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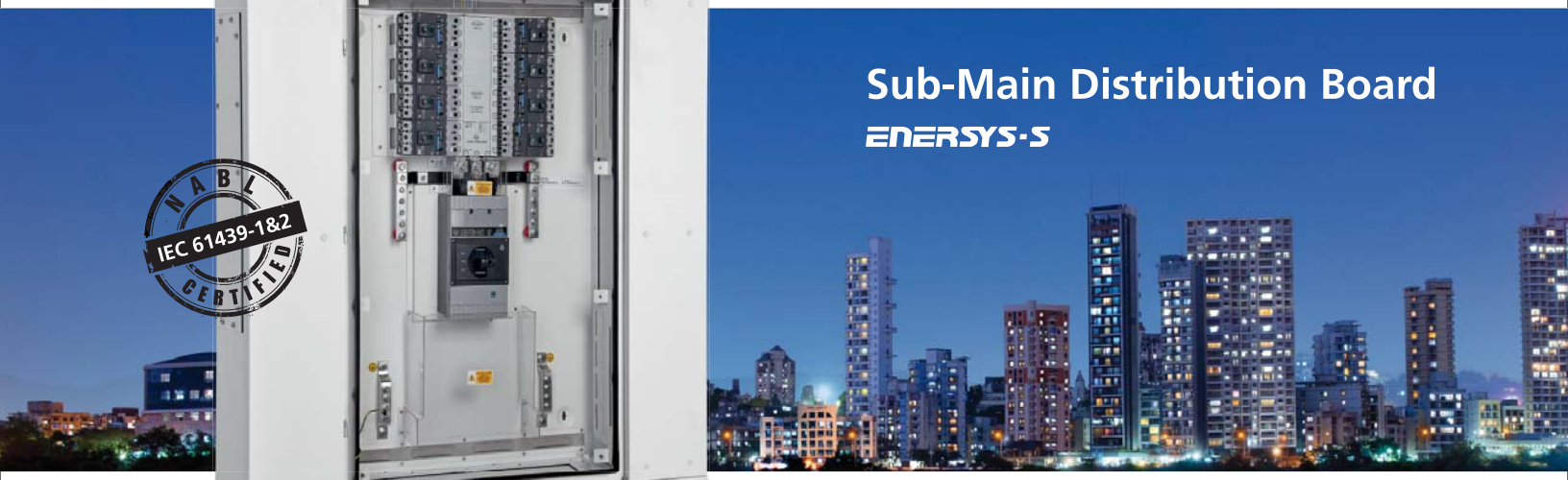

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PUBLISHER'S LETTER

Hello and welcome once again to Electrical India. As I write this note, I am happy to inform that the ranking of the magazine site www.electricalindia.in (as per Alexa.com) has gone up by another 10% to 4,30,673 since last month.

A country's growth is gauged by its electrification and the per capita consumption of electricity. India's per capita electricity consumption is the lowest among BRICS nations. The per capita consumption of Russia is 6 times, China 3 times, South Africa 4 times and Brazil more than 2.5 times that of India.

This morning newspapers flashed headlines saying more than 37% of schools in the country have no electricity. This was the reply given by the minister of state for human resource development in the Rajya Sabha. Assam has 25% schools with electricity connection while Meghalaya has 28.54%. Others in the list include Bihar (37.78), Madhya Pradesh (28.80), Manipur (39.27), Odisha (33.03) and Tripura (29.77). That's a sorry state of affairs. I spoke to Aruna Kumarankandath from the Centre for Science and Environment and she felt the definition of electrification itself is flawed.

The government defined electrified village differently prior to 1997 and after 1997. According to a criteria used by the power ministry after 2004, a village is considered electrified if electricity is provided in public places such as schools, dispensaries and at least 10% of households. So, a village can be considered electrified if 90% of its households do not have electricity. So there is a flaw in the definition of electrified villages.

When Prime Minister Narendra Modi pledged to bring reliable power to all citizens during the campaign that propelled him into office in 2014, the same year the World Bank pegged India as home to the world's largest un-electrified population. "How can we say a village is electrified if 90 percent of homes in an electrified village don't get power?" asks Aruna, who feels the government's definition of an electrified village doesn't make sense. According to the data published by the power ministry as of May 16, 2017, while 73% of the 18,452 villages identified for electrification had power, only 8% of these villages had all their households electrified.

Even though India is the third largest market in terms of gross electricity generation, it still has almost 25 crore people, or almost a fifth of its population, without access to power. Energy and electricity growth will therefore become crucial for powering the country's future. The challenge of 100% electrification can only be overcome through concerted improvements at various levels. Hopefully, the next data that comes out from the department concerned would be practical and not confusing.

Do send in your comments to me on miyer@charypublications.in

Mahadevan.

Publisher & Editor-In-Chief

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Kingdom of Saudi Arabia signs MoU with EESL

Energy Efficiency Services Limited (EESL), under the administration of Ministry of Power, Government of India (GoI), has signed a Memorandum of Understanding (MoU) with National Energy Services Company, Kingdom of Saudi Arabia to implement energy efficiency programmes and scale-up demand side measures in the Gulf country. The MoU was signed by Waled Alghreri, Chief Executive Officer, National Energy Services Company and Saurabh Kumar, Managing Director, EESL.

As per the MoU, EESL will provide consultancy and expand the capacity of the National Energy Services Company, which is instituted by the Kingdom of Saudi Arabia, to execute energy efficiency programmes. The move comes in the wake of the Arab Kingdom working ardently towards reducing its power subsidies and introducing energy efficiency initiatives. With rapidly increasing population coupled with soaring energy prices, the electricity demand of Saudi Arabia is growing at a rapid pace. According to the estimates by the World Bank, the electricity generated in Saudi Arabia completely relies on non-renewable sources like oil, gas and coal sources.

Keeping this in mind, the National Energy Services Company has engaged with EESL to replicate the success of latter's street lighting national programme and retrofit of buildings, with energy efficient appliances in Saudi Arabia. EESL has also agreed to depute its officials in Saudi Arabia to provide technical and financial consultancy and monitor the execution of energy efficiency projects.

India can integrate 175 Gigawatts of Renewable Energy into the Electricity Grid, Reveals Study

Union Minister of State (IC) for Power, Coal, New & Renewable Energy, Piyush Goyal released the first part of the study 'Pathways to Integrate 175 Gigawatts of Renewable Energy into India's Electricity Grid'. The second volume, to be released in July, takes a more in-depth look at system operations in the Western and Southern regions.

The study, developed under the U.S.-India bilateral program 'Greening the Grid', confirms the technical and economic viability of integrating 175 gigawatts (GW) of renewable energy into India's power grid by 2022, and identifies future course of actions that are favourable for such integration.

The Government of India in 2015 had set the ambitious target of adding 100 GW of solar energy and 60 GW of wind energy into the country's energy mix.

The report resolves many questions about how India's electricity grid can manage the variability and uncertainty of adding large amounts of renewable energy into the grid. The results demonstrate that power system balancing with 100 GW solar and 60 GW wind is achievable at 15-minute operational timescales with minimal reduction in renewable energy output. India's current coal-dominated power system has the inherent flexibility to accommodate the variability associated with the targeted renewable energy capacities.

Some of the key operational impacts that came out of the report were:

1. large-scale benefits of fuel savings and reduced emissions due to increased renewable energy production;
2. existing fast-ramping infrastructure is sufficient to maintain grid balance; and
3. in post-175 GW clean energy scenario, coal plants operating at part capacity will need suitable incentives for flexibility.

The study also evaluates the value of strategies to better integrate renewable energy and demonstrates the importance of policy and market planning.

BRPL joins hands with TERI to increase roof top solar PV penetration in India

The Electricity Act, 2003 aimed to bring in a paradigm shift in the functioning of the power sector, distancing the sector from direct government control, corporatising the sector and bringing it under the control of independent regulators. To minimise the distance and develop a strategic association to work jointly for achievements of common goals and objectives, The Energy and Resources Institute (TERI) has collaborated with BSES Rajdhani Power Limited (BRPL). The partnership will enable TERI to carry out a study for technical challenges and solutions for renewable energy grid integration.


Amal Sinha

The growing penetration of solar roof top systems into the distribution system may cause undesired effects in the operation of the distribution system. As a part of the collaboration, TERI will look into the cases of a few distribution companies of the country with a view to analyse the emerging technical challenges in the context of increasing roof top solar PV penetration. The growing penetration of solar roof top systems into the distribution system may cause undesired effects in the operation of the distribution system in many ways. Therefore, TERI will be undertaking a study to understand the challenges that may arise with higher penetration of solar rooftop systems in distribution grids.

Amal Sinha, CEO, BRPL, said, "BRPL is prepared to accept the challenges of incorporating large scale rooftop solar and electric vehicles into distribution system rather opposing the same."

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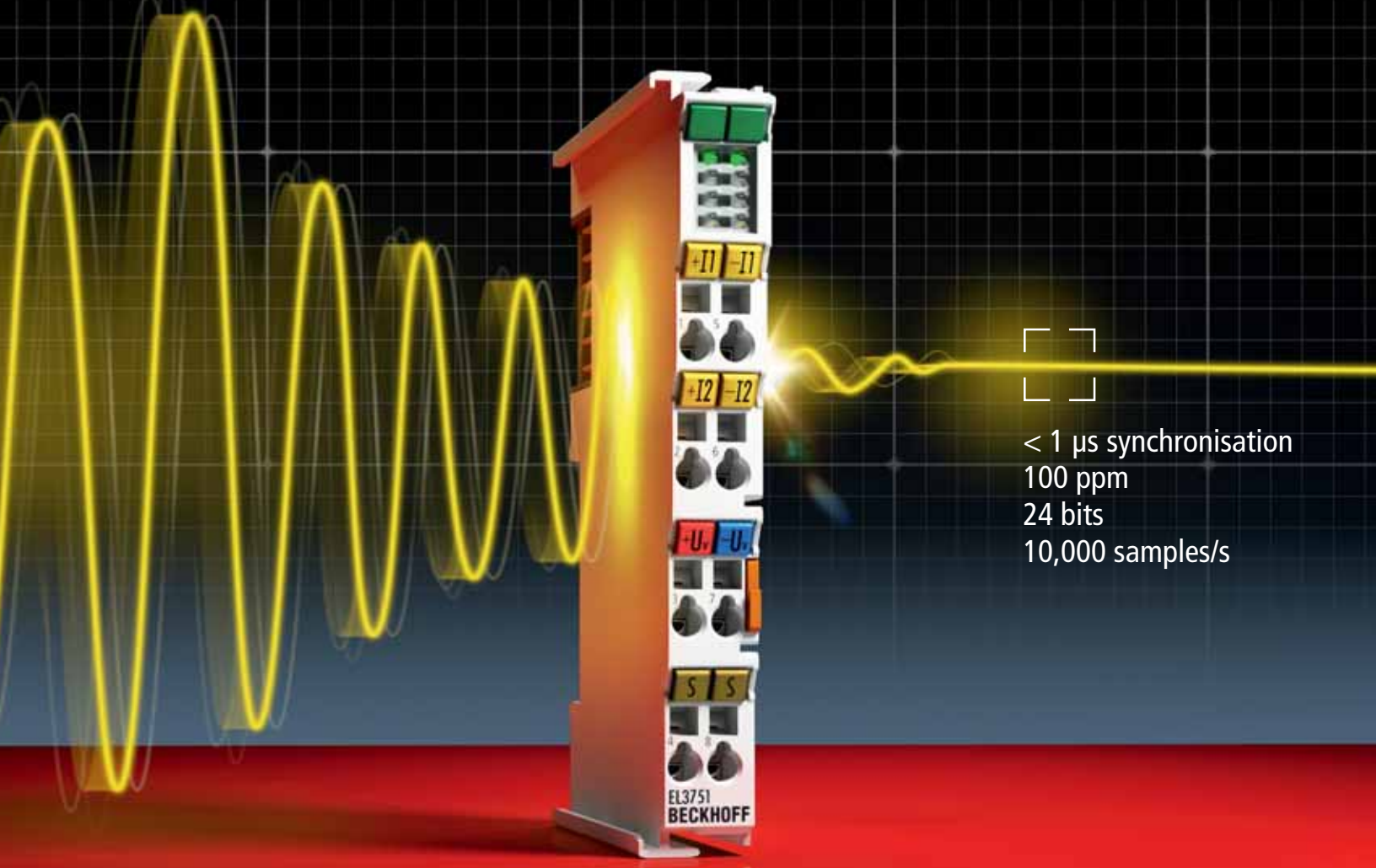

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7 updates on Indian Power sector

All India Statistics of Indian Power Sector are released by Central Electricity Authority (CEA). The main highlights are as follows:-

1. Generation Capacity Addition target during the period 2012-17 from conventional sources was 99,209.47 MW against a target of 88,537 MW, over achieving the same by 112%. Conventional generation capacity addition achieved in the past 3 years (2014-15, 2015-16 & 2016-17) has been 60,752.6 MW, which is about 61 % of the total capacity addition achieved during this period.
2. In 2015-16, conventional generation capacity addition achieved was 23,976.6 MW, which is the largest ever capacity addition in a single year.
3. The Renewable Energy Sources installed capacity as on 31.03.2014 was 31,692.14 MW. As on 31.03.2017, India has achieved an Installed Capacity of 57,260.2 MW of RES showing an increase of 80% during 2014-2017.
4. The Peak Demand met increased from 130 GW in 2013-14 to 157 GW in 2016-17, which works out to a CAGR of 6.5 %. Along with this growth in demand, the quantum of 'power not supplied during peak' has reduced substantially from 6.1 GW in 2013-14 to only 2.6 GW in 2016-17, a reduction of 57%.
5. The quantum of energy supplied by the State Distribution Utilities increased from 960 BU in 2013-14 to 1135 BU in 2016-17, showing a CAGR of 5.8 %. This increase is in-spite of energy conservation and efficiency improvement measures. Without the energy efficiency measures, the growth rate would have been much more. Along with this growth in supply of electricity, the quantum of 'energy not supplied' has reduced substantially from 42.4 BU in 2013-14 to 7.6 BU in 2016-17, a reduction of 82%.
6. The energy actually used by all the consumers including industries, grew at an even higher rate. The gross generation in the country, which reflects the consumption by consumers (other than about 0.2% growth rate of export to Bangladesh and Nepal), increased from 1020 BUs in 2013-14 to 1242 BUs in 2016-17, showing a CAGR of 6.8 percent. The reason that there is a higher growth in gross generation, vis-à-vis energy supplied by State Distribution Utilities, is that many industries are now purchasing power through open access from IPPs without contracts with the States. Therefore, the consumption of these industries has reduced from the State Utilities and increased through open access, which is reflected as generation increase from IPPs without contracts. This growth rate is, in-spite of energy conservation and efficiency improvement measures. Without the energy efficiency measures, the growth rate would have been much more.
7. Adequate power is available in the country to meet the demand of power of the consumers who are having access to electricity. In 2013-14, the demand-supply gap in terms of Energy and Peak stood at 4.2% and 4.5% respectively. This has now come down to an all-time low of 0.7% and 1.6% respectively in 2016-17. Further, this gap is on account of factors other than inadequacy of power in the country.

India's PowerGrid endorsed for alternative procurement arrangements by the World Bank

Earlier this year, India's PowerGrid transmission utility company became only the second implementing agency in the world, following the experience of Bhutan's Thimphu Thromde--to have its procurement system and regulations assessed for use in World Bank-financed projects, under the World Bank's new Procurement Framework.

The new framework, which took effect in July 2016, enables the Bank to rely on the procurement arrangements of national agencies or of other multilateral development partners as 'alternative procurement arrangements', or APAs. This agreement is a breakthrough for countries that work hard on strengthening their national institutions and for the World Bank, which is working to become more flexible and efficient.

PowerGrid, one of the largest transmission utility companies in the world, establishes and operates regional and national grids to ensure the distribution of power across India. The World Bank has partnered with PowerGrid since its inception in 1989. Since 2005, PowerGrid has procured about 150 contracts under Bank financing worth around $2.7 billion.

Under APA, an implementing agency is assessed to ensure they have the right laws, regulations, capacity, and performance to meet the Bank's fiduciary requirements. PowerGrid was successful in this regard. This will be reflected in the financing agreement, where it is agreed that using PowerGrid's procurement arrangements is the best approach to deliver developmental objectives.

Every few years, PowerGrid will undergo a review to ensure the agency continues to meet the standards for alternative procurement arrangements.

Like the case of Bhutan, this is just the beginning. A number of other agencies are being assessed for the possible use of APAs, something that will help strengthen the national procurement systems in countries.

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Adani Group commissions 50 MW solar plant in Mahoba, UP

Adani Group, a well known integrated infrastructure conglomerate, revealed the commissioning of 50 MW solar PV plant in Mahoba, Uttar Pradesh, under the National Solar Mission Scheme, with an investment of Rs. 315 cr.

The technology used for setting up this plant includes String Inverter Technology, which is 1st of its kind in UP with crystalline silicon modules that allows miniature level control of solar power generation. The transmission line runs up to a stretch of 21.5 km. The power generated by this plant will be evacuated by 132 kv transmission line to UPTCL, Mahoba Substation under agreement signed with NTPC. Indirect and direct employment opportunities were created for a total of around 250 personnel, who worked diligently to achieve this feat, and employment opportunities will be provided through the generation period as well.

Jayant Parimal

Jayant Parimal, CEO, Renewable Energy Business, Adani Group, said, "We are delighted to have achieved the setting up of this plant, helping us prove our dedicated efforts towards nation building as well as showing our commitment to the government's green energy mission. We are moving closer to our aim of revolutionising the renewable energy sector in India. We would like to extend our heartiest gratitude to the UP government officials for their support and playing a huge role in helping us achieve the smooth commissioning of this plant."

BIAL partners with Bosch India to generate Renewable Energy for its operations

Bangalore International Airport Limited (BIAL) revealed the inauguration of its solar farms at the Kempegowda International Airport, Bengaluru. The first project of 440kW has been installed in the car park area in front of the BIAL corporate office, and the second project of 2.5MW solar panels at the airside. Both projects – jointly – will reduce carbon emission by 3125 tonnes per annum (3075 tonnes of CO2 emission per annum at the airside and 550 tonnes of CO2 emission per annum at the car park area). The project implemented by Bosch Limited, a well known supplier of technology and services and executed by the Bosch Energy and Building Solutions (BEBS) team in India, will generate approximately 4.4 Mio units of electricity, annually.

(L2R) Hari Marar, President, Airport Operations, BIAL and Soumitra Bhattacharya, President, Bosch Group India

World Resources Institute (WRI) India assisted BIAL in the techno-commercial evaluation of the bids for this project. WRI is an environmental research organisation that works closely with global leaders to turn big ideas into action to sustain the Earth's natural resources - the foundation of economic opportunity and human well-being.

Both projects were designed keeping in mind the uniqueness of their locations – the 440kW project located at the car park area has been designed to optimise land usage enabling the generation of more than 6 lakh units of power, annually, and double as a car park for about 160 cars; due to the proximity to the runway, the 2.5MW project has been additionally designed to sustain high wind speeds.

Rays Power Infra commissions a 5.5 MWp Solar PV equity project in Karnataka

Upholding its commitment towards the promising solar power market existing in Karnataka, Rays Power Infra, a well known Solar Energy Company, revealed that it has successfully completed a 5.5 MWp Solar PV equity project in the state. The project execution work was started in October'2016 while the project was commissioned in February 2017.

Spread over an area of 28 acres at Koppal District, Karnataka, the project was executed on turnkey basis right from the land acquisition till the commissioning. With this, the total portfolio of commissioned projects of the leading integrated solar power company crosses over 400 MW.

Sanjay Garudapally, Director – Business Development, Rays Power Infra, said, "Karnataka is an important market and strategic geography for us and we are fully committed towards catering to its requirements. The State has an ambitious renewable energy policy and we are focused on supporting their endeavor. On one hand, India is an energy deficit country coupled with high cost of electricity and on the other hand, customers are now increasingly acknowledging the importance of solar energy over other sources available today."

"Rays Power Infra has done the complete design, engineering, civil work, Installation process, testing and commissioning of the Solar PV project", he further added.


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Rural Electrification Corporation rings the LSE Opening Bell

Rural Electrification Corporation (REC) Limited, India's leading financier in the power infrastructure space, rang the opening bell at the famed London Stock Exchange.

REC's Green Bond is the first to be listed on the International Securities Market segment of LSE, through which REC has raised USD 450 millionfor tenure of ten years from the offshore market. The bonds have been issued at a yield of 3.965 %.

REC launched its maiden USD Green Bonds to become the first Indian PSU corporate to launch Green Bonds denominated in US Dollars, against the backdrop of green energy's enormous potential in the Indian power sector and the Indian Government's thrust on developing this space. The bonds have been offered under REC's existing USD 1 billion Medium Term Note (MTN) programme and have been listed on the London Stock Exchange as well as the Singapore Stock Exchange.

The Green Bonds have been certified by the Climate Bond Initiative, London while the 'Green Bond framework' formulated by REC has been verified by KPMG. The proceeds will be allocated for financing existing projects including re-financing and new eligible green projects in solar, wind, biomass and small hydro (less than 25MW), subject to availability of sector-specific technical criteria under Climate Bonds Standard.

ANZ, Barclays Bank, BNP Paribas, Mizuho Securities, MUFG Securities and HSBC are the Joint Lead Managers to the issue. EI

Siemens inaugurates showcase digitalised factory in India

Siemens India inaugurated its showcase digitalised Low-voltage Switchgear factory at Kalwa. The globally-benchmarked factory is capable of producing more than 180 variants at the rate of one product every nine seconds. The plant can manufacture over five million devices annually. Products at the plant communicate with machines and all processes are optimised for IT control, resulting in a minimal failure rate. The production methods deployed at the plant are expected to be a standard for small and medium-sized manufacturing units in India, achieving a visionary model for the future of manufacturing: end-to-end digitalisation where the real and virtual worlds merge in 'Digital Factory'.

The digitalised factory is proof of how adopting digitalisation will help Indian industry, specially small and medium enterprises (SMEs), achieve manufacturing excellence. SMEs can utilise digitalisation to address growing demands such as mastering increasing product and process complexity, reducing time to market, adapting to changing market requirements, deliver individualised products and secure continuous product improvement. The Low-voltage Switchgear factory at Kalwa Works has achieved end-to-end digitalisation across its value chain through Product Lifecycle Management software such as NX and Teamcentre, Totally Integrated Automation (TIA) Portal and manufacturing execution system. These solutions enable design of products, tools and equipment, master data management, automation, process simulation and product traceability.

Ashish Bhat, Executive Vice President and Head, Digital Factory, Siemens Limited, said, "The need for localising global products and adapting them to the local conditions has been the priority at Siemens in India. Digitalisation will help us engage with our customers and industry suppliers across the complete value chain. A key element in this evolution is an improved technological prowess and a world-class product manufacturing plant." EI

Tata Power's Maithon Power Limited installs Solar RO plant in Poddardih village, Dhanbad

Tata Power, India's well known integrated power company, has always prioritised the wellbeing of its surrounding communities and has simultaneously worked towards improving the quality of life and health of people living in and around its operational areas. In line with this philosophy, Tata Power's Maithon Power Limited (MPL), a 74:26 joint venture between Tata Power and DVC, recentlty installed a Solar powered RO water plant in the nearby village of Poddardih to help the community get access to clean drinking water.

The solar powered RO plant was jointly inaugurated by K. Chandrashekhar, CEO & ED – MPL; Chandrashekhar Agarwal, Mayor of Dhanbad; P. Thakur, Dy. Chief Executive Officer- MPL; Mr.PC Mondal MLA Sindri, Aparna Sengupta, Ex Minister, Govt of Jharkhand and Mithun Ravidas, Member of Zila Parishad. Before the inauguration all the dignitaries planted a sapling in nearby High School which was established long back in 1868.

