Existing DT repairers can be incentivized to undertake proactive repairs through performance tied improved repair contract or service level agreements (SLAs) with further extension to provide integrated DT managed services for improved reliability and life cycle management.

1.Current Scenario of Distribution Transformer Repair Practices in India

In India, DT failure rate is one of the important KPI for Indian DISCOMs. Any failure of the DT before expiration of its designed lifespan results in unplanned outage, revenue loss, unavailability of critical services and in most cases huge financial losses to both utilities and customers. Overall, it affects the KPI of the utility. The prominent reason for DT failure is cited to be winding failure on prolonged overloading. It has been observed that no factual data is collected on loading of the transformers. Overloading of the transformer goes unnoticed till the DT fails. As per DT assessment study, failing of LV and/or HV winding is reported to be one of the major types of failure occurring in DTs as compared to core damage (~2% DTs). The high DT failure rate and losses in DTs usually originates from weak practices in asset life-cycle management. These include procurement, regular O&M and repairs. Some of the practices observed are as mentioned below:

- The DT procurement often ignores life-cycle cost or the total cost of ownership as against meticulously observed in case of power transformers.
- Tendering process is more on standard bidding philosophy (accepting lowest bid) rather than performance-based contract.
- DTs normally fail much before completion of its service life (20-25 years) impacting the cost of capital deployed to service customers. Part of the reason for such high failure rate is overloading, absence of Condition based/Preventive monitoring, protection and Routine/Periodic maintenance
- The repair practice follows a passive approach to attend the DT when it fails. The focus is merely to get the DT back into the service, rather than availing the opportunity to completely renovate with eye for preventing energy loss and improving asset health.
- Current practice is to measure the losses in the DT post repair only, leaving no scope for further improvement. Also, the current repair contract and

defined Service Level Agreements (SLAs) do not encourage technical loss reduction.

- The DT repairer’s staff is adept in routine repair practices and do not consider design optimization for loss reduction or enhancing reliability. This at times lead to adoption of sub optimal practices.
- The equipment used for losses measurement or estimation are not well kept as needed to be maintained in laboratory environment, calibrated and updated for accuracy.

2.About the study

The study focuses on developing a mass replicable proactive approach to undertaking repairs (hereinafter mentioned as ProactiveRepair) of DTs in service and bring down the technical losses. Proactive repair of DTs is a method that primarily focus on technical loss reduction in DTs through winding compensation, including any change in winding material. The core, if not beyond a certain level of degradation, is left unchanged as different makes of DTs will require different laminates design and cuts and that would not be an easy and replicable repair methodology. Proactive repair can be carried on both the breakdown as well as functional legacy DTs, though usually it shall be selectively applied to high loss DTs.

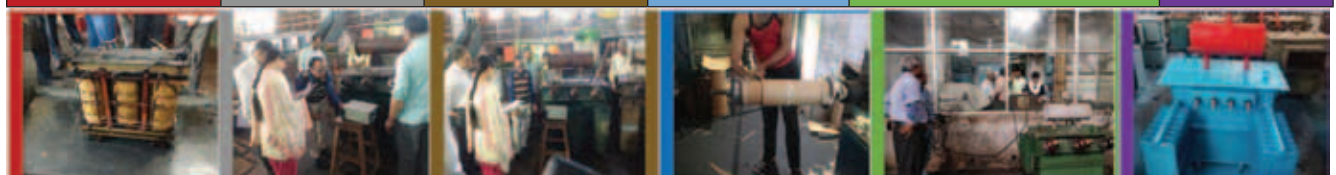
The study was carried out at Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited (MPPKVCL), Indore on 100kVA and 200kVA DTs. In this paper we will focus on case study for 200kVA DT. Various tests like Open Circuit & Short Circuit test were carried out under the supervision of MPPKVCL representative at Major Transformer Repairing Unit (MTRU) and technical loss reduction was validated by ERDA.

3.Proactive Repair Methodology

Below is a stepwise approach that was adopted for undertaking active repair on two sample DTs:

4.Pilot Results

DT selection	Pre Repair testing	Design Options & Finalization	Productive Repair Execution	Post Repair Testing	Reporting
<ul style="list-style-type: none"> • Requisitioned failed DTs from Repair Centre for sudy 	<ul style="list-style-type: none"> • Loss levels were measured at MTRU in presence of MPPKVCL representatives 	<ul style="list-style-type: none"> • Multiple design options were prepared • Final Design Option was reviewed & approved with MPPKVCL team 	<ul style="list-style-type: none"> • Undertook Proactive repair based on finalized design 	<ul style="list-style-type: none"> • Loss levels were measured at MTRU in presence of MPPKVCL representatives • The results were also validated by ERDA by conduction loss and impedance measurement test and temperature rise test 	<ul style="list-style-type: none"> • Test results were recorded & reported to MPPKVCL



Case 1:200 kVA failed DT: After Proactive Repair, it was observed that total loss reduced by 40% (compared to spec + allowed deviation values). Post repair results in comparison with baseline measurements and manufacturing specifications are shown in Table-1 below.

Key Design Parameters	unit	Specification	Baseline (AS-IS)	Actual Post repair results (measured at MTRU)	Actual Post repair results (measured at ERDA)
Capacity	kVA	200	200	200	200
Year of Manufacturing			2004		
Flux Density	Tesla	1.55			
LV Winding Material			DPC Al	DPC Cu	DPC Cu
# of LV Turns	#		42	42	42
HV Winding Material			DPC Al	DPC Cu	DPC Cu
# of HV Turns	#		1848	1848	1848
Total Loss	Watt	3000	3850	2319	2297
Impedance	%	4.5		4.36	4.42
Total Winding Weight	kg		86.19	297.45	297.45

Table 1. Design and Results for proactive repair with reference to the baseline measurements and utility specs

The DT loading was assumed to be 70% with average cost of supply of Rs. 6.25 /kWh and 10% inflation YoY. Proactive repair yields a sum total savings of 4858 kWh/year compared to baseline losses, and simple payback of around 3.5 years. The payback period further improves with increase in DT loading or cost of supply. As it was a failed DT, its kVA capacity was assumed to be same as the name plate rating of 200 kVA. However, based on the post repair test by ERDA it was observed that the kVA capacity was enhanced by 9.5% (219kVA) after the proactive repair, which can allow DT taking up more load with higher reliability. Additionally, this overhauled and upgraded DT can give full new life cycle similar to any new DT.

