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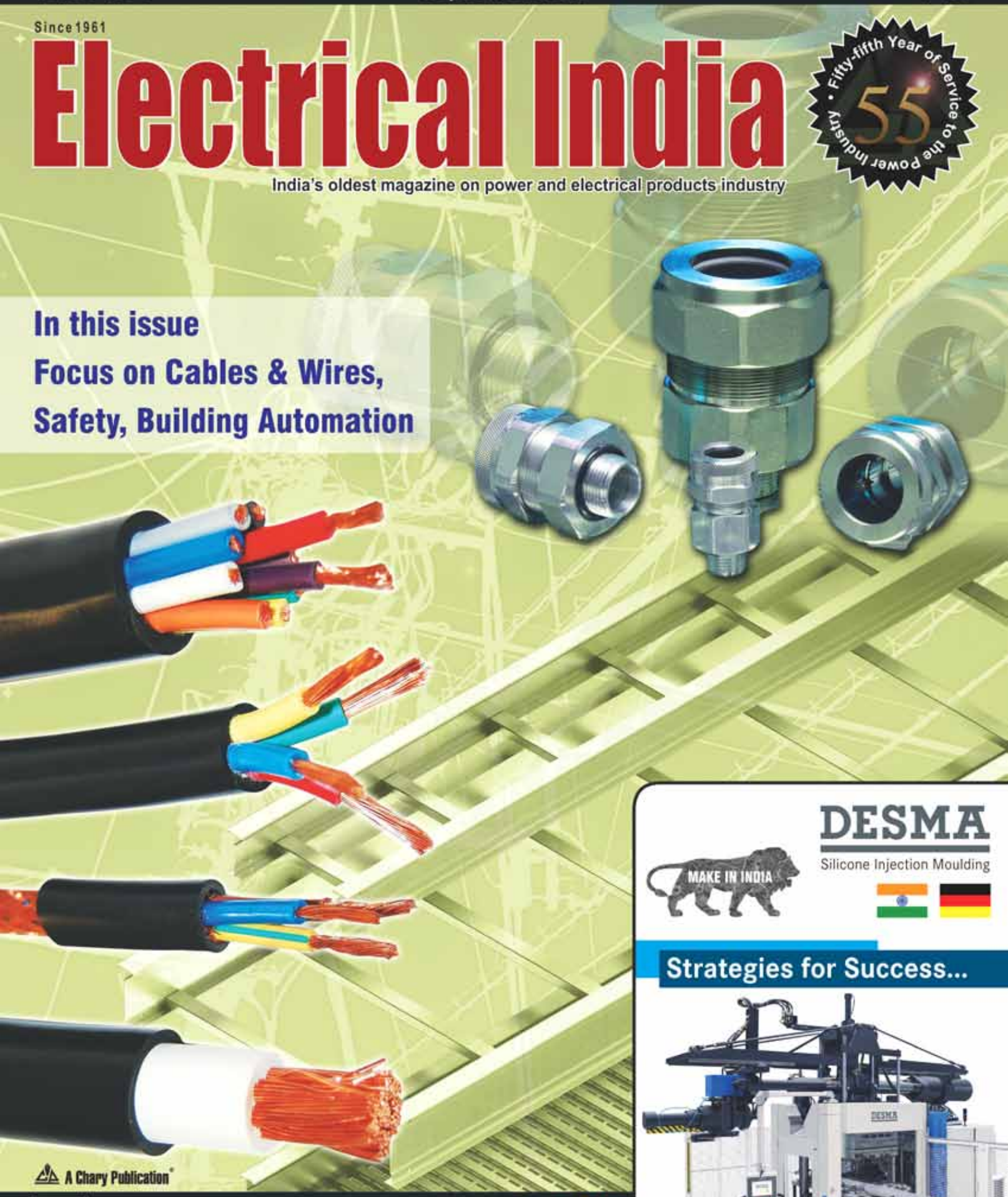
In this issue

Focus on Cables & Wires, Safety, Building Automation



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Clarion/MEDIA/015/2015

Mahadevan Iyer
Editor-in-chief, Publisher & Managing Director
miyer@charypublications.in

Today's home environment is no less complicated than any other industrial set-up...

Energy saving is a very popular topic these days. There are different ways of saving energy at home. It's not like that we do not know or we are not aware of some very common practices that can amazingly reduce our energy bills.

However, among us there is a big gap between knowledge and implementation. What I mean is – mere collection of knowledge serves no purposes unless we implement that properly with right spirit and consistently follow up to prevent any deviation of the practice.

Today's home environment is no less complicated than any other industrial set-up where a number of machines are kept to ease household jobs. Thus, several energy saving steps that are recommended for industrial establishments are equally helpful to domestic arenas. So, we need to follow some common steps at both the places as the target is the same.

As in most of the industries, there is a prevailing practice called fail-safe approach, I often think, that should be invariably adopted in home environment too. More clearly, the home auditors suggest switch off the lights when there is no one in the room to use those.

Obviously, you know, it will take many more years in Indian environment to implement this approach at every home every time. Then? Well, it does not cost much time or money to install occupancy sensors. Whether each and every person follows a rule or not, the sensor will do its job. Ultimately, the house owner's energy bill will reflect that. Isn't it a better choice?

Do send in your comments at miyer@charypublications.in

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Office Address:

Editorial, Subscription and Advertisement Office:
201, Premalaya,
Next to Cafe Coffee Day,
Opp. Telecom Factory,
Deonar, Mumbai - 400 088.
Tel.: (022) 2507 3300 / 01
www.electricalindia.in

Directors
Pravita Iyer
Mahadevan Iyer

Publisher
Mahadevan Iyer

Editor-in-chief
Mahadevan Iyer
miyer@charypublications.in

Editor
P K Chatterjee
pkchatterjee@charypublications.in

Editorial Co-ordinator
Nafisa Kaisar
nafisa@charypublications.in

Advertisement Department
Yasmeen Kazi
yasmeen@electricalindia.in
Kaushalya Kadam
advt@electricalindia.in

Design
Rakesh Sutar

Subscription Department
Hemant Yelave
Nafisa Khan
sub@charypublications.in

Accounts
Dattakumar Barge
Bharati Solanki

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Editor : P K Chatterjee

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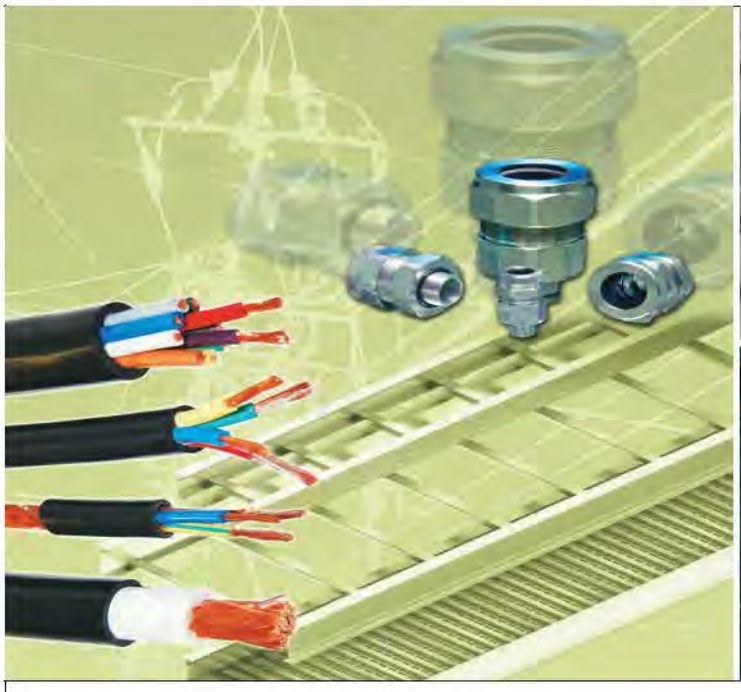

Departments

Interview

V K Mohindru
Executive Director
Hartek Group

Cable And Wire Market

With the new government's emphasis on providing power for all by 2019, this industry will definitely get a boost...

P K Chatterjee (PK)

Depending on applications, the global cable and wire market is segmented into telecommunication cables and power cables. During the last one decade or so, the telecommunication market has grown rapidly worldwide and especially in India. As before the present union government took over, the Indian electrical sector was growing at a slow gear, the wires and cables market was also sluggish. However, the scenario is changing now.

Although there are little differences in figures projected by different market researchers as far as the valuations of global cables and wires industry are concerned, everybody agrees that the industry will chart a positive growth path.

According to BCC Research, the global cable market was valued at $188.3 billion in 2013, and this market is expected $297.4 billion in 2019. A Compound Annual Growth Rate (CAGR) of 7.7% will be seen from 2014 to 2019.

ResearchMoz points out in their research report that the global cable and wire market is expected to grow at an approximate CAGR of 8% between the years 2014 and 2019. Global technological advancement is marked by the booming cable and wire market. They hold that the global cable and wire market is driven by the growth of the communications and the information technology industries where cables and wires play a very pivotal role in power transmission. ResearchMoz's report also states that the cable and wire market witnesses high demand from various end-use segments that include commercial, residential and industrial aspects. Power supply companies and telecom operators are some of the end-use industries operating in the global cable and wire market.

With the new government's emphasis on providing power for all by 2019, this industry will definitely get a boost. However, the projects have to move as per schedule. That apart owing to the projects from other countries, Indian cable and wire manufacturers will find a good export market too very soon.

Please e-mail me your views at pkchatterjee@charypublications.in

P. K. Chatterjee

Vikram Solar collaborates with Edmundson Electrical

Image Courtesy: www.edmundson-electrical.co.uk

Indian solar module manufacturer Vikram Solar has teamed up with UK's Edmundson Electrical Greentech. As part of the collaboration between the two companies, Edmundson Electrical Greentech has added Vikram Solar's photovoltaic modules to its product range. The supply agreement covers Eldora Ultima modules with a total annual output of around 25 MW.

"Vikram Solar is the ideal partner for us. Not only does the company's tier 1 status demonstrate its future viability and efficiency, but its Eldora Ultima modules have also been proven to fulfil our strict quality criteria. Last but not least, we were also impressed with the particularly good price-performance ratio and Vikram's local presence in Europe and especially the UK," said Andrew Fawcett, Business Development Manager, Edmundson Electrical.

Eldora Ultima modules are available from 250 Wp to 265 Wp and certified to operate in very harsh conditions. The UK's leading independent renewable energy auditor, OST Energy, confirmed that, at the time of the audit in October 2014, the modules had the highest efficiency at Nominal Operating Cell Temperature (NOCT) of any comparable product it had audited.

Govt launches Indian Wind Resource Atlas

Image courtesy: PIB India

Piyush Goyal

Piyush Goyal, Minister of State (IC) for Power, Coal & New and Renewable Energy stated that the Indian Wind Resource Atlas will help policy makers at Centre and State Governments to deal with issues related to tariff fixation, transmission, grade frequency etc., and providing better infrastructure for the investors.

He assured that the Ministries of Coal, Power and New & Renewable Energy will keep on providing more and more data in public domain and thus work on bringing transparency in the system. Saurabh Patel, Gujarat Energy Minister, Rajendra Shukla, Madhya Pradesh Energy Minister, Pushpendra Singh, Rajasthan Energy Minister, D.K. Shivkumar, Karnataka Energy Minister, senior officials from central agencies, state government and high level representatives of the wind industry were also present at the occasion.

The new Indian Wind Atlas is an important online GIS (Geographic Information System) tool for identification of the regional and local wind energy potential in India. It contains average annual values of Wind Speed (m/s), Wind Power Density and Capacity Utilization Factor (CUF) calculated for an average 2 MW turbine at 100 m.

Power Grid to use Alstom's T&D components

Alstom's world class transformer and reactor manufacturing facility at Vadodara...

Powergrid Corporation of India Limited (Power Grid) has placed an order for transformers and shunt reactors for 765/400kV substation situated at Agra in Uttar Pradesh – and spare units of 765kV transformers and reactors as part of Eastern and Southern Region Strengthening Schemes, with Alstom T&D India. Together, the three new contracts worth approximately €33 million (INR 2317 million). The products for all these contracts will be delivered from Alstom T&D's factory at Vadodara. Once commissioned, these substations at Agra will help transmit power from the Lalitpur Thermal Power Plant to meet the growing demand for electricity in the northern region of the country.

In the words of Rathin Basu, Managing Director, Alstom T&D India, "We are pleased that Power Grid continues to repose faith on our products, technology and capabilities to strengthen the transmission backbone of the national grid. Alstom Grid is one of the major technology providers in the area of 765kV AC, 800KV HVDC and Automations to Power Grid – and thus a strong contributor in its ambitious plan for building a solid national grid. Through our world class transformer/reactor facility at Vadodara, we continue to offer our customers with reliable and advanced offerings, which have a vital role in developing the transmission network of the country."

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Telangana to get 200MW of solar photovoltaic projects

The State of Telangana, under the leadership of Chief Minister K. Chandrashekar Rao has awarded SkyPower with solar photovoltaic projects of 200MW.

Telangana is the second state after Madhya Pradesh where Skypower has been awarded with Solar PV projects. This move by SkyPower is going to help India to embrace solar energy and push forward the efforts to rapidly adopt solar – as a means to help grow its economy and provide families with access to lower-cost electricity.

SkyPower has unique abilities to leverage its global purchasing power, experience and track record to help meet its targets in India, which are aligned with the vision and objectives for solar energy in India as detailed by Prime Minister, Narendra Modi and Minister of State for Power, Coal and New & Renewable Energy Piyush Goyal.

"India is leading the world in deploying solar, not only with its significant targets but also by its very actions. It is truly an example for others to follow," said Kerry Adler, President and Chief Executive Officer of SkyPower Global.

SkyPower considers India to be one of the key solar markets in the world that holds tremendous growth potential as is evident by the Government's commitment to rapidly increasing the country's electrification rate and helping to support and foster the growth of what clearly is a trillion dollar industry.

SkyPower is thrilled to be part of the fabric of India and plans to actively and competitively participate in various other states and processes in the months ahead.

Siemens bags modernising orders worth INR 75 crore (approx.) for grids

Jan Mrosik, CEO of the Siemens Energy Management Division, Siemens AG

Siemens is modernising the power distribution grids of the cities of Amritsar, Jallandhar, Ludhiana, Dehradun and Faridabad in northern India. The objective of these projects is to improve the quality and availability of the power supply to residents as well as to reduce the downtimes in the event of blackouts in the entire grid.

As part of the modernisation, the company will implement its Spectrum Power network control system and equip the grid with SCADA/DMS functions (Supervisory Control and Data Acquisition/Distribution Management System) for monitoring and control. The customers are three utility companies, Punjab State Power Corporation, Uttarakhand Power Corporation and Dakshin Haryana Bijli Vitran Nigam. The volume of the orders amounts to a total of approximately Rs. 75 crore. In these projects, Siemens network control technology will be used as part of an energy development programme sponsored by the Indian government.

"Our SCADA/DMS systems are being successfully used by numerous energy suppliers and grid operators in India, where – among others – our systems reduce the downtimes in the event of blackouts in the grid. With the new orders from northern India, as the leading supplier of grid automation, we are consolidating and expanding our position worldwide," said Jan Mrosik, CEO of the Siemens Energy Management Division, Siemens AG.

Sunil Mathur, Managing Director and Chief Executive Officer, Siemens India, said, "For cities to be able to deliver true value, they need to be able to provide their inhabitants with the highest standard of living – while ensuring sustained protection of the environment. One such area is the Smart Grid Solutions, which can effectively transform the operational capabilities of power utilities, leading to improved service to its consumers."

BHEL commissions the 7th 500 MW plant for Vindhyachal STPS

Bharat Heavy Electricals Limited (BHEL) has added one more coal-based power plant to the grid by successfully commissioning the 500 MW Unit-13 of Vindhyachal Super Thermal Power Station (STPS), Stage-V of NTPC.

The project is located in Vindhyanagar in Singrauli district of Madhya Pradesh. Significantly, BHEL has earlier commissioned 6 units of 500 MW rating each at Vindhyachal power station.

With the commissioning of this unit, BHEL has now commissioned 7 sets of 500 MW aggregating to 3,500 MW, the highest by the company in a power project. BHEL's scope of work in the contract envisaged design, engineering, manufacture, supply and erection & commissioning of Steam Generator and Steam Turbine Generator along with associated Auxiliaries and state-of-the-art Controls & Instrumentation. The equipment for the project was manufactured at BHEL's Trichy, Ranipet, Haridwar, Hyderabad, Bangalore and Bhopal Plants, while the company's Power Sector - Western Region undertook erection and commissioning of the equipment.

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Prysmian Group wins contracts in Belgium

Contracts have been awarded to Prysmian Group to supply wind turbine inter array cables for the Bligh Bank 2 offshore wind farm, located off the coast of Zeebrugge in Belgium by Nobelwind NV. Prysmian is responsible for the design, manufacture and supply of the 33 kV submarine cables with various cross-sections to be used to connect the 55 individual wind turbines and an Offshore High Voltage Substation (OHVS) that form the 181.5 MW wind farm located near the existing OHVS of Belwind1.

In addition a 33 kV coupling cable shall be supplied for use as a back-up connection between the Belwind1 OHVS and the Bligh Bank OHVS. Prysmian will also provide the offshore cable termination and testing services for the project. The cables will be produced in Prysmian's facility in Drammen,

Norway, one of the Group's excellence centres for submarine cables. Installation works are scheduled to be complete by the first half of 2017.

This new project re-affirms the Group's full capability and expertise in offshore wind farm cable connections and demonstrates an extended ability to execute complex solutions that support the demands of this growing industry. Over the years Prysmian has moved ahead with major investments in new and upgraded assets, broadening the range of its offered products and innovative technologies, strengthening services and capabilities in production and execution in order to serve the market as a trusted and dedicated partner for offshore wind parks cabling needs, whether for medium voltage inter-array cables, HVAC and/or HVDC export cables, as well as turn-key EPC installation services.

Prysmian can rely on three production facilities dedicated to submarine cables, situated in Arco Felice (near Naples, Italy), Pikkala (Finland) and Drammen (Norway); two installation vessels, Giulio Verne and the recently upgraded Cable Enterprise, together with well-proven in-house cable protection equipment, and specialised operations teams.

FLS Energy starts construction of solar energy plants

FLS Energy has closed financing and begun construction on 33 megawatts of utility-scale solar farms across seven locations in North Carolina. The solar energy plants will produce approximately 50 million kilowatt hours of electricity per year or enough energy to power over 4600 average U.S. homes.

The portfolio of projects is being constructed as a bundle and will be financed by Key Bank. "We are very pleased to have played a leading role in the financing of FLS Energy's solar portfolio. The financing of this type of projects demonstrates our commitment to sustainability and renewable projects with solid fundamentals," said Andrew Redinger, Managing Director and Head of KeyBanc Capital Markets' Utilities, Power & Renewable Energy Group.