The objective of this initiative was to provide the community with pure and safe drinking water thereby protecting them from water-borne diseases especially during monsoons. The solar powered RO plant is of a capacity of 1000litre/hour. This is the fifth solar powered RO plant established, commissioned and dedicated to the community by MPL team. The other plants are currently operational at Dumbhui village (at 2 places), Barbendiya and Pandra. The plant after inauguration will be handed over to the community, for having access to safe pure drinking water; it will be maintained by the village water user group which has been formed by the village community. On this occasion ED cum CEO MPL & Dy CEO MPL also assured the villagers that soon MPL will establish a computer class room in the 150 year old Rajkriya Poddardih High School which will make the rural students studying there computer literate. The dignitaries, students, teaching staffs and local community applauded this kind gesture of the leadership team of MPL. EI

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ABB extends medium-voltage DC breaker range

ABB introduces a new version of its high-speed bi-directional direct current (DC) circuit breaker, DCBreak, for rolling stock applications--covering 1500 V systems as well as protective metallic enclosures for the entire DCBreak family.

With this additional variant, ABB increases its market coverage in metro and light rail applications primarily operating at 1500 V. The 1500 V DCBreak design inherits its main features from the existing 750 V version, such as a small footprint, reduced weight, and ease of maintenance. The DCBreak is a 'plug and play' solution for simple replacement of the majority of circuit breakers currently available on the market, both for installation in the undercarriage as well as overhead, without the need for specific adaption.

It's predicted that about 60 % of the world's population will live in cities by 2030 which makes transportation by rail the sustainable and eco-efficient alternative to move goods and people as cities become congested and polluted

The use of cadmium-free contacts allows the new product to be RoHS compliant, while remaining on a par with the lightest comparable circuit breakers on the market.

With the extended DCBreak range, ABB has confirmed its willingness to provide to the rolling stock industry first-class products that are fully type-tested according to latest IEC 60077-3 and IEC 61373 standards, with ratings that meet customer requirements.

Moreover the optional protective metallic enclosure is fit for operation in highly aggressive and polluted environments. The design prevents severe damage in case of shock and risk of hazardous voltages on its external surfaces, while offering multiple customisation possibilities with regards to fixing points, glanding plates, low-voltage plugs or paint colours. EI

Siemens and AES join forces to create Fluence

Siemens AG (Siemens) and The AES Corporation revealed their agreement to form a new global energy storage technology and services company under the name Fluence. The joint venture will bring together AES' ten years of industry-defining experience deploying energy storage in seven countries with over a century of Siemens' energy technology leadership and its global sales presence in more than 160 countries. Combining the proven AES Advancion and Siemens Siestorage energy storage platforms with expanded services, Fluence will offer customers a wider variety of options to meet the challenges of a rapidly transforming energy landscape. The company will empower customers around the world to better navigate the fragmented but rapidly growing energy storage sector and meet their pressing needs for scalable, flexible, and cost-competitive energy storage solutions.

Siemens and AES will have joint control of the company with each holding a 50 % stake. Fluence's global headquarters will be located in the Washington, DC area with additional offices located in Erlangen, Germany and select cities worldwide. The transaction is expected to close in the fourth quarter of calendar year 2017, subject to regulatory and other approvals.

Fluence will operate independently of its parent companies, combining the robust capabilities and expertise from Siemens' battery-based energy storage solutions group under the Energy Management division with AES' subsidiary, AES Energy Storage. AES and Siemens are currently ranked among the leading energy storage integrators worldwide by Navigant Research. Together, the two companies have deployed or have been awarded 48 projects totaling 463 MW of battery-based energy storage across 13 countries, including the world's largest lithium-ion battery-based energy storage project near San Diego, California. EI

ENERCON returns to India in cooperation with local service providers

ENERCON, an innovation leader among international wind turbine manufacturers, is opening a new chapter in its collaboration with India. As a first step, the company has concluded non-exclusive cooperation agreements with three independent Indian service providers: Renom Energy Services, Kintech Synergy, and POWERCON Ventures India. All of them have extensive experience in the Indian wind energy sector. The objective of this cooperation is to support repair, maintenance and service of wind energy converters which have been set up with ENERCON technologies in India.

Under the cooperation agreements now concluded with Renom, Kintech, and POWERCON, ENERCON supplies original spare parts to the three service partners and provides them with comprehensive technical support as well as training for their engineers. ENERCON also assures the availability of special tools necessary for wind turbine maintenance in India. The company has already begun to deliver original spare parts from Germany to its Indian service partners.

Hans-Dieter Kettwig, Managing Director of ENERCON, said, "ENERCON is committed to support quality services for Indian wind turbine operators who rely on our technologies and seek service reliability, proven maintenance capability and need spare parts. Together with our Indian service partners, we will protect the interests of wind park owners, investors and banks which finance wind energy projects in India."

More than 6700 wind energy converters in India are based on ENERCON technologies. They have a combined electricity generation capacity of 4.8 Gigawatts, making them systemically relevant for India's energy security. However, lack of maintenance and spare parts have already caused hundreds of these wind turbines to cease operation. This impacts India's electricity supply and creates risks for wind power producers, wind park investors, and banks financing them. EI

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ReneSola awarded 5MW of solar projects in Thailand

ReneSola Ltd (ReneSola), a well known fully-integrated solar project developer and provider of energy efficient technology products, revealed that it was awarded 5MW of agricultural projects in Thailand.

The Energy Regulation Commission in Thailand unveiled project winners, which were selected by a lucky-draw system. Winners participate in a power purchase scheme featuring ground-mounted solar farms specific to certain governmental agency and agricultural cooperative programs. Of the projects awarded, 119MW are agricultural cooperative projects and 52MW are government agency projects.


Xianshou Li

All of the projects are eligible for a guaranteed tariff of Thai Baht 4.12/kWh. The projects are all expected to be connected to the grid by December 31, 2018. The electricity generated from the projects will be sold to the local utility under a 25-year purchase agreement.

Xianshou Li, Chairman and Chief Executive Officer of ReneSola, said, "We are excited to further develop our project business in Southeast Asia, which is a high growth market for solar power. This program is an example of the innovative ways that the Thai government is encouraging the development of renewable power in their country. We look forward to further supporting solar deployment in Thailand and other Southeast Asian countries."

Sterling and Wilson scales new heights

Sterling and Wilson, one of the dominant global forces in the solar PV space, has bagged Turnkey Engineering Procurement and Construction-- along with Operation & Maintenance contract for the world's largest single location solar PV plant in Sweihan, Emirates of Abu Dhabi. The project will deliver a capacity of 1177 MWp, easily surpassing the current largest 850 MWp single location plant in China.

With construction already underway, the prodigious plant, which is spread over a desert area of 7.8 sq. km, is scheduled to be fully integrated with the grid in a record timeline of just 23 months. To top it all, the project was awarded at the lowest ever recorded bid in the history of PV solar.


Bikesh Ogra

The plant is jointly developed by Marubeni, a Japanese integrated trading and investment giant, along with Jinko, a global leader in the solar industry, and Abu Dhabi Water and Electricity Authority (ADWEA). The consortium has successfully bid a tariff of USD 2.42 cents per kilowatt hour, marking the lowest cost ever for solar power. This is a positive demonstration of the promising future of clean energy, reducing the dominance of fossil-fuel-backed power plants.

The prestigious project will play a major role in the Emirates of Abu Dhabi achieving its aim of sustainability and energy diversification.

The plant, once commissioned, would save around 7 million tonnes of carbon emissions every year, a number that would be a national landmark. To put it in perspective, 1177 MWp can power around 1, 95,000 homes, thus contributing to the welfare of the current as well as the future generations of the people of the UAE.

Bikesh Ogra, President – Renewable Energy, Sterling and Wilson, said, "We are fully geared and very excited to be a part of this important milestone in the global solar market. The strongest contributor to this tariff is the capital expense driven by lower equipment cost and a highly efficient system design. Our unique design offerings and state-of-the-art robotics optimises the yield and performance of the plant."

Wärtsilä to supply main equipment for a 240 MW power plant to Indonesia

The national utility of Indonesia, PT PLN (Persero), has appointed a consortium between PT WIKA and TSK Electronica Y Electricidad S.A. to deliver a peaking power plant in Lhokseumawe, Aceh, North Sumatra, Indonesia. The power plant will be powered by 13 Wärtsilä 50SG engines, operating on natural gas and providing an output of approximately 240 MW. Wärtsilä will deliver gensets and performance related equipment to TSK. The order is booked for the second quarter of 2017, while the first deliveries are expected in 2018 and the power plant is expected to be fully operational in the first half of 2019.


The agreement was signed by Francisco Martín, Managing Director – Power and Industrial Plants, TSK, and Javier Cavada, President of Wärtsilä Energy Solutions

The Sumbagut-2 Peaker Power Plant will be the largest peaking power plant with Wärtsilä technology in Indonesia and will be located next to the existing PLTMG Arun power plant that was delivered by Wärtsilä and PT WIKA in 2015. In addition, this will be the first Wärtsilä power plant in Indonesia using the Wärtsilä 50SG engines.

Robert Stoor, Business Development Manager, South East Asia, Wärtsilä Energy Solutions, said, "This project is a significant step to establish a new business relationship with TSK for future endeavours and at the same time further nurture the long term relationship between PLN and Wärtsilä. Wärtsilä has a strong commitment to develop efficient power supply in Indonesia and enable a transfer to a more sustainable, affordable and reliable power system."

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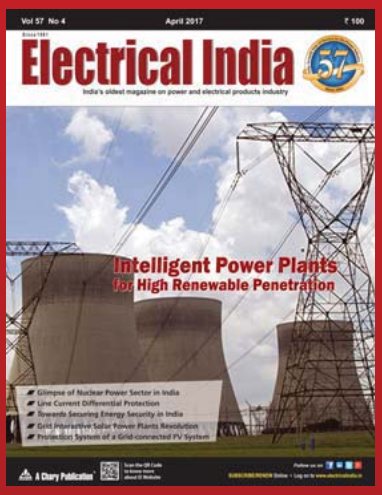

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A.A.Phadke, IRSEE takes over as Chief Electrical Engineer, South Central Railway

A. A. Phadke has taken charge as Chief Electrical Engineer, South Central Railway. He belongs to the 1982 batch of Indian Railway Service of Electrical Engineers (IRSEE).

Before taking over the charge of new assignment, he served as Chief Electrical Services Engineer and Chief Electrical Loco Engineer, South Central Railway.

A. A. Phadke has done M.Tech from IIT/Madras in 1983. He joined the Indian Railways as Assistant Electrical Engineer in South Central Railway after completion of probation. He held various posts in Senior Scale, JAG/SG Grades over Indian Railways. He was promoted to Senior Administrative Grade in December, 2004 and worked in various capacities like Additional Divisional Railway Manger, Pune, Senior Professor/IRIEEN/Nasik, Chief Workshop Manager, Traction Machine Workshop, Nasik.

A. A. Phadke

During his career spanning over 33 years, he had worked in all the fields of Electrical department at various places.

Enel's CEO Francesco Starace new President of EURELECTRIC

The EURELECTRIC Board of Directors elected Francesco Starace, Chief Executive Officer and General Manager of Enel, Europe's largest power utility per market capitalisation, as the new President of the association on a two-year mandate.

Before taking the helm of Enel as CEO and General Manager, Francesco Starace was Chief Executive Officer of Enel Green Power between 2008 and 2014.

Upon taking on the role of the Presidency of EURELECTRIC, he said, "The energy sector is going through a radical transformation driven by disruptive technological innovations and the fight against climate change. Electricity plays a key role in tackling the challenges of this energy transition by fostering the full integration of renewables, progressive electrification of the economy, and the deployment of digital technologies.

Francesco Starace

My main objective as President of EURELECTRIC will be to work together with all the key actors of the industry in order to achieve these goals, whereby ensuring the competitiveness and sustainability of the power sector."

S N Subrahmanyan assumes office as CEO and MD of L&T

S.N. Subrahmanyan stepped into his role as CEO and Managing Director of Larsen & Toubro since July 1, 2017.

This followed his appointment to the role by the Board of Directors of Larsen & Toubro at its meeting held on April 7, 2017. Prior to this Subrahmanyan was the Deputy Managing Director and President of the Company.

At the meeting on April 7, 2017, the Board had also requested A.M. Naik, Group Executive Chairman, L&T, to provide guidance and mentorship to the Company's leadership subsequent to his current term. Consequently Naik will continue as Non-Executive Chairman of the Company for a period of three years effective October 1, 2017.

S. N. Subrahmanyan

Subrahmanyan joined the construction business of L&T in 1984 as a project planning engineer after completing a degree in civil engineering and post-graduation in business management. His ability to develop innovative solutions in the construction and infrastructure space has seen him rise rapidly up the leadership rungs of the Company. He successfully helmed L&T's largest infrastructure projects including new airports in major cities, metro, and freight corridor projects across India and expansion of operations in international geographies. The L&T Construction business has grown multifold under his leadership to rank among the top 25 global contractors and by far the largest EPC player in the country. In 2011, Subrahmanyan was inducted into the L&T Board.

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Duke Energy receives top award for supplier diversity

The Edison Electric Institute (EEI) has awarded Duke Energy the top honour in the electric utility association's 2017 Business Diversity Awards program.

The annual awards program recognises companies for their efforts in advancing purchasing opportunities for diverse suppliers, including minority-, female-, veteran- and LGBTQ-owned businesses within the electric power industry.


Swati Daji

Duke Energy earned the industry's overall Excellence Award for its efforts to improve business diversity and inclusion. The company developed an innovative approach to relationship-building by hosting several business development events in 2016 and promoting the personal and professional development of supplier representatives.

The company also sponsored various educational workshops, industry seminars, and other activities presented by partner community economic development organisations.

Duke Energy continues to proactively seek diverse suppliers. These efforts have made lasting positive effects on economic development locally, regionally, and nationally.

Duke Energy's Senior Vice President and Chief Procurement Officer, Swati Daji, said, "At Duke Energy, we value diverse skills, experiences, perspectives and backgrounds, and understand how important diversity and inclusion is in powering the lives of our customers and the vitality of our communities. We are honoured to be recognised by our industry for our business diversity achievements with our suppliers."

Rice computer scientist wins NSF CAREER Award

Rice computer scientist Anshumali Shrivastava hopes to come up with clever algorithmic strategies to enable faster, more scalable computations required by big data and machine-learning technologies – thanks to a new CAREER Award from the National Science Foundation.

CAREER awards support the research and educational development of young scholars likely to become leaders in their fields. The five-year grants, which are among the most competitive awarded by the NSF, are given to some 400 scholars each year across all disciplines.


Photo Credit: Patrick Kurp
Anshumali Shrivastava

Shrivastava earned an integrated M.S. and B.S. in mathematics and computing from the Indian Institute of Technology, Kharagpur, in 2008 and a Ph.D. in computer science from Cornell University in 2015, the same year he joined the Rice faculty.

Vikram Solar modules among the top performers of 2017

The quality of the photovoltaic modules manufactured by Vikram Solar has convinced the authors of the PV Module Reliability Scorecard Report 2017. Vikram modules were ranked among the best products in three of the five categories tested in the report. The report is published by the leading global certification body DNV GL.


Ivan Saha

The DNV GL Module Reliability Scorecard Report has been published for the third time. This year's edition saw products from 22 module manufacturers undergo comprehensive testing in five categories. The report aims to deliver well-founded information on the long-term reliability of solar modules.

Vikram modules scored above average in highly accelerated stress tests of dynamic mechanical load and damp heat at high ambient temperatures, as well as under humidity freeze tests which represent frosty conditions in regions of Europe, North America and Asia. Such aggressive tests can have a detrimental effect on the lifespan of solar modules. Damp heat prevails in many of the sub tropical countries where Vikram markets its solar modules. Similarly, dynamic cyclic loads are often caused by wind or snow, and can lead to cell cracks and other damage in extreme cases, especially in high windy regions of the world.

Ivan Saha, BU Head - Solar Manufacturing of Vikram Solar, said, "Long-term functionality of solar installations is becoming more and more important in order to create differentiation with our competitors. Optimal manufacturing operations without defects and malfunctions helps to guarantee that every module that comes out of our factories have the same class leading reliability features as demonstrated by the modules tested in DNV GL labs. With our modules, customers can be confident their solar power plants will run for a long time without any problems. It is clear that our investments in state-of-the-art production technology and our quality strategy are really paying off."

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ICRA Predicts Strong Outlook for RE

The improving cost competitiveness for Renewable Energy players has been driven mainly by competitive bidding process followed as well as a significant fall in photovoltaics (PV) module price levels over the last three year period for solar players...

The long-term demand outlook for renewable energy (RE) is strong aided by favourable policy support from the Government of India and the state governments of key states as well as an improving tariff competitiveness of wind and solar power. The improving cost competitiveness for RE players has been driven mainly by competitive bidding process followed as well as a significant fall in photovoltaics (PV) module price levels over the last three year period for solar players.

Sabyasachi Majumdar, Senior Vice President & Group Head, ICRA, says, "Even under a conservative assumption of overall Renewable Purchase Obligation (RPO) at 15.0% (comprising 10% non-solar RPO and 5.0% solar RPO) by FY2022 on an all India basis, the incremental cumulative RE requirement for the period FY2018-FY2022 is estimated at 65 GW, which is quite significant. Within this, ICRA estimates the share of wind and solar energy capacity addition requirement to be at least 35% and 55% respectively."

Given the strong pipeline of projects awarded in the last 12-month period, ICRA expects solar capacity addition of 7-7.5 GW in FY2018, which is likely to be higher than the wind energy capacity addition. In case of the wind energy segment, the capacity addition in the near term will be critically dependent upon the finalization of bidding plans by distribution utilities and the Ministry of New & Renewable Energy (MNRE).

On the flip side, the sector continues to face regulatory challenges related to RPO norms and its compliance, continuing delays in payments from distribution utilities and risk of forced back down by the utilities in a few states. Nonetheless, some easing in release of payments has been observed in few states in the recent months, with the implementation of the Ujwal DISCOM Assurance Yojana (UDAY) scheme. This apart, while falling tariffs improve demand outlook, they also affect the cost competitiveness of pre-existing RE projects as well as the project economics of new projects. The viability for the winning bidders from the credit perspective would depend upon availability of long tenure debt at cost competitive rates, plant load factor (PLF) levels and their ability to meet the budgeted costs.

"The RE projects in few states are facing issues with tariff renegotiation requests by utilities in view of the falling wind and solar tariffs under competitive bidding. However, such renegotiation is unlikely given that there has been a precedence of regulatory ruling in favour of the developers in such cases. Nonetheless, such RE projects may remain exposed to risk of forced back-down by utilities, especially, in case of purchase power agreements (PPAs) wherein tariff is significantly higher than average power purchase cost of the respective state owned distribution utilities", Majumdar added.

Going forward, the timely alignment of RPO trajectory in line with targets specified by the Ministry of Power along with improvement in RPO compliance remains extremely crucial for achieving the 175 GW RE capacity target set by the Central Government. Moreover, a fundamental improvement in the financial position of the distribution utilities remains important in the long run, which is dependent upon their ability to curtail distribution loss levels in line with targets and tariff adequacy. EI

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Electricity Grid
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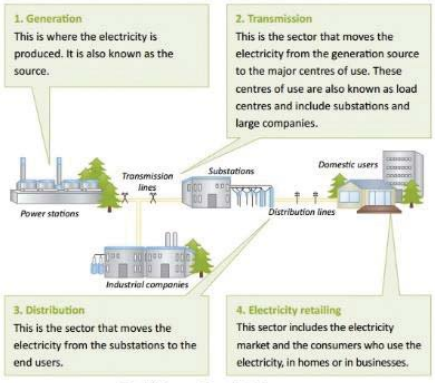
Er. K S Sidhu

Former Director Research PSPCL (Punjab), Certified Energy Auditor & Fellow of The Institution of Engineers India

To meet the needs of India's growing economy, providing reliable, affordable and sustainable energy requires exploring a range of options. One of the most important requirements is reinventing the grid with the introduction of grid intelligence and communication systems for its secure and efficient operation. This paper is an attempt towards grid redesign to meet the requirements of the transforming energy sector in India.

India has significant challenges in the power sector. The country is home to about 25% of the worldwide total of 1.4 billion people who lack access to electricity apart from growing centres of electricity consumption. There is also a massive demand-supply gap aggravated by delays in capacity addition and inefficiencies, especially, in network segments. For fulfilling huge power demands, number of generating stations – hydro, thermal, atomic (conventional) and solar and wind etc. (non-conventional) are being created. Depending upon the availability of resources, these stations are constructed at different places. So, it is necessary to transmit these huge power blocks from generating stations to their load centres. The power transmission system is a complex network. Power generated at voltage levels of 11to 33KV, has to be stepped up to high/extra-high voltages (220/400/800KV-AC) and then again reduced in stages to lowest distribution voltage level of 240/415 volts. Typical power system network is shown in the figure.



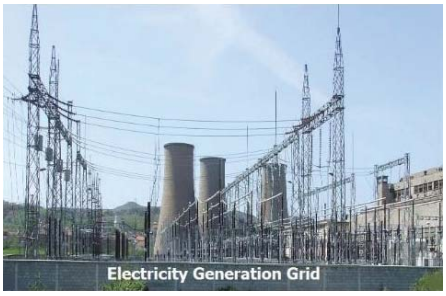
Typical Power Supply System

For maintaining these voltage levels and for providing stability, a number of transformation and switching stations have to be created in between generating station and consumer ends. These transformation and switching stations are known as substations or grid substations or electricity grids. It is these grids that are required to be developed to achieve reduction in system malfunctions as well as reduction in the meantime to repair. Consequently, outage times

shall be reduced leading to a significant decrease in the energy losses.

Electricity Grid

The electricity grid has grown and changed immensely since its origins, when energy systems were small and localized. With the passing of time, rising electricity consumption, new power plants and increasingly decentralised generation (DG) of electricity from renewable energies require grid expansion. However, simply expanding the grid, as it is constructed now, would be highly inefficient. The wildly fluctuating power feed-in from renewable energies (sun, wind) into the entire power grid occasionally leads to unforeseeable power flows, which can affect grid stability. Furthermore, the liberalisation of the electricity market in India has led to an increase in electricity trading. Short-term trading activities and the associated transmission of electricity over long distances represent an additional challenge for the grid. Due to the nature of the changes, the grid needs to be partially reinvented and automated. Grid intelligence and communication is required for grid operation to meet the requirements of the transforming energy sector. Nevertheless, data measurements from various places and various levels in the grid are necessary to enable the utilities to monitor everything that happens on a real time basis (or to start with, on a daily, hourly or quarterly basis). The utilities then can take actions more accurately, effectively and swiftly, improving the energy services. Electricity grid is shown in the picture.



Electricity Generation Grid

Present State of Grid Automation

Developed countries have already automated their complete power supply system and their grids are remotely controlled. On the other hand, even after having edge in IT skill, India is way behind in automation. What to talk of existing grid network automation, even the new grids (especially, by states) are being constructed with old and outdated technology without any intervention of automation. Centre Government's initiative of providing funds for automation & improvement under ARPDC scheme are either unutilized or are invested haphazardly in IT that resulted in issues such as:

- Stand-alone systems-Coverage to limited geographical areas
- Inadequate interface and integration with other applications
- Absence of a standard architecture
- High cost of maintenance
- Basic operations are still manual without inbuilt controls

These issues have adversely affected the returns from IT investments. Incoherent technology strategy leads to situations where incompatible options are selected and large sums of money are wasted in attempts to integrate them. The bottom line is that the business performance has not improved. Power sector expenses and revenue yield is depicted in Fig. 1:

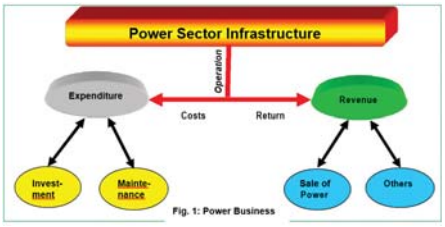


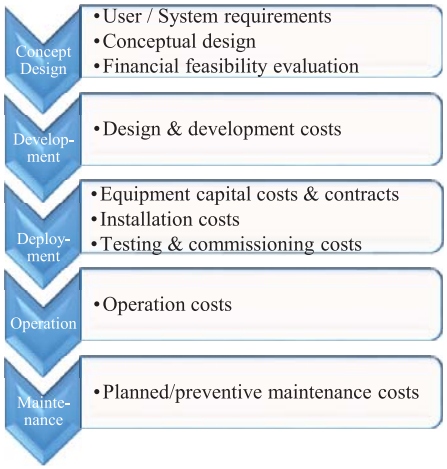
Fig. 1: Power Business

Evidently, fundamental changes are required in the working of the power sector entities. Information Technology (IT) would become the key enabler in the initiatives under the reform process initiated by Government of India. This will enable substantial improvement in the overall health of the utilities.