5. Post Repair Monitoring

Post Proactive Repair metering was done on both sides of the DTs (both 100 kVA and 200 kVA) with DISCOM



Figure 1. Metering on Proactive Repaired 200 kVA DT



Figure 2. Metering on Proactive Repaired 200 kVA DT

team. The metering will help monitor the performance of Proactive Repaired DTs.

6. Applicability to broader Utility

MPPKVCL has total 2,48,611 DTs in service in two regions - Indore and Ujjain. Annually, ~20k DTs are procured across different capacities based on the field demands. The AT&C losses is around 29% as per performance indicator of MPPKVCL (Ref: UDAY Portal). Base on the estimation of loss deviations of Discom data and representing at MPPKVCL level, it is observed that DTs contribute ~5% of technical losses at overall utility level, resulting in ~1302.92 MU loss (assuming avg. cost of power supply as 6.25 kWh/unit).

If 5% technical loss can be brought down to 3% (based on best performing utility's standard) through effective & Proactive DT repair & maintenance, it can save nearly INR 254 Cr. per year (approx. 3.83% of Avg. revenue). Even if 71% of MVA capacity (less than 200kVA) is Proactive Repaired it can save nearly 180 Cr./year.

	Scenario 1 (if DTs perform as per specs)	Scenario 2 (if DTs are at acceptable loss levels)	Scenario 3 (if losses are high deviated from spec)	Scenario 4 (if DTs Proactive Repaired)
% loading	50%	15%	50%	50%
% deviation of No-load loss	0%	15%	15%	10%
% deviation of Full load loss	0%	1,206	30%	-30%
Estimated total losses (Mus/year)	1,048	5.19%	1,302	896%
% Total losses with respect to energy input	4.51%	753.93	5.61%	3.86%
Total DT technical losses (Cr.)	656%		814%	560%

Assumptions		
Total Transformers	#	2,25,296
Avg. Loading	%	50%
Avg. Cost of power supply	kWh/unit	6.25
Total revenue of MPPKVCL (as per ARR 2017-18)	Cr.	11,364
Energy Input (as per ARR 2017-18)	MU/year	23,242

7. Conclusion

As power distribution systems continues to grow in size and complexity, technical loss reduction will form greater priority. Added with the efficiency drive the utilities are looking at reliable supply to consumers. Proactive repair with only winding compensation provides an opportunity for sizeable technical loss reduction at reduced costs over replacement with new DT incurring heavy CAPEX. In addition, the reliability improvement assures of lesser downtime. The proactive repair case demonstrated significant deviation of total losses from the specification values, and that proactive repair offers business case for sizable loss reduction.

Leveraging the breakdown repair window opportunity

for legacy DTs, proactive repair can be applied to selective high losses DTs that can yield attractive payback period. It can also be applied to selective functional DTs based on loss data if tracked well from previous conventional repairs. It is evident that along with technical loss reduction repair additional benefits is brought-in in the form increased kVA capacity, higher reliability (i.e. reduced failure rate) and increased asset life with copper. To make this a viable option, DISCOMs can develop new business models and contracting for DT repairing that encourage performance tied SLAs, including technical loss reduction and possibly some combination of managed services around DTs for effective life cycle asset management.

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ACHIEVEMENT

Siemens rolls out 1000th steam turbine from Vadodara plant

Siemens has announced a key milestone for its steam turbine factory in Vadodara with the rollout of the 1,000th steam turbine from the factory premise.

The 1,000th turbine is a 29-mw waste-heat recovery steam turbine for JK Cement, the second largest manufacturer of white cement in India. Waste heat recovery, it may be mentioned, is a method where waste heat generated from industrial operations is recovered and used to preheat the boiler fluid (usually water). This is a method to increase the overall efficiency of the plant and, thus, lower fuel demand.



(R to L): Sunil Mathur, MD & CEO, Siemens Ltd, Puneet Arora; Senior Vice President—Engineering & Planning, JK Cement; and Gerd Deusser, Head – Gas & Power, Siemens Ltd. with the scale model of 1,000th turbine.

Power, Siemens Ltd, said, "Siemens has maintained its strong market position in the power generation sector in India with a significant installed generating capacity operating on Siemens turbines. The latest milestone further solidifies Siemens' standing in the industrial applications space. Siemens has a wide portfolio across the energy value chain to meet customer requirements."

LEADING SUPPLIER

Siemens is one of the leading suppliers for steam turbines in the world. Over a century, Siemens has manufactured some of the most

VADODARA FACTORY

The Siemens steam turbine factory at Vadodara in Gujarat manufactures steam turbines of up to 200 mw rating, for the domestic and overseas markets. The factory, with its world-class facilities, has been operational since 2004 and is an established Centre of Competence for

steam turbines from 2 mw to 100 mw used in industrial applications.

Spread over an area of 6,500 sqm, the factory manufactures single-stage and multi-stage steam turbines for industrial applications in addition to providing after sales and repair services.

According to Gerd Deusser, Head—Gas &

technologically advanced steam turbines in the industry. Siemens' steam turbines have set the industry standard with an overall efficiency of more than 48 per cent and maximum reliability. They also comply with the most stringent environmental standards. The company offers a full spectrum of 50Hz and 60Hz steam turbines. ■

Distribution transformers

Dual certification, delayed payments hurting industry

A survey conducted by T&D India with the senior management of small and medium transformer manufacturers reveals that dual certification and delayed payment by state-owned power distribution utilities (discoms) are the biggest concerns of the industry.