The portfolio of projects is the fourth phase of approximately 250 megawatts of solar energy facilities FLS Energy will be building in 2015. "We are very excited to have a new partner in Key Bank and look forward to a long and mutually beneficial relationship. This portfolio of projects is another example of how the North Carolina solar industry continues to create high paying jobs while making our state the emerging clean tech hub of the eastern U.S," said Dale Freudenberger, CEO of FLS Energy.

Sterling and Wilson to set up a PV power plant

Bikesh Ogra, President, Sterling and Wilson, Electrical & Solar Business

A solar energy developer in Philippines has appointed India's well known Solar EPC Sterling and Wilson to set up their 28.6 MW solar photovoltaic power plant in Sanroque, Digos, Davao, Philippines. Enfinity Philippines Renewable Resources Inc., is a subsidiary of Enfinity N.V.

This project will be constructed under the Department of Energy's (Philippines) Solar Power Procurement Program under the Feed-in-Tariff mechanism. The solar power plant capacity is expected to be around 28.6 MW (DC) / 24.75 (AC).

Bikesh Ogra, President, Sterling and Wilson, Electrical & Solar Business, said, "The fact that we are one of the only Indian Solar EPC to have already set up solar projects in the international market gives us immense motivation to work harder. With human assets of nearly 3500 technically proficient people working from India and abroad, we possess an inherent strength to execute international solar projects in an efficient and cost effective manner."

"We are confident that our superior engineering capabilities, experience and expertise in setting up solar power plants internationally will enable us to deliver Enfinity Philippines Renewable Resources Inc. with a solar solution that will exceed predicted plant performance levels," he added.

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GE to upgrade Sutton Bridge power station

Sutton Bridge Power Station...

GE will upgrade Calon Energy's Sutton Bridge Power Station in Lincolnshire with a broad range of hardware and software technologies to increase power production, improve efficiency and flexibility and reduce its operating costs. The 800 Megawatt (MW) natural gas-fired combined-cycle power plant provides electricity to the East Anglian region of the United Kingdom, and the upgrades will help increase the competitiveness of the plant in the country's challenging power industry.

Sutton Bridge's two existing GE 9FA gas turbines and a D-11 steam turbine will be upgraded with multiple applications from the OpFlex controls software suite, a Dry Low NOx 2.6+ combustor and Advanced Gas Path (AGP) technology solutions. The project represents the first 9FA AGP upgrade in the U.K. These enhancements will help the power station become a far more flexible, reliable and efficient plant able to meet the demands of the U.K.'s power needs today – while also being able to respond to the requirements of the future with the introduction of the U.K. Power Market Balancing Mechanism. Sutton Bridge also will benefit from additional availability to generate power with extended periods between planned outages with these upgrade solutions. The project is expected to begin in mid-2016 and be completed some months later. "This is a significant investment by Calon Energy, particularly in the current economic situation. We play an important role by providing energy at peak times and cover renewable generation intermittencies," said Kevin McCullough, Chief Executive, Calon Energy.

SkyWolf rolls out its DAWT technology

Wind and solar power in one wind turbine...

SkyWolf Wind Turbine has recently introduced its new patented Solar Hybrid Diffused Augmented Wind Turbine (DAWT) technology in the world that combines Wind and Solar power in one wind turbine, exponentially increasing the efficiency and electric energy output by reducing the static pressure behind the rotor blades.

Through a twelve year patent cycle, SkyWolf has completed the design and development of the first ever (as claimed by the company) Solar Hybrid Wind Turbine, which is capable of producing more energy output in lower wind speeds as low as 3 mph within a significantly smaller footprint compared to traditional turbines. The exponentially increased efficiency and electric energy output is a result of reducing the static pressure behind the rotor blades and facing the wind. Solar panels have been added to capture the additional solar source of energy provided by earth. After an initial beta installation, the DAWT has produced a monthly average 600 to 800 kWh in an average wind speed of 16 to 18 mph.

Gerald Brock, President and CEO of the company says, "After two installs and 12 years of design and development and four patents, we have finalised our Solar Hybrid DAWT product to a point that these units are capable of producing more electrical power than conventional wind turbines at wind speeds as low as 3 mph all within a lower height of only 26' and smaller swept blade area footprint of only 11' diameter."

Paul Morrell, VP Business Development of the company says, "We are finally ready to commercially launch this product into the marketplace – and we believe this product offers an outstanding alternative to the wind and solar energy industry. The smaller physical size and large electrical energy output makes this an exceptional product application."

Institution hosts national level automation competition

Vishwakarma Institute of Technology, Pune, is set to host the first ever national-level automation competition for students in India launched by Mitsubishi Electric India. The competition will take place on 12-13th February, 2016. The Mitsubishi Electric Cup has already kickstarted across the country and students can start registering at http://www.MitsubishiElectric.in/FA/MECup. The competition invites participation from technical institutions across the country. Students are required to integrate Mitsubishi Electric's factory automation products (including PLC, servo, inverter and human-machine interface, etc.), build up and achieve an analogous system of intelligent manufacturing and energy saving management application, based on e&eco-f@ctory concept while taking e-f@ctory system as the trunk.

The top 15 teams need to prepare working model of various industrial manufacturing processes, energy saving solutions, smart solutions for building automation etc. Teams will be provided with technical support, training and FA equipment worth ₹ 1.75 lakh to make the model, on a returnable basis by Mitsubishi Electric India.

All the participants will be given certificates of participation and the winning team will get a prize worth of ₹ 1 lakh. The runner up team will be awarded prize worth of ₹ 75,000.

President Obama's 'Clean Power Plan' receives applause

Prof. Nicholas Stern

Professor Lord Nicholas Stern, Chair of the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science and President of the British Academy has welcome President Obama's Clean Power Plan.

In his words, "This is a very important announcement by President Obama which will reinforce the credibility of the commitment by the United States to reduce its greenhouse gas emissions as a new international agreement on climate change is being finalised. It shows the determination of the world's richest country to maintain better economic growth while also cutting greenhouse gas pollution. President Obama has recognised in particular the enormous damage caused by pollution from the burning of coal in power stations. Coal emits twice as much carbon dioxide as natural gas per unit of electricity generated when it is burned in a power station, and also releases other pollutants that threaten the lives of Americans.

Recent estimates suggest about 200,000 Americans die prematurely each year due to air pollution, and a quarter of those deaths are attributable to emissions from power stations. The International Monetary Fund published figures last week that the failure by the United States to take into account the full impacts of coal on human health and the environment represented a subsidy of more than $200 billion each year, or about % of its GDP. Curbing pollution from power stations in the United States will improve the health of Americans, strengthen its economy, spur innovation and growth, create jobs and opportunities, set a powerful example for the rest of the world, and promote the prospect of a more ambitious international agreement on climate change at the summit in Paris at the end of this year."

ABB supports Saudi Arabia's T&D upgrade effort

ABB has won orders worth around $150 million from the Saudi Electricity Company (SEC) to expand five existing substations, helping to ready the country's transmission system for a 50% expansion of power generation capacity to accommodate a growing economy. SEC, Saudi Arabia's national power transmission and distribution operator, is increasing the capacity of the substations, with three located in the central region and one each in the eastern and western regions. The orders were booked in the second quarter of 2015.

Economic growth in Saudi Arabia and the Gulf Cooperation Council (GCC) countries, primarily driven by oil and gas, necessitates a strong power infrastructure to secure a reliable electricity supply to growing industrial and commercial sectors in the region, as well as to households. To meet this rising demand, Saudi Arabia is boosting its power generation capacity from less than 60 Gigawatts (GW) to about 91 GW by 2020, and to more than double existing capacity over the longer term. ABB is supporting these efforts through several projects across the country, including an additional $60 million order booked in the second quarter from SEC for 65 power transformers.

"We are privileged to continue supporting the development of Saudi Arabia's power infrastructure. These substations will strengthen the grid and enhance transmission capacity, enabling electricity to reach more consumers and support this growing market, in line with our next level strategy," said Claudio Facchin, Presidentof ABB's Power Systems Division.

CG extends its support to EDP again

Laurent Demortier
CEO & MD, CG

Energias de Portugal (EDP) has given another major order to Avantha Group Company CG, selecting them as the main suppliers for data concentrators. The contract is to supply ZIV single phase smart meters to EDP. ZIV's single phase smart meter model is nowadays the reference smart meter in the PRIME PLC market segment, after the deployment of over 3 million ZIV units worldwide.

A year ago, EDP began the deployment of PRIME Advanced Metering Infrastructure (AMI) in Portugal and CG has been selected as the major provider of the 150,000 single phase meters (known as EDP boxes in Portugal) to be deployed. EDP Distribuição, is an EDP Group Company operating in the regulated distribution and supply businesses in Portugal, with more than 6 million clients and 220,000 km network. CG's Data Concentrator Units (DCU) have already been selected earlier this year within the scope of InovGrid, a project conceptualised by EDP to introduce AMI (Advanced Metering Infrastructure) improvements in the network, benefitting its customers.

"We are very excited to partner with EDP again, supporting them to build a modern, efficient grid and improve their overall end-user experience. This new win reinforces our segment leadership with the full portfolio of products under advanced metering infrastructure that has become crucial in empowering both consumers and utilities in managing power distribution and consumption," Commented Laurent Demortier, CEO and Managing Director, Avantha Group Company CG.

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Experts assemble to address Africa's energy crisis

Currently, around 600 million people in Africa lack access to grid electricity, with the figure expected to rise to 700 million by 2030. The continent is increasingly looking to alternative energy sources to bridge that gap. With an estimated potential of 20,000 MW, geothermal energy may provide an answer to the continent's energy shortage.

With a view to addressing the great challenge of harnessing geothermal energy, around 80 delegates, including representatives of 13 African countries, recently gathered in Nairobi to explore the feasibility of establishing the Africa Geothermal Centre of Excellence (AGCE). This will enhance the continent's institutional and infrastructural capacities, and create a critical mass of geothermal scientists and engineers.

This immense potential remains largely untapped, as the continent faces challenges in terms of skilled human resources and development of technological know-how. To address this problem, African countries are planning to set up the AGCE as a vehicle to ensure the development of skilled personnel and the promotion of sustainable use of geothermal expertise in the continent.

The two-day workshop assessed a feasibility study, which catalogued the region's needs for geothermal development, drafted the AGCE's vision and evaluated its long-term sustainability.

Europe's largest solar farm to be connected to grid in October 2015

© Clemessy

Cestas Solar Farm in France...

Europe's largest solar farm, Cestas Solar Farm in France, which is due to be connected to the grid in October 2015, will have approximately one million solar panels. The solar farm, located near Bordeaux in southwest France, will generate more than 350 GWh per year with a peak capacity of 300 MW, which is enough to cater for the daytime power consumption of the entire population of Bordeaux.

Eiffage Energie operates on behalf of Clemessy – which pilots a consortium of several investors including Neoen – formed to build, operate and maintain the farm that is coveing 250 hectares of land divided into 25 solar plants. The project has called on the expertise of Clemessy subsidiary RMT for engineering studies, Eiffage Energia for connection work, Eiffage Travaux Publics for earthworks, Schneider Electric for the electrical conversion chain and Krinner GmbH for screw-in foundations and photovoltaic structures.

Nexans is connecting the photovoltaic cables after Eiffage Energie awarded them the contract to supply 90% of the cables for the Cestas Solar Farm. As a part of the contract, Nexans is manufacturing to supply approximately 5,000 kilometres of medium and low voltage, Photovoltaic Cables (PV) and data cables (optical fibre). The cables are being manufactured at their Bourg-en-Bresse, Jeumont and Andrézieux plants in France.

Fernando Dos Santos, Photovoltaic Projects Manager, Eiffage Energie, said, "Eiffage Energie chose Nexans because of its full range offer from low and medium voltage cables to photovoltaic cables for this project. Another important factor was that Nexans offers advanced supply chain solutions and direct delivery to site."

Pnuematic test is going on at Carrington power station

Pneumatic testing of the gas pipeline at Carrington power station is being carried out from 24th August to 11th September 2015. Alstom and DF Energy are consortium partners for the construction of this power station.

Pneumatic testing is a procedure that uses nitrogen under pressure to test pipelines, and is an essential part of the commissioning phase for the power station. Exclusion zones will operate around the testing area and barriers installed to ensure safety for the workforce and immediate vicinity. Pressure testing is required to ensure the gas piping system is capable of withstanding the pressures it will be subjected to during normal power station operations. Part of the testing will need to take place outside normal working hours and may cause some disturbance in the evening.

"We're keen to keep the community informed about any procedures on site that are likely to have an impact in the local area and apologise in advance of any disturbance caused," said Rainer Lueoend, Site Manager, Alstom.

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Rexel's executive committee to include a new member

Thierry Delarue

Delarue brings a wealth of experience in strategy and business development in multiple sectors...

Rexel has appointed Thierry Delarue as Group Senior Vice President Strategy & Business Transformation. In this role, he will work closely with the Regional CEOs, the functional leaders and their respective teams to accelerate Rexel's business transformation and the implementation of its strategy. He will become a member of Rexel's Executive Committee, reporting directly to Rudy Provoost, Rexel's Chief Executive Officer. Having previously headed Strategy & Business Development for Asia Pacific & Japan at Thomson Reuters, Delarue brings a wealth of experience in strategy and business development in multiple sectors.

Delarue, 45 years old, joins Rexel from Thomson Reuters in Hong Kong, where he held the position of Head of Industry Solutions & Partnerships, following his initial appointment as Head of Strategy & Business Development, Asia Pacific & Japan.

Prior to joining Thomson Reuters, Delarue worked with Nokia Mobile Phones from 2008 to 2013 as Head of Strategy & Business Development, India, Middle East & Africa.

He has both French and Australian nationalities. He has a BA Architecture and a Diploma in Industrial Design from Queensland University of Technology. He also has an MBA from INSEAD.

Enbala appoints a new CCO and Executive VP of Sales

Trent Bowers

"I am extremely honoured to be joining such an innovative organisation..."

Former Vice President of the Industry Solutions Group of Toshiba/Landis+Gyr, Trent Bowers has joined Enbala Power Networks as Chief Commercial Officer (CCO) and Executive Vice President of Sales. He will lead the company's sales, marketing and partner relations initiatives globally.

Bowers has 23 years of experience. His entire career has been focused on technology, communications and services, with the last 10 years concentrated on delivering integrated software solutions to further advance grid modernisation initiatives in the energy and utility industry. His knowledge and experience span the full utility value chain, from generation to the customer experience and including advanced grid analytics, demand response, Distributed Energy Resource (DER) management, operational data management and dynamic voltage management. Previously, Bowers was Vice President of Global Strategic Sales for Trilliant, a business executive in IBM's Intelligent Utility Network business unit and Energy and Utility Sales Director for Alcatel-Lucent.

"I am extremely honoured to be joining such an innovative organisation," said Bowers.

APTEL gets a new technical member

Inder Jit Kapoor

Kapoor is expected to bring momentum into Indian power sector growth profile...

Inder Jit Kapoor has taken over as Technical Member of Appellate Tribunal for Electricity (APTEL) recently. Before joining the Appellate Tribunal, Kapoor was serving as Director (Commercial), on the board of NTPC Limited for about seven years.

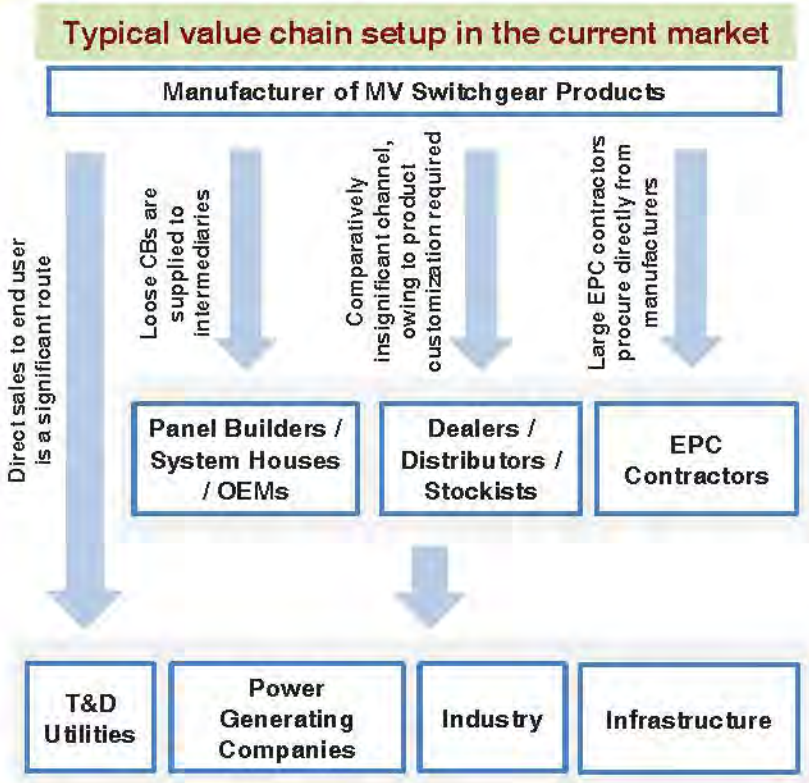
In an illustrious career in power sector spanning over three decades and a half, he has made professional contributions in overall management functions including the fields of commercial, engineering, operations, contracts & and materials management, consultancy and project management. His professional acumen encompasses engineering, commercial and market orientation, legal and financial soundness, strategic management and business leadership.

A complete power professional, having held key positions in NTPC, and having versatile experience in important functions of entire electricity value chain including generation, transmission, distribution,trading including power sector of neighbouring countries Bangladesh and Sri Lanka, Kapoor is expected to bring momentum into Indian power sector growth profile.

The post of Technical Member in APTEL was lying vacant since Rakesh Nath demitted the office of Technical Member on 20th May 2015.

Revival Is Expected

Recovering economy & market sentiments will help revive Indian Medium Voltage (MV) switchgear market...



Major trends

- Majority of MV switchgear products are supplied directly to the end-user by the manufacturer.
- Large suppliers also reach the market through external switchgear builders – in order to reduce lead times and reach geographically wider markets. Loose circuit breakers are supplied to such external switchgear builders by the manufacturers.
- EPC contractors typically prefer to buy MV switchgear products from the CB manufacturers themselves, and they maintain a list of pre-approved suppliers.
- Since there is a high level of customization involved in the product, there is limited scope for stockists to operate in this market.

Source: Frost & Sullivan analysis.

The uncertain economy and restricted investments in the industry and utility sectors had stalled growth of the Indian medium voltage switchgear market over the last couple of years. However, as the economy expands and market sentiments improve, the growth rate for MV switchgears will rise over the next five to six years.

A new analysis from Frost & Sullivan, titled 'Indian Medium Voltage (MV) Switchgear Market', finds that the market earned revenues of US $448.5 million in 2014 – and estimates this to reach $695.0 million in 2020. The study covers indoor switchgear, outdoor switchgear, Ring Main Units (RMUs), and compact or unitised substation. The RMU segment is expected to witness the highest revenue compound annual growth rate over the forecast period.

"Government initiatives towards power capacity augmentation and the expansion and development of the transmission and distribution network will fuel the demand for MV switchgears in India. Revenue opportunities are expected from retrofitting and replacement programmes as well as the adoption of superior technologies," said Venkatesh Ganji, Senior Research Analyst, Energy & Environment Practice, Frost & Sullivan.