Automation Roadmap

It is absolutely clear that all the grid substations can't be automated in all power sector utilities in one go because of the enormous magnitude of the effort and investment required. The approach, therefore, should be to give priority to generation and extra-high voltage level grids, especially, those linking inter-state power systems. Nevertheless, the overall blue print of IT architecture of complete power system network (transmission system in particular) must be prepared and kept in view so that in the final phase all applications must be integrated easily and the hardware requirements are also minimized.

Different phases of automation project are portrayed in Figure 2 (there is no scope to explain these phases in this paper)



Ownership of IT Components

Utilities need to assess to what extent they will buy, deploy and operate the solutions on their own.

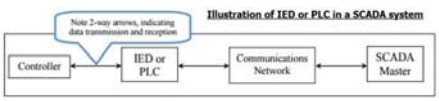
The main components to be considered for ownership are:

- Software licenses
- Infrastructure-Network and
- Hardware People and skills.

Substation Automation System (SAS)

In SAS, the various quantities (e.g., voltage, current, switch status, temperature, and oil level) of various equipment are recorded, using a data acquisition device called Intelligence Electronic Devices (IED). IED can establish communication between remote sensors and controllers and the communications network. An IED differs from a Programmable Logical Units (PLC) in that a single IED can control several different aspects of a piece of equipment so that the entire piece of equipment works in harmony with the rest of the needs of the system and within established design parameters.

A key difference between the Remote Terminal Unit (RTU) and the IED, is the same as that of the RTU and PLC, and it is illustrated in the Fig: 3.



In this figure, note that the machine language, and hence the data, moves in both

directions, thus, allowing for not only data acquisition, but also control. IEDs receive data from sensors and power equipment, and can issue control commands, such as tripping circuit breakers if they sense voltage, current, or frequency anomalies, or raise/lower voltage levels in order to maintain the desired level. Common types of IEDs include protective relaying devices, On Load Tap Changers, circuit breaker controllers, capacitor bank switches, recloser controllers, voltage regulators etc. These system quantities are transmitted on-line to the remote control room through a variety of communication media. The media could be either wireless or wired. The measured field data are processed in the control room for display of any operator selected system quantity through Graphic User Interface (GUI). In the event of a system quantity crossing a pre-defined threshold, an alarm is automatically generated for operator intervention. Any control action (for opening or closing of the switch or circuit breaker) is initiated by the operator and transmitted from the remote control room through the communication channel to the RTU associated with the corresponding switch or circuit breaker. The desired switching action then takes place and the action is acknowledged back to operator for information.

SAS Architecture

SAS is dedicated to the monitoring and protection of the critical equipment of a substation and its associated lines or feeders and also generates MIS data, reports and graphs etc from remote control centre, station HMI as well as from local bay controller IED. Traditionally, the functionality of SAS has been logically allocated on three distinct levels called the station, bay and process levels classical hierarchical system architecture.

- The bay level or field bus functionality is concerned with coordinated measurement and control relating to a well-defined sub-part of a substation (usually denoted as a bay - comprises of one circuit breaker and associated isolator, earth switches and instrument transformer). Data that comes from the sensors and is sent to actuators due to the special temporal requirements needed, is transmitted over the field buses. These are buses where operation is done in real time, and are designed to support a high traffic of limited messages in the form of orders and status data. They are buses with low transmission rate and cable length. These buses are typically proprietary one, but lately some open buses have also been developed.
- The process level or control bus functionality is more or less an interface to the primary equipment. Typical functions specified at this level are data acquisition (sampling) and issuing of I/O commands. The communication between process control devices and/or between personal computers with SCADA/HMI application is usually performed over another type of bus, known as control bus. Control buses have higher transmission rates and more relaxed temporal restrictions than field buses; the network reach is also wider than on field buses.
- The topmost station level is the control centre or the information bus with HMI that protects and controls the entire substation and provides linkages to remote control centres. These systems need to deal with a greater data load. These buses are known as information buses. Information buses are designed to support a high load of information, but are more sensitive to data such as status and control messages arrival of which can't be delayed.

Figure 4 below shows three level network architecture:

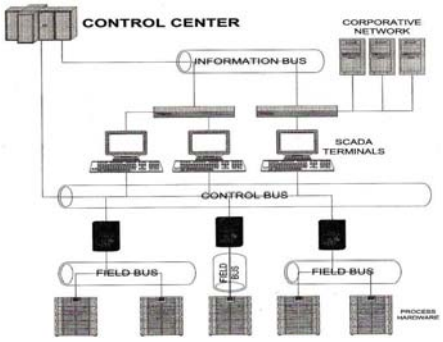


Figure 4: Typical buses on SCADA systems

The data exchange between the electronic devices on bay and station level shall take place via the communication infrastructure. This shall be realized using fibre-optic cables. Data exchange is to be realised using IEC 61850 protocol with a redundant managed switched Ethernet communication infrastructure. The communication shall be made in 1+1 mode, excluding the links between individual bay IEDs to switch, such that failure of one set of fibre shall not affect the normal operation of the SAS. The installation of IEDs for control and protection of different equipments at a 132/11KV substation is shown in Figure 5 as an illustration.

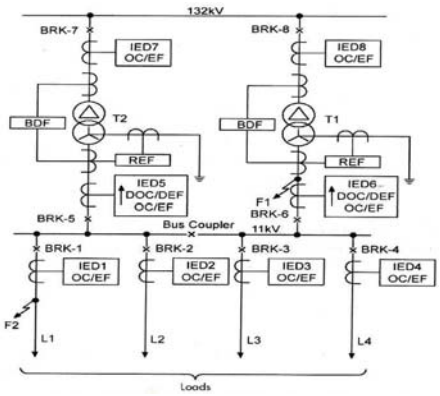


Figure 5: Single Line Diagram of a typical 132/11 KV Grid Substation showing IEDs

Abbreviations: OC: over current relay, DOC: directional over current relay, EF: earth fault relay, DEF: directional earth fault relay, BDF: biased differential relay, REF: restricted earth fault relay, BRK: circuit breaker, T1, T2: transformers, IED: intelligent electronic device.

Specifications & Design

The SAS specifications and design must fulfill the following conditions:

- The system should be totally open on its architecture, software, technology and it must comply with the latest standards.
- Operating system software should be industry-standard, off-the-shelf software. It should provide a window based full graphical user interface (GUI) environment.
- The system must include all required communication protocols as part of its library of protocols (DNP3.0, Modbus, IEC-60870-5-101/104 as communication protocol between Host Computers & IEDs & for transfer of data from Grid's real time database to the existing SCADA system. IEC 60870-5-104 may be preferred to IEC 60870-5-101. IEC-61850 for LAN communications, ICCP, etc.). There should be no need for an external protocol converter (hardware) or internal (third party driver – software). The SCADA/EMS System of the Center and the Information Systems of the State will collect information

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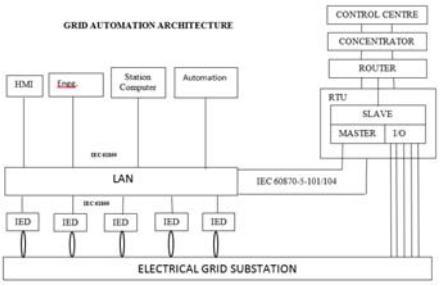
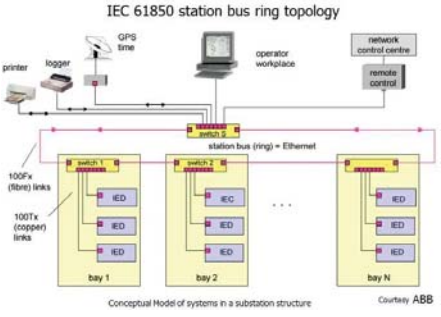
in parallel from the field and will be able to exchange data by means of a direct link using the ICCP protocol.

- The system should not have any limitation on the type (power line carrier, microwave, optical fibre, VSAT or leased line) or number of communication lines, so it will be capable to handle as many communication lines as needed by the end user whether they are serial or over TCP/IP.
- No additional licensing and software upgrade must be required to increase the number of communication lines for protocols already available on the SCADA systems.
- The system must be able to grow to handle an unlimited number of Intelligent Electronic Devices (sub-stations RTUs, Meters, Protection Relays and Controls etc.), an unlimited number of local and remote operator and engineering workstations, unlimited number of zone groups (areas of responsibility) with ability to enable/disable events and sufficient data; without any need for software or hardware upgrade or expansion or having to pay any additional licence-fee.
- The system must be capable of communicating with other systems/servers such as SCADA, DMS or EMS no matter what type or model those systems are (any vendor) by means of the use of ICCP (Inter Control-Centre Communication Protocol – TASE.2) without any additional license fee or having to expand/upgrade the hardware/software of the SCADA system.
- The system should include Data Exchange facilities that allow to exchange real time, historical, operations and events information to/from any relational databases (i.e. MS Access, MS SQL Server, Oracle, Sybase, etc.), directly from/to the SCADA database. This data exchange capability must be available bi-directionally (to/from the SCADA system).
- The system must be able to notify any alarm condition identified by the system remotely by means of any commercial paging system, e-mail or SMS (Short message Service).
- The system must include tools to exchange any type of information available within the SCADA system (real time, historical, operations, events, etc.). It should include functions of master/slave alarm hierarchy, storm alarm suppression and on line editing. The alarms and events shall be time-tagged with a time resolution of 1 ms. All recorded data from the IEDs with integrated disturbance recorder as well as dedicated disturbance recording systems shall be automatically uploaded (event triggered or once per day) to a dedicated computer and be stored on the hard disc.
- System must be able to generate trend and historical measured and calculated reports on real time and time interval basis (half hourly, daily, weekly, monthly, semi-yearly and yearly) with display facility.

Allowing ease of access for Central and State staff to gather necessary information from anywhere in the electricity network using web services subject to security controls consistent with international standards and best industry practices. In order to support remote control the development of a communication backbone connecting all the substations under the states' management is a fundamental requirement. Fully digitalized substations, remote terminal units, remote operation and supervision represent the key elements for the success of SAS initiative.

In particular, protocol IEC 61850 to be assumed as a base reference for the allocation of functions and communications, whilst the communication with the remote centre can be performed using protocol IEC 60870-5-104.





Conceptual models of grid substation architecture are also shown in Fig: 6 and picture, highlighting the basic systems and equipment involved; the two protocols used for communication are also indicated.

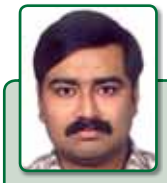
Cyber Security

Enabling geographically-dispersed sites to freely exchange information and messages is a boon to business productivity. However, the data is traveling unprotected over an open network where it is vulnerable to hackers and others. Therefore, cyber security is an important criterion for a secure, efficient and reliable operation of the Automated Grid. The most important goal of cyber security is the protection of all relevant assets in grid substation from any type of hazards such as deliberate cyber security attacks, inadvertent mistakes, equipment failures, information theft and natural disasters. In order to achieve an adequate level of protection, security objectives such as confidentiality, integrity, availability and privacy must be assured by the implementation of security controls.

Conclusion

Reinventing, expanding and interconnecting power grids have proven to be economically desirable. In developed countries, billions of dollars are presently being saved through buying, selling and wheeling power between neighbouring utilities and countries. In India too, electricity is being traded within the states. However, present power systems are based on concepts that haven't reformed much in a century: to generate power, step up the voltage, transmit power, step down the voltage and distribute power. Due to numerous small scale generating plants (DG), upsurge in dependency on electricity and increasing demand of electricity, power system has become intricate and is becoming complex day by day. Limitations of space for electrical installations, rights of way constraints for new line routes, environmental concerns; all demand newer and more advanced alternatives to more effectively manage the power supply system. As on today, with all the latest technologies in place, there is no security of electricity supply; brief and widespread blackouts are possible, albeit rare.

Power Factor Compensation & Harmonic Filtration in Integrated Steel Plants



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Power factor compensation and harmonic filtration in integrated steel plants is a tool to reduce stress in electrical system. The paper focuses on energy efficiency issues and advantages with compensation and harmonic filtration. The paper presents comparative study of compensation requirement in various steel plant units. It would be interesting to find that requirement is the most in Rolling Mills, BOF, CCP, BF & Sinter Plant. In fact the entire steel plant is energy guzzler and with advent of drives, automation and precision requirement, fanning out electrical system stress has become more important and crucial...

Power factor is necessarily present in any electrical system. It is defined as cosine of the angle between the current and the voltage. As the power factor decreases, the kW delivered by any electrical motor decreases, simply meaning for the same kVA, delivery of kW shall be less as power factor decreases.

This not only decreases output, but also leads to various mechanical stalling. Electrical system unnecessary gets burdened to meet supply of increased kVA for same kW. The electrical system then needs to be designed for higher current capacity for no gain. Also electricity utility bills also increases.

Stress, causing electrical system to heat up and wear out soon, increased power consumption gives financial impact besides national loss, as power production is always finite.

To annihilate the same, capacitors are used preferably at load end to correct the power factor and keep it as close as unity. Even electrical utilities reward the plants with better power factor and impose penalty when power factor reduces beyond certain prescribed value. In Rolling Mills of all sectors, whether primary or secondary steel, the power factor correction requirement and its benefits become more grossly visible because of large quantum of power being consumed.

Besides power factor, presence of harmonics plays a vital role in degrading the electrical system, hence, negatively affecting the plant performance. Harmonics are concern in the management of electrical system. Designers are required to pay more attention to quality power, energy efficient and reliable system. Because of variety of load requirement, especially in mills, with multiple periodic or non-periodic impacts, the electrical system has to employ advanced electronics devices. These electronics devices,

though capable of precise process control and energy savings benefits, bring in a drawback to disturbance in electrical system, called Harmonics.

Designers' Concern in Power Factor correction and Harmonic filtration in Integrated Steel Plants

The amount of power handled in steel plants is enormous. Because of bulk load handling along non-linear loads, the concern becomes more as the stress increases.

Following is the tabulation depicting the maximum demand of various units of an integrated steel plant power distribution system:

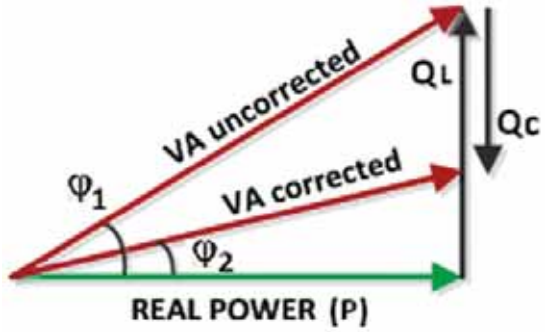
Area Of load Centre	Bus Voltage of Switchboard	Maximum Demand (MVA)	P.F.
Sinter plant	11KV	24	0.85
	6.6KV	3	0.85
Flux Crushing & Screening	6.6 KV	6	0.85
Ore Handling Plant	6.6 KV	10.5	0.85
Coal Handling Plant	6.6 KV	9.3	0.85
Coke Oven Battery & By product Plant, CDCP, Coke Sorting Plant	11 kV	1.5	0.85
	6.6KV	11	0.85
Blast Furnace	11 kV	31	0.8
	6.6KV	10	0.8
Raw Material Plant (Lime Calcinations & Dolo plant)	11kV	13	0.85
Basic oxygen Furnace	11 kV	44	0.85
	6.6KV	3.5	0.85
Continuous Casting Plant	11 kV	40	0.85
	6.6KV	6	0.85
Bar & Rod Mill	11 kV	68.4	0.80
BRM – Water Treatment Plant	6.6 kV	18.5	0.8
URM – Water Treatment Plant	6.6 kV	6.4	0.8
Universal Rail Mill	11 kV	57.6	0.8
Intake & Make-up Water Pump House	6.6 KV	3	0.8
Make-up Water Pump House	6.6 KV	6	0.8
Data are of an Efficient Integrated Steel Plant. The other Steel Plant data may differ depending on capacity and respective unit sizes and end products.			

It is now evident from above table, Sinter Plant, Blast Furnace, Basic Oxygen plant, Continuous Casting Plant and Mills are the prime energy guzzlers. Since non-linear loads are more evident in Blast Furnace and Mills, Harmonics also plays major role.

The incentive to improve power factor to unity is very much evident now. Due to Quantum of Power handled with most precise electronics system in automation and control, Harmonic distortions become very much evident. Arresting the same and maintaining system reliability is an imperative requirement.

Capacitor banks are installed for each bus system. The capacity of capacitor banks (kVAr) are derived as follows:-

KVAr = kW (tan Ø1- tan Ø2)



Where Ø1, Ø2 are the inverse cosine of existing and desired power factors respectively. KW is the power in kilo Watts for existing power factor (Cos Ø1).

To achieve power factor of 0.98 in various major units, following compensation is arrived:

Units	MVA	MW without Compensation	Compensation (MVAr)	MW With Compensation
Sinter Plant	24	19.2	9.5	23.52
Blast Furnace	41	32.8	17	40.17
BOF	47.5	38	19.3	46.51
BRM	68.4	54.72	34.4	67.02
URM	57.6	46.08	25.5	56.44

Hence, for same MVA, there is much gain in MW availability after power factor correction to 0.98. It can be summarily noted that after one time

Figure 1: Typical Capacitor Bank Installation

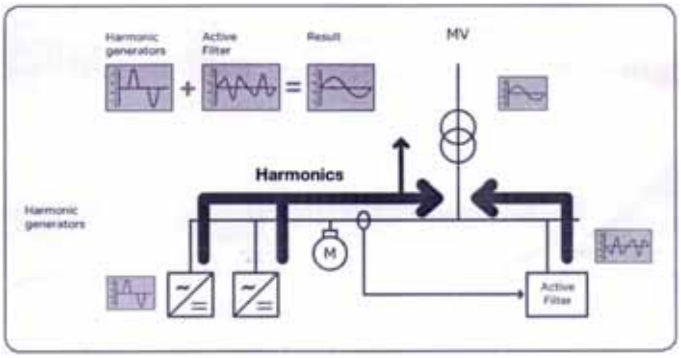


Figure 2: Typical control circuit

installation of capacitor banks of 105.7 MVAr there is increased availability of 43 MW (Demand Equivalent to demand of BOF or Mill, or even more than Blast Furnace).

Harmonic Filtration

Harmonics: Origin, Effects and Consequences

Harmonics currents are caused by non-linear loads connected to the distribution system. A load is said to be non linear when current it draws does not have same wave shape as the supply voltage. The flow of harmonic current through the system impedances causes voltage distortion in the distribution system. Following are the major Harmonic generators:

- Industrial Processes viz, Welding, Impact Loads, Induction Furnaces, Battery Charger, DC Power Supplies
- Variable speed Drives for AC & DC motors
- Uninterrupted power Supplies
- Office Equipment (PCs, Printers, Servers, displays etc.)

Harmonic currents increase the RMS current in electrical systems and deteriorate the supply voltage quality. They stress electrical network and potentially damage the equipment. They may disrupt normal operation of devices and increase operating costs.

Symptoms of problematic harmonic levels include overheating of transformers, motors and cables, thermal tripping of protective devices and logic faults of digital devices. In addition, the life span of many devices is reduced by elevated operating temperatures.

Mitigation of Harmonics

In the state-of-the-art ever evolving electrical technology, active front end is used in all the drives being used in Mills, Cranes and Welding Process.

These electronic power quality devices are designed to measure the load current, calculate variance from objectives set in the Mill and inject the right amount of current to meet the required level of harmonics, displacement power factor or load balancing.

When harmonic mitigation is required, the logic measures the load current and calculates the harmonic current spectrum, i.e the amplitude and phase angle for every harmonic to as high as 50th order. The control signal is generated and semiconductors (IGBT) are directed to duplicate the control signal as injected into the supply. This reduces the supply side Harmonics. The typical control circuit is shown in figure 2.

The achieved mitigation in one of the welding units in Rolling Mills is also depicted in figure 3.

In the unit, electric filters are installed to comply following relevant standards and norms:

- IEEE 519: Recommended practices and requirements for harmonic control in electrical power systems
- IEC 61000: Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems.
- ER G5/ ER G4: Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission systems and distribution networks

Conclusion

Conventional measurement of the power factor is relevant only for loads that are linear and wave forms are purely sinusoidal. With increase in non-linear loads of heavy capacity in precise automation requirement in Rolling Mills, Harmonics play major role.

When non-linear load exceeds 50% of the total load as in case of Blast Furnace, Rolling Mills and Welding Lines, power factor correction cannot be achieved by capacitors alone. Capacitors can be destroyed due to overheating or resonance. Hence, active Harmonic filters are sized to keep total Harmonic Distortion under the prescribed limit. While designing plant and sizing electrical devices with active filters, the end value of compensation and Harmonic filtration achieved should necessarily be calculated.