VENUGOPAL PILLAI

Distribution transformers are supposed to be certified by two agencies – Bureau of Industrial Standards (BIS) and Bureau of Energy Efficiency (BEE). This dual certification, the industry feels, is superfluous. BIS certifies transformers for their losses and accordingly grades transformers as Level-1, Level-2, etc. This certification is also a measure of the efficiency of the distribution transformer (DT). However, over the past decade, it has become mandatory for DTs to also have certification from BEE under the Standards & Labeling (S&L) programme. Transformers, according to their efficiency, are labeled with “stars”—from one to five—in increasing order of efficiency.

The respondents that *T&D India* interacted with felt that this dual

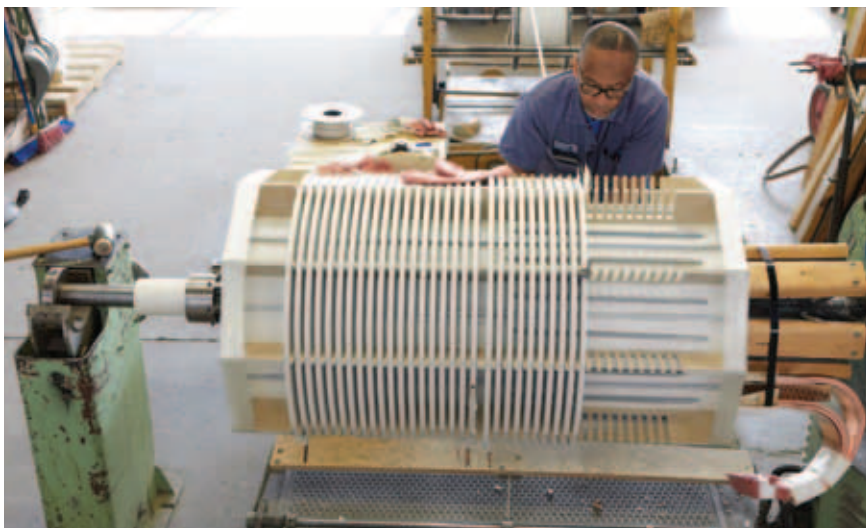


certification is indeed superfluous. The certification given by BIS is good enough and there is no real “value addition” by the certification from BEE. Here is a small technical background. A few years ago, BIS revised its standard for distribution transformers, which is “IS1180”. In the revised standard, detailed specifications and losses were specified for all DTs of 11kV, 22kV and 33kV class and having capacity up to 2.5 MVA. It was mandated

that all transformers manufactured and sold within the country shall adhere to this standard. Simultaneously, the BIS abolished 1-star and 2-star categories (as per BEE) and the efficiency relating to 3-star was the lowest efficiency that could be manufactured. In the BIS standard, it was designated as “Level-1”. Similarly, the 4-star and 5-star were designated as “Level-2” and “Level-3”.

Especially after the revision of the IS1180 standard by BIS, everything that BEE did with respect to “energy efficiency” is now taken care of by BIS. Respondents felt that there is no real role for BEE as far as certifying DTs on the basis of energy efficiency.

Dual certification is proving to be a time-consuming process, apart from higher financial outgo. This translates into higher input costs that get built into the final pricing of the end-product. Respondents feel that it could take even up to six months to secure certification from BEE. A section of the respondents felt that BEE could do well in streamlining its processes and expedite the certification process. If dual certification is mandated by law, the least that could be done to mitigate the hardship of DT manufacturers was to expedite the BEE certification process. Even when manufacturers duly submit all test reports of their DTs to BEE—as a prerequisite to securing the certification—there are allegedly bureaucratic delays that can push back the certification process by as much as six months.



One respondent felt that the star labeling programme of BEE was best suited for consumer appliances like lighting equipment, refrigerators, air-conditioners, etc. A non-consumer electrical equipment like a distribution transformer should have been kept out of the purview of BEE, especially since it was already certified by a dedicated agency like BIS.

The experience of dual certification of DTs has left the industry embittered and the hardships faced by manufacturers on this count militate against the philosophy of "Ease of Doing Business". This sentiment was echoed by almost all the respondents surveyed.

Distribution transformer manufacturers, through industry associations like ITMA and IEEMA have made several representations to the government on the issue of dual certification. However, there has been no resolution of this issue as yet.

DELAYED PAYMENTS

Power distribution utilities are dithering on making timely payment to suppliers. In the case of distribution transformers, discoms constitute the biggest clientele. This irregularity in payment has taken a toll on the financial health of DT manufacturers. This is particularly true as nearly 95 per cent of the DT manufacturers in India fall under the MSME (micro, small and medium enterprise) sector. The respondents surveyed felt that payments should be made according to the MSME Act, which calls for making prompt payment and without the need to go into litigation.



In fact, in November last year, the Union government issued a notification under the Micro, Small and Medium Enterprises (MSMEs) Development Act, 2006 with a view to ensuring timely and smooth flow of credit to MSMEs and minimise sickness among them.

As most DT manufacturers fall under the MSME category, they do not have the financial wherewithal to even initiate legal action against discoms, on the issue of delayed payments. One industry source pointed out that over the recent past, several small DT manufacturers have turned financial unviable.

PROGRESS ON CRGO

Amidst the difficulties faced by the distribution transformer industry, there is one piece of good news. The government's efforts of clamping down on the use of scrap CRGO has borne fruit. CRGO (or cold-rolled grain oriented electrical

steel) is a critical material used in transformers. The ultimate efficiency of a transformer depends on the quality and quantity of CRGO used. It is estimated that the usage of inferior (scrap) CRGO in the distribution transformer industry is today not more than 5-10 per cent. There will of course always be the odd company that engages in willful use of inferior CRGO. However, these instances have sharply reduced over the recent years. It may be recalled that a few years ago, the government of India made it mandatory for all international suppliers of CRGO, interested in India, to have their products "marked" by BIS so that only prime grade material finds its way into the country.

All the same, India's efforts to produce CRGO domestically haven't borne fruit as yet. The entire requirement of this critical material is met through imports. South Korean steel giant POSCO (Pohang Steel Corporation) had come very close to setting up a steel plant in Odisha. The mega project was to produce several steel products including CRGO steel. However, POSCO ultimately shelved its plans altogether, depriving India of a local source of CRGO. ■



SLNP crosses 1-crore mark for LED streetlights

Under the Government of India's Street Lighting National Programme (SLNP), Union power minister R.K. Singh recently dedicated 1 crore smart LED streetlights to the nation, which are illuminating 2.7 lakh km of roads in India.