Moreover, the expansion of key industry sectors will generate business for MV switchgear manufacturers. Despite the government's fiscal deficit and long approval process for projects, infrastructure and construction activities will gain pace, boosting MV manufacturers' prospects.

Though the primary demand for MV switchgears traditionally comes from energy-intensive industries such as oil and gas, petrochemical, steel and cement; tightening liquidity and the lack of policy reforms are holding back these industries from investment. With the ongoing introduction of reforms and flagship initiatives like 'Make in India,' the economy is expected to improve and revive the investment cycle, which will result these downtrends to reduce over the forecast period.

"Indian MV Switchgear Market is currently dominated by the top 4 players, accounting for 65% of the total market. Wide product portfolio, competitive pricing, and strong network of system integrators and panel builders are essential to succeed in the market. With tier 2 players expanding their geographic reach and investing in R&D to introduce new products, the competition intensity is expected to increase in next 3 to 4 years," noted Ganji.

Competition Has Increased Among Cable Manufacturers

The increased focus on renewable energy, grid interconnections, and economic development are expected to drive the demand for transmission and distribution cables across the world...

Due to the impact of the economic slowdown, the market witnessed a decline in the growth rate from 2009. However, the market is set to achieve strong growth rate from 2012 onwards. Capital spending and investments in industries worldwide is expected to boost growth of the market.

The economic recession had its effect on the transmission and distribution sector, and due to the ongoing financial crisis in many countries, the pricing of the cable has become a competitive parameter. Moreover, the electric utilities are expecting the cable manufacturers to reduce the prices. Furthermore, due to the cancellation of transmission expansion plans and delays in orders, the competition between existing players has also increased.

Companies are adopting various strategies to counter the competition and survive in the market. Some of them include merger and acquisitions, focus on custom and high end products, increased emphasis on research and development, plant closures, exploring new markets and so on.

Major corporations involved in the competition are Southwire Company, Prysmian, General Cable, Okonite Company, Alcan Cable, and many others. High emphasis on the commercialisation of renewable energy throughout the world is expected to drive the growth of transmission and distribution cables. Renewable energy resources are often at far off places where the transmission network is not available. In the future, lot of expansion in the transmission network is expected to transfer the electricity from the far off power plants to the load centres.

Many countries are integrating their regional grids to form a nationwide grid. The idea is to have seamless flow of electricity across the nation. The development of renewable energy is further supporting the grid interconnection. In European countries, work is going on to form a single European grid amongst all EU nations. Moreover, as the Asian countries develop, energy trade between them is expected to rise. Furthermore, in many countries, the transmission networks are not reliable enough to transfer the electricity from the growing number of power plants. The increased focus on renewable energy, grid interconnections, and economic development are expected to drive the demand for transmission and distribution cables across the world.

Interview

"Never compromise quality for a small affordable extra expenditure"

Hartek Power Pvt Ltd, formerly known as **(Amtek Energy & Power Pvt Ltd)** is one of the India's fastest growing Engineering, Procurement and Construction (EPC) company. It executes large and complex industrial and urban infrastructure projects. In an exclusive interview, **V K Mohindru, Executive Director, Hartek Group** is talking to **P K Chatterjee** on various aspects of his company's involvement with the Indian power transmission sector. Excerpts...

➢ What kind of potential of growth are you finding in the Indian T&D sector?

The potential growth of Indian T&D is definitely great and achievable. This is mainly because the rate of growth of this particular sector lags behind in the 'Growth of Generation Capacity.' The National Transmission Authority of India is an initiative by the Government of India to start the National Forum by sidelining the regional compulsions. This is similar to National Movement initiated by Mr. Atal Bihari Bajpai, the then Prime Minister of India. It is a requirement just like the National Highway Authority of India. Now, expanding the Road Network throughout the expanse of India is seen as a ground reality. If accepted and agreed upon, the National Transmission Authority of India will be the pioneer for successful growth in this segment.

➢ What are the challenges in this segment?

There are quite a few challenges that must be tackled. The first of these are regional roadblocks in the expansion of National Transmission Grid Network. The fact that there is no nationally approved platform for acquiring uniform approval of T&D schemes is also a major challenge. Most of the newly upcoming generating power houses are situated in remote corners at pit heads of coal and other fuel heads. Approval and laying of the transmission network is also mostly dependent on regional policies of the states on that particular route. Therefore, it is vital that the National Authority be constituted to have uniform flow and distribution of power to the states that need it.

➢ What's your comment on the sluggish fund flow in this segment?

The 'sluggish fund flow' is mostly because of the fast cash refund in the generation segment in the private sector. Most of the generating projects such as hydel and coal based projects take 48 to 60 months to be ready for generation. On the contrary, laying EHV Transmission line of level of 765kV- or even 400kV- sometimes take years in getting clearance. Similarly, most of the time survey of transmission line has to be repeated because of local hurdles such as local

influential leaders. Due to reasons like these, the time frame for completion of Transmission Projects cannot be defined correctly even after the sanction of the project. Apart from these reasons, further return in form of wheeling charges of transmitting of power is much slower and meager in power development.

➢ What kind of capability have you developed to provide a turnkey solution in this segment?

We have taken the measure of creating a strong infrastructure consisting of a team of experienced engineers having a minimum of 20 yrs experience in fields such as design, planning, procurement, and management of design. This team is supported by young and talented engineers who have some experience in their own fields.

Preference is given to those longing to perform and deliver. The main engineering team is also supported by a required infrastructure of foremen, fitters, electricians, and cable laying and termination experts. Every team is given a firm time frame i.e., a 'PERT Chart' to make sure they complete the project in time. There is a special team known as the 'protection and testing team.' It is a team of experienced engineers supported by qualified test inspectors and test mechanics to complete the 'pre-commissioning testing' of the constructed project. They declare it fit for testing and get clearance by 'Protection Wing of State Electricity Board' and 'Chief Electrical Inspector of (respective) State Government.' After this entire process, the project is ready for commission on schedule. An important thing to be mentioned here is that the head office finance department is headed by a team of experienced charted engineers supported by financial experts.

➢ Do you have any immediate plan to enhance your capability beyond 400kV substations?

Definitely. We have an ever increasing hunger to raise ladders of technical proficiency coupled with the zeal to perform and excel in every EHV field. We are ready to take up each and every challenge – may it be 400 or 765kV. We are definitely open to new projects and augmentations, additions and alterations in and EHV project. We are already in the process of upgrading our infrastructure in order to take up the challenges that I mentioned before.

➢ What kind of guarantee do you offer for your projects?

We are currently the leading system partners with top manufacturers of each major product being used in any EHV Grid Project. Areva makes power transformers, Schneiders makes relays, Siemens makes all types of EHV circuit breakers and isolators, Mehru makes CTs and PTs of all voltage levels and Havell's makes cables of all voltage level. These are only a few of the top manufacturers that we are working with.

We have a strong team for protection testing and giving value added services. The team is headed by senior engineers who have over 30 years of experience in this field. They are also supported by talented engineers for ensuring our after sales service.

➢ What percentage of your company's annual income is spent for R&D?

At present, more than 2% of our annual income is spent for R&D. We are of a firm view that no corporate can expand well or capture the market appropriately without the proper guidance of their R&D cell. Furthermore, this cell is to be given a free hand in doing any research connected with the growth of the company. We are planning to enhance this percentage to 4 to 5% of our annual income in the next three years.

➢ Why do we see so much failure in the distribution transformers in India?

Although this is the oldest industry in India to cater to the basic need of distribution systems, originally it was governed by top corporates. The quality in those days up to the 1980s was 'par excellence.' After the 1980s, medium scale manufacturers took over this industry and started sale at much lower price because of low infrastructural expenses.

Due to this reason, major corporates lost interest in this segment of the industry. Somewhere around 1990 and beyond, the industry went into the hands of small scale manufacturers, and they started to complete the product at 'throw-away' prices. So, the excessive failure that we see is because of and at the cost of quality compromise.

➢ What would you like to communicate to your potential customers to aid their decision making (in purchase)?

Our continual advice to the potential customer is that they go in for a proper designing expert for evaluating their future planning and requirement correctly. We request them to be vigilant while selecting products, and urge them to choose top quality products only. They must engage suppliers who are competent and will look after everything right from the supply to the commission of equipment. We request them to evaluate the capability of their supplier of EPC service to give 'long term after sale service' by original manufacturers. Lastly, but most importantly, we urge you to never compromise quality for a small affordable extra expenditure.

Data Communication Protocols
In Building Automation Systems – An Overview

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BACNet and KNX both are reliable and robust systems, independent and open systems, and hence are supported by a large number of manufactures across an exhaustive product range...

Building Automation Systems (BASs) provide means to control as well as monitor various operational aspects of buildings. Activities that typically require human interface such as data logging, equipment health monitoring, data analysis etc. can be automated by a BAS system to reduce human error – as well as enhance efficiency and accuracy of data. With the cost of manpower increasing, and the need to operate and manage buildings at the lowest possible cost, BASs are finding their ways in more and more building designs. A BAS while costing more at the build stage helps lower operating costs for the owners and the payback periods for the Capex are in the range of 2 to 4 years.

A typical BAS installation enables equipment and systems of a building such as the generators, HVAC plants, domestic water systemsetc. to be 'connected' to a management system through sensors. Sensors capture system data such as pressure, temperature, flow etc., as well as the state of the equipment – on or off, speed etc. The sensors convert the data to electrical signals that are transmitted to the analysis device, usually a microprocessor or a computer where the data is again converted to enable the device to 'read' the data. The output of this data collection activity is the physical value the operator sees on the computer screen of the controller. Data can be logged in the computer's memory or output to standard printers for review.

A BAS can be a simple monitoring tool where only system data is captured and analysed, but no active control of the equipment is provided. Advanced BAS have both monitoring and control abilities, which enable remote start/stop as well as operations of the systems.

BAS communications protocols

While a BAS has a number of components, the sensors, actuators and the controllers are the most important and critical elements. The sensor senses the physical quantity and the controllers manipulate the system through actuators to the required end points. There are a plethora of manufactures of both sensors and controllers, and hence, for the sensors, actuators and controllers to function correctly in a system, a common method of understanding data is essential. A communication protocol is a means for a device manufacturer to make sensors that can send out data in a way that the controller is able to read the data and take suitable action.

There are two main classifications of communication protocols – Proprietary and Open protocols. The proprietary systems are designed by manufactures that have the entire gamut of BAS systems inhouse or where there are specific building requirements. Open systems are the more common ones as they allow a larger number of options for the end users. The most commonly used protocols in the building automation industry are the BACnet, Modbus and LONWORKS.

BACNet (Building Automation and Control Network)

This protocol was specifically designed for the building automation sector, and the HVAC systems, and hence is one of the most commonly used protocols. The BACNet protocol is an ASHRAE/ANSI standard (135P) and was introduced in 1995. BACnet devices have a microprocessor that associated software to use the BACnet protocol for system application. The BACNet protocol uses 'Objects,' 'Properties' and 'Services' to represent data of the system.

- **Objects:** Each object has an identifier and a number of properties associated with it. The properties are used to monitor and control the object. 54 standard objects are defined in the protocol, such as Analog Input, Analog Output etc.
- **Properties:** The properties define a BACNet object. An Object can have multiple properties and each property has an identifier and a value. The property can be read only, where other objects read the value of the objects property and read/write where the property value can be changed – e.g. changing set point of a VAV controller.
- **Services:** This is the process by which one BACnet device request for information or gives instructions to other BACNet devices to carry out tasks. The BACNet protocol has a list of 32 standard services and categories into Object Access, Device Management, Alarm and Event, File Transfer and Virtual Terminal.

The BACNet protocol is very versatile and widely used in the industry as it can be used on most common network systems such as Ethernet, ARCNET and IP. The IP protocol allows BACNet devices to connect over standard internet networks, thus, allowing remote monitoring and operations. A typical BACNnet system is shown in figure 1.

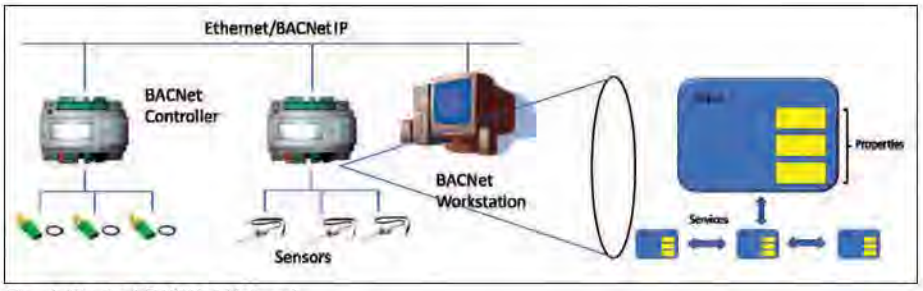

Fig. 1: Typical BACNet Network...

KNK Protocol

The KNK communication protocol is an approved European (EN) and International (ISO) Standard, which is also widely found in building automation system applications. The protocol can be used over simple Twisted Pair lines as well as RF and IP networks.

The KNK protocol has two configuration modes which manufactures provide

- S Mode (System Mode), which is used for complex installations requiring a high level of customisation and features.
- E Mode (Easy Mode) provides basic functionalities to the devices and can be programmed without any specialised knowledge and tools. This mode is used for simple systems.

A KNX system has two main components – The sensor and the actuator. Data between Sensors and Actuators are shared in the form of 'data telegrams.' These telegrams are sent out to Group Addresses which are logical names for 'topics.' The topics link the output of a sensor to the input of an actuator. Sensors emit the telegram and multiple sensors listen into the topics.

A KNX system can be used without a controller during normal operation – as a processor is not required for the group to listen to the telegrams. This allows the system to be robust as well as reduces cost.

An Engineering Configuration Tool (ETS) is used to configure KNX devices that use the S Mode configuration. Figure 2 shows a typical KNX installation.

Fig. 2: Typical KNX Network...

KNX has been developed for use on a large number of building management systems and covers:

- lighting
- blinds & shutters
- Heating, Ventilation And Air Control (HVAC)
- Audio/Video Control (AV)
- operation and visualisation
- security
- remote access

Conclusion

BAS are essential components of modern buildings, with many Green certification systems mandating them. The BAS systems enable better control of the various equipments and systems in a building, resulting in higher efficiencies and reliability. Which system to use, BACNet or KNX? Both are reliable and robust systems, independent and open systems, and hence are supported by a large number of manufactures across an exhaustive product range.

The choice of communication protocol to be used is usually decided by the equipment and control elements that are installed and the level of flexibility that is required. Building automation products typically use the BACNet protocols – while the building management systems tend to deploy the KNX protocol.

High Temperature Superconductors Wires And Cables: Technologies Of Energy Conservation

Emerging technologies of High Temperature Superconductors (HTSrs) have an enormous potential for improving capacity of underground and overhead power T&D systems, motors, generators and power plants – because higher Jc and zero resistance of HTSrs reduce losses and can replace conventional conductors...

Rapidly growing population, industrialisation, urbanisation, smart cities and transportation have led to rising demand for the electric power supply through T&D cables and wires. Demand of energy for world's economy is consuming colossal fossil fuels (such as coal, petroleum oil and NG) in the electricity generation and transportation – and it is being forecasted by EIA that electricity generation may be doubled to 30673.8 TKWhr by 2030 from the 16595.2 TKWhr (2004), which will damage the whole ecological balance. So, energy conservation by the energy efficient winding wires and power T&D system is essential to solve the problem of energy shortage, depletion of fossil fuels and environmental crisis (pollution and electromagnetic radiation). Power T&D cable networks are the backbone of the economic growth. Near about 8% electrical energy is being lost due to technical reasons. Technical losses in conventional power T&D systems are due to conventional conductors (Such as Al & Cu), which are used in the winding of cables, generators, overhead lines, motors and transformers. Due to the characteristic conditions of conventional conductors, power T&D cables and wires wear low critical current density (Jc) (Table 1) and they experience a drop in voltage and dissipate lot of the electrical power in the form of joule heat (I^2R). As, transformers' failure due to poor efficiency of conventional conductors lost about 400 million kWh energy/year according to National Committee on Distribution 1995. Emerging technologies of High Temperature Superconductors (HTSrs) have an enormous potential for significantly improving capacity of underground and overhead power T&D systems, motors, generators and power plants – because higher Jc and zero resistance of HTSrs reduce losses and can replace

conventional conductors and low temperature superconductor (LTSrs) also. Therefore, in the present energy and environmental crisis, selection of energy efficient winding wires and power T & D cable technologies is essential to increase efficiency of the whole power industry and demand side. This article explains that how technologies of HTSrs eliminate shortcomings of power T&D systems and power generation industries for energy conservation.

Any materials or superconductors, those oppose the penetrating of applied magnetic field (H) flow through the interior surface of superconducting materials it is known as Meissner effect...

Sr. No.	HTSrs compounds	Types of fabrication	Jc (Amp/cm^2)	Hc (Tesla)	Cryogenic (^{0}K)	Tc (^{0}K)
	HTSrs:					
1.	YBaCuO	Thin film	1.2×10^6	-	77	88.9
2.	TBCCO	Thin film	5.8×10^6	-	77	91.8
3.	YBCO	Wire	$>2 \times 10^6$	Selffield	77	93
4.	BSCCO	Tape	$>10^7$	5	77	-
5.	MgB_2	Sample	1.5×10^7	-	-	39.6
	LTSrs:					
1.	Nb_3Sn	Wire	6×10^4	28	4.2	18.5
2.	NbTi	Wire	5×10^5	11	4.2	9.5
3.	Nb3Ge	Wire	4×10^6	5	4.0	-
	Normal Conductor:					
1.	Cu	Wire	100-500	-	-	-

Table 1: Jc of some conductors, LTSrs and HTSrs...

High temperature superconductors

In 1986, HTSr (LaBaCuO) discovered at 35^{0}K (the phenomenon of disappearing of electrical resistance of superconducting materials at high Tc). In March 1987, High Temperature Superconductivity (HTSy) in YBaCuO compound was also discovered at 93^{0}K as the compound cooled by LN_2 (77^{0}K). Thereafter, many discovered compounds (like YBaCuO, BiSrCaCuO, MgB_2, HgBaCaCuO and TlBaCaCuO) have been fabricated for commercial applications, which are highly effective in power cables and wires compared to conventional conductors and liquid helium (LHe, 4.2^{0}K) cooled LTSrs (like Nb_3Sn, NbTi etc). Since the discovery of HTSy, superconductivity in many superconducting materials has been reported above the room temperature (RT$\geq$ 300 K). First generation (BiSrCaCuO) and second generation (YBaCuO) of HTSrs are giving higher level of energy efficiency improvements in the electricity generations, nanotechnology, magnetic refrigeration, transportation, medical care (MRI, CT Scan etc., as detecting of small magnetic field by HT SQUIDs), windmill direct drive generator, tokomak, power grids and demand side power utilisations (Figure 1). Generally, identifying factors for superconductivity are zero electrical resistance below Tc, Hc & Jc and complete absence of internal magnetic field in the metals or compounds (When a material makes the transition from the normal to superconducting state, it actively excludes magnetic fields from its interior; this is called the Meissner Effect); above these parameters property of superconductivity vanishes. High temperature superconducting (HTSing) wire works efficiently to carry large Jc at very high Hc or self-field along with high Tc (Table 1 & 2) which are giving opportunities to develop highly energy efficient wires, tape and thin film and help to reduce environmental pollutants as well as GHGs (Such as CO_2, NO_x, CH_4, SF_6 etc). Wires of HTSrs are resistance free under bath of LN_2 (coolant) and can wear Jc 100-150 times the amount of same size conventional conductors. In the USA, inefficient conventional power generation process and T&D system waste about 400 million barrels oil/year according to PSFC Massachusetts Institute of Technology (USA). AC and DC power cables of HTSrs offer a highly desirable alternative to conventional wires and cables. Losses of electricity and natural resources in the conventional electrical designs are due to conventional conductor's lower Jc & Tc and high resistance.