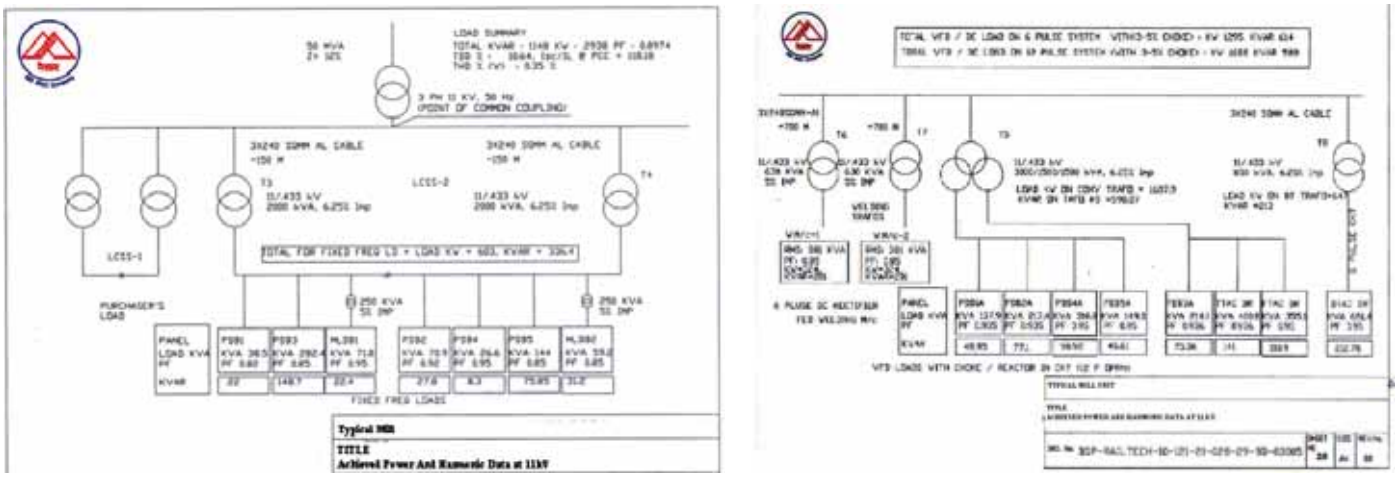
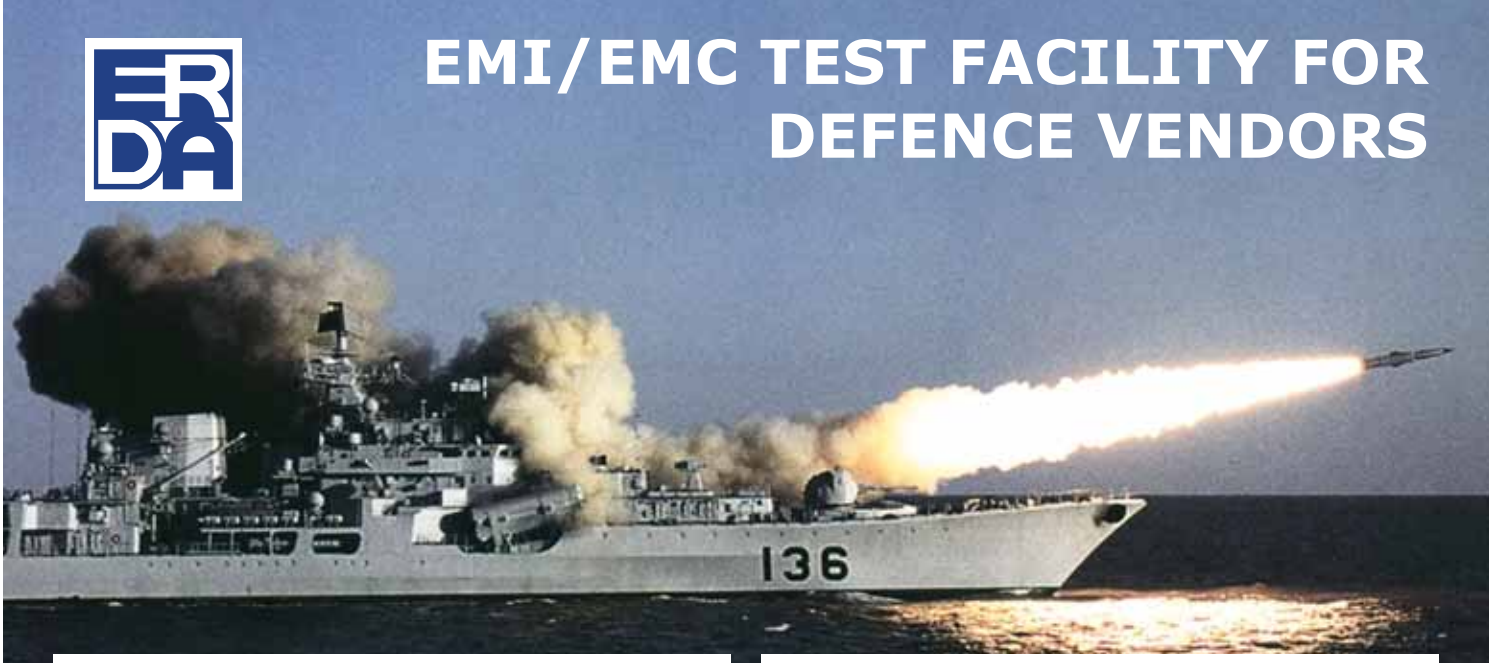
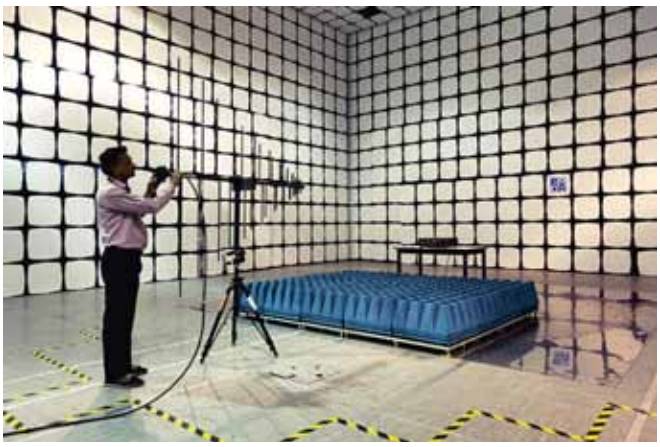


Figure 3: Achieved mitigation in one of the welding units in Rolling Mills

EMI/EMC TEST FACILITY FOR DEFENCE VENDORS





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New Coal Allocation Policy Positive for Power Sector

The implementation of the new coal allocation policy, namely SHAKTI, is expected to positively benefit the coal-based power generation capacity of about 28 GW in the private IPP segment (both under-construction and operational), according to ICRA. These were hitherto adversely affected by the lack of fuel supply agreements (FSAs). Also, the improved availability of domestic coal since FY2015 has benefited thermal IPPs, especially those with competitively bid PPAs based on domestic coal that had been unable to pass-through the additional cost of imported coal to the state distribution utilities.

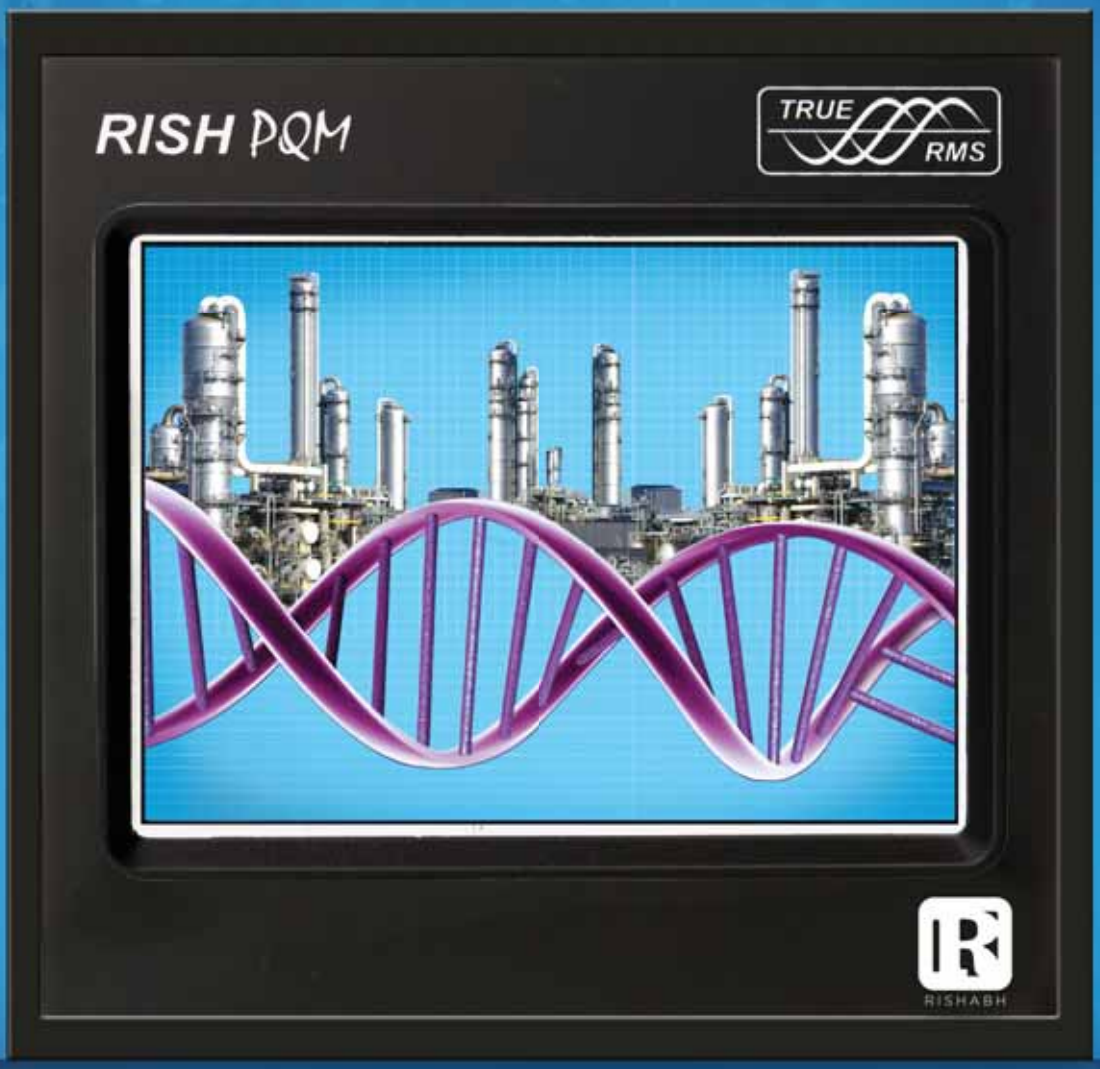
Says Girishkumar Kadam, Sector Head & Vice President, ICRA Ratings, "However, lack of fresh PPAs and subdued energy demand growth remains the areas of concern. About 26 GW capacity in the private IPP segment (both commissioned and under-construction) does not have long-term PPAs and remains exposed to price and volume risks in the short-term trading market. Moreover, this has affected the ability of IPPs to off-take domestic coal under FSAs with Coal India Limited (CIL), as the supply of coal is subject to availability of valid long-term PPAs or medium-term PPAs with distribution utilities."

The progress in issuance of tariff orders for FY2018 has remained modest, with the State Electricity Regulatory Commissions (SERCs) with only 18 out of the 29 states issuing tariff orders so far, with an average tariff hike of 4% for FY2018. Further, delays continue to be observed in filing of tariff petitions and issuance of tariff orders in large states like Rajasthan, Tamil Nadu and Uttar Pradesh.

"The progress on refinancing of the discom debt with issuance of bonds worth Rs 2.32 lakh crore by states has improved the liquidity profile of the discoms to some extent. However, the debt takeover as agreed in the UDAY MoUs has not materialised fully in some states and consequently, the reduction in book losses is likely to be lower than anticipated earlier. Based on the debt takeover progress so far for discoms in 14 states, ICRA expects the discom book losses on an all India level to decline from Rs. 60,000 crore in FY2016 to Rs. 35,000 crore in FY2018," Kadam added. BI

Refining, Reshaping & Realigning Power Architecture

RISHABH



Poor quality of power causes not only physical damage to equipment's but also results in downtime (which, in turn, lowers productivity) and a substantial increase in energy cost. So, whether you want to measure power factor or investigate disturbance, observe electric trends or enhance productivity, RISHABH's Power Quality Monitor (PQM) is a must have.

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"Delta is committed to developing innovative technologies"

We are the leading and preferred inverter supplier in India since four years with much more than one third of market share, asserts **Niranjan Nayak, Business Head for PV Inverters, Delta Power Solutions India** in an interaction with **Electrical India**.

Please tell us about Delta's Power Inverters' business.

Delta Group, founded in 1971, is the global leader in power and thermal management solutions. Our mission is to provide innovative, clean and energy-efficient solutions for a better tomorrow. Delta, as an organization, focuses in addressing key environmental issues such as global climate change. As an energy-saving solutions provider, Delta's businesses encompass power electronics, energy management, and smart green life.

We are the pioneers in residential, commercial and utility scale (indoor and outdoor) PV inverters. Our major installations include airports, key metro stations, government offices, educational institutions, industrial establishments, residential properties, large solar farms etc with a total of 0.75+ GW installations across India.

Further strengthening the 'Make in India' an initiative launched by the Government of India to boost the multi-national companies to manufacture their products in India, Delta has set up a manufacturing facility at Hosur. Delta's Central inverters are being manufactured at this factory with the current production capacity of 50MW per month; however, this production capacity will be scaled up to 200MW by January 2018. Delta worldwide offices and manufacturing facilities are in Taiwan, China, USA, Europe, Thailand, Japan, India, Mexico, and Brazil.

What do you observe as the trends in Indian renewable energy sector? What are the growth drivers of this sector?

Power is one of the most perilous components of infrastructure crucial for the economic growth and welfare of nations. The existence and development of suitable infrastructure is indispensable for the evolution of Indian economy.

India's power sector is one of the most expanded segments in the world. Sources of power generation range from conventional sources such as coal, lignite, natural gas, oil, hydro and nuclear power to viable non-conventional sources such as wind, solar, and agricultural and domestic waste. Electricity demand in the country has increased rapidly and is expected to rise further in the years to come. In order to meet the increasing demand for electricity in the country, massive addition to the installed generating capacity is required.

Propelling the current and future growth in the solar energy such as infrastructural and economic growth, persistent energy deficit, government's heavy subsidiaries, and preference to eco-friendly technologies and many more factors are the key drivers of solar energy sector. According to the sources of Bridge to India, as the Indian market inclines, it will be a significant mainstay for the growth

when the demand in other leading countries including China, Japan and even possibly the USA is anticipated to slow down. We already foresee that the leading international solar suppliers currently paying more attention to Indian market by developing specific pricing and product strategies.

Besides, Rooftop solar will also continue its remarkable growth in 2017. We believe around 1.2 GW of rooftop solar capacity to be additional in 2017, up 75% from 2016, determined by investment subsidies and considerable demand from public sector. We are the leading and preferred inverter supplier in India since four years with much more than one third of market share. Largely, FY 2017-2018 will be a bumper year for the solar sector in India. Total installed capacity is expected to reach 18-20 GW by the end of the year.

What are Delta's specialty products and services catering to solar energy segment?

Delta's state-of-the-art Renewable Power Inverters' portfolio includes grid tied transformer-less topology catering customers with residential, commercial and utility scale inverter requirements. This comprises of solar inverters for residential scale - 3kW, 5kW and 6kW; commercial scale - 10kW, 15kW, 20kW, 30kW, 50kW and 66kW. The utility scale of inverters are developed for Indoor- 1MW, 2MW and 4MW solutions and the outdoor range begins from 88kW(string inverter), 500kW, 1MW, 2.5MW and 3MW. Delta inverters are multi-faceted and can be used in every system size as well as are compatible with all commercially available solar modules and BoS. We also take the pride in informing that our 1500VDC inverter solution will hit the market by the end of 2017. And in the pipeline to launch hybrid inverter range by September 2017 which will further boost rooftop installations.

How unique are your products? Do you have R&D hub?

Delta Group offers their products with certifications in UL, IEC and JET by which we qualify to support the grid code for the whole globe. We offer world class inverters with best-in-class features, reliable and efficient power inverters at cost effective benefits without compromising on quality and service. Delta is a leading provider of inverter models to consumers that are customized to Indian grid conditions. In addition to their Industry's high efficiency (up to 98.8%), Delta inverters are characterised by a long service life and are easy to install, maintain and monitor. With our well-established pan India presence and highly motivated and trained Photovoltaic solutions' team, we are offering Delta customers fast and reliable local service support in terms of Application Engineering and after sales service support. We have developed solutions for Monitoring and Power Management Control which ensures that our customers are getting the most out of installed system. More than 1500+ different sites are being monitored with our in house developed monitoring system-DelREMO. Delta inverters are SCADA compatible and have been proven in some of the most demanding projects in India.

Delta PVI R&D team has strong capabilities in-house designing, component validation, type tests, anti-islanding and LVRT - Grid Simulation and we have one of the finest, high- end machinery and equipment. And with our global resources we constantly upgrade and strengthen our technological competences. Delta India is heavily investing on R&D and our new facility to house 1000+ R&D Engineers and is being set up in Bangalore by 2018.

India can become a renewable energy hub. Please comment.

Yes, India can become a renewable energy hub. India is leading global climate change initiatives and has tremendous potential in becoming pivotal green energy solar power hub. With the Government announcement of 100GW solar targeted by 2022, this has increased the scope for the solar industries, motivating the industry players for investment and by creating the industry demand. We are preparing India for a Better Tomorrow with Green Rich Power Energy.

What potential would you envisage for your company with the government's reforms such as 'Power for all' and plans to add 88.5 GW of capacity by 2017 and 93 GW by 2022?

Currently we stand at the first position for Rooftop Inverters according to Bridge to India annual report. The 93GW goal by 2022 has developed a resolution in Indian Solar industry. Government is taking ample steps to create the investor's interest by increasing energy petition and developing worldwide acceptance towards solar energy. These are the great opportunities for the Indian Solar industries to rapidly propagate.

We are investing 500 million USD at our proposed Krishnagiri manufacturing setup and in Bangalore R&D lab. In today's highly competitive PV business where uptime is critical and productivity is of prime importance, Solar Inverters or Power Conditioning Units, being the heart of PV system, play a critical role. The inverter market is extremely fluid with ongoing innovations in technology, design and functionality raising efficiency and lowering costs.

Being a world leader in power conversion technology, Delta offers a complete product range of solar inverters, accessories and services to our partners and installers and the best photovoltaic systems to maximize profit. With over 750 MW of string and central grid-tied solar inverters already installed in India. The new Renewable Power Inverters (RPI) will provide wide range of frequency and voltage tolerances, single and dual Maximum Power Point Tracking topologies with higher efficiencies coupled with competitive pricing.

Delta is continuously enhancing our engineering capabilities and is committed to developing innovative technologies and solutions for a better tomorrow. EI

Applications of Power Electronics

Munazima Ali
Assistant Professor
Islamic University of Science and Technology, Kashmir

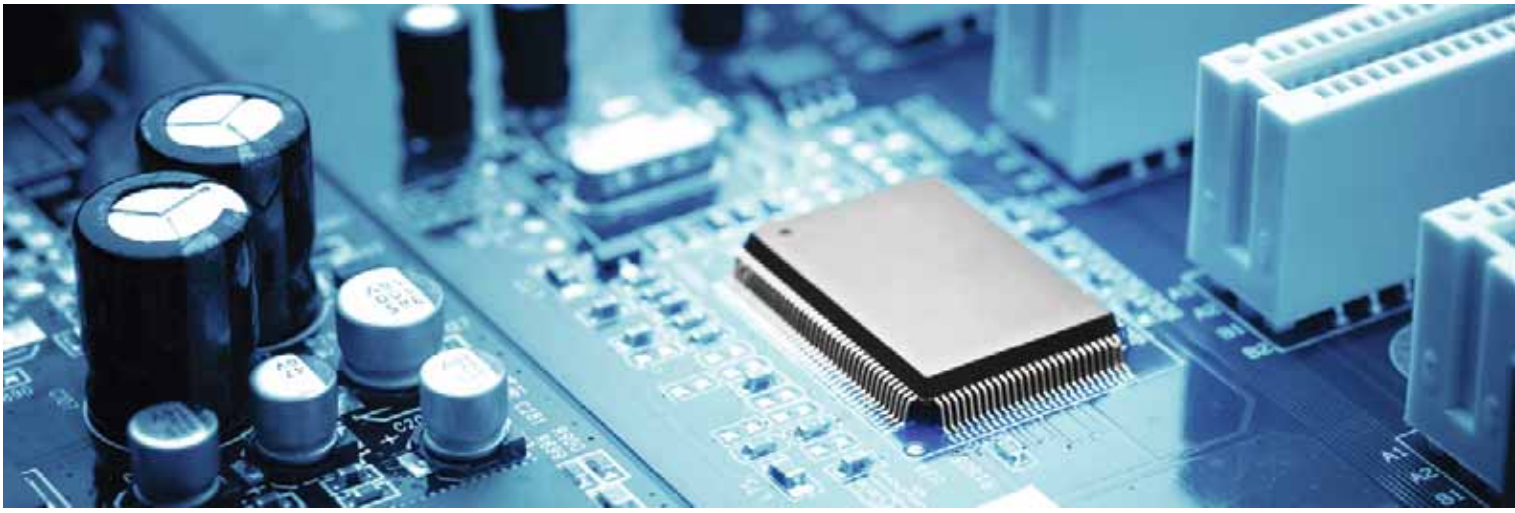
During the last two decades, there has been a tremendous increase in the use of power electronic devices and are capable of performing various functions such as rectification, amplification, control and generation…

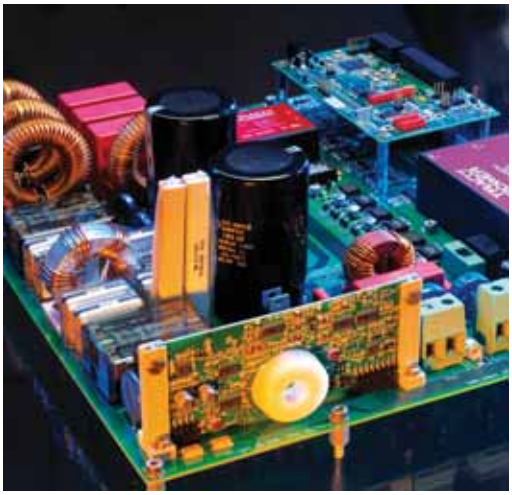
The first electronics revolution began in 1948 with the invention of the silicon transistor was proposed by Bell Labs and commercially produced by General Electric in the earlier fifties. Mercury Arc Rectifiers were well in use by that time and the robust and compact. In power electronics SCR was the first started replacing it in the rectifiers and cycloconverters. The second electronics revolution began with the development of a commercial thyristor by the General Electric Company in 1958 and was the beginning of a new era of power electronics. Since then, many different types of power semiconductor devices and conversion techniques have been introduced.

Generally, power electronics is the process of using semiconductor switching devices to control and convert electrical power flow from one form to another to meet a specific need. In other words, power electronics enables the control of the power flow as well as its form ac or dc and the magnitude of currents and voltages.

Having the most advanced technology for power electronic devices, silicon (Si) power devices can be processed with practically no material defect. However, silicon technology has some limitation for higher power utility applications. The primary limitation of Si devices is voltage blocking capacity due to the narrow band gap (1.1eV), which limits the voltage blocking capacity to less than to 10kv. For higher voltage applications, stacking packaged devices in series is required. Stacking package is expansive from a packing standpoint. Hence, there are incentives to develop devices having great voltage blocking capacity in a same or smaller device package. Such devices could be used in a variety of utility switching applications from distribution level (tens of kV) to transmission levels (>100kv).

During the last two decades, there has been a tremendous increase in the use of power electronic devices and are capable of performing various functions such as rectification, amplification, control and generation. In the medical field, some of the medical devices make use of electronics and ECG (electrocardiograph) used to find the condition of the heart of the patient, EEG (electroencephalograph) used for recording the electrical activity of the brain, EMG





Electronic circuits are employed for controlling many operations such as control of thickness of a job, moisture contents in a material.

(electromyograph) used for determining the activity of the muscles, X-ray machine used for taking pictures of internal bone structure and also for treatment of some diseases.

For quick arithmetical calculations electronic computers are employed for automatic record keeping and solving of complicated problems. Any computer can be connected to internet through an electronic device, called the modem. Electronic link is being used to transmit and receive e-mail and fax messages.

Use of automatic control system in industry is increased day by day. Speed of industrial motors is controlled through thyratrons, thyristors or magnetic amplifiers.

Instrumentation plays a vital role in any industry and research organization for precise measurement of various quantities. Accuracy of electronics instruments such as cathode-ray oscilloscope, strain gauges, frequency counter etc, is much higher than that of ordinary instruments. No research laboratory is completed without suitable electronic instruments.

Air traffic is controlled electronically. It is through the RADAR (Radio Detection and Ranging) that country is guarded from enemy aircraft. By employing RADAR, it is possible not only to detect, but also to determine the exact location and velocity of the enemy aircraft. Most of the sophisticated military attack and detection equipment are operated electronically.

Electronic circuits are employed for controlling many operations such as control of thickness of a job, moisture contents in a material. Electronic amplifiers are employed to control the operation of automatic door-openers, lightning systems, sound systems, power systems and safety devices.

Power electronics can be found in power system in many forms within the power system. These forms range from high voltage direct current (HVDC) converter station to a flexible ac transmission system (FACTS) devices that are used to control and regulate ac power grids, variable speed drives for motors, the electric drive in transportation systems, fault current limiting devices, the solid-state distribution transformer, and transfer switches.

The challenge facing the power system

Differences in essential features of devices call for special protection schemes particular for those devices.

engineering today is to use existing transmission facilities to a greater effect. Improving utilization of the existing power systems is provided through the application of advanced control technologies in power electronics based equipment or FACTS. FACTS provide proven technical solutions to address new operating challenges being presented today. With that said, FACTS are too expensive to purchase, install, and maintain in the current utility systems.

Power electronics can provide utilities the ability to more effectively delivering power to their consumers while providing increased reliability to the bulk power system. Power electronics can also play a pivotal role in improving security of the nation's electric grid. Although it is very difficult to quantify reliability benefits, studies show the estimated present value of aggregated attributes of reliable, modernized grid to be USD 638 to USD 802 billion over a twenty year horizon, with annualized values of between USD 51 and USD 64 billion/year. With that power electronics is not considered ideal systems. Some of the important issues the power electronics encounter include cost, reliability, cooling methods, efficiency, thermal management and control.

Power electronic converters often operate from the utility mains and are exposed to the disturbances associated with it. Even otherwise the transients associated with switching circuits and faults that occur at load point stress converters and devices. Consequently, several protections must be incorporated in a converter. Power semiconductor devices are commonly protected against:

- Overcurrent.
- di/dt.
- Voltage spikes or over-voltages.
- Gate-under voltage.
- Over voltage at gate.
- Excessive temperature rise.
- Electro-static discharge.