Launched in January 2015, SLNP is the world's largest streetlight replacement programme, being implemented by Energy Efficiency Services Ltd, a joint venture of Central PSUs under the power ministry.

Locations: The 1 crore smart LED streetlights have been installed in Delhi, Punjab, Haryana, Chandigarh, Himachal Pradesh, Uttarakhand, Jammu & Kashmir, Uttar Pradesh, Madhya Pradesh, Bihar, Jharkhand, Assam, West Bengal, Sikkim, Chhattisgarh, Odisha, Andhra Pradesh, Tripura, Telangana, Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra, Gujarat, Pondicherry, Port Blair, Lakshadweep and Rajasthan, helping generate employment for around 13,000 people in the country.

Savings: The installation of 1 crore LED streetlights has resulted in annual energy savings of 6.71 billion kwh and avoided 1,119.40



mw of peak demand, resulting in reduction of GHG emission by 4.63 million tonnes of CO2 every year.

AP leads: Under SLNP, Andhra Pradesh is leading with an installation of 28.9 lakh LED streetlights followed by Rajasthan and Uttar Pradesh with 10.3 lakh and 9.3 lakh, respectively. As on October 1, 2019, 1,502 Urban Local Bodies (ULBs) across India have been enrolled under the programme out of which work has been completed in around 900 ULBs.

Innovative financing: EESL has adopted the Pay-As-You-Save (PAYS) model where EESL makes the entire upfront investment in installation of the LED streetlights and no additional budget allocation from the municipalities is required. The contract with the municipalities/ULBs is for a period

of 7 years. The seven-year contract with the local bodies guarantees a minimum energy saving of typically 50 per cent and provides free replacements and maintenance of lights at no additional cost to the civic partners. The municipalities pay EESL from their savings in energy and maintenance cost over a 7-year period, making the LED lights affordable and accessible.

High quality: Under SLNP, EESL procurements conform to BIS specifications and carry a 7-year warranty against technical defects. EESL conducts appropriate quality checks right from the bidding stage to the field level. This has resulted in the overall technical fault of LEDs being less than 2 per cent in the 1 crore streetlights installed by EESL in the country. EESL has maintained an uptime of 97 per cent for all streetlights across the country.

Social audit: EESL undertakes social audits in the ULBs where the project is under implementation and post the completion of the project. These social audit results have shown that about 99 percent respondents feel more comfortable with the LED installations. They also feel that there is significant improvement in safety and business activities.

Vision 2020: By March 2020, SLNP aims to replace a total of 1.34 crore conventional streetlights in India with smart LEDs. This includes the 1 crore lights already installed. When installed, the 1.34 crore LEDs will enable peak demand reduction of about 1,500 mw, annual energy savings of 9 billion kWh, and reduction in 6.2 million tonnes of CO2 per year. EESL intends to bring investment to the tune of Rs.8,000 crore by 2024 by covering entire rural India. It is expected that more than 30 million LED streetlights would be retrofitted/installed by EESL. ■

Power Grid clinches ISTS project in Madhya Pradesh

Power Grid Corporation of India Ltd has been declared as the successful bidder under tariff based competitive bidding (TBCB) to establish Inter-State Transmission System-associated with LTA applications from Rajasthan SEZ Part-B on build, own operate and maintain (BOOM) basis. The Letter of Intent has been issued to Power Grid Corporation of India Ltd, the company said in a stock exchange filing.

The transmission system comprises a 765kV double-circuit transmission line and associated bays to be established in Rajasthan. PGCIL, pursuant to its selection as the successful bidder, has acquired Bhind Guna Transmission Ltd (BGT), the project SPV to establish the ISTS-based transmission scheme.

The transmission system comprises 400kV, 220kV and 132kV transmission lines apart from establishing a new 400/220kV and 220/132kV substation at Guna, and Bhind respectively. The transmission system is an intrastate transmission system project in Madhya Pradesh and is to be completed by 36 months.

REC Transmission Projects Company Ltd, a wholly-owned subsidiary of REC Ltd, was the bid process coordinator. ■

Schneider Electric India launches EcoStruxure for oil & gas industry

Schneider Electric has announced the launch of EcoStruxure Power & Process (EP&P) to drive efficiency and augment profitability in oil, gas and petrochemicals sector.

The company has partnered with Microsoft to create commercial internet of things (IoT) solutions in the areas of energy management and automation, thus bringing power and process systems together. Through this platform, Schneider Electric aims to address the challenges of market volatility in the O&G sector, while reducing CapEx and OpEx by 20-30 per cent, a release from Schneider Electric noted.

When power and process management systems operate as separate silos, industrial organisations soon find themselves at a competitive disadvantage. Separate teams of engineers and programmers are needed to build up and maintain operations. As a result, the cost of supporting these complex, customised interfaces across the lifetime of the asset is high and it restricts the



organisation's ability to respond to changing market conditions.

With the introduction of EcoStruxure Power & Process in the Indian market, companies in the oil, gas & petrochemical sector can break down the traditional barriers between power and process control systems to solve critical engineering and operating challenges. This can result in better returns on capital employed (ROCE), with a 20 per cent reduction in CapEx, 15 per cent drop in downtime, and a 3 per cent growth in profitability.

Speaking on the launch, Anil Chaudhry, Zone President & Managing Director, Schneider Electric India, said, "The Indian hydrocarbon sector is at the cusp of major transformation as

companies across the value chain step up their efforts to boost India's self-sufficiency in oil and gas, expand refining capacities, and set up pipeline infrastructure for transportation across the country. Through our partnership with Microsoft we aim to deliver real/tangible solutions and measurable business results for oil and gas players, improve efficiency, bring down cost of running operations and raise profitability."