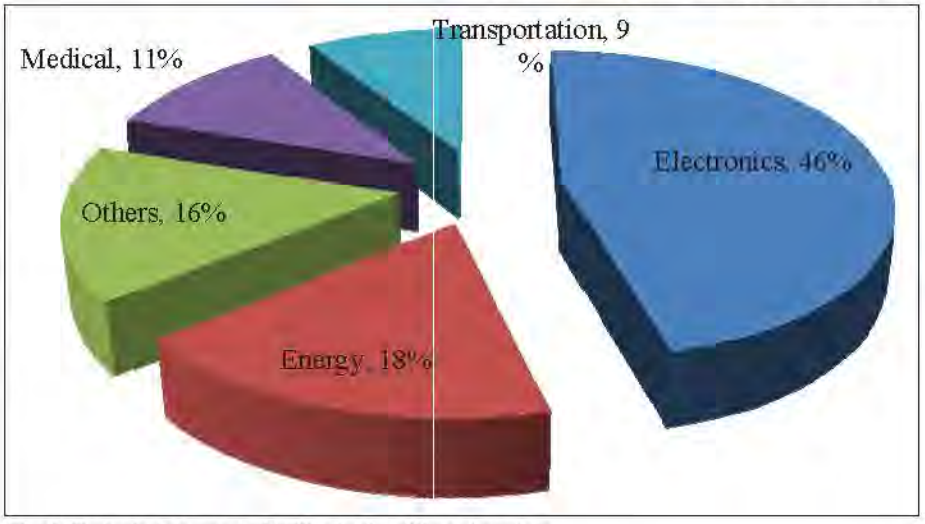

Fig. 1: Projected demand of HTSrs in the different sectors...
(Source: HT Baiej, University of Wollongong, Thesis collection, 2013).

Characteristics properties of HTSrs

Perfect superconductors work efficiently under the limits of some critical parameters

Sr. No.	Description of cable specifications	Conventional conductors cable (AC)	HTSrs cable (AC)	HTSrs cable (DC)
1.	Power transmission capacity (MVA)	1500	1500	1500
2.	Power transmission voltage	275 kVrms	66 Vrms	130kV
3.	Power transmission current	1kArms/phase	3.3 kA rms/phase	12 kA/phase
4.	Cable type & dia size (cm)	Single phase XLPE (~14)	3 in one (~13.5)	3 in one (~13.5)
5.	No. of cables	9	4	1
6.	Transmission losses (kW/km)	740	200	20

Table 2: Comparison between HTSrs and conventional cables performance...
(Source: M. Hirose, SEI Technical Review No. 61, January, 2006, Pp. 29-35)

Fig. 2: Energy conservation potential (%) in the different sectors of India...

or in the superconducting state [Tc, Jc, Hc/ or (H_{C1} & H_{C2})], beyond these parameters any superconducting materials may be found fail to perform efficiently in applications.

- **Transition Temperature (Tc):** The temperature below which, metals or materials completely lose their electrical resistance.
- **Critical Current Density (Jc):** Jc of the conductors depends on the density of electrons in their unit volume. Superconductors/ HTSrs allow flow of electric power under zero voltage drops in the superconducting state. However, beyond critical limits of Jc, superconductors develop resistance and property of superconductivity ceases.
- **Critical Magnetic Field (Hc):** Superconductivity in metals or materials can be destroyed by the applied strong external magnetic field (H) when applied H in the superconducting state exceeds a critical value (Hc) and it depends on the function of temperature of operation (T <Tc) also.

HTSrs winding wires and power T&D cable

Energy conservation targets and environmental challenges can be solved by the HTSrs wires and cables technologies instead of conventional conductors (Figure 2). Wires and thin film of HTSrs are highly capable to wear large Jc (> 10^6 amp/cm^2 at 77^{0}K) with zero resistance, low impedance, zero electromagnetic radiation and free from hazardous cooling oil than conventional power cables and wires. Underground power T&D network of HT Superconducting technology uses inexpensive and environmentally safe LN_2 cooling core, which maintain superconducting state of materials. In addition, installation costs of underground T & D cable could be cut more than 20%. Reliability of electrical cables, tapes and wires is almost dependent upon the selection of conductors and their thermal, mechanical and electrical properties. DC power transmission through HTSrs has absolutely zero resistance or zero electrical losses. HTSing cable losses are less than half (4%) compared to 8% of conventional power cables; and losses in the power industries and utilities can be avoided up to 90% (Table 3). Power transmission cable losses are about 2.5% of total transmitted power while the losses in transformers are between 1 and 2%. It is being expected by the scientists of the USA that technologies of HTSrs could save more than 10774 GWhr of energy and 1636940 metric tons carbon, 16891 metric tons SOx and 8351 metric tons NOx by 2025. In conventional overhead Cu based power T&D cable system, about 740 kW/km of electrical energy is dissipated due to high resistance of conductor that can be reduced by HTSrs (Table 2). Transmission of 5 GW with 765 kV overhead AC lines require about 600' wide Right of Way (ROW) & 130' high and heavy pole; whereas 5GW with 200 kV underground DC cables of HTSrs require about 3'diameter pipe and 25' ROW according to AMSC (USA) that avoid complex, contentious and costly procedures (Figure 3).

Advantages of HTSing power T&D cables and wires

HTSrs based energy efficient technologies are capable to provide energy conservation and environmental advantages:-

- HTSrs with LN_2 dielectric extend operating life of cables, wire and insulation.

Sr. No.	HTSrs equipments	Of the conventional designs	Energy saving (GWhr) by 2025
1.	Generators (Some MVA—> 100 MVA)	30–50%	5785 1194
2.	Transformers (Stationary & Mobile)	50%; 80–90%	- -
3.	High-field magnets	>95%	-
4.	Fusion magnets	20%	-
5.	Current leads	20–30%	-
6.	Induction heating	50%	-
7.	Magnetic separator	>80%	-
8.	Motors	50%	468
9.	Cables	50%	3326

Table 3: Saving of energy by the by HTSrs equipments...
(Sources: AMSC, USA; HTS-10; IEA)

- Needs about 25% ROW compared to conventional conductor.
- Increased resources security and clean energy production.
- HTSrs cooling with LN_2 will replace oil cooled transformers and power T&D system.
- Enhance energy efficiency of electricity generation.
- Replacement of costly and environmentally unsafe SF_6 (it has the highest global warming potential 23600) and LHe by LN_2 at the power grid sgas transmission cables, energy storage devices etc.
- HTSing cables have no external magnetic fields radiation due to self-shielding design that eliminates the impact on living beings.
- 2nd and 3rd generation HTSr Reduce cable & wire size, weight and production cost.

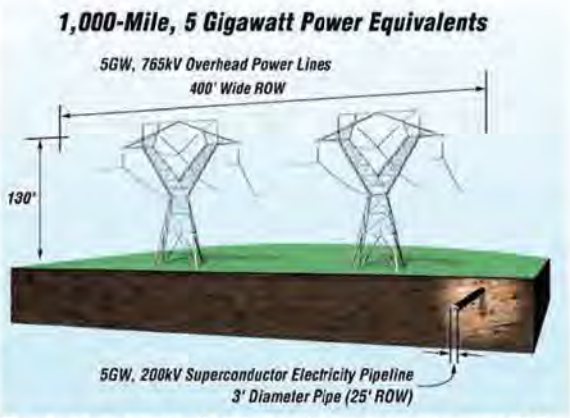

Fig. 3: Comparison of HTSrs and conventional power T&D systems... (Source: AMSC USA).

Conclusion

In 21st Century, Technologies of HTSrs are opening new horizons for energy efficiency improvements and energy conservation efforts. The applicable ability of HTSrs with zero resistance can make many revolutions in the electricity generation, utilities, power cables, wires and many other fields. I predicts that in near future room temperature superconductor will serve in commercial applications.

Growing demand of energy and environmental crisis are forcing to develop and discover energy efficient and clean power generation technology. It is being concluded in this article that emerging power cable and wire technology of HTSrs are giving better opportunities to operational flexibility, energy conservation and environmental pollution and GHGs emissions reduction.

Profile

Hambir Singh

Assistant Shift Manager
Production Department
National Fertilizers Ltd.

Energy Conservation

Energy conservation is nothing but a strategic use of energy in order to reduce the energy requirements per unit output. Energy conservation in domestic sector is a good point to start as about 20 to 30% of the total energy generated is utilised for domestic purpose, which is a considerable share...

Better living standards, modernisation, industrialisation or development in all aspects is closely related with energy consumption. According to the International Energy Agency (IEA, 2007, p.74) projections, world primary energy demand expected to exceed half between 2005 and 2030 with an average annual rate of 1.8%. In the twenty first century, energy consumption is increasing at the fastest rate in developing nations due to rapid population growth, modernisation, urbanisation, industrialisation and economic development. According to IEA (2007, p.77) projection, developing countries expected to contribute approximately 74% of the increase in global primary energy consumption from 2005 to 2030.

India is also a very fast developing country. Like every country, India is also continuously increasing its power generation capacity. India has increased its installed capacity from 1362 MW in 1947 to 271,722 MW in 2015 with major portion (approx 70%) of thermal based generation. In spite of such growth in generation, the imbalance between demand and generation of electrical energy is increasing every year. This imbalance in power generation and demand is because of India's vast population of more than 1.28 billion, and limited natural energy sources present in India. The developing countries like India are obliged to maintain a certain growth rate for which energy is ingredient.

Japan and U.S.A. has lower energy intensity per unit of GDP compared to India. India has 3.7 times and 1.55 times energy per unit GDP in reference of Japan and U.S.A. respectively. This clearly indicates the inefficient use of electricity in India also responsible for imbalance between generation and demand. So there are two terms energy efficiency and energy conservation, which have their own significance in electricity sector. The reduction in gap between demand and generation needs efficient use of energy and its conservation. Efficient use and conservation has its importance in view of the fact that if we save one unit of consumption reduces the need of generation from 1.5 to 3 times of it. Generation of additional electricity is costly and needs long time in establishment, but the energy conservation activities can be implemented in short time period – and will reduce the gap between generation and demand at comparatively low investment.

Energy conservation is nothing but a strategic use of energy in order to reduce the energy requirements per unit output.

In India, for energy conservation and efficient use of energy, Bureau of Energy Efficiency (BEE) implements norms for appliances etc. BEE also started 'Star Rating System' for electrical appliances i.e. lamps,

geysers, television etc. In star system, 5 star indicates that it gives highest efficiency in this segment.

Strategies for energy saving in industry sector

Energy conservation options available in industrial sector are as diverse as the industries themselves. Most of the industries mainly use electric motors, compressors, boilers, furnaces etc.

Electric motors: Half of the total energy consumption is due to motors used for processes in industry that may give sufficient options for financial savings from energy consumption. Remarkable savings can be achieved with regard to the selection and operation of electric motors by following four things: energy efficient motors, variable speed drives, correct size or rating motor, regular or routine maintenance.

- **Energy efficient motor:** Most energy efficient motors use high quality materials for construction and also use latest manufacturing techniques. These motors require less input energy for same output compared to normal motors with reduced vibration, noise, and heat. In our country too, we are following global standards for manufacturing of such high efficient motors.
- **Variable speed drives:** Machinery that are equipped with facility to control the speed of machinery. Many industrial processes need drives, which should be capable of operating at different speeds. Process control and energy conservation are two primary reasons for using variable speed drives.
- **Proper rating motors:** In industry many motors works on partial loading. If it is much less than full rating, reduction in efficiency may be significantly large. It should be preferred to use less number of motors operating at full load, instead of more number of motors operating at partial load. However, it should also be taken care of that the motor is not significantly oversized too for the usual load.
- **Maintenance of motors:** Maintenance of motors is necessary to ensure the limit on motor temperature, noise, vibration, and other operating parameters. It increases the life cycle of motor as well as energy efficiency of motor. The saving in terms of energy consumption could range from 5 to 25% of consumption by the total motor unit.

Maintenance of motors increases the life cycle of motor as well as energy efficiency. The saving in terms of energy consumption could range from 5 to 25% of consumption by the total motor unit...

Compressed air system: The process of compressed air system generates considerable amount of heat. In many applications, excess heat or waste heat from the compressed air system can be used for space heating and/or in further process. In such cases, heat recovery from compressed air can increase the overall efficiency and can make the system more effective.

Power factor correction device: In many industries, plants operate with low power factors, which increase the per unit generation cost. Government also implemented policies/tariff for industry customers in terms of limit at operating power factor. Use of power factor device at user end of industry customers can help in improving the power factor of the plant.

Strategies for energy saving in domestic Sector

Energy conservation in domestic sector is a good point to start as about 20 to 30% of the total energy generated is utilised for domestic purpose, which is a considerable share.

Lightning System: Light bills can be cut down by use of energy efficient bulbs and by using proper light fittings or arrangements. There are two main energy efficient bulbs: Compact fluorescent lamps (CFL), and Light Emitting Diode (LED).

- CFL, LED produces visible light from electricity with efficiency more than five times compared to ordinary bulbs. In other words, it can be stated that it saves about more than 60% of energy for the equal lightning level.
- Use task lightning, which concentrate mainly only in the space where it is required.
- Always use light coloured surface in workspace. Light surface reflects more light and reduce the required number of lamps for same intensity of light or illumination in space.
- Place lamps in corners of rooms, where they can reflect light from two wall surfaces instead of one.
- Try to use natural lightning as much as possible.

Government has also taken initiative with energy companies to remove less efficient light bulbs from the market. Light bulb manufacturers are also changing or modifying their factories and adopting technologies to produce energy efficient bulbs.

Air conditioners: In typical family house of our country, air conditioning uses more electricity than anything else - more than 15 to 25% of total electricity used.

- In summer, ceiling or table fan can be used against heat. Compared to air conditioner (7-10 Rs/hour), ceiling fans costs about 1-2 Rs/hour to operate.
- If we set temperature to above 22^{0}C, then we can save 3 to 5% energy for each degree above 22^{0}C. It is always recommendable to set the temperature of air conditioner at 25^{0}C to have the better comfort at least energy usage.
- Generally air conditioner cool and reduce the humidity level of room in less than half an hour, so use sleep mode or timer and keep the air conditioner off for sometime.
- Remove dust from filter every month, it help in proper airflow. It also enables the unit to cool down quickly and use less energy.
- West and south walls exposed to sunlight during major part of the day in summer. Therefore, it is always recommendable to place air conditioner in north and east.

Refrigerator: Refrigeration is a common need of every house. Proper use and precautions can save considerable amount of energy.

- Do not keep your refrigerator and freezer at very low temperature. Energy usage may go high up to 20 to 30%, if we set it to 2 to 3 degrees lower than required.

- Never place refrigerator against west and south facing walls which are exposed to direct sunlight.
- Before placing food items, always letting it cool at room temperature.
- Always lid off or cover the liquid items in the refrigerator. It is because liquids may get vaporised and can add load to compressor.
- We can reduce the amount of time the door remains open. If we think about what we need before opening refrigerator door.
- Clean the condenser coils regularly to make sure that air can circulate freely. Otherwise, the motor will be more loaded to circulate the air and will consume more energy.

Washing Machines: In this 21st century, washing machine is a common need of every house. Energy consumption for washing machines can account for as much as 20% of the electricity bill.

- Each cycle of washing uses many liters of water. For efficient use, machine should operate on full load and should also plan periodic wash to save on water too.
- Do not use too much detergent. It causes more time to wash and may require more energy for extra rinses.
- Soak or pre-wash the cloths for effective cleaning and to save time of washing. It indirectly saves energy consumption.

Geyser/Water Heater: Heating water in a geyser can be an expensive task if not done correctly. A water geyser requires a lot of energy to heat water. This high consumption of electricity shoots up the electricity bill during winters. Therefore in order to lower the monthly electricity bills, it is very important to use water geysers in a right way.

- There are two types of geysers available in the market: One with thermostat settings outside and changeable, other where thermostat is not visible from outside and cannot be changed. Most geysers available in market have a default thermostat setting of 60 degree or high. This means that water in your geyser will be heated till it reaches a temperature of 60 degrees or high. Water heated up to this temperature becomes extremely hot and needs to be mixed with lot of cold water before use. According to many energy saving groups, water that is heated up to 40 to 45 degrees C is good to use. So, if you have a geyser with outside thermostat setting, change it from 60 degrees to 40 to 45 degrees C.
- Do not keep water geyser ON for longer duration. Many people have a tendency of leaving the geyser 'ON' all the time. This tendency leads to lot of electricity wastage. Once the water is heated the power supply automatically cuts off. After some time hot water begins to loose the heat through the body of geyser. This way the temperature of water comes down after sometime. Once the temperature of the water is down by certain degrees, the thermostat switches on the power supply and water heating process starts all over again. This on-off process repeats all through the day and consumes electricity.
- Select the right sized geyser as per your requirement. An over-sized geyser means heating extra water that is not required
- Install solar water heating system.
- Use BEE labeled product. Five Star rated geysers consume less electricity for heating water as well as have much less heat loss.

Profile

Vishal Kumar Gaur

Junior Research Fellow (JRF) in Electrical Engineering Department, IIT Roorkee

Bhavesh R Bhalja

Assistant Professor Department of Electrical Engineering, ADIT, Gujarat

Electric Wire, Cable Market In India Will Grow

Major vendors are incorporating some of the eco-friendly functionalities in their power cables...

As per the latest available report by Technavio, the government of India is making efforts to upgrade the electrical T&D network in response to the rising demand for electricity. This modernisation is driven by the need to ensure the security of national energy reserves, the high maintenance costs of existing electrical systems and the need to raise the efficiency of power plants.

"The growing demand for upgrades will contribute to the growth of the electric wire and cable market in India during the forecast period. Some of the eco-friendly functionalities that major vendors incorporate into their power cables include flame retardant properties, lower emission of poisonous fumes, non-corrosiveness and halogen-free wires," says Faisal Ghaus, Vice President of Technavio.

Lighting Systems And Their Effect On Power Quality

Poor power quality management inevitably leads to an increase in operational costs and places an unnecessary strain on already dwindling resources. The ultimate reason that we are interested in power quality is economic value...