Some of these techniques are common for all devices and converters. However, differences in essential features of devices call for special protection schemes particular for those devices.

Applications of Power Electronic Devices

- High efficiency due to low loss in power semiconductor devices.
- High reliability of power electronic converter systems.
- Long life and less maintenance due to the absence of any moving parts.
- Fast dynamic response of the power electronic systems.
- Small size and less weight result in less floor space and lower installation cost.
- Mass production of power semiconductor devices has resulted in lower cost of the converter equipment.

Semi-Conductor Devices

- Develop high-voltage, high-current SiC devices for utility applications.
- Develop low-cost SiC IGBT devices to elevate the capability of power electronics in utility applications by replacing GTOs.

Wide Bandgap Materials

- Conduct system-level impact studies to evaluate the impact of wide bandgap semiconductors on the utility grid.
- Develop high temperature packing to take advantage of the capability of SiC devices.
- Develop innovative wide bandgap materials processes to create low cost, defect free wafers.

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Electronics Components and Devices

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Electronic devices have become an extension of our body parts. They play a vital role in helping humans condition the environment according to their suitability. In this article, attention will be focused on the basic electronics components…

Resistors

The electronic component known as the resistor is best described as electrical friction. For comprehending resistance, let us suppose that electricity travels through hollow pipes like water (figure 1). Assume two pipes are filled with water and one pipe has very rough walls. It would be easy to say that it is more difficult to push the water through the rough-walled pipe than through a pipe with smooth walls. The pipe with rough walls could be described as having more resistance to movement than the smooth one.

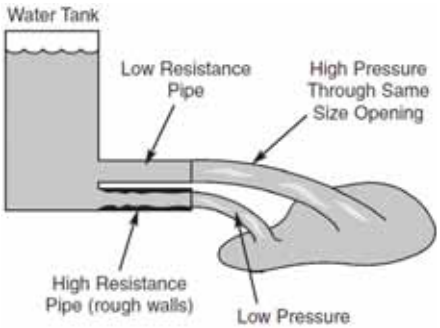

Figure 1: Analogical illustration to comprehend electronic resistance

Types of Resistor

A broad categorization of resistors is shown in the arrow diagram below (figure 2):

Figure 2: Categories of resistance

Capacitor

Capacitors are components that can store electrical pressure (Voltage) for long periods of time. When a capacitor has a difference in voltage (electrical pressure) between its two leads, it is said to be charged. A capacitor is charged by forcing a one way (DC) current to flow through it for a short period of time. It can be discharged by letting an opposite direction current flow out of the capacitor. Consider for a moment the analogy of a water pipe that has a rubber diaphragm sealing off each side of the pipe as shown in figure 3. If the pipe had a plunger on one end, as shown in the figure, and the plunger was pushed toward the diaphragm, the water in the pipe would force the rubber to stretch out until the force of the rubber pushing back on the water was equal to the force of the plunger. One could say that the pipe is charged and ready to push the plunger back. In fact, if the plunger is released it will move back to its original position. Figure 4 illustrates the symbols for different capacitor types.

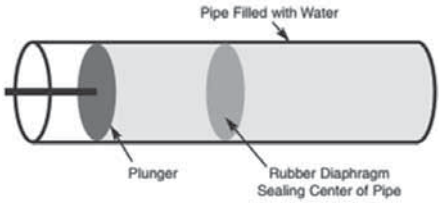

Figure 3: Analogical illustration to comprehend electronic capacitance

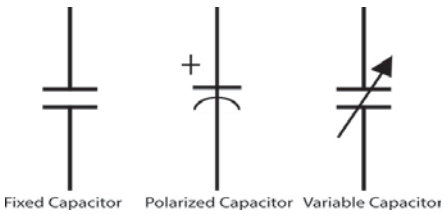

Figure 4: Symbols for various types of capacitors

Capacitor Manufacturing

The most common form of capacitor- the

metal foil capacitor, is constructed by tightly winding two foil metal plates that are separated by sheets of paper or plastic as shown in figure 5.

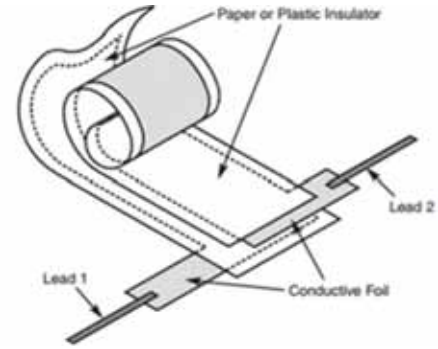

Figure 5: Metal foil capacitor

Inductor

The electronic component known as the inductor is best described as electrical momentum. In the water pipe analogy, the inductor would be equivalent to a very long hose that is wrapped around itself many times (see figure 6). If the hose is very long it will contain many gallons of water. When pressure is applied to one end of the hose, the thousands of gallons of water would not start to move instantly. It would take time to get the water moving due to inertia (a body at rest wants to stay at rest). After a while the water would start to move and pick up speed. The speed would increase until the friction of the hose applied equals the amount of pressure being applied to the water. If someone tries to instantly stop the water from moving by holding the plunger, the momentum (a body in motion wants to stay in motion) of the water would cause a large negative pressure (Suction) that would pull the plunger from the hands.

Figure 7 illustrates the different inductor shapes. Table I gives a comparison of inductors and capacitors.

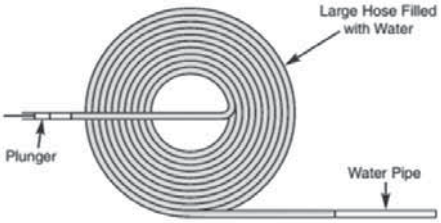

Figure 6: Analogical illustration to comprehend electronic inductance

Figure 7: Different inductor shapes

Diode

An electronic diode passes current in one direction and blocks it in the opposite direction. It can be compared to a check valve as shown in figure 8. The basic function of a check valve is to allow water to flow in only one direction. Once the force of the spring is exceeded, the plate moves away from the stop, allowing water to pass through the pipe. A flow of water in the opposite direction is blocked by the solid stop and plate. Figure 9 is an illustration of the symbol of a diode.

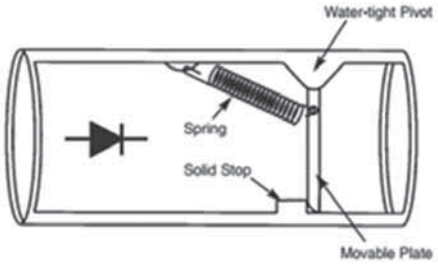

Figure 8: Analogical illustration to comprehend electronic diode

Figure 9: Symbol for diode

Table I: Comparison of capacitor and inductor

Capacitor	Inductor
Blocks Direct Current	Blocks Alternating Current
Passes Alternating Current	Passes Direct Current
Voltage in Capacitor cannot change instantly	Current in an Inductor cannot change instantly
Quick Voltage change produces large Current	Quick Current change produces large Voltage
Stores Energy in Electric Field	Stores Energy in Magnetic Field
Current leads Voltage	Voltage leads Current

Cleanmax Solar Recognised as India's Largest Rooftop Solar Developer

Tops Bridge to India's 'India Solar Rooftop Map 2017' with 24% market share…

Viviana Mall Thane Maharashtra 11 MWp

CleanMax Solar, India's leading solar solutions provider, has been acknowledged as 'India's largest rooftop solar developer' for the third consecutive year, in the latest Bridge to India (BTI) report. BTI's 'India Solar Rooftop Map 2017' pegs CleanMax Solar's market share at 24%, up from 23% as per BTI Rooftop Map 2016. Holding nearly a quarter of the market, CleanMax Solar caters to many of India's leading corporates, large-scale industries and infrastructure projects. CleanMax Solar has commissioned more than 80 plants in FY 2016-17, with a capacity of over 38 MW and leverages its scale advantages to offer very attractive solar power costs to its customers. The OPEX 'zero investment' model facilitates consumers to avail solar power at significant discounts to grid tariffs, with no capital investment.

Commenting on the achievement, Kuldeep Jain, Founder & Managing Director of CleanMax Solar said, "To maintain the top position for three consecutive years with a quarter of the market share in India is a matter of pride for us, and a testament to the faith our clients have put in CleanMax as their sustainability solutions provider."

"Our recent funding from Warburg Pincus comes as a validation of our business model and our success to date in this market. As we work to maintain and grow our leadership position, the investment by Warburg Pincus will help us further our growth, both nationally and internationally, as we expand within India and into the Middle East and South Asian markets. We are also looking at using the funds by venturing into energy storage solutions as a logical next step in broadening our sustainability solutions for our corporate clients", he added.

The report published by Bridge to India, a leading strategic consulting and market intelligence firm in the Indian renewable resources market, contains vital information on the sector. Through the map, they have identified key sectors and trends in India's rapidly growing rooftop solar industry. CleanMax Solar has led the rooftop solar segment since the launch of the map three years ago.

Since its inception in 2011, CleanMax Solar has commissioned over 200 projects for more than 50 corporates, with a combined onsite solar capacity of 85 MW, which makes it the only developer with a true pan-India presence. Mindtree Limited in Bangalore, Kudremukh Iron Ore Company Limited (KIOCL) in Mangalore, Konecranes India in Pune, Carlsberg's Breweries at Alwar in Rajasthan and Daruhera in Haryana, Alkem Laboratories in Navi Mumbai and Mandawa in Gujarat, Viviana Mall in Thane are few companies that draw green power from CleanMax' installations. While in educational sector, some of CleanMax' projects include - Aligarh Muslim University in Uttar Pradesh, NIT Surathkal in Mangalore, Manipal Education & Medical group across various locations, Integrated Institute of Technology in Delhi, Ambedkar Institute of Technology in Delhi etc.

Leveraging its strong position in the commercial and industrial rooftop segment, CleanMax has also emerged as the preferred partner for several high-profile public infrastructure projects like Kempegowda International Airport (Bangalore), Chennai Metro Rail Ltd (CMRL), Tourist Hub - Delhi Haat etc. EI

Manipal University Jaipur - 800 kWp

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- GPS synchronizes a wide variety of microprocessor-based power system equipment including: SCADA systems, remote terminal units (RTUs), protection relays, sequence of event recorders, digital fault recorders, tariff meters, Slave Display Units, Data Loggers and other Intelligent Electronic Devices (IEDs), Linux, Solaris & Windows servers
- GPS provides secured access for device configuration and management through SSH, SCP, HTTPS

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"We expect steady growth"

The UPS market in India for the previous year has been flat. The Three-phase UPS market has seen a significant growth compared to Line Interactive and Single Phase UPS market which has been quite flat, informs **Palash Nandy, Chief Commercial Officer, Numeric India** in an interaction with **Electrical India**...

Please take through the journey of the company and its products & services in India.

Numeric, one of the top three UPS manufacturers in India, was established in the year 1984. The 1st UPS of Numeric was introduced in 1985. Since then it has evolved as the undisputed leader in Single Phase UPS and Line Interactive UPS in the last 24 years. In 2012, Numeric joined the Legrand Group.

Today, Numeric has a complete solution in UPS across Line Interactive, Online Single Phase, Three Phase and the latest generation modular UPS. This enables us to cater to any application from 600 VA to 1.2 MVA. Numeric products use state-of-the-art technology, are extremely user friendly and very easy to maintain. Over the years Numeric has also built the widest and largest service network in India. Today, the service network consists of 254 service centers across India. Close to 1200 people are dedicated in the service operations, of which, there are close to 900 field technicians. As a consequence, our customers are able to get proper service irrespective of their business location.

Being a part of the Legrand group now, Numeric gets access to the best in class technology worldwide and our experience in the market provides us fantastic market knowledge. We now proudly mention ourselves as a GLOCAL company- Global expertise and local knowledge. Some examples of how our products provide added value to customers:

- **Modular UPS** with Granular Parallel Architecture helps the customer to have more redundancy on the installed capacity. Help the customer to plan the capacity of the UPS as per their today's requirement and gives flexibility to increase the rating of UPS as per their business growth.

- **KEOR T** with its regenerative handling capability in mains mode is a unique feature, is suitable for both IT and industrial application. 3-level IGBT inverter design - helps to improve the overall efficiency to reduce the operation expenses.

- **Our 1 phase** products (HP Max & Onfiniti) offers to our customer built in isolation transformer on a compact footprint. UPS with isolation transformer increases the reliability of the product and its performance for India market.

What is the USP of your products?

The biggest strength of Numeric is its ability to be at the cutting edge of UPS technology. Our technological prowess grew as we became a part of the Legrand group in 2002. This gave Numeric access to the global expertise of Legrand combines with our knowledge of the market, customers and the applications. Today, Numeric has the very latest technology in the UPS space. To give you an example, KeorT UPS by Numeric has the capability to handle and manage regenerative loads. These ranges of modular UPS by us are truly granular not only across the three phases but also within each phase. This allows the customers to scale up their UPS power as they grow their operations instead of investing in the whole setup right at the beginning. Energy efficiency is already one of the key drivers for us. Our products are the most energy efficient products in the Indian market. In fact some of our products have energy efficiency levels of upto 96%.

What kind of potential do you envisage for Indian Power sector with the government's particular focus on upgrading overall infrastructure like roll out of 100 smart cities, commitment to provide 24*7 electricity to all?

Going ahead, we expect a steady growth in our industry. The factors driving the growth would be digitalization activities across sectors including GoI Digital India initiative, smart cities initiative, the need of clean power across industries, penetration of sensitive electronic gadgets in homes and hence the need for clean and uninterrupted power at home, various infrastructure projects, the growth of surveillance needs, distance education projects, digitalization of entertainment etc. We are very well placed to take advantage of this potential. With our wide product offer and the huge service infrastructure, we would be able to do justice to all the requirements of our customers. We aim to grow 2X compared to the market growth.

What are the bottlenecks that the company is facing while offering its services? What kind of support would you expect from the government?

Some of the challenges been faced by the industry are:

- Lack of standardization: We would like Bureau of Indian Standards (BIS) to be more proactive in terms of ensuring that the products that are being sold in India adhere to the standards prescribed by BIS.
- Volatility in the price of lead and the USD exchange rate: Lead is an important component and in the recent months, it has been extremely volatile. This affects the input costs and as a consequence the price and margin. Same is true for USD.
- Some of the market segments have become extremely price sensitive. The only factor been considered is the price and not the value. Hence, a lot of cheap imports are coming in.
- GST should be a great help in making the market better in terms of compliance. This should help all organized and professional manufactures like Numeric.
- Major manufacturers like Numeric should play a more active role in educating or informing the market stakeholders about the technological changes and their benefits.

What measures would you suggest to overcome the problem of Import of Chinese equipment ?

We, at Numeric, are constantly engaged in maximizing value for our customers. Maximizing value in terms of technological advancement, customer friendliness in terms of product usage, installation, commissioning and after sales provide customers the right service back up. We do not believe in price competition. We are working hard to provide the best price Vs value proposition to our customers. We are also devoting our energy in providing our customers the best service (pre sales and post sales). That has been our strategy for quite some time and we have been very successful in implementing the same. In line with our objective of continuously upgrading of product offer, we will launch two new products in Three Phase UPS category in August.

The Government has up-scaled the target of renewable energy capacity to 175 GW by the year 2022 which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro-power. Going ahead, what potential will it generate for the power segment?

This would obviously generate incremental business opportunities for the power segment. It would generate new business models. We already have products that are compatible with renewable energy sources like solar and wind. As part of the Legrand group, we are closely watching and contributing to developments that are happening in this space and would be ready with required products as and when the demand for the same would arise.

What is your outlook for the sector?

The UPS market in India for the previous year has been flat. The Three-phase UPS market has seen a significant growth compared to Line Interactive and Single Phase UPS market which has been quite flat. However, we expect a steady growth going ahead. Digitalization of activities across sectors including the GoI Digital India initiative, the smart city initiative, the need of clean power across industries, penetration of sensitive electronic gadgets and hence, the need for clean and uninterrupted power at home; various infrastructure projects, the growth of surveillance needs, distance education projects, digitalization of entertainment in homes, growth in the healthcare segment are some of the factors driving the growth.

Alstom Associates with Bangalore Metro

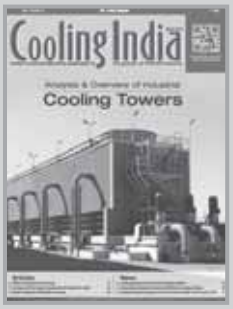
As part of the contract, valued at a total of € 114 million (INR 710 crore), awarded by Bangalore Metro Rail Corporation Ltd (BMRCL) in 2009, Alstom provided the design, manufacture, supply, installing, testing and commissioning of the train control and signalling & telecommunications systems that have been deployed by engineering and R&D team in Bangalore…

Alstom is proud to be associated with the Bangalore metro's much-awaited launch of operations on the Green Line that will connect Nagasandra in North Bangalore with Yelachanahalli in the South, the last section of Bangalore Metro Phase 1. Inaugurated by President of India, Pranab Mukherjee in the presence of M. Venkaiah Naidu, Union Minister for Urban Development, Housing, Urban Poverty Alleviation, Information & Broadcasting, India, Siddaramaiah, Chief Minister of Karnataka and other dignitaries, this milestone is a clear illustration of Alstom's global capabilities out of its Bangalore Engineering and Innovation Centre in India.

As part of the contract, valued at a total of € 114 million (INR 710 crore), awarded by Bangalore Metro Rail Corporation Ltd (BMRCL) in 2009, Alstom provided the design, manufacture, supply, installing, testing and commissioning of the train control and signalling & telecommunications systems that have been deployed by engineering and R&D team in Bangalore. They equip two corridor lines (42 km, 41 stations) including two depots, one Operation Control Centre (OCC) and one Back up Operation Control Center (BCC). It includes the Urbalis 200 Automatic Train Control system which will ensure optimal safety, flexible operations and heightened passenger comfort. This solution has already been successfully deployed in many cities around the world and in cities like Delhi, Jaipur and already operational sections of Bangalore Metro.

Commenting on the occasion, Bharat Salhotra, Managing Director, Alstom in India and South Asia said, "It is our great pleasure to be associated with this prestigious project and a matter of great pride for the team to see the project come to life. Bangalore is home to our talented engineering base which has been instrumental in bringing the project to successful completion. We at Alstom are working tirelessly to ensure our teams in Bangalore bring out the best-in-class, competitive and sustainable mobility solutions of the future."

Alstom is committed to evolving India's urban transport infrastructure requirements as the country embarks on its journey towards managing its growing cities. The successful deployment of this solution showcases the close co-operation between several Alstom units: Bangalore and Coimbatore in India, Saint-Ouen and Villeurbanne in France, and Bologna in Italy.



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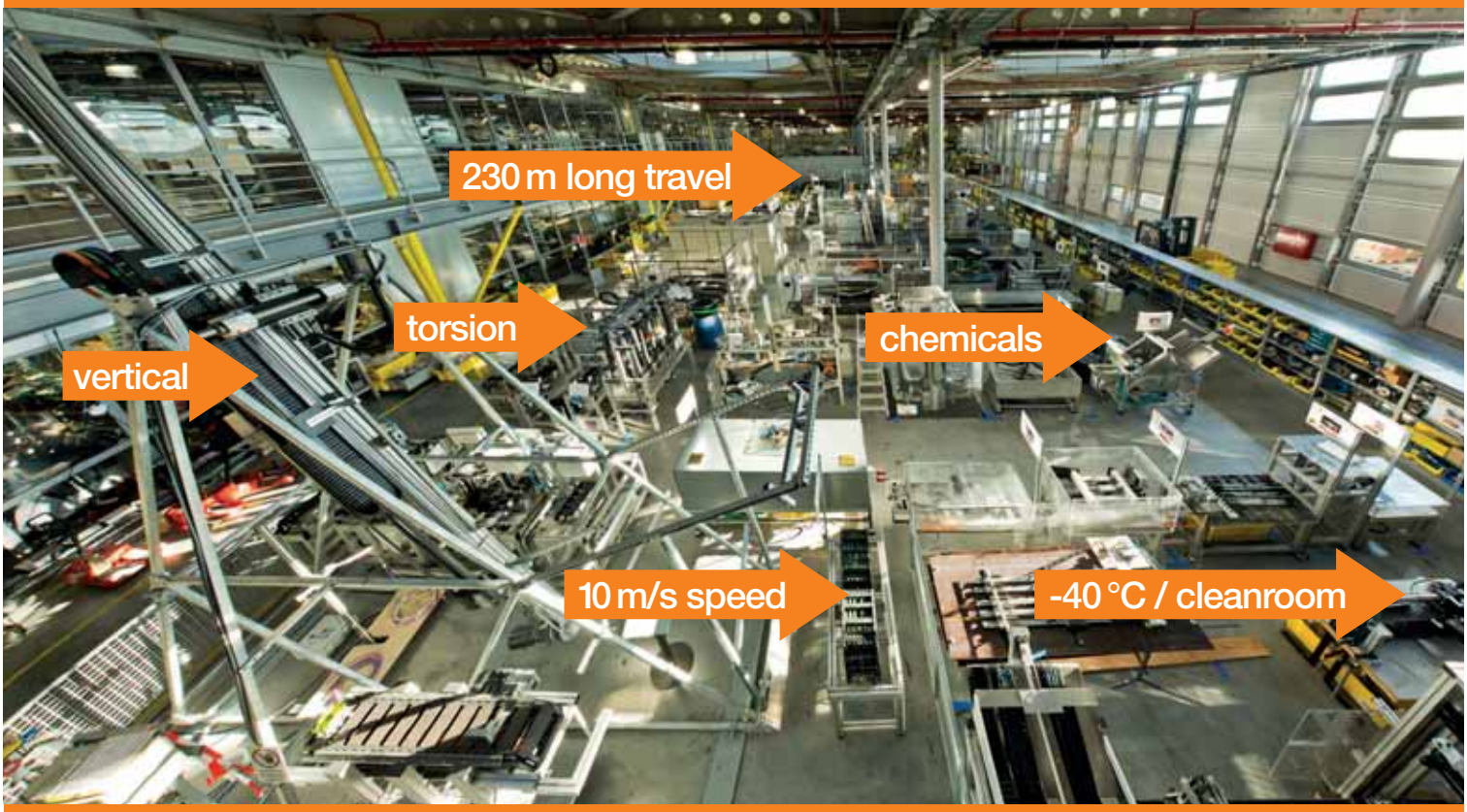

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Comprehensive Energy Data Saves Money from Building to Machine

An energy data management system that is integrated into the PC-based control system enables monitoring and analysis of all energy consumers – consistently and linked to the higher-level energy data management system.