By leveraging EcoStruxure IoT-enabled system architecture and platform, customers can connect assets that are the centre of their projects with assets that are at the center of their operations across the full lifecycle of their plants, including their supply chains.

By offering both tangible IoT solutions that are available today as well as leading edge innovation to address future needs, customers will benefit from the blend of domain/subject matter expertise from Schneider Electric and industry-leading cloud technology from Microsoft, the release added. ■

Legrand unveils "Innoval" experience centre in Chandigarh

Legrand India inaugurated its eighth state of the art experience centre Innoval in Chandigarh on October 1, 2019.

Innoval will host its India group company products – Legrand, Numeric & Valrack. Globally Innoval's are present at France, Greece, Chile, Brazil, Colombia, Dubai, and made its first-time entry in the Asia Pacific region with its launch in Mumbai, India followed by its successful launches in Ahmedabad, Lucknow, Dehradun, Coimbatore, Kochi and its first voice controlled experiential center in Bangalore.

Innoval is Legrand's global brand of product showcases. The narrative at Innoval is based on the concept of 'Source to End Usage', where the products are arranged in relation to each other and according to where they fall on the energy and data distribution grid. Products are arranged as per the business verticals—user interface, energy distribution, structured cabling, UPS and cable management.



Samir Kakkar, Director – Sales, Legrand India at the inauguration of the company's experience centre in Chandigarh.

Innoval is also built from the perspective of providing training for all players in the electrical trade, from investors to installers. The purpose of Innoval, the Legrand Group's training provider for the residential and commercial markets, is to support all these partners (investors, system integrator, architects, panel builder, end customer etc.) by helping them to acquire new skills in order to better understand the market.

According to Tony Berland, CEO & Managing Director, Legrand India, 'The breadth of Legrand's offer in India has diversified over the last 20 years.

It has developed product solution for various industries and its user (investors, system integrator, architects, panel builder, end customer etc.) To speak to these new-age customers and to consolidate its credibility with regards to the new offers and expertise, Legrand has updated its approach. We recently launched our first voice enabled experiential centre- Innoval in Bangalore." ■

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Techno N from HPL Electric

HPL Electric & Power Ltd. has recently introduced 'Techno N' – miniature circuit breaker. Designed with state-of-the-art technology, incorporating best industry features and made in compliance with India and international standards, Techno N is HPL's newest product under its switchgear range.

The high-tech 'Techno N – MCB' is suitable for against short circuit and over current protection in domestic and industrial applications. It provides better arc quenching and cooling systems which ensure enhanced short circuit performance. Its unique technology is energy efficient and enables trip free mechanism.

The salient features of the new product are: state-of-the-art design; CE marking and BIS certification; conformity to IEC/IS: 60898-1; rated short-circuit breaking capacity 10kA; current limiting design; trip free mechanism; cable termination up to 35 sqmm; IP 20 protection on live parts, and low watt loss, energy limiting as per Class-3 category utilization.

Luminous launches array of solar inverters

Luminous Power Technologies recently launched an array of technologically advanced solar inverters at the Renewable Energy India Expo 2019. These solar solutions by Luminous intend to maximize consumers' savings by efficiently managing power at home. The new range of solar inverters is designed for high performance catered to diverse consumer needs.

These highly efficient solar inverters deliver uninterrupted power supply for all electrical applications and are extremely safe and reliable. The range of inverters is summarized below.

Microinverter (On-grid): Connected to four solar modules, MI 1500 Microinverter converts DC power into grid-compliance AC power. It improves energy harvest, increases reliability and dramatically simplifies design, installation and management of solar power systems. It ensures superior performance even in shaded weather conditions. Through its enhanced monitoring system, the inverter also provides detailed real time information and guidance for maintenance.



Microinverter (On-grid)

Hybrid TX Series (Hybrid): Hybrid Inverter can be used as a standalone On Grid or Off-grid Inverter or both as it comes with in-built back-up capability. These inverters come with dual competency, under normal operation it can supply power to run electrical appliances at home and charge the batteries as well as export excess electricity to grid. In the event of a power cut, the unit will automatically switch over to battery supply and continue to operate independently from the electricity grid, making it extremely safe and reliable.

Solarverter (Off-grid): Solarverter range from Luminous allows smart management of solar power, grid supply and battery. These inverters come with Smart Solar Optimization, which means it gives priority to solar in both backup and charging mode of operation thereby maximizing solar



Solarverter (Off-grid)

energy utilization. These inverters are equipped with a user-friendly LCD Display which allows the user to monitor various performance parameters. Complying with MNRE recommended standards, these inverters come with two years warranty.

Extended range of EPCOS power line chokes

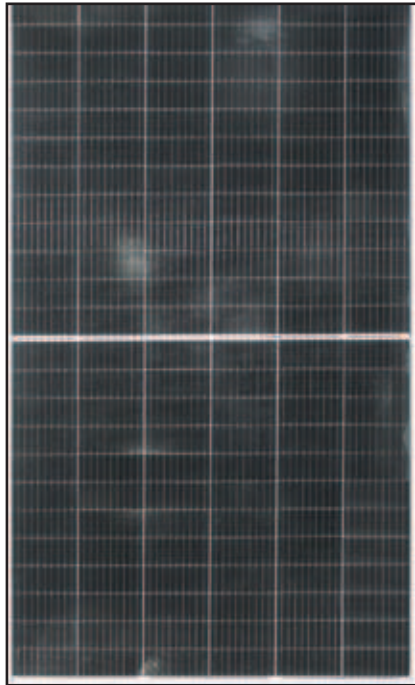
TDK Corporation has extended its range of EPCOS power line chokes to include six new types. The new components are available in three different core shapes with different rated currents and inductance values, delivering great design flexibility. The B82116B* rod core chokes cover rated currents of 10 A, 21 A and 25 A and offer inductance values of 1.8 μ H, 3.3 μ H and 3.4 μ H. Both B82116S* mushroom core chokes feature a current capability of 25 A and are available with inductances of 2.9 μ H and 3.1 μ H. The new range is completed with a ring core choke (B82622S*) with two windings, which is designed for a current of 30A and has an inductance of 2.1 μ H.