New technologies in lighting have today's designers focusing a keen eye toward power quality. Power quality is the ability of an electrical system to deliver power in the safest and most efficient manner. Power quality is an important consideration in all industries, but with the advent of LEDs, Compact Fluorescent Lighting (CFL), High Intensity Discharge (HID) lighting and others, the commitment to an efficient power distribution system is more essential than ever.

Many new lighting technologies, while certainly more efficient, can adversely affect power systems through harmonics which decrease power quality. Inefficiencies in power quality may limit the amount of devices that can be placed on the distribution network. It may also cause equipment to under-perform or to behave erratically. In the most severe cases, it can even harm the system and the devices along the network. Poor power quality management inevitably leads to an increase in operational costs and

places an unnecessary strain on already dwindling resources. Therefore, lighting systems should be driven by efficient and sustainable power sources that will not unnecessarily burden the power grid while still providing the perfect electrical environment for advanced lighting systems. The ultimate reason that we are interested in power quality is economic value. There are economic impacts on utilities, their customers and suppliers of load equipment.

Harmonics in power systems

With the connection of increased electronic devices, it is necessary that we observe the quality of power. Stable voltages and undistorted waveforms are the two most desired qualities in power systems. Harmonics are a mathematical model to analyse distorted waveform.

Any periodic waveform can be expressed as a series of sine waves with varying frequencies and amplitudes. That is, we can create a series of sine waves of varying frequencies and amplitudes to mathematically model this series of pulses. The frequencies we use are multiples of the fundamental frequency, 50 Hertz. We call these multiple frequencies harmonics. The second harmonic is two times 50 Hertz, or 100 Hertz. The third harmonic is 150 Hertz and so on.

In our three phase power systems, the 'even' harmonics (second, fourth, sixth, etc.) cancel, so we only need to deal with the 'odd' harmonics. This is because when both the positive and negative half cycles of a waveform have identical shapes, the Fourier series contains only odd harmonics. This offers a further simplification for most power system studies because most common harmonic-producing devices look the same to both polarities. In fact, the presence of even harmonics is often a clue that there is something wrong – either with the load equipment or with the transducer used to make the measurement.

In a three phase power system the third harmonic is the harmonic of primary interest. The higher order harmonics do not affect system performance to a very large extent. The third harmonic of each of the three phase conductors is exactly in phase. When these harmonic currents come together on the neutral, rather than cancel, they actually add and we can have more current on the neutral conductor than on phase conductors. Our neutral conductors are no longer protected as we would like.

In a three phase power system the third harmonic is the harmonic of primary interest. The higher order harmonics do not affect system performance to a very large extent...

These harmonic currents create heat. This heat over a period of time, will raise the temperature of the neutral conductor. This rise in temperature can overheat the surrounding conductors and cause insulation failure. These currents also will overheat the transformer sources which supply the power system. This is the most obvious symptom of harmonics problems; overheating neutral conductors and transformers. Other symptoms include:

- Nuisance tripping of circuit breakers
- Malfunction of UPS systems and generator systems
- Metering problems
- Computer malfunctions
- Overvoltage problems.

Remedies for neutral heating due to third harmonics

- **Oversizing Neutral Conductors:** In three phase circuits with shared neutrals, it is common to oversize the neutral conductor up to 200% when the load served consists of non-linear loads. For example, most manufacturers of system furniture provide a #10 AWG conductor with 35 amp terminations for a neutral shared with the three #12 AWG phase conductors. In feeders that have a large amount of non-linear load, the feeder neutral conductor and panel board bus bar should also be oversized.
- **Using Separate Neutral Conductors:** On three phase branch circuits, another philosophy is to not combine neutrals, but to run separate neutral conductors for each phase conductor. This increases the copper use by 33%. While this successfully eliminates the addition of the harmonic currents on the branch circuit neutrals, the panel board neutral bus and feeder neutral conductor still must be oversized.
- **Oversizing Transformers and Generators:** The oversizing of equipment for increased thermal capacity should also be used for transformers and generators which serve harmonics-producing loads. The larger equipment contains more copper.

Lighting systems and their effects

Hence it can be seen that it is of very high priority to eliminate or reduce the effect of harmonics. The analysis of the effect of harmonics on different lighting systems has been carried out in order to address this issue. Lighting comprises approximately 17.5% of global electricity consumption.

As the world transitions from incandescent to Solid State Lighting (SSL) technology, utilities and government regulatory agencies worldwide are concerned that, as this large segment of the consumption base switches to SSL, it will increase infrastructure costs. This is due to the reactive nature of LED-based solid state lighting, which results in higher distribution currents that adversely affect Power Factor (PF) and, in turn create a larger demand on the power grid.

The move to LED-based solid state lighting promises a significant reduction in the carbon footprint of the electrical power grid simply due to the dramatic reduction in real power consumption. However, if power factor is not managed, the grid will still need to be able to provide a much higher power level than is actually needed at the load, eliminating a significant portion of the benefits of moving to solid state lighting.

Historically, incandescent bulbs have had near-perfect power factor. Therefore, solid state lighting is being held to a much higher PF standard compared to legacy AC/DC power supplies. In most cases, power

	Company Name	Rated Wattage	Voltage (RMS)	Current (RMS)	Wattage	Power Factor	Fundamental %	3rd Harmonic Current %	5th Harmonic Current %
Compact Fluorescent Lamps (CFLs)	Wipro Smartlite	20 W	231	0.12	24	0.3	100	16.1	9.4
	Crompton Greaves	15 W	231.3	0.075	14.4	0.24	100	13.8	7.6
	Aspa	11 W	232	0.09	10.8	0.16	100	33.6	18
	Shyam Lite	5 W	233	0.05	5.6	0.15	100	21.8	11.8
	Bajaj	15 W	233.2	0.075	12	0.21	100	9	4.5
Light Emitting Diodes (LEDs)	PP LED Bulb	5 W	234	0.095	2	0.1	100	15.6	26.3
	Syska	7 W	233.8	0.15	4	0.1	100	41.6	21
	Philips	7 W	232.1	0.04	4	0.09	100	14.5	6.2
	PromTech	7 W	233.2	0.06	4	0.13	100	25.5	17.5
	LED T8	18 W	233	0.1	16	0.3	100	9	6.3
Fluorescent Tubelight	Philips	49 W	230	0.34	44	0.34	100	8.5	1.6

Table 1: Harmonic content of different lighting systems...

supplies are free from any form of power factor regulation for supplies rated up to 75W. However, for solid state lighting, PF regulations typically kick in as low as 5W or below.

CFLs are an energy efficient alternative to traditional incandescent lamps because they offer similar light but use one-fourth the electricity and last up to eight times longer. CFLs are also cost effective because the initial cost can be recouped within two to three years in the form of reduced electricity bills.

Moreover, CFLs can be used by electric utilities in Demand Side Management (DSM) programs to reduce peak demand levels and defer the cost of expensive infrastructure upgrades. CFL is a nonlinear load, therefore it injects harmonic to the network. In past, due to lower application of CFL, these harmonics were ignored, however today by the widespread application of CFLs; these small sources are combined and have high effect on power distribution networks.

With regulations dictating power factor requirements for solid state lighting, designers need to incorporate power factor correction circuits into the driver design. A clear understanding of the end requirements based on the intended application of the luminaries determines the type of power factor correction that needs to be implemented to enable a brighter, greener future.

Harmonic analysis of a few commercial lighting systems

A Fluke 434 II Energy Analyzer was used for measuring the voltage, current, power factor and THD content for different lighting systems. The experimental readings are shown in Table 1.

Utilising the new Energy Loss Calculator function, the 434 II measures the fiscal cost of energy wasted due to poor power quality. This energy monetisation capability allows you to identify the most energy-wasteful areas of your facility so you can determine potential energy saving solutions. Add basic power quality measurements to the package and you've got yourself one powerful troubleshooting tool.

From the experimental results we can observe that the 3rd harmonic current in CFL is in the range of 9% to 33.6%, for LEDs in the range of 9% to 41.6% and for fluorescent tubelights around 8.5%. Lights which are not branded gave even worse results and have not been included here.

The above experiment can be done by the consumer which the following intent:

- **Energy monetization:** calculate the fiscal cost of energy waste due to poor power quality
- **Energy assessment:** quantify the before and after installation improvements in energy consumption to justify energy saving devices
- **Frontline troubleshooting:** quickly diagnose problems on-screen to get your operation back online
- **Predictive maintenance:** detect and prevent power quality issues before they cause downtime
- **Long-term analysis:** uncover hard-to-find or intermittent issues
- **Load studies** – verify electrical system capacity before adding loads

Hence consumers must be careful in the choice of the lighting. Based on these studies there is need to formulate a policy on monitoring the harmonic content injected into the grid due to these lighting systems. Standards have to be strictly enforced to ensure that manufacturers maintain the harmonics at permissible levels.

Profile

Dr. K Uma Rao

Professor, Department of Electrical Engineering, RV College of Engineering, Bengaluru, India

Nitish N, Pramod R Rao, Ashish M Rao

Final year undergraduate students of RV College of Engineering, Bengaluru

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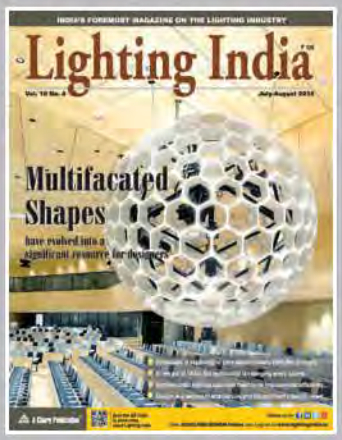

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2 years	24	2400	1750	4800	2625
3 years	36	3600	2500	7200	3750
5 years	60	6000	4000	12000	6000
Cooling India					
1 year	12	1200	1000	2400	1500
2 years	24	2400	1750	4800	2625
3 years	36	3600	2500	7200	3750
5 years	60	6000	4000	12000	6000
Lighting India					
1 year	6	750		1500	1125
2 years	12	1500	1350	3000	2025
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Cheers and promising many more updates as we go along.

Warm regards,

Mahadevan Iyer
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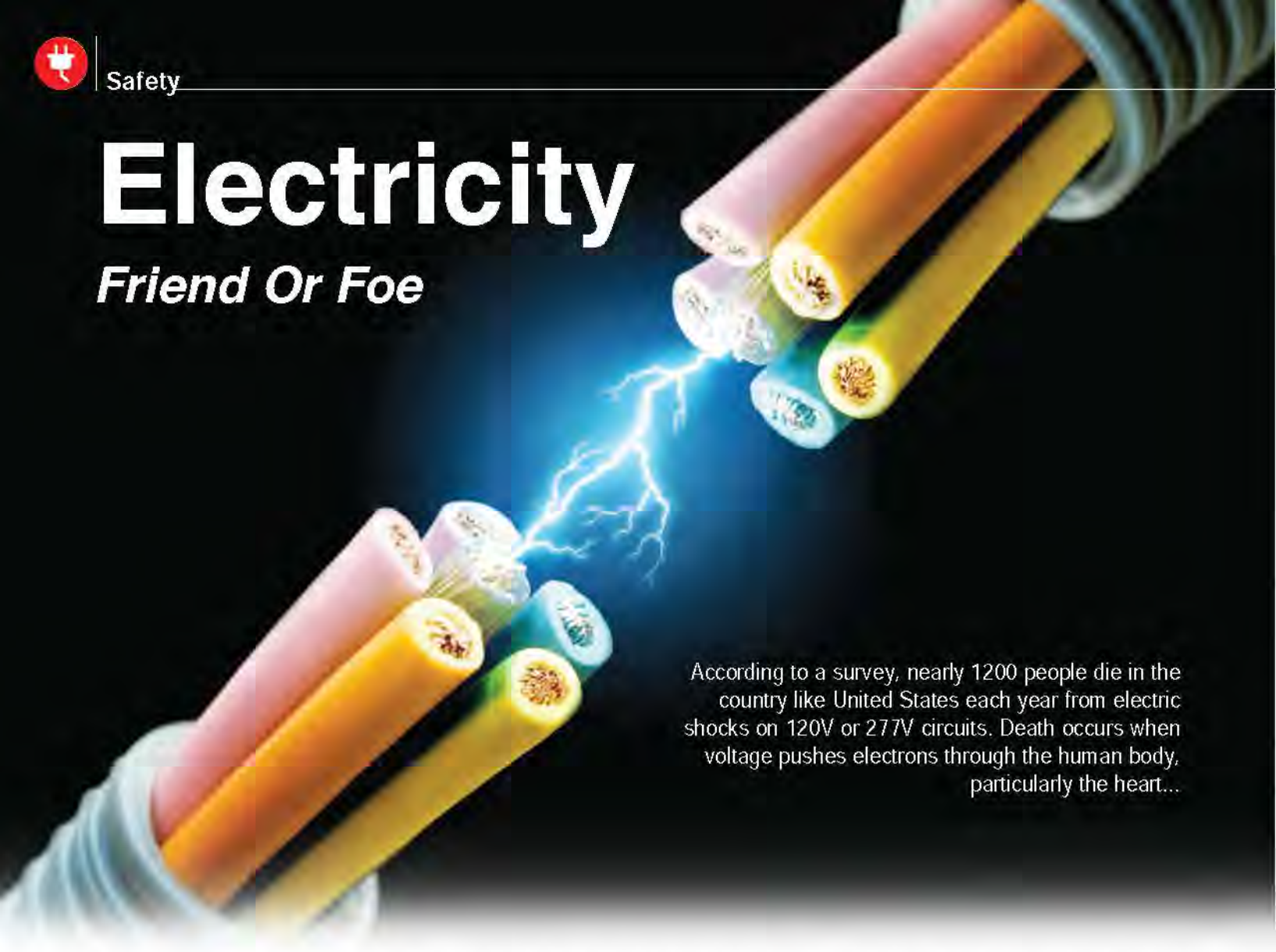
Electricity

Friend Or Foe



According to a survey, nearly 1200 people die in the country like United States each year from electric shocks on 120V or 277V circuits. Death occurs when voltage pushes electrons through the human body, particularly the heart...

It was 22.07 hrs, a hot and humid night of July 1988 in my Submerged Arc Furnace control room wall clock, telephone rang. There was a desperate call from our 230kV receiving station yard about an oil leakage in one of our Minimum Oil Circuit Breaker (MOCB).The shift was about to end in next 45 minutes at 23.00 hrs.

I joined Steel Authority of India (SAIL)'s Ferro Alloy Plant just 15 days ago as a Graduate Engineer Trainee (my first job). Only after 10 days of formal training, I was made shift in-charge, sole electrical engineer in the plant to decide during the shift operation, due to staff shortage. I contacted transport department for the vehicle to rush to yard but my request was humbly dumped to dust bin as all vehicles were busy due to end of the shift duties. I, therefore, decided to move 'on foot' to yard, which was almost 800 meters away from control room. Yard was in the outer periphery of the plant at the edge of Tadoba Animal Sanctuary. On our yard's water reservoir, a family of leopard was spotted recently.

Breathing heavily, my heart was thumping violently between my ribs, I was pretty nervous and cursing myself under the breath. In my five years engineering college life; I had not worked on any minimum oil circuit breaker before. Actually, what is taught in our class room and what we face on shop floor are poles apart. I was about to step in yard's panel room at 22.48 hrs., I heard a big bang, earth was shaking under my feet. What happened next is a history and need not mention here. God once again spared us with a severe warning only. During departmental enquiry, it was found serious electrical safety breach. Operator was in a hurry to go home, due to end of the shift, did something unimaginable in normal course, bypassing electrical safety. At that moment, I had decided to learn thoroughly the first chapter of electrical engineering i.e. electrical safety.

"Everything in the universe is made up of atoms, and atoms are made of electricity. Electricity is all throughout space, because of the loose electrons in space. There are electrons inside stars, and on all planets. Lightning is just one form of natural electricity. When life started in the beginning on our planet, electricity probably had something to do with it. And inside your body, your thoughts are really little spurts of electricity that travel along your nerves and between cells in your brain. When a person has a seizure, that is when too much natural electricity gets loose in their brain and probably when we die, it is because of any vital electric circuit failure in our body!"

Electricity is a form of energy that is inside us as well all around us from micro-volts to mega-volts. It is our best friend as long as we treat it properly but might be much more lethal than king cobra and may result into death with slight mishandling....so no excuse, no second chance!

According to a survey nearly 1200 people die in the country like United States each year from electric shocks on 120V or 277V circuits. Death occurs when voltage pushes electrons through the human body, particularly the heart. An electric shock from as little as 50VAC for as little as 1 sec can disrupt the heart's rhythm, causing death in a matter of minutes.

The severity of electric shock depends on the current flowing through the body, which is a function of the electromotive force (E) in volts, and the contact resistance (R) in ohms. Put these values into the formula

I=E/R

to find out how much current will flow through the body. Electric shock can come in several forms like

Electric sensation

Tingle sensation occurs at about 0.25 to 0.5 mA for an adult female and between 0.5 to 1 mA for an adult male (It varies according to internal resistance of our body).

Uncomfortable feelings

Current greater than 1 to 2 mA is very uncomfortable.

Maximum permissible limit

The maximum let-go threshold level for a female is about 9 mA and about 15 mA for a male.

Fibrillation level

This is a function of current over time. For example, you will get fibrillation with 500mA over 0.2 sec or 75 mA over 0.5 sec. But what is fibrillation? It is muscular twitching involving individual muscle fibers acting without coordination.

Dangerous limit

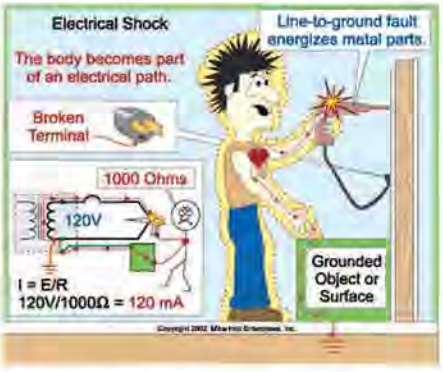
This is the current level at which humans lose muscle control; the electricity causes muscles to contract until current is removed.

According to IEEE Std. 80, you can determine the maximum safe shock duration by the formula,

T=0.116÷(E÷R),

where T is duration in seconds, E is the electromotive force in volts, and R is resistance of the person, which is assumed 1,000 ohms in the following example but varies upon skin conditions like (1) wet (2) moist (3) dry (Figure below).

Electrical injury occurs when an electric current runs through a portion of the body, usually from either a man-made source or lightning...



For a 230V circuit, maximum shock duration = 0.116 ÷ (230V÷1000) = 0.504 sec

Electrical injuries overview

Electrical injury occurs when an electric current runs through a portion of the body, usually from either a man-made source or lightning. The outside of the person's body may appear to have only minor injuries, but internal injuries may still be significant.

As current enters the body (source), it causes surface to deep burns, damages muscles and organs as it passes through the body, and eventually exits at another distant point (ground), which causes a second burn or wound. The electrical current may trigger irregular heartbeat or stop the heart entirely. Among man-made sources, direct current (DC) tends to throw people from the source after one shock. Alternating Current (AC) is more dangerous. AC causes muscle spasms that often prolong contact with the power source, which increases the extent of the injury.