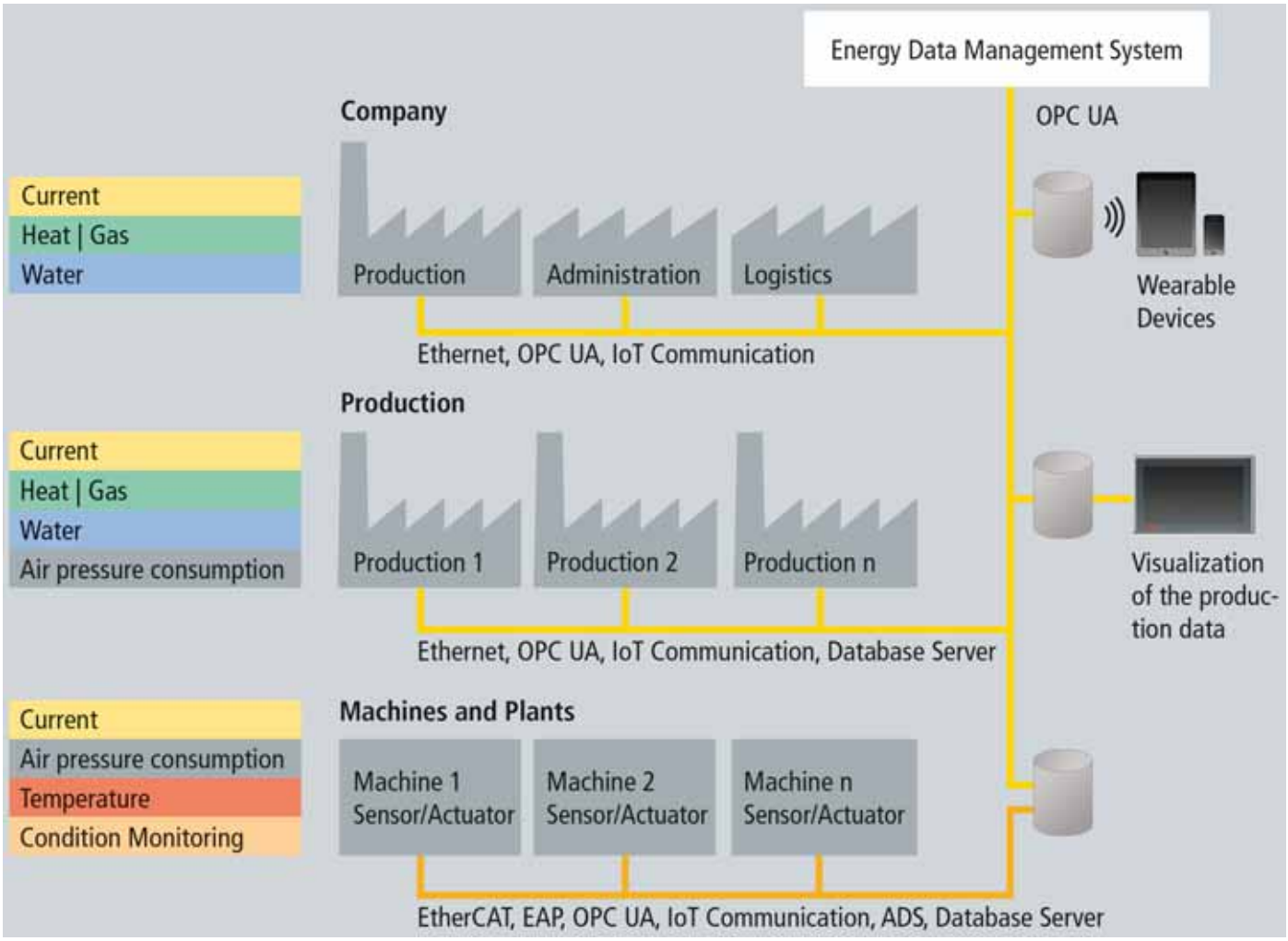
More than ever, managing energy consumption in buildings, production facilities and machines is critical to the success of a company. Making correct cost reduction decisions requires the ability to collect and process all energy-related data. Scalable energy data management systems integrated into PC-based control equipment cover everything from the building to the machine and even each individual motor.

The only way to uncover all potential energy savings is by taking a comprehensive view of the entire business – the administrative level with its offices, conference rooms, and cafeterias; the production facility level; and the individual machine and equipment levels. To secure meaningful results, one must be able to identify all "energy hogs" and make appropriate improvements in some cases, while coordinating the operation of all energy consumers, based on comprehensive and reliable energy data.

Energy-efficient Smart Factory Saves Costs

With such an energy measurement system, the forward-thinking company supports the creation of a "Smart Factory", from the aspects that it meets the requirements of the DIN EN ISO 50001 standards as well as from an energy perspective, all with minimal effort. In addition, the integrated and, therefore, lowcost energy data management system does not require large investments. Since the necessary sensors and meters can be integrated into existing buildings and machine automation systems and expanded when necessary, developing a comprehensive energy data management system step-by-step becomes relatively easy, and any investment costs quickly pay for themselves. The end user can analyze and potentially smooth out peak loads based on collected data. In addition, companies can reap clear and long-term cost benefits by consistently optimizing energy usage, which is particularly important against the backdrop of almost certain future price increases.

Also, being "green" is becoming more important to society in general, with businesses facing increasing governmental and political pressure to reduce energy consumption and CO2 emissions. For example, the repayment of the so-called "renewable energy surcharge" in certain countries depends on the introduction of an energy management system (EnMS) or EMAS certification. The EnMS model of the DIN EN ISO 50001 standard, for example, defines detailed energy monitoring, metering and analysis requirements which can be easily implemented with a Beckhoff solution consisting of modular I/O terminals, TwinCAT and open communication standards such as EtherCAT and OPC UA. In addition, continuous improvement of an energy data management system is just as important as its initial implementation because receiving a refund of the renewable energy surcharge as well as the power and pollution tax requires continuously improved compliance with the DIN EN ISO 50001 standard or EMAS certification. Beyond that, the new Energy Services Act (EDL-G) in several countries requires that all companies not falling under the definition of "small enterprises" implement an energy audit as well as an energy or environmental management system. Such improvements are only possible with a continuous stream of accurate energy consumption data.



Modular and finely scalable, the energy data management system can be adapted to the respective requirements on the corporate, shop floor or machine level.

Comprehensive & Integrated Energy Data Collection

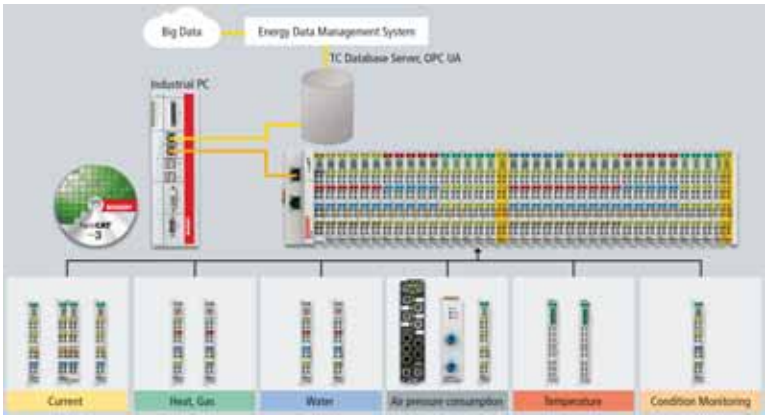
Beckhoff PC-based control technology makes the programming of advanced measurement systems more efficient. The modular and highly scalable PC Control technology works not only for machines, but also for building automation applications with a single, universal software system that can handle all control and energy data. This makes it easy to process, combine, and correlate all relevant data, forwarding it to the energy management software. The user also benefits greatly from the flexibility and openness of PC-based control. On the one hand, all signals can be easily integrated into the control system via the modular and extremely broad I/O spectrum. On the other hand, all popular field bus systems and transmission standards, such as OPC UA as well as tele-control protocols, and the EtherCAT protocol are all supported and seamlessly integrated into the PC-based control system.

To maintain a highly efficient energy data management system, end users require a generalized view that can still show every detail. Controlling the company's overall energy consumption is just as important as having precise usage data for every consumer. To accomplish this, energy usage is measured locally and with minimal wiring wherever it occurs – in each department, on each machine and on each actuator. The raw data is transmitted to the controller and TwinCAT via the fast, broadband EtherCAT network for pre-processing, scope or HMI functions. Thus, all power, heat, water, gas and compressed air consumption data is available to the energy management system via standard interfaces like OPC UA.

The benefits of a fully integrated energy data management system become especially apparent in highly complex solutions. The metering components can be added to the existing automation technology easily – even to what is already in place – without having to set up a separate metering and control system. Additionally, the seamless integration enables much faster responses to important energy-related events.

Detailed Aata Analysis with Standard Control Software

With the open PC-based control system, energy data is available for analysis and further processing on all software levels, not just in a higher-level energy management system. Since the TwinCAT automation software



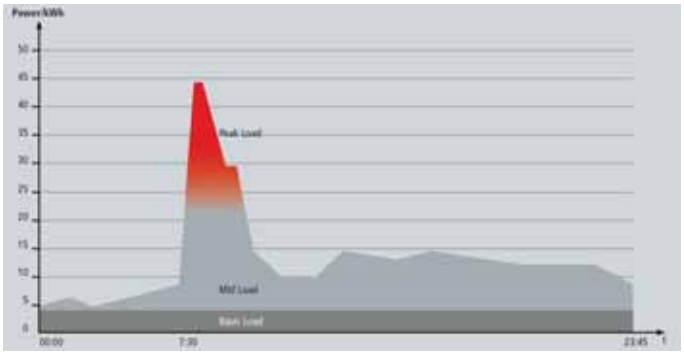
The Beckhoff concept of Scientific Automation combines control and measurement technology in a single system with the help of powerful measurement and condition monitoring terminals.

operates directly on the control level, the consumption data can be analyzed directly in the control algorithms to improve plant energy efficiency. TwinCAT also supplies a wide range of advanced monitoring and analysis tools. The TwinCAT Condition Monitoring Library, as an example, features a modular toolbox of mathematical algorithms for analyzing the energy status of machines and systems, with functions that cover the areas of analysis, statistics and classification.

The energy data can also be monitored with the TwinCAT software oscilloscope, which combines fast data logging with a powerful visualization tool. The logger can process long series in addition to very fast cycles in the millisecond range, for example, from EtherCAT monitoring I/O terminals such as the EL3773 with oversampling functionality. The results are displayed via the Scope View component, which provides an almost unlimited number of curves in high resolution over time. This enables the viewer to see, for example, whether sinusoidal voltage profiles or harmonics are present. Because of the high resolution, even short peaks become visible, which are very hard to analyze with conventional systems.

Application Scenario for Better Management of Energy Costs

Realizing all potential improvements requires a comprehensive energy data management system. This enables users to integrate the collection and analysis of energy consumption data into the building automation system on the administrative level in order to optimize the consumption of power, water, gas and heat with an Embedded PC, TwinCAT and I/O terminals. In industrial environments, an Industrial PC with TwinCAT in connection with EtherCAT Terminals provides the ideal data management solution for evaluating cost centers such as the usage of power and compressed air. Installed within the machine, PC-based control produces and manages accurate data down to the sensor and actuator. It also provides comprehensive condition monitoring as the basis for cost-optimized preventive maintenance. This helps users generate load curves and identify peak usage periods for future load balancing. PC-based control also enables determination of each single load share, as well as the basic and average loads. Companies can also use the information to analyze the machines' power requirements relative to each other and use the results as the basis for further improvements. Identifying "energy hogs" can reduce electricity costs and make it easier to accurately allocate them to the appropriate cost center. Detailed energy data can also be used for control purposes, for example, to make the entire production process more stable and to prevent failures.



PC-based control provides detailed energy consumption data that lets users map load curves to identify peaks and balance the overall load.

Module-based Integration of All Energy Data Types

The PC-based control technology with its scalability and modularity provides the ideal basis for integrated and detailed energy management solutions. It also features a broad I/O system that enables data collection for all forms of energy usage within the enterprise. For example, one can collect data directly via the KL/EL3403 power measurement terminals. In addition, the EL3413 and EL3433 power measurement terminals and the EL3773 power monitoring oversampling terminal provide extended analytical functions. Consumption data for gas, water and heat, on the other hand, can be integrated indirectly into the energy data management system. The KL6781 and KL6401 Bus Terminals with M-bus and LON interface, respectively, make it easy to link popular gas, water and heat meters to the system. The typical counter pulse output can be integrated with digital input terminals.

Temperatures can be controlled directly via thermocouples or RTD resistance sensors via KL3xxx Bus Terminals and EL3xxx EtherCAT Terminals. The compressed air usage can be measured with KM37xx differential pressure measuring terminals and the locally installed EP3744 IP 67 differential pressure metering EtherCAT Box, making it easy to identify energy-wasting leaks. Compressed air sensors can be indirectly integrated into the system via KL/EL3xxx analog input terminals. Sensors with IO-Link interface can also be used. Further, the EL3632 analog input terminal is suitable for condition monitoring applications in which fluctuations are recorded by means of acceleration sensors or microphones. With condition monitoring, impending failures can be recognized early on so that countermeasures can be taken before developing problems bring the application to a halt.

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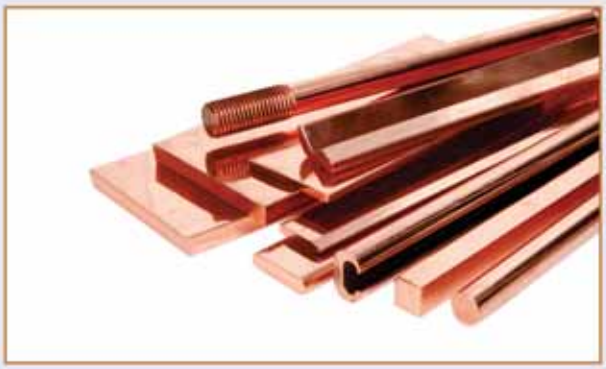

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Hydropower sector gains momentum: Report

Factors such as complex clearance and approval procedures, land acquisition issues, insufficient market depth and scope, limited availability of long term financing, existing models for sharing of hydro benefits etc. have contributed to the slow pace of hydropower development in the past, said 'Accelerating Hydropower Development in India for Sustainable Energy Security', a report by PwC and ASSOCHAM…

India has the fifth largest hydropower reserve in the world, with untapped potential of over 100GW thereby, providing the private sector tremendous scope to help accelerate development of the sector. However till date, only 3.2 GW of hydro capacity, which constitutes only 7% of the total hydropower installed capacity today, has been commissioned by private players.

Factors such as complex clearance and approval procedures, land acquisition issues, insufficient market depth and scope, limited availability of long term financing, existing models for sharing of hydro benefits etc. have contributed to the slow pace of hydropower development in the past, said 'Accelerating Hydropower Development in India for Sustainable Energy Security', a report by PwC and ASSOCHAM.

The report also states that though private participation in the hydropower sector has gained momentum in the recent past, it still faces many impediments across various stages of a project development lifecycle. Several hydropower projects, across the Central, State and Private sectors, with a cumulative capacity of over 13,000 MW are witnessing significant time and cost overruns.

Speaking on the potential of Hydropower as a clean and green energy source, Yogesh Daruka, Partner -Energy and Utilities, PwC India said, "Hydropower is ideally suited to support the variability and intermittency of solar and wind generation, through provision of peaking support and ancillary services. Accelerated hydropower development will play a critical role in supporting the Government of India's renewable energy capacity target of 175 GW by 2022. Moreover, for India to meet its INDC commitments under COP 21, an additional 20 GW of hydropower capacity needs to be developed by 2030.

The recent GOI proposed initiatives for the hydropower sector like interest subsidy, hydropower purchase obligations, classification of hydropower as renewables (irrespective of its capacity) are likely to accelerate growth for the sector and reduce the impediments faced by hydropower developers, including safeguard concerns. This will help revive many of the hydro projects in the country which are currently stranded," he added.

To help achieve these ambitious targets for the hydropower sector, the PwC – ASSOCHAM report mentions some specific strategies and key interventions:

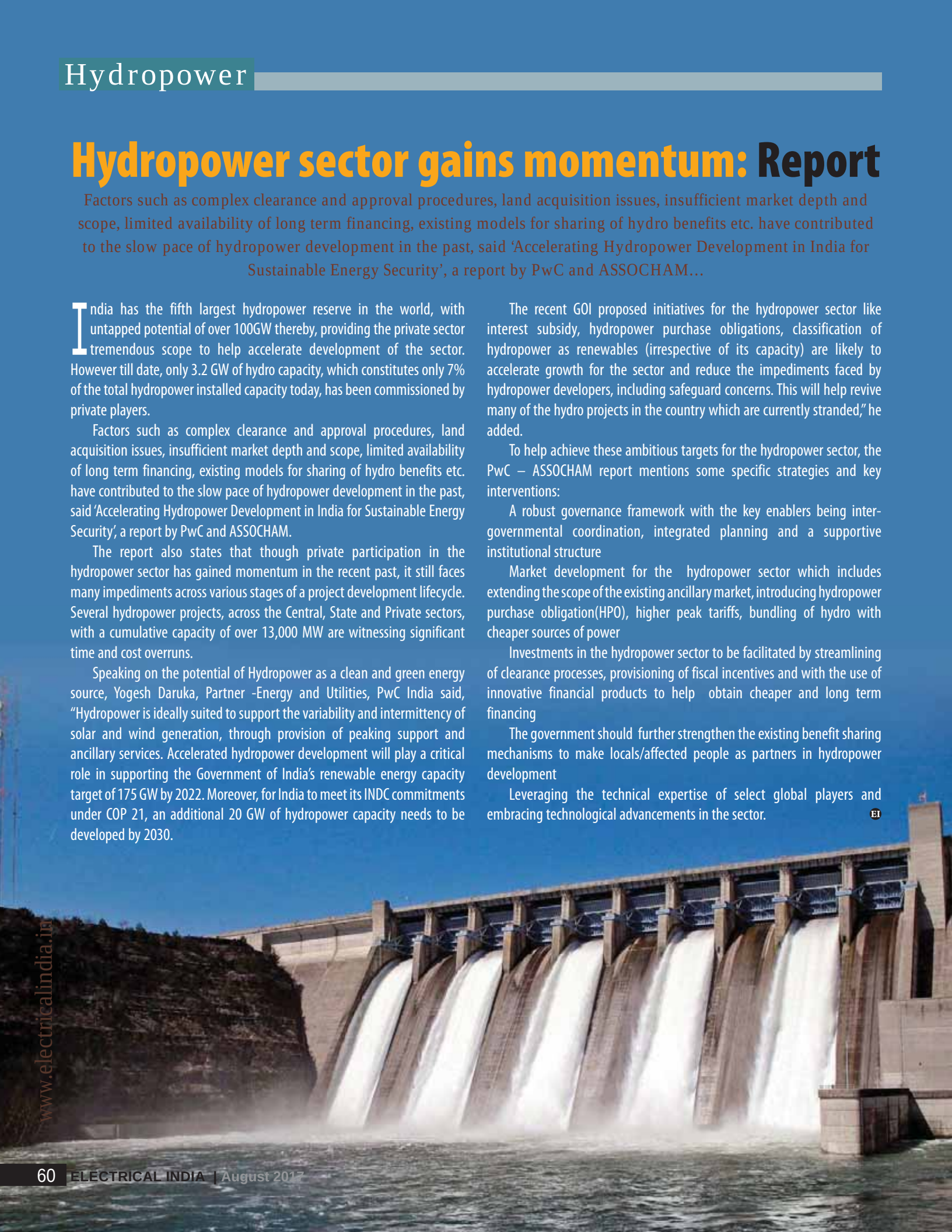
A robust governance framework with the key enablers being inter-governmental coordination, integrated planning and a supportive institutional structure

Market development for the hydropower sector which includes extending the scope of the existing ancillary market, introducing hydropower purchase obligation(HPO), higher peak tariffs, bundling of hydro with cheaper sources of power

Investments in the hydropower sector to be facilitated by streamlining of clearance processes, provisioning of fiscal incentives and with the use of innovative financial products to help obtain cheaper and long term financing

The government should further strengthen the existing benefit sharing mechanisms to make locals/affected people as partners in hydropower development

Leveraging the technical expertise of select global players and embracing technological advancements in the sector. EI



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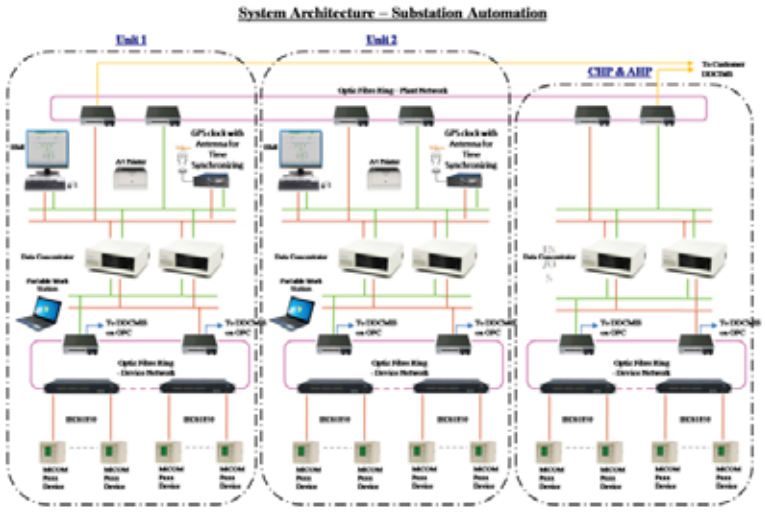
Substation Automation System (SAS)

Substation automation refers to using data from intelligent electronic devices (IEDs) control & automation capabilities within the substation and control commands from remote users to control power system devices…



Substation automation is a buzz word off late to build a smarter, more reliable power grid. As the technology is changing with fast pace and health monitoring of the grid has become inevitable. Nobody knows that what is going to happen in the next second and therefore, the dynamic real time measurement has come into effect. The SCADA system is also moving to be the technology of past and synchro phaser technology is replacing with slow pace by installing PMUs (Phaser Measurement Units) for monitoring the number of critical substation & line parameters.

"Substation automation refers to using data from intelligent electronic devices (IEDs) control & automation capabilities within the substation and control commands from remote users to control power system devices."

The principal standard for the substation automation is with invoke of IEC 61850. This deals with the perquisite parameters of substation automation. A few are mentioned here for the reference of engineers, consultants and professionals.

The resource constrained systems like intelligent electronic devices (IEDs) such as RTUs, reclosers, PLC , V meters, video for security or equipment status assessment, metering, switching, volt / VAR , wave form, event data, management etc.

Key Benefits of Automation

- Automatic supervision of interlocks
- Graphical presentation of safety procedures
- Local and global alarm & warning
- Detect fault location – useful for distribution systems
- Equipment diagnostics
- Intelligent interlocking system
- Diagnostic of disturbances
- Automation with supervisory & advisory control
- Substation control via operators
- IEC 61850 substation automation
- Substation control and monitoring system (SCMS)
- Enforce complex logic for device protection & coordination
- Programmable logic editor with compiling and execution
- Automatic generation of switching sequences
- Enterprise wide view via intelligent one line diagram
- Automatic retrieval of all data from substation
- Security control with multiple access levels
- Minimize outage
- Reduce operating & maintenance costs
- Enhances information management
- Improves productivity
- Improves asset management

Digitizing Substations

This will provide significant cost saving, performance enhancement & safety improvements by equipping primary equipment with modern sensors and digitizing conventional copper based analog communication with secure, seamless, steady and open standard base fiber optic communication.

Conclusion

The whole thing is moving towards the centralized supervision based process for monitoring and control of power system parameters essential to maintain the health of integrated system. Then only uninterrupted and good quality of power can be provided to the end users and served better.

Dr B P Singh
B Tech Electrical, MBA & Hon PhD, Mumbai

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DEIF Ensures Reliable Power for Hospital

DEIF's Automatic Genset Controller, AGC-4 features proven technology for a wide range of generation systems in critical power applications…

Indian Healthcare Sector

According to the Department of Commerce, Govt of India, the Indian healthcare sector is one of the fastest growing industries and was sixth largest market globally in terms of size in 2015. Healthcare revenue in India is set to reach USD280 billion by 2020. Govt of India has allowed 100% FDI in healthcare sector – a major growth driver for this sector. Medical tourism in India is on the rise because of state-of-the-art private hospitals and diagnostic facilities available at low cost. Treatment for major surgeries in India costs approximately 20% of that in developed countries. Patients from developing countries are also attracted due to lack of advanced medical facilities in their own countries. For healthcare sector to grow further by attracting foreign patients, availability of reliable power is the critical need.

Why is it so critical for Hospitals?