Depending on the type, the maximum permissible operating temperatures are between 85°C and 140°C. The RoHS-compatible chokes use class 200 insulated wire and are UL-listed in accordance with EN 60317-13. All components are qualified to AEC-Q200. The main applications for the new chokes include industrial and automotive motors and motor controllers

Half-cell modules from Vikram Solar

Vikram Solar recently launched a new line of high-efficiency MBB (multi busbar) half-cell modules. This module series is an upgrade of Vikram Solar's existing 5 BB



half-cell module and a new addition to the company's product portfolio.

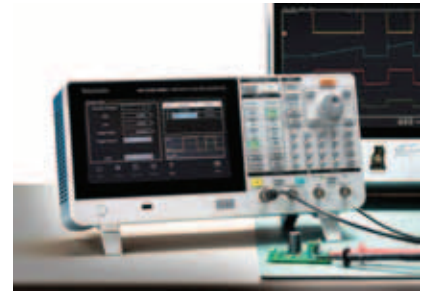
The modules, to be commercially available from January 2020 onwards, will house 144 half-cells and would have maximum power up to 415 Wp in

monocrystalline technology. This new series would be available in the market from January 2020 and would offer increased light harvesting by reducing inactive area of solar cells and internal resistance to yield higher field performance.

Fitted with higher number of busbars, the new MBB half-cell module would also reduce performance impact from micro-cracks in field, and offer lesser internal resistance by reducing space between cell bus bars leading to lower levelised cost of energy. These features will result in improved performance and durability, a company statement said.

Software plug-in for AFC31000

Tektronix, Inc. has announced the availability of a new software plug-in for its AFC31000 Arbitrary/Function Generator that makes it possible to perform crucial double pulse testing in less than a minute, saving a significant amount of time when compared to alternative methods. With the new Double Pulse Test software, engineers can quickly define pulse parameters from a single window on the AFC31000's large



touchscreen display and then generate the pulses they need to perform testing – all in under a minute. The application offers impedance adjustment of pulse width and the time gap between each pulse, up to 30 pulses. Pulse widths can range from 20 ns to 150 μ s.

Double pulse testing is used by researchers and design and test engineers in the power and semiconductor industries to measure and evaluate the switching parameters and dynamic behavior of power devices, including those made from wide band-gap materials such as silicon carbide (SiC) and gallium nitride (GaN).

Information in this section has been sourced from official press releases of respective companies.

SOLAR NEWS

- **Waaree Energies** recently announced the expansion of its module manufacturing capacity to 2 GW from 1.5 GW. With the manufacturing facility based in Gujarat, the company has now upgraded the production capacity to 5.7 mw per day. The demand for solar energy has seen an uptake in the recent years with the current requirement holding strong at 25 GW. However, due to various policy driven and geo-political factors, the Indian solar manufacturing segment is equipped only to produce module equivalent to 3 GW. Waaree aims to bridge this demand – supply gap and inch towards a viable indigenous ecosystem, a release from Waaree said.
- His Excellency Khaltmaagiin Battulga, President of Mongolia, along with a delegation visited the cell and module manufacturing facility of **Tata Power Solar** in Bengaluru, Karnataka. During his visit, the Honourable President praised capabilities and capacities of Tata Power Solar in utility- scale projects, rooftop and solar powered agriculture pumps. Along with this, he applauded the company for the usage of innovative technology in the manufacturing plant. Tata Power Solar's module manufacturing lines have an in-house production capacity of 400 mw for modules and the cell manufacturing lines with a capacity of 300 mw can process both mono and multi-crystalline wafers of 125mm and 156mm sizes.



- **Vikram Solar** announced that it has commissioned a 164 kWp rooftop solar plant for Damodar Valley Corporation (DVC) at Belur Math, the headquarters of Ramakrishna Math and Ramakrishna Mission. The plant will power six buildings at Belur Math- Shilpvidyalaya, Shilpamandira, Shilpayatan, Shikshanmandira, Bank and Showroom, a release from Vikram Solar said.
- **Viviana Mall**, in the Mumbai Metropolitan Region, has increased its rooftop solar power installation by over 35 per cent to 1,340kVA. With this, about half the common area electricity the requirement is now being met with by this renewable source of energy generation. The solar setup at Viviana Mall now generates approximately 1.75 lakh kwh of clean energy each month.

GE to expand SF₆-free HV equipment portfolio

GE Renewable Energy's Grid Solutions business announced plans to invest tens of millions of dollars to expand its range of sulphur hexafluoride (SF₆)-free high-voltage substation equipment to include all key high-voltage levels by 2025.



This is one of Grid Solution's biggest portfolio investments in years and will support customers in their efforts to reduce greenhouse gas emissions, the company said in the press release.

Due to its strong insulating properties, SF₆ is widely used in substation equipment such as switchgear and instrument transformers, with the transmission industry accounting for

approximately 80 per cent of the world's usage. However, this potent greenhouse gas is estimated to contribute 23,500 times more emissions than CO₂ in the event of a leakage and can remain in the atmosphere for up to 3,200 years.

By 2025, GE's Grid Solutions will offer SF₆-free instrument transformers up to 420kV, gas-insulated substations up to 420kV, and dead tank and live tank circuit breakers up to 550kV.