What happens during electric shock?

- Makes you fall down
- Muscle contraction
- Seizures
- Dehydration
- Burns
- Fractures
- Clotting of blood
- Tissue death (narcosis)
- Respiratory/heart/kidney failure

Steps to follow

- Do not attempt to move the victim from current source
- First step is to switch off the current source
- Otherwise, move the source using a wooden stick
- Attend to the victim
- Check for breathing
- No breathing, do cardio pulmonary resuscitation (CPR)
- Call emergency medical aid
- If breathing, do a physical examination
- Treat for minor burns
- Re-establish vital functions
- Excessive burns may require hospitalisation/ surgery
- Supportive care must be provided

Prevention

Steps to prevent electrical injury depend on the following aspects:

- Proper design, installation, maintenance of electric devices
- Educating the public regarding electrical devices
- Keep electrical gadgets out of children's reach
- Learn to respect electricity and electrical devices
- Never compromise on electrical safety
- Install proper earthing/grounding

Grounding / earthing

There are a number of good reasons to ground but primary among them is to ensure personnel safety. Good grounding is not only for the safety of personnel but to provide for the protection of plants and equipment. A good ground system will improve the reliability of equipment and reduce the likelihood of damage as a result of lightning or fault currents. In the US, it is called grounding while in Europe/India 'Earthing.'

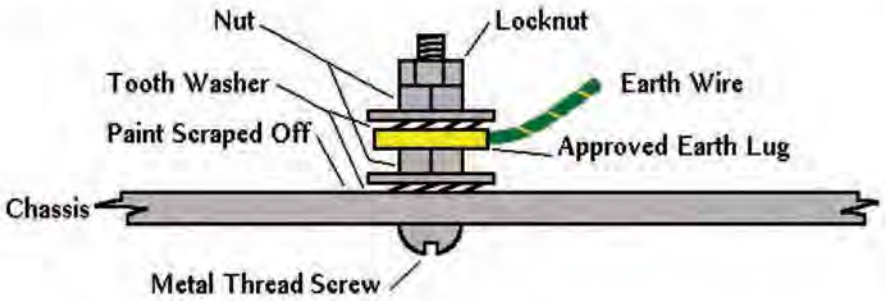
How does the earthing work?

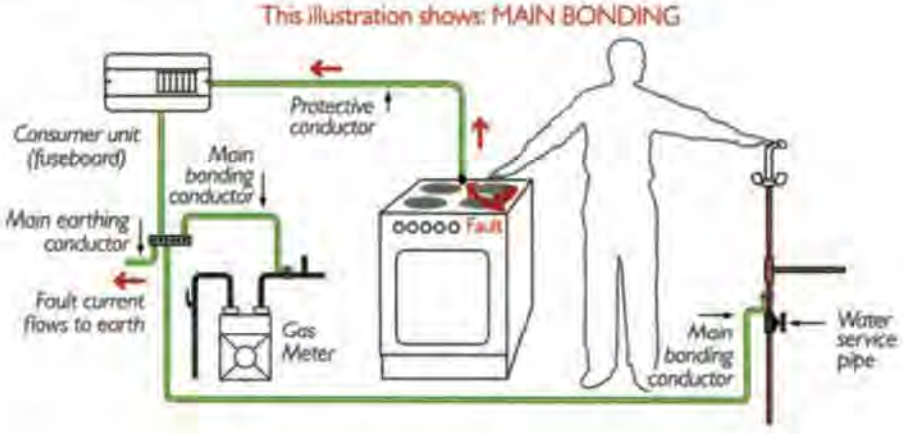
The basic idea of an electrical safety earth (or ground) is the same everywhere. The chassis of the equipment is connected to an earth pin on the mains outlet. This is then connected through the house wiring and switchboard to an electrically solid earth point, which is commonly a (copper) water pipe buried deep into the ground.

Should a fault develop within the equipment that causes the live conductor to come into contact with the chassis, the fault current will flow to earth, and the equipment or main switchboard fuse or circuit breaker will blow. This protects the user from electric shock, bypassing the dangerous current directly to earth, rather than through the body of the person who just touched it.

Main earth connection

'How should I connect the mains safety earth to the chassis?' The regulations change from one country to the next, but the principles are the same. The figure below shows a view of the basic connection, which is very safe. The lug used must be an approved earth lug.





Domestic protection measure:

Earth leakage circuit breakers (RCD - Residual Current Detectors) measure the current in the active and neutral conductors. If these differ by more than a few milliamps, the circuit is disconnected. The principle is simple - if the current in the two wires differs, some of it must be going somewhere that is undesirable, so the supply is interrupted immediately. These safety circuit breakers are very fast acting, and have saved many lives since their introduction. The 50mA that will kill you is detected by the breaker, and the power is disconnected - fast! Most of these type of breakers will operate on as little as 20 mA, so you are not only protected against major faults, but also against excessive AC leakage caused by faulty insulation or moisture.

I learnt many useful tips in my career abroad, which we usually ignore in our day to day life in India and compromise with electrical safety aspects. Electrical tools and their proper use and selection are very important for any engineer or technician.

List of essential tools

You are already familiar with some of these tools; others are limited to the electrical trade. These tools will cut, strip, and twist wires and will secure electrical boxes, light fixtures, switches, and receptacles. Good cutting and stripping tools prevent wires and insulation from getting nicked and enable you to work with wire in tight areas such as small boxes. The following tables list the basic hand tools for electrical work and some more specialised tools.

- Claw hammer for securing boxes to studs and joist
- Long-nose pliers for bending wires
- Lineman's pliers for Pulling wires & cutting
- Diagonal pliers for Cutting in tight spaces
- Slotted screwdriver for securing switches and receptacles
- Phillips screwdriver for securing switches and receptacles
- 25-inch measuring tape for setting box heights and so on
- Keyhole saw for cutting through walls and ceilings
- Hacksaw for cutting flexible, armoured cable
- Wire stripper for stripping wire insulation
- Cable stripper for stripping cable insulation
- Flashlight for working in dark spaces
- Voltage tester for testing for current
- Receptacle analyser for testing for electrical faults
- Continuity tester for testing for interruptions in the path of current
- Adjustable wrench for tightening rigid conduit connectors.

Description of some important tools:

Claw Hammer: A 16 oz with a steel or fiberglass handle and non-slip grip is the best. Look for build in shock absorption, heat treated metal, smooth face head and rubber grip.

Locking Pliers: Known by the name Vice Grip Pliers, adjustable tightening aperture allows these wrenches to lock on to nuts, bolts, pipes and all kinds of things.

- **Screwdriver Set:** Possibly the most important in your list of hand tools. A half dozen or so slot (flat tip) and Philips (star point) is essential. And, using the right screwdriver for the job is important as well. Look for: heat-treated, corrosive resistant, rubber handle, comfort grip, nickel-chrome plated.

- **Utility Knife:** hold and handle to see how they feel in your hand. You'll be cutting things with a razor blade, so it's wise to get one you can hold securely.
- **Tape Measure:** You need a good one. Look for stud markings (16", 19.2", 32") in red for easy locating, positive blade lock, heat treated spring and at least a 25 feet range.
- **Hand Saw:** These are designed for use on wood and can become damaged if cutting other materials. Get at least a 15" blade, wooden or fiber/rubber hand & heavy duty.
- **Hacksaw:** This is the tool for cutting everything but wood. A 'fixed frame hacksaw' has a metal frame which holds a removable blade (get a 10" saw). Look for easy blade changing, sturdy, 24 tooth blade.
- **14" Pipe Wrench:** Combined with your locking pliers, this tool is what you'll need for most plumbing jobs – PVC or metal. Look for high strength steel, jaw opening up to 2".
- **7" Needle Nose Pliers:** For more delicate work, mostly in regard to electrical work, these are among the most abused of all tools in the entire list of hand tools. These are for holding small wires and things to solder, twisting SMALL metal wire and jobs like that. Look for drop-forged, heat hardened, corrosion resistant.
- **8" Wire Cutter/Stripper:** For electrical work, this is really the tool you need if you reconfigure your entertainment system, work on electric yard tools or any job requiring the stripping of speaker wires, F connectors, ring type terminals or electrical wiring. Look for comfort grip handles, durable blades and different sized crimping nests.
- **Electrical Tester:** This little tool is the one you need to make sure the device is turned off and to see if an outlet, switch or appliance is live. Important info if you're planning to stick your hand in and touch electric wires. Look for one that lights up on voltages between 80 and 500 volts.
- **Power Drill:** Okay, not on your list of hand tools, but corded or battery powered, one cannot survive the tests of modern life without a drill. A 3/8" drill with motor (corded) or 18VDC (cordless) with screw-driving bit storage, keyless chuck, variable speeds & reversible.

Multimeter

A multimeter capable of reading up to 600 AC volts is necessary. It should also be able to detect continuity. A clamp on style of multimeter with amperage capability is preferable.

Tick tester (non contact voltage detector)

Every electrician should be equipped with a non contact tick tester and many have a spare tester in the truck as well as one in their pocket. Testers that use ordinary AAA batteries are preferable.

What are the best tools?

The best tool is one that:

- Fits the job you are doing
- Fits the work space available
- Reduces the force you need to apply

How do you know if you have a problem with tool?

You may have a problem if you have any of these symptoms:

- Tingling
- Swelling in the joints
- Decreased ability to move
- Decreased grip strength
- Pain from movement, pressure, or exposure to cold or vibration

Tips for selecting hand tools

Select the tool

- **Tool with sleeve:** For single-handle tools used for precision tasks: Select a tool with a handle diameter of 1/4 th inch to 1/2 inch.

- **Closed grip span – open grip span:** For single-handle tools used for power tasks: Select a tool that feels comfortable with a handle diameter in the range of 1 1/4 inches to 2 inches. You can increase the diameter by adding a sleeve to the handle.

Close grip...

- **Tool Handle:** Select a tool that is coated with soft material. Adding a sleeve to the tool handle pads the surface but also increases the diameter or the grip span of the handle.

Open grip...

- **Tool Grip:** Select a tool that has a non-slip surface for a better grip. Adding a sleeve to the tool improves the surface texture of the handle. To prevent tool slippage within the sleeve, make sure that the sleeve fits snugly during use.

Routine maintenance of tools: Cleaning, lubricating, tightening, simple tool repairs, hand sharpening and adjustments using engineering principles.

Important tips to avoid electrical accident

- Use quality wire and cables for wiring, use RCCB in domestic wiring
- Never underestimate power of electricity
- Read and understand drawings carefully
- Never bypass any safety interlocking
- Never work alone on electrical system in an isolated area
- Follow the electrical safety norms seriously.

Profile

Aqeel Ahmad

Substation & Solar Energy Expert

E-mail: aaemail987@gmail.com

Fig. 2: Programmable weather chamber...

Solar Cables For Photovoltaic Systems

Even a small increase in cable resistance resulting into increased I^2R losses is considered as a higher loss of energy and such cable will lose its acceptance...

Due to rapid depletion of conventional fossil fuels, various resources of renewable energy are now highly focused globally. Energy from solar and wind contribute major portion of total country's renewable energy generation. In India, we are having about 300 sunny days in a year and therefore harnessing the solar energy through photo voltaic system becomes one of the preferred green energy options today.

A historic revolution is being witnessed by our country with the Government of India's highly ambitious plan – The Jawaharlal Nehru National Solar mission, to reach the solar power generation to 100 GW by 2022.

To receive solar energy, number of photo voltaic arrays are required to be installed facing the sun, and photon energy in the form of DC current is carried through SOLAR CABLES to storage batteries. In our country electricity in AC form is the most popularly accepted form, and therefore using the inverter, the DC electrical power is then converted to AC electricity. Solar PV system may be a stand-alone or a grid connected system. The hassle-free performance of a typical solar PV system is generally expected to be more than 25 years and therefore optimisation of all relevant components of solar PV system becomes necessary.

In PV system, one of the important parts is the SOLAR CABLE. They are connected on DC side of the system. Cables used for connecting individual PV modules in a string to form a PV generator are called as string cables, and all strings in parallel are connected to generator junction box. The main DC cable connects the generator junction box to the inverter. The PV energy will be in the DC form with low voltage and high current and this results in principle differences for DC cables. To get the desired efficiency, selection of proper sized cable draws major attention while designing the system, because, undersized cable results into heating which may lead further to fire also. The quality and performance of solar cable plays very important role for extracting solar energy with higher efficiency in PV system. Even a small increase in cable resistance resulting into increased I^2R losses is considered as a higher loss of energy and such cable will lose its acceptance. As solar cable has to function in open atmosphere over a long period, it has to withstand all environmental severities like UV radiation, rain, dust & dirt, temperature variations, humidity, insects and microbes etc. Any frequent failure / replacement of solar cable will decrease the overall project efficiency and therefore before actual installation, it becomes necessary to evaluate SOLAR CABLES to ensure its successful functionality over a desired life span through conducting series of tests.

Based on the requirements listed in manuscript of working group AK 411.2.3, Leitungen fur PV-System' of the German committee for standardization, the specification 2 Pfg1169/08 for solar cable was published. UL 4703 is one another specification on photovoltaic wires published

Fig. 1: Programmable ozone test chamber...

in USA in 2005. Recently, British Standards Institution - BSI has also published BS EN 50618 -2014 as specification for 'Electric Cables for Photovoltaic Systems'. In this article, the specific requirements for solar cable for PV systems as per international norms, its constructional requirements like flexibility, single core with cross linked insulation and sheath; special requirements like low smoke, halogen free, stringent high voltage withstand capability; environmental requirements like ozone resistance, UV resistance, flammability requirements etc., are discussed.

Figure 1 shows the programmable ozone chamber to evaluate ozone resistance property. Significance and specific requirements of major critical tests are also discussed.

Solar cables: general requirements

Stand-alone / roof top solar PV systems are of low voltage level, in general < 100 volts. The grid connected solar PV systems are of higher voltage level and due to the added complexities and considering safety aspects, are installed at separate well protected area and allowed to operate through skilled persons only.

The voltage drop between PV array to the inverter is one of the critical parameters for selection of size of solar cable. The guidelines for size selection are specified in BS: 7671.

To suit the variable weather conditions, the solar cable is designed to meet the temperature range from -40^{0}C to + 90^{0}C...

As per NEC norms, the overall voltage drop between PV array and inverter is allowed < 3%. In order to maintain this, in addition to cable size, the most practicable shorter length of solar cable is preferred.

To suit the variable weather conditions, the solar cable is designed to meet the temperature range from -40^{0}C to + 90^{0}C. The maximum conductor temperature of 120^{0}C is expected at a maximum ambient temperature of 90^{0}C.

Depending upon its area of application, a solar cable may be a single conductor with double insulation, which is generally routed through a suitable conduit / trunking system. For better mechanical robust solution, single conductor with single wire armouring is used. For main DC cable between a PV generator junction box and inverter, multi core single wire armoured cables are used.

The nominal DC voltage of solar cable is 1.5 kV between conductors as well as between conductor and armour, which is up to 1.8 $kV_{maximum}$.

Solar cable: constructional requirement

Solar cable should have flexible, class 5, heavy duty tin coated copper conductor. The conductor is to be provided with low smoke, halogen free cross linked insulation and over-sheath. In light of its working in open atmosphere under sun light with UV radiation, solar cables are commonly black in colour. Solar cables after installation, does not experience frequent flexing or torsion forces – and therefore these two parameters are not having major requirements. The insulation & sheath have to perform at higher temperature range with additional high mechanical stability, flame retardant and free of halogens. To meet these requirements, generally cross-linked polyolefin copolymers are preferred.

Compared to PVC type A as per IS: 694 / IS: 1554-part 1 and XLPE as per IS: 7098-part 1, the EN: 50618 specifies special requirements for solar cable insulation / jacket materials.

Few of major physical requirements are listed in Table 1.

Property	Solar Cable	PVC Type A	XLPE
Reference standard	EN 50618	IS: 694 IS: 1554-pt 1	IS: 7098-pt. 1
Tensile strength before aging, min. N/mm^2	8.0	12.5	12.5
Elongation at break, min. %	125	150	200
After aging – Aging temperature; ^{0}C / duration; hrs	150 / 168	80 / 168	135 / 168
After aging - % variation in mechanical properties	± 30	± 20	± 25
Hot set test Test temperature Hot set, max.% Permanent set; max. %	 250 100 25	NA	 200 175 15
Cold bend test Temperature, ^{0}C	- 40	- 15	- 15
Shrinkage of sheath Temperature; ^{0}C / Duration; mins. Shrinkage, max.%	 120 / 60 2	 150 / 15 4	 130 / 60 4
Thermal endurance (temperature index; ^{0}C corresponding to 20000 hrs)	≥ 120	NA	NA
Sheath resistance against acid and alkaline	23^{0}C for 168 hrs	NA	NA

Table 1: Physical Properties of Insulation / Jacket material...

Table 1, shows requirement of solar cable insulation / jacket material to meet atmospheric temperature variation. Solar plants are required to work under extreme weather conditions – not only for high temperature, but at low temperature also. The aging temperature, hot set temperature and cold bend temperatures are therefore stringent compared to PVC and XLPE materials. To ensure the expected performance for 25 years, standard specifies thermal endurance test, which will determine the temperature index and it should be > 120^{0}C.

In Table 2, few more critical requirements on as a whole cable are listed out.

In view to its application in open atmosphere, solar cable has to confirm its resistance to weathering / UV exposure. Figure 2 shows the programmable weather chamber to evaluate this parameter.

Dynamic penetration test will prove the solar cable for mechanical load. A long duration damp heat test gives idea of stability of solar cable material against any degradation in mechanical properties due to temperature and humidity. Smoke emission tests expect min. 60% light transmission, in case solar cable is under fire. Figure 3 shows the Smoke emission test set up to evaluate this property.

As solar cables are connected in vicinity of solar PV arrays, control panels, electronic controllers, inverters etc., amount of HCl content, pH & conductivity, content of bromine & fluorine requires to be controlled to meet the specified limit.

Fig. 3: Smoke emission test set up...

Conclusions

Solar cables of different sizes and construction designs are available to meet the efficiency requirements of solar PV systems. The international standard EN 50618 specifies the performance requirement of solar cables. It is necessary to evaluate solar cables before actual installation to ensure its desired life span of 25 years.

Property	Solar Cable	LT PVC cable	LT XLPE cable
Reference standard	EN 50618	IS: 694 IS: 1554-pt 1	IS: 7098-pt. 1
High voltage test on complete cable at RT	6.5 kV AC / 15 kV DC	3 kV AC / 7.2 kV DC	3 kV AC / 7.2 kV DC
Long term DC high voltage Temperature; ^{0}C / duration; hrs DC voltage; kV	85 / 240 1.8	60 / 240 1.2	NA
Sheath surface resistance	>10^9 ohms	NA	NA
Ozone Resistance	No crack	NA	NA
Weathering / UV resistance	720 hr (360 cycles)	NA	NA
Dynamic penetration	Test force >F_{min}	NA	NA
Damp heat test	90^{0}C + 85 % RH for 1000 hrs	NA	NA
Smoke emission of complete cable as per IEC 61034-2 - Light transmission, min.	60%	Under consideration	Under consideration
Assessment of helogens for ALL non-metallic materials	pH & Conductivity Chlorine & Bromin Fluorine	HCl content	HCl content

Table 2: Requirements for complete cable...