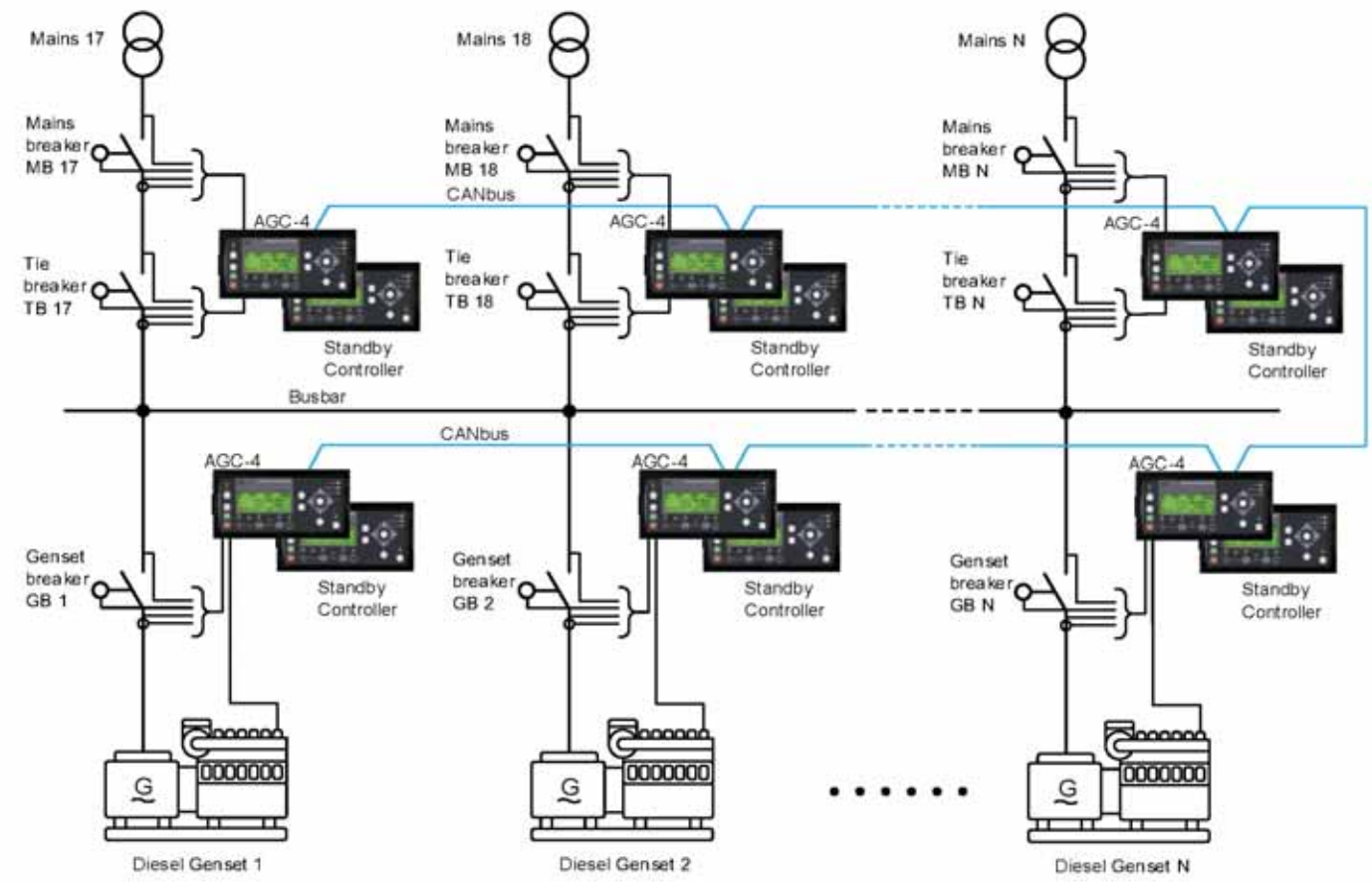
Designing electrical systems for healthcare facilities, especially hospitals, is more demanding than for conventional buildings due to complexity of the system, and its size. It involves many different systems consisting of alternate sources of power, switching equipment, controls, and distribution equipment. The stakes are so high that even a slightest interruption of power can result into a tragic event. Seriously ill and injured people's lives could be at risk. On the other hand, there is increased patient awareness while insurance companies play a crucial role through regulations. Hospitals come under the Clinical Establishment Act and Consumer Protection Act and any shortfall in patient care and safety will invite medico-legal consequences. Major accreditation bodies such as JCI (Joint Commission International), NABH (National Accreditation Board for Hospitals and Healthcare Providers), and ISO (International Organisation for Standardisation) have stringent norms for electrical power availability.

Modern healthcare facilities depend on reliable availability of medical equipment. Without power backup, high-tech healthcare equipment are vulnerable to software or hardware damage. It would result in loss of respiratory devices and other critical equipment for patients in intensive care, neonatal or cardiac units. ECG monitors, ventilators, incubators, laparoscopy system, electrocautery, suction apparatus, defibrillator, ultrasound, biochemistry analysers, and other equipment can stop working. It would also result in loss of lighting, HVAC, refrigeration and water pressure, inability to sterilize instruments, transportation of patients and supplies between floors due to non-operational elevators. Disturbances of the power translate into failed processes, lost electronic patient medical records, decreased efficiency, unhappy patients and lost revenue.

A primary challenge for many healthcare facilities is to provide a high-quality source of electrical power that is backed up with highly reliable emergency and standby power systems to ensure uninterrupted flow of electricity to the entire facility, particularly, during crisis and natural disasters. Power outages force hospitals to look for alternate power sources, where diesel genset are the most favoured option for in house power generation. Control system that would support future expansion for at least over a decade without major modifications is preferred. Availability of local service and support during sudden breakdown is most sought for.

We Suffice Your Requirements

DEIF has a strong track record in developing emergency, standby and



backup power solutions for hospital and healthcare facilities. Deploying DEIF's solution will keep your life saving and revenue-generating medical equipment operational giving you the crucial business edge with satisfied patients and benefit you in numerous ways.

DEIF's Automatic Genset Controller, AGC-4 features proven technology for a wide range of generation systems in critical power applications.

Increased Reliability and Flexibility

In DEIF's redundant control system, two controllers operate in Hot Standby mode, with one as active controller while the other acts as a standby controller. The standby controller is connected to the active controller through CAN bus and remains updated with the latest events and information at all times. In case of any unexpected fault in the active controller, the standby controller assumes control without any load or speed jumps during transition, thus ensuring continuous flow of power.

Fast Energy Backup

AGC-4 controllers are capable of synchronous starting of multiple genset using Close Before Excitation and can deliver record start-up from an impressive less than ten seconds for multiple genset in parallel, redundant control systems, or even an entire redundant power plant.

Fuel Optimisation

DEIF's controllers are designed to run optimum combination of genset, thus reducing fuel consumption, cutting emissions and operating cost, and increasing efficiency of your backup genset power making it greener with fast ROI.

Remote Monitoring

DEIF's Advanced Graphical Interface - AGI 300 series, allows the user to view the entire system on a single screen thus facilitating convenient and effective monitoring and control of all systems or any other third party systems and critical parameters simultaneously; over one centralised IP based network from a remote location at the touch of the graphical user interface.

Scalability

Aiding your future growth and expansion plans, DEIF's controller system is fully scalable multi-master system of up to 992 genset with plant management option in one application without making major modifications in the existing project.

Quick Service

DEIF India has offices in Mumbai, Delhi, Bangalore, Ahmedabad, Chennai and a repair centre for fault identification & rectification in Mumbai. Choosing DEIF means reliable and fast on-site service & support.

For more information, contact: india@deif.com

Illuminating Lives of Underserved Communities

IIT Bombay has received a sanction from the Government of India's Ministry of Finance's National Clean Energy Fund (NCEF) through the Ministry of New and Renewable Energy (MNRE) for distributing 1 Million solar lamps to several states across India…

Many rural areas in India have no access to electricity, and the largest of these are often the rural poor and their school children. In response to such conditions affecting the night studies and other activities of school children in remote rural communities, the project 'Localization of Solar Energy through Local Assembly, Sale and Usage of one Million Solar Urja Lamps (SoUL)', initiated by IIT Bombay aims to empower populations in underserved communities, through high quality programs that meet their real needs to improve the quality of their lives. IIT Bombay has received a sanction from the Government of India's Ministry of Finance's National Clean Energy Fund (NCEF) through the Ministry of New and Renewable Energy (MNRE) for distributing one Million solar lamps to several states across India.

The solar study lamps will enhance school children's daily night studies, exams preparation, homework and other educational programs. It provides numerous health, educational, environmental, and other effective benefits, including eliminating kerosene lanterns and wood fires that produce noxious fumes that are inhaled by such children thus causing health hazards to their lungs and eyes.

Block status: State-wise summary
Total target: Distribution of 1 million (10 Lakhs) solar lamps

State	75% Saturation Target	Institutional Partners	Presence in Districts	Blocks	Assembly Centers	Soul Repair/ Resource Centers (SRCs)	Manpower Trained/ Employed
Maharashtra	1,72,634	BAIF WOTR	Palghar Ahmednagar Pune Nashik	Total:14 Saturated:4	Total:9		223
Madhya Pradesh	4,23,251	Ashagram AKRSP BAIF CARD GVT Sahjeevan Samiti	Annupur Barwani Dhar Jhabua Khandwa Khargone Betul Mandla shahdol	Total: 46 Saturated:22	Total: 28	137	679
Odisha	1,47,168	FES Harsha Trust	Koraput Nabrangpur	Total:24 Saturated: 6	Total:10	21	160
Rajasthan	2,40,644	BAIF FES GVT	Baran Bhilwara Chittaurgarh Dungarpur Rajsamand Udaipur Pratapgarh Banswara	Total:19 Saturated: 5	Total:13	64	347

Project Objectives

The specific objectives of the project "Localization of Solar Energy through Local Assembly, Sale and Usage of 1 Million Solar Urja Lamps (SoUL)" are:

- Localization in assembly, distribution and service of high quality study lamps
- Distribution of 1 Million SoULs to 1 Million students in rural India through the model of block saturation, in a time bound manner
- Research on the impact of solar technology on various socio-economic indicators at the grassroot level

The various outcomes expected of this project include:

- Improvement in attendance and performance of students in schools
- Reduction in school dropout rate and illiteracy
- Reduction in kerosene consumption
- Employment generation and entrepreneurship development
- Awareness about use and capability of solar photovoltaic technology and products

Funding Model

The total funds for this project is contributed by three partners: 36% from the National Clean Energy Funds (NCEP), Ministry of New and Renewable Energy (MNRE), Government of India; 40% from various philanthropic partners including state governments, trusts, corporate social responsibilities, and individuals and 24% comes directly from the student beneficiaries.

The total cost of the Solar Urja Lamp (SoUL) is Rs 500 but student gets this lamp at student discounted price of Rs 120, the break-up of which is illustrated in Chart 1.

Localization

The solar lamps are assembled locally, used by local people and serviced by the locals. By transferring technical skills and knowledge and training locals to use technology, they cease to become dependent on anyone. Local assembly not only results in employment generation, but also allows the locals themselves to repair and maintain the solar products in the future. This local repairing capability will help increase product lifetime, and eventually, build confidence in solar Photovoltaic (PV) technology.

Source: **www.millionsoul.iitb.ac.in**

MoviTHERM Relies on FLIR Thermal Imaging Cameras

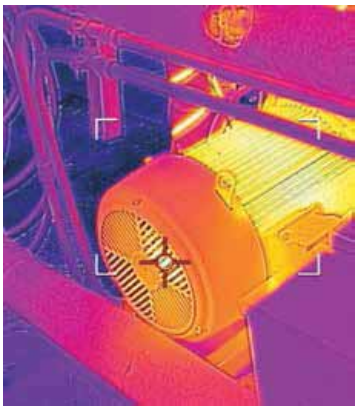
At the pace of modern business today, no one can afford unplanned production outages and costly downtime. Machine Condition Monitoring (MCM) is all about averting these problems before they happen. Based on its many years of experience with the application of thermal imaging, thermography specialist MoviTHERM (Irvine, CA, USA) designed a dedicated MCM solution with FLIR thermal imaging cameras…

Combining thermal and visual cameras in a small, affordable package, the FLIR AX8 provides continuous temperature monitoring and alarming for of critical electrical and mechanical equipment.

Thermal imaging has proven to be an effective way to monitor machine health and detect potential failure points before a failure can occur. Critical in-service health and wear characteristics of electrical and mechanical equipment can be assessed using thermal imaging, and longitudinal temperature data provides a valuable contribution to predictive maintenance programs.

Thermal imaging is perhaps the easiest non-contact temperature measurement method available. Monitoring mechanical components such as motors, bearings, heat exchangers, cooling fans, exhaust vents, pipes and so on for "hot spots" can alert you to possible future fail points. In addition, thermal scans of electrical components, such as cables, wiring, terminals, and control panels can quickly reveal problems such as load imbalance, current overload, loose wires, corroded terminals, or heat management issues.

Thermal imaging makes these otherwise invisible problems visible, so



Thermal imaging helps to detect problems early – before they turn into costly and potentially critical equipment failures.

corrective action can be taken prior to catastrophic failure. That is why deploying thermal imaging cameras for critical equipment monitoring can be a very effective first line of defense against unexpected and unplanned downtime.

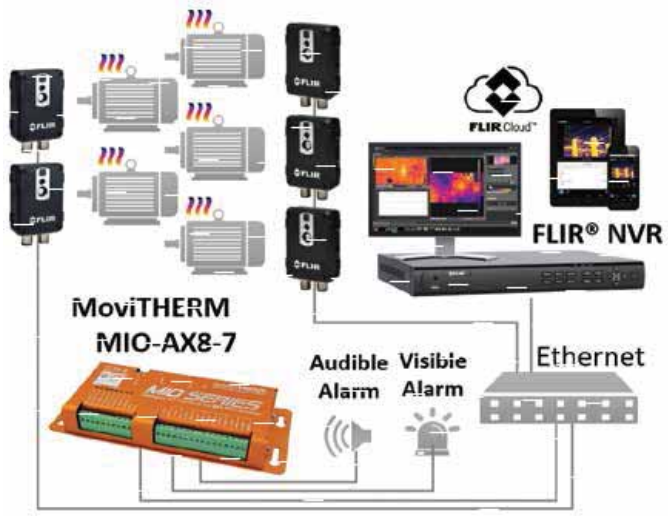
MoviTHERM'S Machine Condition Monitoring (MCM) Solution

MoviTHERM is an authorized FLIR Systems, Inc distributor, integrator, solutions provider and product development company. The company offers thermal cameras and thermal imaging solutions for remote monitoring, automated imaging and non-destructive testing. Some of the industries which MoviTHERM serves are aerospace, general manufacturing, steel, food, agriculture, oil & gas, automotive, academia, and paper and plastic.

To address the growing utilization of MCM for fault detection and predictive maintenance, MoviTHERM has developed a turn-key, integrated MCM System solution. This integrated system has been designed to address the specific needs of industrial MCM installations. Using a combination of advanced thermal imaging and proven, off-the shelf components, the MoviTHERM Machine Condition Monitoring (MCM) System provides a reliable way to detect problems early before they turn into costly and potentially critical equipment failures.

MoviTHERM MIO – the Intelligent I/O

MoviTHERM's MCM system is built around the MoviTHERM MIO Intelligent I/O module. This module processes the temperature data from thermal imaging cameras and updates the analog (4-20mA) and digital (relay) outputs in real-time. Using an advanced embedded architecture, the MIO can drive audible alarms, warning lamps, auto-dialers, SMS message generators, data-loggers or any other standard industrial device — all without a dedicated PC or PLC. The built-in browser-based configuration tool simplifies system set-up and tuning, so you can configure and deploy your MCM system in minutes, rather than hours.



The MoviTHERM Machine Condition Monitoring (MCM) System provides a reliable way to detect problems early

Flir Automation Cameras

The MoviTHERM Machine Condition Monitoring Solution is compatible with a number of FLIR thermal imaging cameras.

FLIR AX8

The FLIR AX8 is a thermal sensor with imaging capabilities. Combining thermal and visual cameras in a small, affordable package, the AX8 provides continuous temperature monitoring and alarming of critical electrical and mechanical equipment. The AX8 helps users guard against unplanned outages, service interruptions, and equipment failure. The AX8 measures only 54 x 25 x 95 mm, making it easy to install in space-constrained areas for uninterrupted condition monitoring of critical electrical and mechanical equipment.

FLIR FC-Series R

The FC-Series R features on-board, non-contact temperature measurement capabilities for fire detection, safety, and thermal monitoring of substations, waste disposal, and valuable equipment. FC-Series R combines state-of-the-art image detail and on-board video analytics. FC-Series R provides reliable detection and flexible alarming options by email, web and mobile apps, edge image storage, digital outputs, or VMS event notifications.

FLIR A310

Fixed-mounted thermal imaging cameras like the FLIR A310 can be installed almost anywhere to monitor critical equipment and other valuable assets. It helps to safeguard production plants and measures temperature differences to assess the criticality of a given situation. This allows users to see problems before they become costly failures, preventing downtime and enhancing worker safety.

FLIR NVR – Your window into the Invisible

The FLIR Network Video Recorder (NVR) displays the live video feeds from the FLIR thermal cameras on a video display screen. In addition, the NVR can be configured to display on-screen warnings and alarm indications. With the Video Archiving function enabled, users can save several months of video on-board, for historical review and issue analysis. Add an Internet connection to the NVR, and the monitoring system can be accessed from anywhere in the world using the FLIR Cloud technology. Alarms and live views can even be consulted remotely, using a PC, Mac, Android, or Apple iOS device running the free FLIR Cloud app.

Unlimited Interfacing Potential

MoviTHERM's Machine Condition Monitoring solution connects to warning lights, audible alarms, auto-dialers, PLC controllers — any type of electrical or control device you can imagine. It provides the intelligent sensor capabilities, Built-in Operator Interface/video wall, and data archiving capabilities in a clean, well-organized package.

For more information, Visit: www.flir.com/automation

Giant Leap on Green Energy Targets

The Government has also approved the enhancement of capacity from 20,000 MW to 40,000 MW of the scheme for development of solar parks and ultra-mega solar power projects. The enhanced capacity would ensure setting up of at least 50 solar parks each with a capacity of 500 MW and above…

In a decisive move to accomplish twin objective of safeguarding climate and tapping renewable energy resources to meet growing demands for power supply, the Narendra Modi Government, during its first three years of governance, has carried forward its commitment of Green Energy, initiating largest ever renewable energy production plans.

In tune with India's Intended Nationally Determined Contributions (INDC), submitted to the United Nations Framework convention on climate change, that India will achieve 40% cumulative electric power capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology, mega plans are being implemented in the Renewable Energy (RE) sector.

The initiatives will pave way for energy security while ensuring power supply in far flung rural swathes where grid supply is inaccessible.

Presently, per capita electricity consumption is only one fifth of the world average. Putting rationale behind thrust on the RE sector, the MNRE officials say the country's present consumption is about 1150 BU and it should reach 1570 BU by 2022. "Even with our ambitious goal of 175 GW renewable power, out of additional requirement of 420 BU, solar will add about 140 BU and Wind around 60 BU, thus 220 BU will be required from conventional power projects."

India has an estimated renewable energy potential of about 900 GW from commercially exploitable sources viz. Wind – 102 GW (at 80 meter mast height); Small Hydro – 20 GW; Bio-energy – 25 GW; and 750 GW solar power, assuming 3% wasteland.

Recently, record low solar and wind power tariffs in latest biddings have added another positive dimension to the sector. Bidders quoted a price of Rs 3.46 per kWh for 1 GW wind tender and Rs 2.97 per kWh for setting up of 750 MW solar power plant in Rewa. It made wind and solar competitive energy source. Lower clean energy tariffs will pose major challenge to fossil fired power. Experts say if power evacuation is ensured, developers may lower tariffs further.

Encouraged by RE sector's big strides, southern state of Andhra Pradesh, according to sources, may soon start solar farming under which farmers will replace existing pump sets with wind energy pumps, and surplus power will be evacuated to grid for additional income.

Sources indicate plans are being mooted to tap hydro power in big way by lacing the sector with incentives like bringing all hydro projects under the ambit of RE scheme against existing benchmark of considering hydro projects of 25 MW only under the sector.

The Ministry of New and Renewable Energy (MNRE) has set another record in the wind power capacity addition by adding over 5400 MW in 2016-2017 against the target of 4000 MW. This year's achievement surpassed the higher capacity addition of 3.423 MW achieved in the previous year.

Now, the Government has also approved the enhancement of capacity from 20,000 MW to 40,000 MW of the scheme for development of solar parks and ultra-mega solar power projects. The enhanced capacity would ensure setting up of at least 50 solar parks each with a capacity of 500 MW and above. Smaller parks in Himalayan and other hilly states where contiguous land may be difficult to acquire in view of the difficult terrain, will also be considered under the scheme.

Solar Parks and Ultra Mega Solar Power Projects will be set up by 2019-20 with Centre's financial support of Rs 8,100 crore. The total capacity when operational will generate 64 billion units of electricity per year which will lead to abatement of around 55 million tons of CO_2 per annum during its life cycle.

A total of 852 projects (based on Solar PV) have been operational under Decentralized Distributed Generation (DDG) of Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY). The MNRE is already implementing a scheme for development of at least 25 solar parks with an aggregate capacity of 20,000 MW, which was launched in December 2014. More than 34 solar parks of aggregate capacity 20,000 MW have been approved which are at various stages of development.

According to latest statistics, under the scheme of setting up of 1000 MW grid connected solar PV power projects by CPSUS and Government organization with VGF(Viability Gap Funding), Total VGF of Rs 450.55 cr has been released so far. Rs 90 crore will be released soon to take total release to Rs 549.55 crore.

Of the total sanctioned capacity of 1037.26 MW to 15 CPSUs/ Government organization within sanctioned funds of Rs 1,000 crore for the scheme, solar projects of 441.50 capacity have already been commissioned so far.

Implementing pilot projects for development of grid connected solar PV power plants on canal banks and canal tops, 50 MW canal tops and 50 MW canal bank solar PV projects have been allotted to eight states. Three MW canal top SPV power project and 16 MW canal bank projects have been commissioned till February, this year.

The Government has set a target of 175 GW renewable power installed capacity by the end of 2022. This includes 60 GW from wind power, 100 GW from solar power, 10 GW from biomass power and 5 GW from small hydro power.

A target of 16660 MW grid renewable power (wind 4000 MW, solar 12000 MW, small hydro power 250 MW, bio-power 400 MW and waste to power 10 MW), has been set for 2016-17. Besides, under off-grid renewable system, targets of 15 MW eq. waste to energy, 60 MW eq. biomass non-bagasse cogeneration, 10 MW eq. biomass gasifiers, 1.0 MW eq. small wind/ hybrid systems, 100 MW eq. solar photovoltaic systems, 1.0 MW eq. micro hydel and 100,000 nos.

The Biomass Cook stove division of MNRE, under the Unnat Chullha Abhiyan (UCA) is also providing improved stoves kitchens of mid-day (MDM) scheme, forest rest houses, families in rural areas, Dhabas, units etc.

The Biogas Technology development division, installed 84,882 of biogas plants during 2014-15 and 74,705 plants in 2015-16 and 47,304 in 2016-17 so far. There are as many 49.5 lakh biogas plants are there in the country. Officials say total estimated biogas generation is about 4 lakh cubic meters per day, replacing annually estimated 44.10 lakh numbers of LPG cylinders of domestic size.

Rs 38,000 crore Green Energy Corridor is being set up to ensure evacuation of Renewable Energy. Many other parallel initiatives were also taken. These include: amendments in the tariff policy for strong enforcement of Renewable Purchase Obligation (RPO) for providing Renewable Generation Obligation (RGO), provision of rooftop solar and 10 percent renewable energy as mandatory under Mission Statement and guidelines for development of smart cities, amendments in building bye-laws for mandatory provision of roof top solar for new construction or higher FAR, raising tax-free solar bonds, making rooftop solar a part of housing loan, ;compulsory net-metering; raising funds from bilateral and international donors, creation of Surya Mitras for installation and maintenance of the solar projects.

Source: **Press Information Bureau**

Neeraj Bajpai,

Member - Press Council of India

Updating LINK Industrial Drive Control Systems

Oracle Drive Systems use the new LINKNET system to update ageing fibre optic LINK drive control system, replacing it with new LINKNET modules for click-and-connect set-up and fast, straightforward configuration via Parker DSE software…

SSD LINK systems were very popular on a number of continuous process machines through the 80s, 90s and into 2000. The LINK system used block programming via software called DSD and connected multiple drives on a fibre optic network. The software was function based so traffic was kept to a minimum allowing very fast processing times - far greater than any of the PLCs of the time. The software also incorporated a number of special blocks that made specialist functions such as winding very straight forward. These blocks could be specially adapted to maximise the performance of the machine.