Currently, GE's g3 products are type-tested and available for live tank circuit breakers and gas-insulated substations up to 145kV, gas-insulated lines (GIL) up to 420kV and instrument transformers up to 245kV. ■

IN BRIEF

- Power Grid Company of Bangladesh Ltd (PGCB)** successfully completed another major ACCC Conductor project in Barisal, Bangladesh. Earlier, PGCB completed its 230kV double circuit Patuakhali-Payra transmission line upgrade. PGCB selected 564.4 sqmm Hawk size ACCC Conductor (double bundled) to double the capacity of this 48+ km transmission line. PGCB used over 575 km of ACCC Conductor manufactured by Sterlite Power using CTC Global's patented ACCC Core. The use of ACCC Conductor allowed PGCB to utilize all of the existing lattice structures (134 total) without the need for modification or replacement. Span lengths ranged from 87m to 527m. China National Cable Engineering Corporation provided engineering services, while Hanbaek and Islamic Engineering Mullah Traders provided installation services.
- The Dhaka Power Distribution Company Ltd (DPDC)** will implement a mega project to build 40 substations in the Bangladeshi capital. The scheme will be funded by China to the tune of around \$2.5 billion and will be executed by Tabian Electric Apparatus (TBEA) Co. Ltd, a Chinese government-selected contractor. Under the scheme, a total of 40 substations will be set up in the city while overhead cables of Hatirjheel Lake and Dhanmondi residential area will be laid underground in next five years.
- The Abu Dhabi Transmission and Despatch Company, TRANSCO,** and Siemens have recently announced the activation of a newly-installed smart power transformer. The transformer, a Siemens Sensformer, was installed at TRANSCO's Al Foah 220/33kV substation, part of a pilot

project that will use the generated data to improve the performance of the substation. The activation of the Sensformer at Al Foah is the first time the technology has been used in the UAE and the Middle East. These next-generation transformers act as information hubs and are equipped with a connectivity feature that transmits a defined set of data to a cloud-based platform application.

- NKT** has successfully completed the Caithness-Moray turnkey project of a 320kV high-voltage direct current (HVDC) XLPE off- and onshore power cable system covering a total transmission length of 160 km. The link has been in commercial operation since end-2018. For this project in Scotland, the cable-laying vessel NKT Victoria made her maiden installation voyage, successfully and with high precision installing the bundled HVDC power cables and fibre optics on the seabed. The Caithness-Moray power link connects the electricity grid on either side of the Moray Firth inlet using world-leading and well-established HVDC power cable technology from NKT, with a minimal visual impact.
- Prysmian Group** successfully completed the submarine laying operations for the Evia, Andros and Tinos islands interconnections. The Group developed, supplied and installed the first non-metallic armoured cable, whose armour has been designed with a composite material based on High Modulus Synthetic Fibres, which shape the new generation of cable technology. Water installation, performed by Prysmian Group's state-of-the-art cable-laying vessel Cable Enterprise, reached 550m in the link between the islands Evia and Andros. Thanks to this innovative

product featuring a synthetic armour that can be 30 per cent lighter than steel, Prysmian will be able to perform ultra-deep installations reaching up to 3,000m, and to provide its customers with almost all the submarine cable routes they might need.

- Sunbelt Transformer** has launched a patented oil sample tap kit developed to eliminate downtime and prevent arc flash. According to the company, the sample tap kit provides customers with a safe and efficient way to access oil samples and nitrogen service lines without a need to stop production. The solution does not require de-energization of pad-mounted transformers after installation, thus allowing 24/7 operation and eliminating any downtime.
- ANDRITZ** has signed a contract – as part of a consortium with the European construction group STRABAG– with Dubai Electricity & Water Authority (DEWA) to supply and commission the entire electromechanical and hydromechanical equipment for the Hatta Pumped Storage Power Plant located in the Hajar Mountains 140 km southeast of the city of Dubai. Startup is expected for the first quarter of 2024. The contract value for the electro- and hydro-mechanical equipment is more than 100 million euros. ANDRITZ will provide the electromechanical equipment for two 125-mw Francis-type pump turbines with double-fed asynchronous generators and auxiliary systems, all gates and trashracks, 320 m of penstocks, main inlet valves, main power transformers, GIS switchyard, and high-voltage cables to connect the new power plant to the national grid. ■