Profile

Nilesh Pandya
Sr. Manager and Head – Cables Section, ERDA

Sheetal Panchal
Asst. Manager, Cables Section ERDA

Jay Purohit
Asst. Engineer, Cables Section ERDA

Electrification Of High Rise Buildings

Once the estimated total demand has been arrived at, we have to decide how we are going to distribute the power...

The requirements of the planning and execution of electrical works of an ordinary building having ground plus one or two floors housing are quite different from those of a multistoried or high rise building. A building is classified as 'High Rise', if it has more than Four floors (Ground + 3 Floors) or height more than 15 meters. It can be regarded as a miniature township requiring entire range of civic services such as electric power from the electricity board, stand by / emergency power from diesel generator, water supplies for various applications, fire fighting system, elevator services, sanitation, recreation facilities, swimming pool, lighting for apartments as well as common areas etc.

Details of electrical power requirements

The basic planning of the electrical works in high rise buildings starts with identifying the various requirements of the occupiers of the building, as well as the requirements of the statutory regulations. For this, one need the layout

plan of each of the apartment, the activity planned in each room, the furniture layout, location of various electrical gadgets & their individual power requirement, plumbing needs etc. The requirements of apartments also largely vary depending on whether the occupier belong to high or low income group. Generally the high income group owner may prefer a large number of electrical outlets for lights, fans, table lamps, floor lamps, radio, T.Vs, music system, personal computers, fax machine, cordless telephones, air conditioners, washing machines, geysers, microwave oven, refrigerators, grinders, dish washer etc. This will not be the case with lower income group owners who may have one or two light points in each room, one or two sockets, a TV, a few fan points, refrigerator and a few kitchen appliances. Larger the income, higher is the power requirement & consumption. In addition to the individual requirements of the owners, there are also requirements for certain common areas, common facilities of the entire complex, such as common area and road lightings, elevators, water supply pumps, fire water systems, & fire fighting controls, recreation / swimming pool, communication system, security system etc. In the event of power failures, standby diesel generators need to take care of the common area lighting, drinking water pumps, fire water pumps, sewerage & storm water drainage pumps, elevators and a few lights for each apartment. This calls for laying of separate circuits for emergency lighting and change over facility for elevators, pumps etc. Based on these loads, total requirement of normal power as well as the emergency power with a provision for 15 to 20% future load growth & considering a Load factor of 0.6 to 0.8 depending on the type of load and one's experience in calculating the total demand.

Power distribution and safety devices

When once the estimated total demand has been arrived at, we have to decide how we are going to distribute it. In a simple 2/3 floor building it is fairly simple as there are only a few individual owners and their cumulative demand is also low. This low demand of power can be generally met by the utilities through a single phase supply to each owner and measured through independent energy meters. However, in the case of high rise buildings the requirement could be in terms of 1 to 2 mega watts depending on the number of apartments. Advance interaction with the electricity board with regard to the availability of catering such large power from their existing system is necessary. Otherwise the utility has to plan necessary High Tension (HT) sub stations / feeders exclusively for the high rise complex. Such large power requirements are generally catered through High Tension supply, which could call for installation of a few step down substation inside the high rise complex. Each such substation has its own three phase + neutral, low tension power distribution boards. The electrical designer has to suitably plan the feeders and the out going cables in such a way that the loads or properly balanced on all the three phases and that each consumer gets proper voltage at his premises. Incoming supply to each consumer has to be protected by provision of an Earth Leakage Circuit Breaker (ELCB) to safeguard the persons against electrical shocks from faulty electrical gadgets. Further each circuit within the apartment is to be protected by Miniature Circuit Breakers (MCBs) to safely trip that particular circuit whenever there is an over load or short circuit. All power sockets need to be earthed through an earth conductor and ultimately connected solidly to earthed ground pits for safety of the personnel. With this provision any leakage current from a defective equipment will be directed to the ground and sensed by the ELCB, without harming the person coming in contact with it. Lightning arrestors provided at the top of the high rise buildings are connected to separate Earth pits through metallic conductors to safeguard the building against lightning.

Separately wired emergency light fittings are catered directly from the standby diesel power generators installed at high rise complexes, which automatically switch 'ON' during power failure...

Usually, separately wired emergency light fittings are catered directly from the standby diesel power generators installed at high rise complexes which automatically switch 'ON', on the failure of normal power supply. Similarly the common area lighting loads, water pumps, elevators etc., are so engineered with 'change-over' switching facility from mormal to diesel power and vice-versa. Separate routes for communication cabling, television antennas, fibre optics internet facility etc., have to be engineered based on the consumer's requirement not only inside the apartments but also inside each tower of the building and accordingly separate conduiting

Fig. 1: Roof top solar panel...

to be planned. For this, proper interaction with the interior decorators & civil Engineers, in advance, is necessary. Separate fire fighting controls and public address systems with Battery assisted power supplies are also to be planned.

Solar power on high rise buildings

High rise buildings consume a large amount of energy because potable & Non-potable water that have to be pumped to the highest occupied floors, mechanically ventilated design makes elevators generally used instead of stairs and many lights are used during day times also in rooms, corridors etc, located far from windows & windowless spaces. Further the supply of traditional electrical energy by utilities are becoming more and more expensive as well its availability is in short supply due to the ever increasing demand. In view of this, most of the State Govts., are taking all possible steps to promote solar energy generation in their states. They have even come forward to buy the Solar power at a higher rate than the tariff rates thereby giving an incentive to the installer to recover the entire cost of the solar installation over a period of about 7/8 years and the life of the solar installation is expected to be over 25 years. Roof tops of high rise buildings are ideal sites for the solar power installation (Fig. 1). A 60kWp Solar power project at the roof top, costing around ₹ 58,00,000/= can generate approximately 1,00,000 units a year of clean & green power & pump it to the grid. The shadow free roof area required is about 450 Sq. metres of the high rise building. Evidently planning & design of high rise building need to take care of the solar power generation and accordingly make provision for cabling, routing of cables, installation of Batteries / Inverters etc.

	LED Lights	Incandescent Lamps	Compact Fluorescent (CFL)
Life Span	50,000 hours	1,200 hours	8,000 hours
Watts of Electricity used (Equivalent to 60W Bulb)	6-8 watts	60 watts	13-15 watts
Kilo-Watts of Electricity used (Equivalent to 30 Incandescent Bulbs/year	329KWh/year	3285KWh/year	767KWh/yr
Light Out Put (Lumens)	Watts	Watts	Watts
450	4-5	40	9-13
800	6-8	60	13-15
1,100	9-13	75	18-25
1,600	16-20	100	23-30
2,600	25-28	150	30-55

Table 1: Comparison chart for energy efficiency...
Note: LEDs use less power (Watts) per unit of light generated (Lumen), LEDs help reduce green house gas emissions & lower eectricity bills.

Fig. 2: 500 LPD solar water heaters...

Energy conservation

With the growth of high rise buildings coming up and correspondingly the demand for large power requirement going up, and supply sources being limited, there is absolute necessity to give importance, at all locations, to conserve energy. This exercise need to be done well at the planning stage of the building itself. Energy conservation could be either from saving in direct electrical consumption, or saving in water consumption (50% of water consumption in a house is at the bath room & toilet), or avoiding wastage of heat etc.

Following areas present potential for energy conservation in high rise buildings.

- Planning the usage of LED, Compact Fluorescent Lamps (CFLs) & avoid incandescent lamps. Comparative benefits can be seen in Table 1.
- Avoid usage of incandescent lamps in display sign boards, which need to be switched on practically the whole day, such as 'EXIT' signs, 'Fire Exit' signs etc. Instead preferably use 'LED' sign boards. For example, instead of a 40watt incandescent lamp used in a display, an LED display unit consume only about 4/5 watts. The latter has a life of about 50,000 hours.
- To provide "solar water heaters" for supply of hot water (Fig. 2).
- To provide air tight self closing doors in all Air conditioned rooms.
- To prevent air leakages in ventilation ducts.

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Fig. 3: Heat insulation around hot water pipe line...

- To provide heat insulation around hot water pipes which are concealed in the walls as well as around bath tubs to avoid loss of heat in to the walls (Fig. 3).
- To use pressure assisted toilet flushing tanks of lesser water volume (1.6 gallons/ flushing) instead of old gravity assisted design (3.5 – 5 gallos/flush). This pressure is created using the pressure of household water supply line itself)
- Wherever gas is cheaper than electricity, to plan combustion gas water heaters instead of electrically heated water boilers to save on running costs.
- To plan re-cycling of used water from bath rooms, sinks, dish washers, washing machines, water used in kitchen for washing vessels etc. in a water treatment plant and re-use this treated water for gardening purposes, car Washing, toilet flushing etc. However, this calls for appropriate designing & plumbing of such water lines before starting of the building construction. By this planning, saving of water to an extent of 50% to 75% is possible as well as bring down the water bill considerably.
- To provide enough natural lighting to apartments by suitably positioning & sizing of the Windows to avoid usage of Electricity during day time (Fig. 4).

Integrated Building Management System (IBMS)

IBMS with respect to high rise buildings is catching up very fast, more so in large commercial complexes, provide "single window" access, for:

- Monitoring & control of fire fighting systems.
- Security module for access control.
- Elevator control.
- Module for management of energy in the complex.
- Module for preventive maintenance of equipments etc.

Life saving module provide primary monitoring & full control of smoke detection. Fire detection through hundreds of smart smoke detectors installed assist in providing information of the Floor affected by fire as well as for safe evacuation of persons.

Security module allows operators to control and monitor entry of persons through smart card readers, card holder management & ability to acquire & use data from human resource data base. Numerous CCTVs installed at strategic places also provide 'movement' information at the central monitoring cell.. software also enable efficient control & optimal usage of elevators. All these devices communicate via the structured cabling system. The security application has comprehensive reporting capabilities with pre-configured reports customised to the individual needs. Building management module integrates & control the HVAC systems, lightings & energy usage. It maintains an extensive historical data of building which can be accessed at required intervals of time. Any abnormal condition in the building, it will alert operators immediately, making it easy to analyse long-term operational patterns to ensure optimal performance.

Maintenance module provides checklist for maintenance of equipments, their periodicity of execution, data on manpower and man-hours requirements, tools & consumables required for each job etc... thereby ensuring efficient maintenance management. In short high-rise buildings present several unique challenges to designers, which are not found in traditional low-rise buildings.

Fig. 4: Building design with natural lighting...

Profile

C V Govinda Raju

Consultant & Educator
Ex President
ISPAT Group of Companies

Use Of Testo Thermography In Electrical Industry

Thermography is a technology by which you can see the thermal patterns of your equipments, materials, buildings and trace the thermal abnormality of the object. With this you can save your expensive equipments from premature wear out or damage and reduce maintenance cost by taking timely actions. It works on infrared radiation detection from your objects. Lately it has become very important to monitor your electrical and electronic equipments so as to reduce its down time and increase the quality and productivity of the same.

All objects which are warmer than minus 273 degrees centigrade (absolute zero), emit infrared heat radiation. Infrared radiation cannot be seen by the human eye.

Thermal imagers, however, can convert this infrared radiation into electrical signals, and present them as a thermal image. The heat radiation is thus made visible for the human eye.

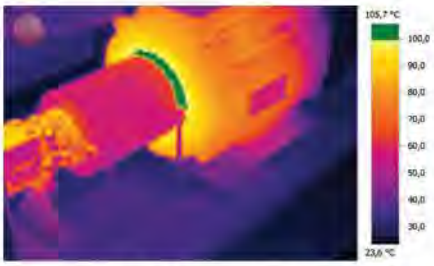
Salient features of Testo Thermal Imagers:

- Best in class thermal sensitivity
- Ease of operation
- Wide temperature range
- High image quality
- Fast and comprehensive analysis
- Upgradation to higher resolution possible with SuperResolution technology.

Most common applications for thermal imagers in electrical field

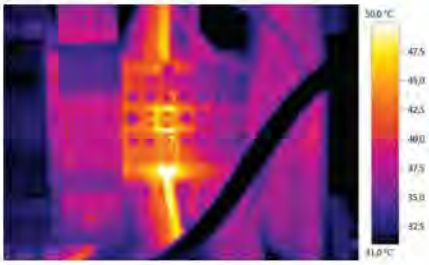
Regular checks in electrical maintenance

Testo thermal imagers allow an evaluation of the heat status of low, medium and high voltage systems. Thermal images lead to early



recognition of defective components, so that the required preventive steps can be taken. This minimises the risk of fire that avoids costly production downtimes.

Thermography in the inspection of switch cabinets

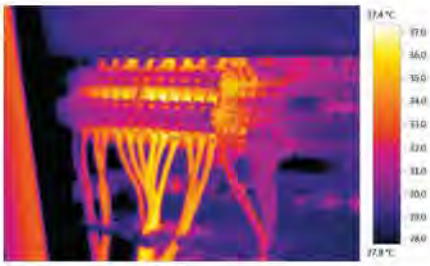


In electrical installations or cables, increased temperatures are always an indication of an overload, an imminent malfunction or an existing defect. The technology of thermography is particularly useful in the maintenance of switch cabinets, as the measurements can be carried out non-contact and at a safe distance. Anomalies can therefore be detected and counter measures can be implemented.

Detection and storage of measuring site – automatically

The SiteRecognition technology also supports efficient and reliable inspection routing for lots of similar switch cabinets. The thermal imager automatically detects the measuring location and stores the measured thermal images in defined folders. Therefore, the thermal images of the switch cabinets can be analysed conveniently and safely on the PC.

Maintenance of electrical installations: conductors and connections



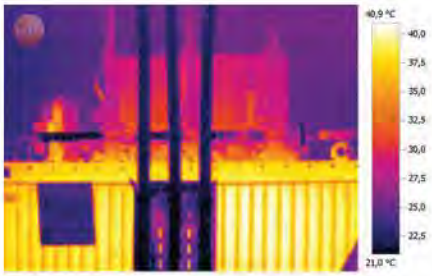
Different temperatures in conductors and connections in electrical installations may be a sign of loose or corroded connections. As shown in the image, heat propagation is also monitored in the cable duct and bundled cables.

Maintenance of electrical installations: electrical components

In case of electrical components, heat distribution within the individual components

is also significant, as well as the connections and access lines. Different temperatures within maintenance indicate the operating status, but can also be indicative of a malfunction. The image shows an overloaded electrical fuse. It may be that this fuse is too small, or the electrical components are producing excessive current.

Maintenance of electrical installations: transformers



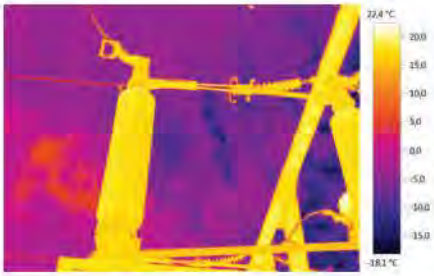
Depending on the type of insulation, the connections, cores or insulation in components of medium-voltage installations such as transformers can be inspected for thermal irregularities.

Maintenance of electrical installations: overhead power lines

The electrical connection points and insulators for overhead power lines in substations or the overhead power lines of high-voltage systems can be checked for maintenance purposes. Typically, these locations are difficult to access. Lots of locations can be inspected thermographically using a telephoto lens with correspondingly high resolution, conveniently from the ground.

Maintenance of electrical installations: control and regulation systems

Electrical distribution systems are operated at low voltage and can be inspected



quickly and easily using thermography. These systems are normally maintained using thermal imagers with a high detector resolution. The higher detector resolution makes smaller details visible. Thus, even the smallest electrical components can be analysed thermographically. Many more applications are possible in design and development and so on.

Seeing it is believing it – so see the problem before the problem sees you. Call us for a demonstration and find more applications for yourself.

For more information, contact:
info@testoindia.com or visit www.testo.in

INDIA

India Nuclear Energy 2015
Venue: Nehru Centre, Worli, Mumbai, India
Date: 15 to 16th October, 2015

LED Expo 2015
Venue: Pragati Maidan, New Delhi, India
Date: 03 to 05 December, 2015

Cable & Wire Fair
Venue: Pragati Maidan, New Delhi, India
Date: 03 to 05 December, 2015

3rd International Conference & Exhibition on Energy Storage & Microgrids in India
Venue: India Habitat Centre, New Delhi, India
Date: 07 to 09th December, 2015

INTERNATIONAL

China Wind Power 2015
Venue: Beijing, China
Date: 14 to 16 October 2015

Global Energy Summit & Expo
Venue: Beijing, China
Date: 02 to 03rd November, 2015

ISES Solar World Congress 2015
Venue: Daegu, Korea
Date: 08 to 12th November, 2015

4th International Conference on Electric Power and Energy Conversion Systems
Venue: Sharjah, United Arab Emirates
Date: 24 to 26th November, 2015

13th India Doble Power Forum

Venue: Vadodara, Gujarat, India | Date: October 13 to 16, 2015

The IndiaDoble Power Forum is one of the most valuable events for the region's practising engineers and executives in electric power utilities and industries. This forum allows participants to share experiences and exchange new ideas for the reliable and safe operation of high voltage equipment and power system protection. Participants will also have the opportunity to get acquainted with the latest techniques.

The programme is divided into two specialised parallel tracks:

- Challenges & learnings in High Voltage Apparatus Diagnostics & Asset Management.
- Challenges & learnings in Power System Protection &Substation Automation.

It is the only event where the focus is on knowledge sharing by power utilities and power apparatus OEMs. Join for this unique experience and gain the knowledge you need.

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Seven Priorities For Global Energy Governance

The risks and challenges to the energy landscape are effectively illustrated by the WEC's 2015 World Energy Issues Monitor. It shows that energy leaders from over 80 countries remain concerned about energy and commodity price volatility and climate framework uncertainty. They also fear market distortions through stop-and-go energy subsidies and trade barriers as well as outdated market design...

Energy ministers of the Group of Seven (G7) industrialized nations recently signed a joint statement on energy security. Its fundamental principle was that energy security is a common responsibility.

A given nation relies on neighbouring countries and on coordinated solutions to overcome weaknesses and provide that security. However, the foundation for a successful international collaboration must be built on robust and balanced policy frameworks in every partner country.

It is estimated that US$48 trillion, or 60% of annual global GDP, must be invested in energy infrastructure over the next two decades. Political and regulatory risks are considered the main issues preventing the mobilization of the capital required to make those improvements.

Balanced policy frameworks for energy in the areas of security, equity and environmental sustainability are the best guarantee to avoid sudden and dramatic policy changes. Political risk is therefore a condition for the mobilization of the required capital and delivery of long-term energy security. At the World Energy Council (WEC) this is referred to as 'balancing the energy trilemma.' This framework ultimately promotes the prosperity and competitiveness of individual countries. Yet, the annual WEC Energy Trilemma Index illustrates that much work remains to be done in most of the 129 rated nations.