The LINK system has been obsolete for a number of years and maintaining these systems has become increasingly difficult. Parker has developed a replacement system called LINKNET which allows these systems to be updated and future proofed. LINKNET is an Ethernet based platform and utilises all the features of DSE software to make the transition as straight forward as possible. Parker is working closely with a number of systems integrators to provide the best access and support for the new LINKNET equipment and this can be used on a diverse range of industrial automation applications.

Using an open protocol such as Ethernet allows maximum flexibility for supporting additional equipment such as HMIs and data collection equipment as well as keeping the data transfer speeds at a rate suitable for process machines. In a production environment the benefits in terms of installation, configuration, ease-of-use and longevity are paramount. This represents a significant yet sensible evolution rather than a revolution meaning that implementing newer approaches is not an especially testing or disruptive experience for the end user.

The benefits of switching from fibre optics to Ethernet were well demonstrated in a recent upgrade project undertaken by Oracle Drive Systems – a Parker systems integrator based in Batley, West Yorkshire. Established in 2004 by former employees of what is now known as Parker SSD Drives, the company has built-up significant expertise in designing, implementing and upgrading control solutions for companies using drives in industrial environments.

The end customer in question – Skymark Performance Films – is a provider of cast and blown film co-extrusions and other printed, laminated and complex conversions. The company's products serve a range of sectors including food & drink, hygiene & medical, stationery and textiles. Production is in volume and often on a 'just in time' basis putting emphasis on reliable, flexible and controllable manufacturing processes.

Prior to upgrade by Oracle, the Parker variable speed drives used by Skymark were controlled via an SSD LINK fibre-optic system that, although extremely reliable, had been in place for over 20 years and was approaching obsolescence with spare parts increasingly difficult to source. For the upgrade, Oracle opted for Parker's newer LINKnet Ethernet based version of the popular, proven, but out of date SSD LINK system. LINKnet uses standard CAT-6 cable and needs no external power supply when used as a plug-in module for Parker's AC690 or DC590 drives. This made the retrofit relatively straightforward and allowed a largely 'click and connect' upgrade process, minimising the impact on Skymark's production facility. The LINKnet Ethernet based system dispenses with the need for repeaters and uses the same popular DSE software as the system being replaced. This means that users benefit from a simple 'drag and drop' interface and many pre-engineered macro and function control blocks in LINK's extensive software library to allow straightforward design of systems.

Oracle has addressed numerous other applications with similar upgrades to Ethernet based control using Parker's LINKnet system. As well as avoiding the issues associated with an aged approach with diminishing popularity, the relatively straightforward adoption of LINKnet can deliver multiple benefits in terms of control, versatility and reliability well into the future.

Commenting on the use of LINKnet and its relationship with Parker Hannifin, John Mullins, Oracle Drive Systems said: "The Skymark application provided a great example of the simplicity and advantages of using LINKnet to control and manage the operation of drives in an industrial environment. It also underlined the importance of our close working relationship with Parker as a systems integrator to help expedite the project."

Grant Shoebridge
Commercial Manager - Intelligent Controls Business Unit
Electromechanical & Drives Europe, Parker Hannifin

Forthcoming Events At A Glance

National

Automation 2017
Venue: Bombay Convention & Exhibition Centre, Mumbai
Date: 09-12 August, 2017
Website: www.automationindiaexpo.com

electronica India
Venue: Pragati Maidan, New Delhi
Date: 14-16 September, 2017
Website: electronica-india.com

Renewable Energy India Expo 2017
Venue: India Expo Centre, Greater Noida
Date: 20-22 September, 2017
Website: www.renewableenergyindiaexpo.com

Intersolar India 2017
Venue: Bombay Exhibition Centre, Mumbai
Date: 05-07 December, 2017
Website: www.intersolar.in

International

Power Nigeria
Venue: Landmark Centre, Lagos
Date: 5-7 September 2017
Website: www.power-nigeria.com

ENERGETAB
Venue: Bielsko-Biala, Poland
Date: 12-14 September, 2017
Website: www.energetab.pl

12th International Wire & Cable Trade Fair for Southeast Asia
Venue: BITEC Bangkok, Thailand
Date: 19-21 September 2017
Website: http://www.wire-southeastasia.com/

14th SOLAR Bangladesh 2017 International Expo
Venue: International Convention City, Bashundhara, Dhaka, Bangladesh
Date: 26-28 October 2017
Website: http://cems-solarexpo.com/

Wire & Tube Southeast Asia 2017: Covering Key Sectors

Wire Southeast Asia 2017 – the 12th International Wire & Cable Trade Fair for Southeast Asia and Tube Southeast Asia 2017 – the 11th International Tube and Pipe Trade Fair for Southeast Asia, will return to the Bangkok Trade & Exhibition Centre (BITEC), this 19 – 21 September…

Converging four synergistic key sectors of wire, cable, tube and pipe, wire and Tube Southeast Asia 2017 will present an all-encompassing showcase by over 400 leading exhibitors from 30 countries. The exhibitions are expected to welcome some 7,000 suppliers, manufacturers, processors, engineers and buyers from across the globe. Together, this unique trade-focused setting will provide ample networking opportunities for exhibitors and visitors to maintain their regional market-relevance, keep abreast of global industry trends, see the latest in machinery and technologies, as well as to strike up new business partnerships and collaborations.

Held biennially, the strategic staging of the trade fairs will present a one-stop platform for industry players to ride on the rising market prospects brought about by robust industrial and manufacturing developments in Southeast Asia.

Rising Applications for Wire & Tube

Wires, cables, tubes and pipes play an indispensable role in today's market and carries extensive use across a number of

applications in several industries. The wire and cable materials market is expected to grow to US$ 297.4 billion by 2019 with a five-year CAGR of 7.7% and this is largely due to the continuously rising demands across major end-use industries, including telecommunication, power, automotive, and construction.

According to the Asian Development Bank (ADB), the energy and transport sectors will account for 62.6% of ASEAN infrastructure investment needs until 2020, while Goldman Sachs has projected infrastructure spending in power and transport in Thailand, Malaysia, Indonesia, and Philippines to amount to USD 524 billion by 2020. This is backed by a recent report by the McKinsey Global Institute, that if ASEAN manages to fully implement the ASEAN Economic Community's integration strategy, the region could add up to US$625 billion in global manufacturing to its annual GDP by 2030.

Reflecting these industry trends and shifts, the expansive product range on the show floor will be augmented by a series of concurrent events including a seminar by TUMCIVIL.COM and Eulogy Group that focuses on the design of tall buildings with seismic design led by Assoc. Prof. Dr Paiboon Panyakapo, a Total Quality Management conference organised by Technology Promotion Association (Thai-Japan), as well as informative technical presentations by exhibitors.

From a value-added programme, to a complimentary business matching service, and fostering of strategic relations with industry partners, trade associations and public agencies, wire and Tube Southeast Asia 2017 will allow exhibitors and visitors from all over the world to network, test out and learn of the latest developments and insights in the wire and tube industry – thus leveraging on international business opportunities and to meet the challenges of today and the future.

NHPC to Generate 4458.69 MUs Additional Power

Presently 41 H.E.P. (above 25 MW), aggregating to 11792.5 MW, are under construction in the country. All the above projects are running behind schedule due to various reasons including natural calamities, geological factors, delays in forest clearances & land acquisition and law & order problems...

Minister of State for Power, Coal, New & Renewable Energy and Mines, Piyush Goyal, informed that NHPC is scheduled to generate 4458.69 Million Units (MUs) additional power (based on design energy) from two of its present under construction hydro projects, viz., Parbati-II HEP (800 MW) in Himachal Pradesh, scheduled to be commissioned in October, 2018 and Kishanganga HEP (330 MW) in Jammu & Kashmir scheduled to be commissioned in January, 2018.

Informing about the status of progress of hydro-electric projects in the country, Goyal stated that presently 41 H.E.P. (above 25 MW), aggregating to 11792.5 MW, are under construction in the country. All the above projects are running behind schedule due to various reasons including natural calamities, geological factors, delays in forest clearances & land acquisition and law & order problems, the Minister added.

Goyal informed about the steps taken by the Government for expeditious commissioning of pending projects, which are as follows:

- Central Electricity Authority (CEA) is monitoring the under construction hydro power projects (above 25 MW) in pursuance of Section 73 (f) of Electricity Act, 2003. The progress of each project is monitored continuously through site visits, interaction with the developers & other stake holders. Chairperson, CEA holds review meetings with the Power Projects Monitoring Panel (PPMP) and monitoring divisions of CEA.
- Power Project Monitoring Panel (PPMP), set up by the Ministry of Power, independently monitors the progress of the hydro projects.
- Ministry of Power also reviews the progress of ongoing hydroelectric projects regularly with the concerned officers of CEA, equipment manufacturers, State Utilities / CPSUs / Project developers, etc.
- In case of Central Power Sector Undertakings' (CPSUs) projects, the project Implementation parameters / milestones are incorporated in the annual Memorandum of Understanding (MoU) signed between respective CPSU's and Ministry of Power (MoP) and the same are monitored during the quarterly performance review meetings of CPSU's and other meetings held in MoP/ CEA. The issues related to erection and supply of Electro-Mechanical equipment is expedited with BHEL in various meetings held in CEA / MoP and other local issues affecting the progress of works are taken up with respective State Governments by the Concerned CPSU / MoP.

Online Feedback

Valuable Information about Harmonic Analysis

Article: Power Harmonic Filters for Technological Excellence
Author: Shaikh Shamser Ali
Issue: March 2017

I like your article because the magazine shared valuable information about Harmonic Analysis. It's very useful to do a power quality analysis. Harmonic distortions are one of the most common and irritating problems in industrial environment. The article mentioned about harmonic wave distortion. It is very nice to gain more knowledge about Harmonic Analysis. Harmonic distortions are one of the most common and irritating problems in industrial environment. We need to identify the source of harmonics and suppress them for a quality supply of power. We need to measure these harmonics at various points in the system and perform proper scientific analysis as per international standards. We use IEEE-519 standards for harmonic analysis studies.

– P Kishore

Correct Selection of PWM Switching Frequency

Article: Analysis and Elimination of Third Harmonics
Authors: Paresh Modha, Minesh Joshi
Issue: December 2016

The article discusses the power quality issues and how is the unwanted component (called harmonic) introduced. Consequence of harmonics according to their sequence will be different and most precarious also.

For the new high power systems with Active Front End using PWM inverters these are connected to the AC supply transformer by a 3 wire connection so synchronised 3rd harmonics cannot be produced. However, with a wrong choice of the PWM switching frequency, it is very easy to produce 3rd harmonic currents that are circulating between the AC lines which have been observed in real applications. This type of 3rd harmonic will pass though transformers and can be measured in the AC supply grid. The correct selection of PWM switching frequency will avoid these third harmonics.

– Eric Lewis

Smart Transformers Best Choice

Article: Smart Transformer For Distribution System
Authors: Narendiran S, Dr. Sarat Kumar Sahoo
Issue: 2015

Smart Transformer can help large commercial facilities use power more efficiently to save money, power & go greener. Smart transformers are the best choice for commercial spaces and environments that requires more power for its operation. Its functioning towards the equal and efficient power distribution can help in saving more resources at large. Thanks for sharing the post!!

– Pradeep Kumar

Updates on Solar Sector

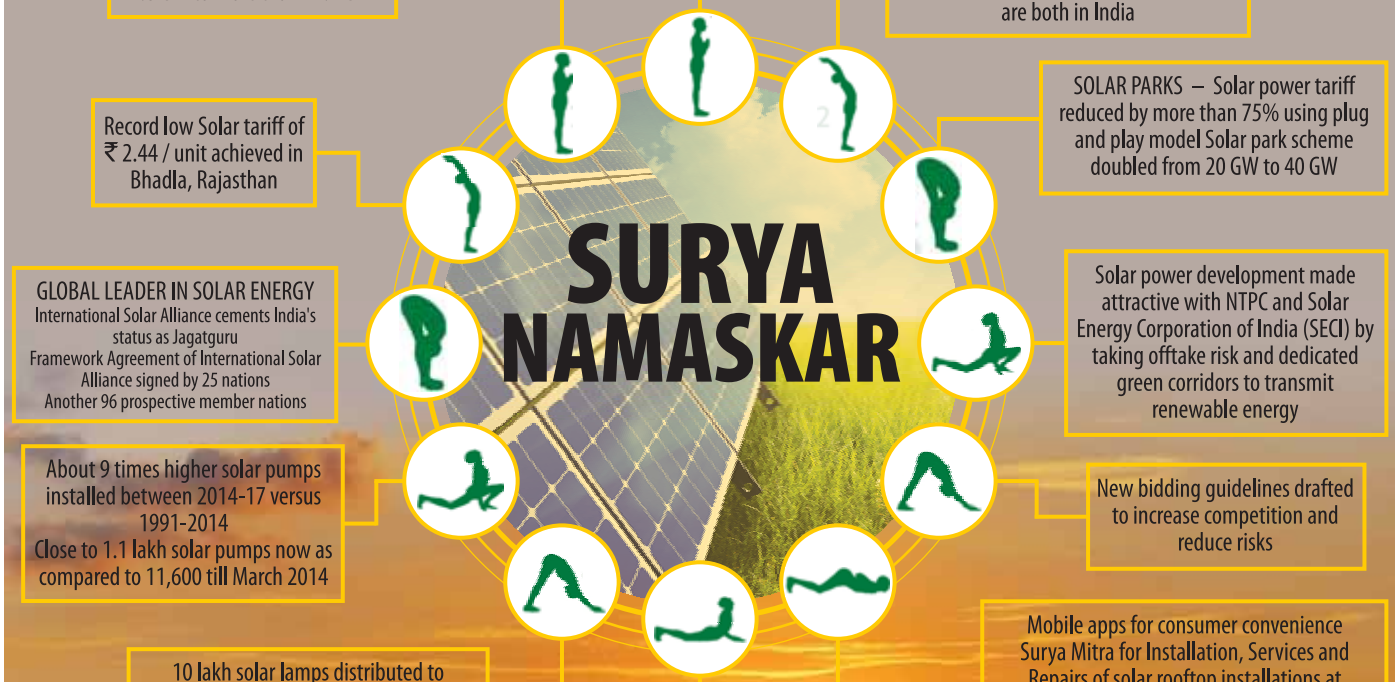
SOLAR ROOFTOPS – Installed capacity increased 15 times from 41 MW in 2014-15 to 656 MW in 2016-17

Solar capacity increased 370% in the last 3 years from around 2.6 GW to more than 12.2 GW

World's largest ground-based solar plant and world's largest rooftop solar plant are both in India

SOLAR PARKS – Solar power tariff reduced by more than 75% using plug and play model Solar park scheme doubled from 20 GW to 40 GW

Record low Solar tariff of ₹ 2.44 / unit achieved in Bhadla, Rajasthan



GLOBAL LEADER IN SOLAR ENERGY
International Solar Alliance cements India's status as Jagatguru
Framework Agreement of International Solar Alliance signed by 25 nations
Another 96 prospective member nations

Solar power development made attractive with NTPC and Solar Energy Corporation of India (SECI) by taking offtake risk and dedicated green corridors to transmit renewable energy

About 9 times higher solar pumps installed between 2014-17 versus 1991-2014
Close to 1.1 lakh solar pumps now as compared to 11,600 till March 2014

New bidding guidelines drafted to increase competition and reduce risks

Mobile apps for consumer convenience
Surya Mitra for Installation, Services and Repairs of solar rooftop installations at customers' door step
ARUN (Atal Rooftop Solar User Navigator) to assist in installation of solar rooftop systems

10 lakh solar lamps distributed to students to enable them to study in the absence of electricity
Another 70 lakh rural students to be provided with solar lamps

Over 130% increase in concentrated solar thermal (CST) from 23,000 sq. mts. in 2014 to 53,000 sq. mts. of collector areas

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Fluke : Committing Best Instrumentation

Fluke Corporation is the world leader in the manufacture, distribution and service of electronic test tools and software. Since its founding in 1948, Fluke has helped define and grow a unique technology market, providing testing and troubleshooting capabilities that have grown to mission critical status in manufacturing and service industries. Every new manufacturing plant, office, hospital, or facility built today represents another potential customer for Fluke products.

From industrial electronic installation, maintenance and service, to precision measurement and quality control, Fluke tools help keep business and industry around the globe up and running. Typical customers and users include technicians, engineers, metrologists, medical-device manufacturers, and computer network professionals — people who stake their reputations on their tools, and use tools to help extend their personal power and abilities.

Fluke has achieved the number one or number two position in every market in which it competes. The Fluke brand has a reputation for portability, ruggedness, safety, ease of use and rigid standards of quality.

A wholly owned subsidiary of Fortive Corporation (NYSE: FTV), Fluke is a multi-national corporation headquartered in Everett, Washington, USA. Manufacturing centers are located in the USA, the UK, Asia and The Netherlands. Sales and service subsidiaries are located in Europe, North America, South America, Asia and Australia. Fluke Corporation has authorized distributor and manufacturer representative channels in more than 100 countries and employs approximately 2,400.

Fluke in India is located at Mumbai, Bangalore, Delhi, Kolkata, Chennai & Hyderabad. Fluke is committed to provide the best instrumentation to assure that manufacturing, electronic & electrical systems operate accurately and at their highest level. Fluke builds tools that people use to calibrate sophisticated instruments. These instruments are used to ensure consistency and quality and to pinpoint problems in manufacturing systems. Fluke tools are required by our customers to do their Job best. Fluke has been specializing in metrology for more than two decades and to help calibration professionals remain up to date with the industry that directly impacts the quality of our manufacturing which will give India a much needed edge in world markets.

For further information: www.fluke.com

DOLD Electric India: Manufacturing Safe Automation Products

By founding a sales subsidiary in India Dold is looking to strengthen contacts with its Indian customers and intensify its activities in the market. Dold & Söhne KG in Furtwangen has founded its subsidiary Dold Electric India, based in Vadodara.

Dold & Söhne KG is an internationally oriented medium-sized family owned company. It develops, manufactures and markets high-end solutions for electrical safety and safe automation in machine building industry. The comprehensive product portfolio includes switchgear, safety relays with forcibly guided contacts, electronics enclosures, safety switch and trapped key interlock systems as well as wireless safety solutions.

The founding of the Indian sales subsidiary Dold Electric India represents a strengthening of the presence in India. With the Indian staff on the ground, contacts to existing customers can be intensified and the market developed to a greater extent. Indian customers are able to benefit in particular from Dold's broad product spectrum and professional service. The combination of a high level of production depth at the parent company and close local customer relationships with current and prospective customers makes customer specific solutions feasible too thus facilitating the provision of solutions for almost any application.

We are sure that through Dold Electric India the presence in the region can be strengthened and that reactions to the requirements of Indian customers can be further improved.

For further information, Email: m.diwanji@dold.in

New Plastic Angle Adapters from igus

Push in the connector, bend the cable, fix and ready to use: With the new igus ibow, cables can be installed with angled plug connectors and save space in just a few steps.
(Source: igus GmbH)

The motion plastics specialist igus has developed the ibow for a quick and easy angling of plug connectors. The angle adapter can be installed either during assembly or retrospectively on existing cables. To ensure operational reliability, the connector need not be removed from the cable. The ibow reduces your planning and delivery times as much as the assembly and storage costs.

Slide it on, bend the cable, fix and ready to use! In just a few steps, the new igus ibow, from the motion plastics specialist igus, can be used to attach cables with an angled plug connection and save space. With this simple injection moulded part, igus allows flexible connection of cables to a machine, whereby the angle of connection is freely selectable. "With the use of the igus ibow, cables can be connected just as easily to machines as without the adapter," explains Christian Stremlau, Head of the Readychain or Readycable Division at igus. "Customers do not need specially trained personnel and also save twice because they only need to get one type of plug connector, the straight connectors and their harnessing are also significantly cheaper than angled connectors." Users can, therefore, obtain the identical connector types as harnessed readycables from igus and also choose the best angle for connecting to the machine later. This saves process and storage costs and above all eliminates errors.

Faster and, above all, safer use

By using the cost-effective igus ibow, the connector does not have to be removed from the cable, which saves time and is also safer. As soon as the cable complete with connector has been pushed through the adapter and angled, it must be fixed with a cable tiewrap. In this way, it can also be removed again easily later if required. Depending on the customer's requirements, igus supplies the ibow as an individual part in various installation sizes or already harnessed together with the appropriate cables. Users can also specify the desired colour or add additional individual labels.

For further information: www.igus.in

Newest Fluke motor diagnostics tool incorporates Veros machine learning technology

Fluke and Veros Systems have entered into an agreement to collaborate on asset performance and condition monitoring technologies, with the goal of increasing visibility into the efficiency and reliability of electric motor driven machines. The Fluke 438-II Power Quality and Motor Analyzer is the first tool to result from that collaboration.

Fluke is the leading provider of power quality instrumentation and technology for maintenance of critical industrial equipment. The Fluke 438-II analyzes three-phase power quality measurements and uses an innovative method developed by Veros to calculate motor output torque, speed, horsepower and efficiency. Using this information, engineers and technicians can evaluate system performance and detect overload conditions while the motor is operational, without the use of any mechanical sensing devices such as tachometers, strain gauges or other intrusive sensors. The combined technologies of the Fluke 430 series and Veros further enhance industry's ability to identify energy waste and maintain critical machinery.

For further information: www.fluke.com/india

Bringing the Innovation with Touch Screen Metering Solutions

In today's complex & challenging Power Demand Scenario, it is essential for every Power Company to look at the Demand, Energy, Power Quality, System parameter monitoring and recording for analysis and to take steps in maintenance and control of the system equipments so as to REDUCE system downtime.

The Multi function meter is basically used to Measure, Record(Via Protocol Like MODBUS, Ethernet) and display of AC electrical parameters like RMS Voltage, Current , Active power, Reactive power, Apparent power , Power factor ,Phase angle , Frequency, Active energy , Reactive energy , Apparent energy, Demand in 3 phase 4 Wire and 3 phase 3 Wire System. This meter is intended for application areas where accurate & reliable measurement is necessary.

Rishabh Instruments has launched various models of Rish Master series multifunction meters in the past which met all the prominent needs of the market and made Rishabh a common name among the customers & Panel builders. Now to enhance the range further and bring Innovation in the metering solutions market, we are launching the advance series of LCD Touch Display Rish Master 3440i and Rish Master 3430i models which are currently available in only LED display without touch.

The key highlights of the product are as follows:

- Touch screen graphics LCD with Custom colour setting.
- Phasor Diagram and Pictorial Representation of Waveform.
- Phase Reversal Indication.
- Measurement of kW, kVA and current Demand.
- Total Harmonic Distortion measurement.
- Indication of Run Hour, ON Hour and No. of Interruptions.
- More than 40 Electrical parameters measurement.
- Optional MODBUS (RS485) Output (With Optical Isolation).

For further information: www.rishabh.co.in

Hitachi High-Technologies introduces New Regulus Series of FE-SEM

Hitachi High-Technologies Corporation revealed the introduction of the new Regulus series of Field Emission Scanning Electron Microscopes (FE-SEM) on May 30. As a new brand for FE-SEMs, the Regulus series lineup comprises four models: the Regulus8100, developed as the successor to the SU8010, as well as the Regulus8220, Regulus8230, and Regulus8240, which extend the functions of the SU8200 series with the use of a common platform. The Regulus series offers enhanced functionality with improved resolution and operability.

Main Features

- Cold field emission (CFE) gun optimised for low-voltage, high-resolution imaging with low aberration
- Resolution improved by20% than previous models (Regulus8220/8230/8240: 0.9 nm/1 kV; Regulus8100: 1.1 nm/1 kV)
- Maximum magnification doubled from 1 million times to 2 million times*1(Only in Regulus8240/8230/8220)
- User-support functions to ensure high performance

For further information: www.hitachi-hightech.com

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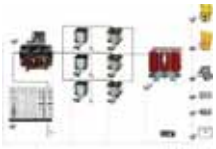

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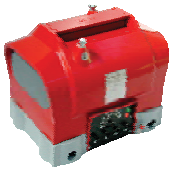

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