- **Power Grid Corporation of India**, pursuant to its selection as the successful bidder under tariff-based competitive bidding, has on October 3 2019, acquired Ajmer Phagi Transco Ltd, the project SPV to establish transmission system for construction of Ajmer (PG)—Phagi 765kV D/C line along with associated bays for Rajasthan SEZ, on BOOM basis from REC Transmission Projects Company Ltd (the bid process coordinator). The transmission system, comprising a 765kV line traversing in Rajasthan, along with associated bays, is an Inter-State Transmission System (ISTS) project.
- A memorandum of agreement for a Digital Substation Collaborative R&D Project has been signed between Power Grid Corporation of India and Bharat Heavy Electricals Ltd. As part of this MoA, intelligent electronic devices (IEDs) and optical current transformers (OCTs) will be developed, which will be validated at PGCIL's Advanced Research & Technology Centre, Manesar. Further field trials will be carried out at PGCIL's Bhiwadi 400/220kV substation. This collaborative effort will enable development of indigenous devices for digital substations, an official release said.
- **Bharat Heavy Electricals Ltd** has commissioned the 1320-mw IB thermal power station in Jharsuguda district, Odisha for project owner Odisha Power Generation Corporation Ltd – a JV company between the Odisha state government and US-based energy company AES. BHEL's scope of work in the project that comprised two supercritical units of 660 mw each encompassed design, engineering, manufacturing, supply, erection and commissioning of steam turbines, generators, boiler, associated auxiliaries and electricals, besides C&I and electrostatic precipitators.
- **NTPC** has signed a pact with the Himachal Pradesh government to set up two hydropower projects aggregating 520 mw in the state. The two projects are Seli and Miyar hydroelectric projects located in Chenab Basin at the state's Lahaul and Spiti district. While Seli plant (400 mw) is a run-of-the-river project with pondage scheme, the 120-mw Miyar plant is a run-of-the-river project without pondage scheme, on Miyar tributary of Chenab River. NTPC already has its first hydropower project, 800-mw Koldam, in Himachal Pradesh, commercially operational since July 2015.
- **Sterlite Power** has announced the appointment of Ms Flora Haixia Zhao as an independent director of the company. Zhao has held leadership positions in companies such as BP and AES. She will advise the Board and leadership team on matters related to strategy and global expansion, a release from Sterlite Power noted.
- The board of directors of **CG Power & Industrial Solutions Ltd**, at its meeting held on September 25, 2019, has appointed Ashish Kumar Guha, Non Executive Independent Director of the Company, as the Chairman of the Board of Directors of the company with effect from September 25, 2019. It may be recalled that the company had earlier sacked its promoter Chairman Gautam Thapar after an investigation exposed gross financial irregularities in the company.
- **NTPC** has commissioned the country's first ultra-supercritical unit having capacity of 660 mw at Khargone in Madhya Pradesh. This plant operates at efficiency of 41.5 per cent which is 3.3 per cent higher than the conventional supercritical ones, with steam parameters of 6000°C temperature and 270 kg/sqcm pressure. The high efficiency will result in less coal consumption and lower reduction of carbon dioxide emissions. The Khargone plant will have a total capacity of 1320 mw coming from two such units of 660-mw each.
- **Chhatrapati Shivaji Maharaj International Airport** was conferred with the prestigious 'Excellent Energy Efficient Unit' Award by the Confederation of India Industry (CII) at its 20th National Award for Excellence in Energy Management 2019. The award lauds MIAL's tireless efforts in sustainable and green initiatives - particularly in assessing the trend of reduction in specific energy consumption, innovation in identifying and implementing energy saving projects, green supply chain, GHG and climate change initiatives.
- **Vedanta Ltd**, Aluminium & Power Business's Lanjigarh unit in Odisha was conferred the 'Excellent Energy Efficient Unit' award at the CII's 20th National Award for Excellence in Energy Management 2019. The unit achieved its best process efficiency in FY19 and registered lowest energy consumption in the refinery's history. This resulted in the lowest greenhouse gas (GHG) emission in Lanjigarh unit's history, in the process creating a global benchmark for a coal-fired refinery. Vedanta has undertaken digital transformation to create efficiency, productivity, adaptability and sustainability across the value chain.
- **Appellate Tribunal of Electricity (APTEL)** has upheld the approval granted for transfer of 75.01 per cent ownership of Prayagraj Power Generation Company Ltd (PPGCL) to Renascent Power Ventures Pvt. Ltd, a 100 per cent subsidiary of Resurgent Power Ventures Pte Ltd, but without any reduction of adopted tariff. Prayagraj Power owns and operates a 3x660-mw coal-based power project in Uttar Pradesh and had become an NPA due to financial and operational stresses. Resurgent is a joint venture between Tata Power International Pte. Ltd, ICICI Bank, Kuwait Investment Authority and State General Reserve Fund of Oman set up to acquire assets in the Indian power sector. Resurgent was selected as the successful bidder for acquisition of 75.01 per cent shares of PPGCL. Approval of the regulators was one of the pre-conditions for concluding this transaction.
- **Bharat Heavy Electricals Ltd** has successfully commissioned five pumping units of the 7x139-mw Kaleshwaram Lift Irrigation Scheme (LIS) Package 8, in Telangana. Significantly, the pump for each unit is designed to lift 89.14 cumecs (cubic metres per second) of water by 120.98m,
- **P. C. Garg, CGM (Projects)**, Power Grid Corporation of India had a meeting with Chief Minister of Kerala, Pinarayi Vijayan on completion and commissioning of PGCIL's 400kV Tirunelveli-Edamon-Kochi D/C line (**Kundankulam line**) in Kerala, a news release said without giving further details.
- **NHPC Ltd**, in a stock exchange communication, announced that it has signed an MoU with the Himachal Pradesh government on September 25, 2019, for execution of the 449-mw Dugar hydropower project located in Chamba district, Himachal Pradesh. The project is a run-of-the-river scheme on Chenab River. The estimated present day cost of the project is Rs.4,112 crore and it will generate 1,610 million kwh in a 90 per cent dependable year with 95 per cent machine availability. ■



INHOUSE & ONSITE TRANSFORMER TEST FACILITY (Accredited by NABL & BIS)

Transformer Testing & Evaluation Services:

- Distribution Transformer as per IS:1180-2014
- Power Transformer as per IS:2026 & IEC:60076
- Paper Covered Copper & Aluminium Conductors
- High Voltage Bushings (upto 66 kV) & Insulators (upto 245 kV)
- CRGO Steel Laminations
- Evaluation of Solid Insulating Materials (Paper/Pressboard/Laminated wood and boards/Cork sheets etc.)
- Transformer Oil (New & In-service) & Dissolved Gas Analysis (DGA)

Field and Diagnostic Services for Transformers:

- Condition Monitoring by Capacitance and Tan Delta Measurements
- Harmonic Measurements of Magnetizing Current
- Online Condition Monitoring by Acoustic Emission Method
- Third Party Testing (220 KV, 100 MVA) including measurement of No-Load and Load losses using own calibrated Instruments at manufacturer's works
- Third Party Testing of Distribution Transformers at Utility Stores
- Noise Level Measurement
- Furan Analysis and Degree of Polymerization (DP) of cellulosic (Paper & Pressboards) insulating materials in Transformers

BIS accredited DT Testing (as per IS:1180-2014) Laboratory at:
ERDA Makarpura, Vadodara (upto 2.5 MVA, 33 KV)
ERDA (West), Rabale, Navi Mumbai (upto 200 KVA, 33 KV)



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Overhead power distribution lines with bare conductors presents several limitations related to technical and environment to Domestic and Industrial power supplies.

- **TREE CONTACT:** Outages are caused when trees interfere with power lines during high winds, tree limbs, entire trees and other vegetation are come in contact with poles and power lines. Any power line which comes in contact with trees can cause a tripping and leads to a disruption of production .
- **TRACKING OUTAGES:** Outages caused by "Tracking" can occur when industrial dust accumulates on the conductor then combines with light moisture usually caused by fog and drizzle results in a spark and pole or equipments are liable to catching fire, again leading to disruption of power supply.

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- No Power line tripping while in contact with the Wet Tree branches, especially during monsoon period
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- No corrosion snapping of overhead conductor in polluted areas, chemical zones and Coastal areas
- Provides safety to Residential/Commercial premises where overhead lines run very close
- Ideal for Road/Rail/river crossing of overhead lines
- Increase Life of overhead conductor
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Applicable Standards

SS-EN 50397-1, BS EN 50182, IS 398-2, IS 398-4, IEC 61089

Available Voltages

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Type Tested

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