Awake at night

The risks and challenges to the energy landscape are effectively illustrated by the WEC's 2015 World Energy Issues Monitor. It shows that energy leaders from over 80 countries remain concerned about energy and commodity price volatility and climate framework uncertainty. They also fear market distortions through stop-and-go energy subsidies and trade barriers as well as outdated market design. While the specific national context requires that every country finds its own solution to creating the best trilemma balance, it is clear that answers to many energy challenges can be found only through crossborder collaboration. The three guiding questions that should drive international cooperation in energy are:

- Which fundamental energy-related prosperity objectives can be achieved only through international cooperation?
- Which existing market distortions or failures prevent the realization of effective solutions to question 1 and require internationally coordinated solutions?
- Which strategic technology areas support the solving of question 1 and deserve priority status for internationally coordinated research and development (R&D)?

With these challenges in mind, international collaboration and governance efforts should be focused on these priority areas:

- Efficient resource sharing through regional integration of infrastructure
- Universal access through promotion of adequate policies, skills development, innovative business models and financing schemes
- Mitigation of carbon dioxide emissions through an international climate-framework agreement and burden sharing
- Sun-setting of distorting fossil fuel subsidies that discourage energy efficiency
- Sharing of green technologies and solutions through elimination of tariff and nontariff barriers

- Revision and regional alignment of outdated market design in electricity and natural gas
- Coordinated R&D in system-critical components with a focus on electric storage and carbon capture/utilization and storage

Building on existing institutions

Clearly, all of these issues urgently need greater international cooperation and further progress than has been observed over the past two decades. Intergovernmental organizations and initiatives struggle to make meaningful progress, with current efforts often focused on merely avoiding back-tracking. The real challenge is strengthening existing institutions and adapting to the changing energy landscape.

The International Energy Agency (IEA), for example, institutionalizes the joint approach among the Organisation for Economic Co-operation and Development (OECD) member countries regarding the strategic petroleum reserves. However, having China and India as full members will be critical for the future credibility of the effort. Regional organizations promote the complex objective of cross-border infrastructure integration in all regions, generally with only limited or slow progress, but this is an area where real progress can be made. The United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Sustainable Energy for All initiative (SE4All) face the most challenging objectives. These can only be achieved through stronger international cooperation to deliver universal access to modern energy services and avoid climate destabilization. It is also clear there can be no effective implementation of international climate framework or substantive movement on many of these issues in the absence of strong and balanced national energy policy frameworks. Setting up an international climate framework without well-structured, balanced 'trilemma frameworks' is about as meaningful as winding a broken watch.

The window of opportunity

As we look to the future we must keep ambitions high for the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) meeting later this year in Paris. The UN's SE4All process has generated new international dynamics, correctly identifying that energy access is critical for the entire development agenda. However, the issue must now move towards real action and the energy sector has a clear role to play in this effort.

This year provides ample opportunities for existing global governance institutions to show they are mastering the challenges they were set up to address. Delivery of a clear, unambiguous and equitable international climate agreement at COP 21, the definition of energy access as a Sustainable Development Goal and delivery of an implementable roadmap for universal energy access are vital. Neither should we forget the World Trade Organization's Ministerial Conference in Nairobi, Kenya, in December, where conclusion is expected on tariff limitations for environmental goods. It is our moral responsibility to use those opportunities and actively support these institutions and initiatives.

- Christophe Frei, Secretary-General, World Energy Council
Courtesy: International Trade Forum, ITC

Ratul Puri named the CEO of the Year in the Asian Power Awards 2015

A jury led by John Yeap, Partner, Head of Energy – Asia at Pinsent Masons, Mark Hutchinson, Energy Expert, Advisors in Energy and John Goss, Managing Director of Ceejay International Ltd declared Ratul Puri as the CEO of the year 2015 for his outstanding contribution to the Indian power sector. The 50 MW solar project commissioned by the Clean Energy arm of the company at Charanka as part of the solar park commissioned by Gujarat Government was awarded the silver prize in the Solar Power of the year 2015 category. This was declared in a ceremony held at Bangkok, Thailand which was attended by over a hundred executives and key industry players yesterday.

Ratul Puri, Chairman, Hindustan Power said, "The Indian power sector has been growing thanks to the current Government's timely intervention. If one is able to plan for a long term sustainable business model, the probability of success is very high which is what we have done at Hindustan Power. We would not have been able to achieve many of our milestones, if not the team and dedication. I must thank my team and all those who have played a role in the organization emerging as one of the leading power players in the country."

Ratul Puri

Asian Power, Tim Charlton applauded the awardees, saying " We have passed a decade of recognizing the best achievements and projects in the region's industry, and tonight we put the spotlight on 2015's key players who bested others in a drive for efficiency and productivity in the power sector."

Rajya Ghei, CEO India Solar Business on the occasion of the 50 MW charanka solar project being declared silver prize winner in the solar project of the year said, "The solar potential in India is immense and with a target of 100 GW of solar by 2022, the country is set to witness rapid growth. The Clean energy arm of the company is the largest solar developer in the country and we intend to keep pace with the growing solar requirements in the country."

Tata Power Solar recognised for its excellent cost management

Tata Power Solar, India's largest integrated solar power company, has won the third place in the prestigious 12th National Award for Excellence in Cost Management by the Institute of Cost Accountants of India.

The Institute of Cost Accountants of India (ICAI) awarded this in recognition of Tata Power Solar's efforts towards cost reduction and cost competitiveness. This recognition comes through demonstrating the use of cost management techniques such as marginal costing, standard costing, VA/VE and benchmarking effectively. CMA A.S. Durga Prasad, President, ICAI said, "Cost competitiveness is the fulcrum on which the survival and sustenance of business enterprises depend. I would like to congratulate all the winners and appreciate their achievements."

Speaking on winning the award, Ashish Khanna, ED & CEO, Tata Power Solar said "We feel privileged to win this award. Over the past year, we have focused our efforts in developing a strong cost management strategy that helped reap multiple benefits such as increased plant utilization capacity, significant cost savings through benchmarking & VA/VE, and also winning a prestigious solar EPC contract in a competitive bidding process. Awards like these not only acknowledge our efforts but also provide us the extra push to go further."

Col. Rajyavardhan Rathore (Retd.), AVSM, Honourable Minister of State for Information and Broadcasting presented the awards. Winners were selected by a jury headed by Hon'ble Justice V.N. Khare, former Chief Justice of India, and evaluated basis reports presented by an independent credit rating agency.

CENTRAL ELECTRICITY AUTHORITY - Grid Operation & Distribution Wing - Operation Performance Monitoring Division
All India / Regionwise Power Generation Overview - 31-Jul-2015

All India/ Regions	Installed Capacity (MW) **	Monitored Capacity (MW)	Annual Target (MU)	Generation 2015-16 (MU)					
				Today's Program	Today's Actual	APR 1 Till Date		Deviation	% Deviation
						Program	Actual		
NORTHERN									
THERMAL	46274.76	41254.26	231799.00	614.54	494.89	74290.00	64425.78	-9864.22	-13.28
NUCLEAR	1620.00	1620.00	10479.00	29.77	34.86	3634.00	3942.73	308.73	8.50
HYDRO	17796.77	17870.27	64500.00	277.74	345.20	26894.00	31644.86	4750.86	17.67
TOTAL	65691.53	60744.53	306778.00	922.05	874.95	104818.00	100013.37	-4804.63	-4.58
WESTERN									
THERMAL	77944.42	81291.41	373266.00	936.45	816.33	124131.00	117480.42	-6650.58	-5.36
NUCLEAR	1840.00	1840.00	11513.00	33.91	34.21	3777.00	4235.70	458.70	12.14
HYDRO	7447.50	7392.00	16012.00	46.08	55.20	4854.00	4601.76	-252.24	-5.20
TOTAL	87231.92	90523.41	400791.00	1016.44	905.74	132762.00	126317.88	-6444.12	-4.85
SOUTHERN									
THERMAL	36222.76	34445.32	189643.00	497.31	489.11	62250.00	61084.13	-1165.87	-1.87
NUCLEAR	2320.00	2320.00	16008.00	45.20	21.06	4393.00	5214.76	821.76	18.71
HYDRO	11398.03	11317.70	31334.00	81.80	98.16	8854.00	7607.82	-1246.18	-14.07
TOTAL	49940.79	48083.02	236985.00	624.31	608.33	75497.00	73906.71	-1590.29	-2.11
EASTERN									
THERMAL	28812.92	32200.05	162051.00	435.77	387.84	54314.00	53498.67	-815.33	-1.50
HYDRO	4113.12	4193.45	12122.00	42.69	48.83	4386.00	4031.98	-354.02	-8.07
TOTAL	32926.04	36393.50	174173.00	478.46	436.67	58700.00	57530.65	-1169.35	-1.99
NORTH EASTERN									
THERMAL	2008.70	1984.20	9941.00	28.20	24.27	3013.00	2530.62	-482.38	-16.01
HYDRO	1242.00	1242.00	4032.00	20.63	19.18	1478.00	1530.76	52.76	3.57
TOTAL	3250.70	3226.20	13973.00	48.83	43.45	4491.00	4061.38	-429.62	-9.57
ALL INDIA									
THERMAL	191263.56	191175.24	966700.00	2512.27	2212.44	317998.00	299019.62	-18978.38	-5.97
NUCLEAR	5780.00	5780.00	38000.00	108.88	90.13	11804.00	13393.19	1589.19	13.46
HYDRO	41997.42	42015.42	128000.00	468.94	566.57	46466.00	49417.18	2951.18	6.35
R.E.S.	35776.96								
BHUTAN IMP		0.00	4800.00	24.48	29.42	1780.00	2138.80	358.80	20.16
TOTAL	**274817.94**	**238970.66**	**1137500.00**	**3114.57**	**2898.56**	**378048.00**	**363968.79**	**-14079.21**	**-3.72**

* ** "Capacity figures are taken from monthly report of D.M.L.F. Division as on the last day of the previous month * UNIT SYNCHRONISED, P = PLANNED OUTAGE, L = LONG DURATION OUTAGE, S = SHORT DURATION OUTAGE

Note: Actual generation is generation from stations above 25 MW. It excludes generation from RES.*

Motwane offers transformer turns ratio meter

Motwane has launched a new transformer turns ratio meter XTRM-3, which is a new generation, fully automatic transformer turns ratio tester. It measures the transformation ratio of single phase and three phase transformers using modern electronic techniques. It is a micro controller operated, user friendly and reliable tester.

The operator has facility to enter test parameters, and XTRM-3 takes over, applies the test voltage, balances the bridge, takes the readings, and displays the results on the LCD screen. The results can be printed on a built-in printer after the test is over. The windows based software is provided for easy operations of the turn ratio meter via USB communication port. The XTRM-3 is a single unit design, encased in a hard industrial cabinet, lightweight (only 10 kg), for easy portability.

Website:
www.motwane.com

CBS ArcSafe launches RRS-3 HK circuit breaker

The CBS ArcSafe RRS-3 HK allows technicians to remotely rack in or out the HK-style medium voltage power circuit breaker from a safe distance while remaining stationed outside of the arc-flash boundary. Installation and operation of the CBS ArcSafe RRS-3 HK is quick, simple, and does not require any modifications to the existing equipment. The CBS ArcSafe RRS-3 HK is compatible with all HK-style circuit breakers manufactured by ABB, BBC, or ITE with current ratings from 1,200–3,000A. The HK-style circuit breakers may typically be found in generation, chiller/HVAC, petrochemical, water/waste treatment, and pulp/paper applications.

Features:

- Remote operation from up to 300 feet away
- Lightweight and portable for hard-to-access areas
- Simple setup, no equipment modification required
- Quick installation and removal from gear
- Adjustable travel and locators to accommodate entire product line
- Reduces or eliminates need for arc-flash hazard suits
- Eliminates all hazardous manual contact with gear during operation
- Designed, manufactured, and assembled in the USA.

Website:
www.cbsarcsafe.com

Twisterband HD presented by igus

The new twisterband HD developed by igus, has been developed for guiding energy, data and media cables to give operational and functional reliability in rotary motions with high loads. It combines the design features and qualities of the proven twisterchain, a circular energy chain for rotary motion up to a maximum of 360 degrees, with its twisterband, the winner of the Red Dot Design Award.

The twisterband HD guarantees high strength with minimal installation space requirements. The outer diameter of this product is just 300 mm, the height starts at 250 mm and varies according to the required rotation angle upward. Due to the innovative design, high angles of rotation are possible: horizontally to around 7,000 degrees and vertically to around 3,000 degrees. The design

principle also opens up the potential for larger versions. But despite this rotational capability, the cables are always well protected.

Combined tests with chainflex cables in the igus' in-house lab arrived at a service life of one million rotary cycles and more. The predefined minimum bending radius contributes towards this, preventing damage to cables.

The special hinge design enables a fast filling from the outside. Together with the tribo-optimised high-performance plastic of the band, a long service life is ensured even under difficult ambient conditions such as temperatures from -40°C to +80°C. Technically advanced, yet inexpensive, the twisterband HD is the ideal, low wear and low maintenance solution for carrying cables in rotary applications, encased in a compact and tough guiding system.

Website:
www.igus.in

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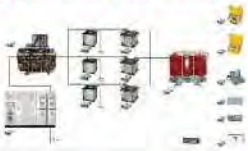

Automatic Transformer Test System

Automatic Flash Point

Cast Resin Standard PT

Battery Conductance Analyser

OUR PRODUCT RANGE

Winding Resistance Meter	Standard Current Transformer	Static Frequency Convertor (EPS)	Oil BDV Test Set
Turns Ratio Meter	Standard Voltage Transformer	Mobile EPS	Flash point Test Set
Digital Microhm Meter	Transformer Loss Measuring System	High Voltage PD Filters	Oxidation Stability
Contact Resistance Meter	Automatic Transformer Test System	Coupling Capacitor/ HV Dividers	Battery Analyzer

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RISH PI – 102: Programmable DC Signal Isolator

Designed with the sole aim of providing enhanced technical flexibility to the customers and Channel Partners coupled with committed excellent performance, Rishabh Instruments Pvt. Ltd. introduced a new Programmable DC Signal Isolator : RISH PI - 102.

RISH PI - 102 has one input and 2 outputs which are fully On-site Programmable. DIP switches are provided to program both, input and outputs as per customer requirement. These DIP switches are directly mounted on front facia which makes it more user friendly resulting in time saving.

In addition, end users can easily build a stock of RISH PI - 102 as inputs and outputs are on-site programmable and thus they do not need to maintain separate stock of various combination of inputs and outputs which would facilitate the planned maintenance. It has got a wide range of auxiliary supply (Universal : 60-300V AC/DC or 20-40V AC / 20-60V DC) and accuracy of 0.2%. It is a DIN rail mounted instrument with a LED for status indication. This programmable signal isolator is mainly designed for applications in process industries, industry automation, panel instrumentation, solar systems and many others.

Website:
www.rishabh.co.in

Bosch presents electric tacker for staples and nails

Bosch is offering its tried-and-tested electric tacker in a new design. The PTK 14 EDT sits even better in the hand – thanks to its ergonomic softgrip.

As per the company, it takes over from its predecessor as the only electric tacker in the market that can drive either one fine wire staple or two fine wire staples at a time. This 'DuoTac' function can be controlled conveniently using a switch on the front of the tool. Slide the switch down and only one staple is driven. Alternatively, you can also drive nails with the tool in this setting. Slide the switch up and two staples are driven at the same time.

The PTK 14 EDT can therefore also be used to quickly and easily fix materials that are sensitive to tearing, such as films... for example, vapour barriers when insulating a roof. You neither have to use flat wire staples, nor convert the tool in order to do so. The ability to drive nails makes this tool the most versatile in its class. In addition to classical tacker applications – such as upholstering furniture or fastening different materials such as leather, cardboard or films on wood, it is also possible to easily nail objects such as slats or cabinet back panels.

Website:
www.bosch.com

OnChip offers high capacitance in small size

OnChip offers new capacitors, which come with a variety of dielectric materials. The CA series is a tantalum bead capacitor available in radial thru-hole or surface mount packages. Tantalum capacitors are ideal for applications that require high capacitance but have limited board space. The CBB series features a polypropylene dielectric that provides a dissipation factor of <0.002, as well as providing consistent capacitance values for applications with fluctuating frequencies.

The CL series is built with polyester and is incredibly stable for long-term usage. CL capacitors feature a precise tolerance as tight as 1%. The CT series is a ceramic capacitor with options for different dielectrics such as

NPO, X7R, Z5U, and Y5V. NPO is recommended in applications where capacitance value needs to be stable in varying temperature, frequency, and voltage. X7R, Z5U, and Y5V have predictable properties that can be used to manipulate the capacitor's capabilities when subjected to these same variations. The TC series of V-Chip Capacitors provide a surface mount option that is good for ripple currents and switching power supplies. They are built to withstand high voltages and protect sensitive parts on the PCB in the event of a short circuit. These capacitors are moisture resistant and rated for DC circuits anywhere from 4-2000V. All capacitors have a rated load life determined by the hours – that they can function at maximum operating temperature, while maintaining their electrical characteristics.

Website:
www.onchip.com

Index to Advertisers

NCV Voltage Detector + IR by Extech

The device launched by Extech Instruments, a Flir company has a built-in IR Thermometer and also is a non-contact voltage detector that measures non-contact temperature up to 445^{0}F (230^{0}C).

Features:

- Detects AC Voltage from 50 to 1000V
- Built-in InfraRed Thermometer measures temperature from
- -20 to 445^{0}F (-30 to 230^{0}C) with 0.1^0 resolution
- LCD displays temperature with selectable ^{0}F/^{0}C internal switch
- Fixed 0.95 emissivity covers 90% of surface applications
- 1:1 distance to target ratio
- NCV probe with integrated indicator light
- Tip fits into outlets or against wire insulation
- Low battery indicator
- Auto power off
- Rugged double molded housing
- Complete with pocket clip and three LR44 batteries.

Website:
www.extech.com

3M helps in improving transformers

3M has introduced an improved standard for insulating high-temperature, liquid-filled distribution transformers. New Liquid-Filled Transformer Insulation (LFT insulation) from 3M is designed to offer excellent thermal stability, low moisture absorption, high thermal conductivity and long-term reliability. The need for new materials that can improve transformer performance comes as global efficiency requirements have increased. These new standards are resulting in bigger and heavier transformers that may require pole and pad-mount size to increase.

Because of new standards, such as IEEE C57.154 and IEC 60076-14, LFT insulation combined with high-temperature insulation liquids and components can help reduce transformer size. For example, if a transformer coil design is optimised for a higher thermal class, a transformer with LFT insulation can be made with less conductor, less liquid, a smaller tank, and potentially lower overall material cost, depending upon design.

In long-term thermal aging tests conducted in accordance with IEEE C57.100 2011 Annex A and B, LFT insulation has been assigned a 155 degrees Celsius Thermal Class rating in mineral oil – 35 degrees Celsius higher than thermally upgraded kraft insulation.

Website:
www.3m.com

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