Vol 55 No 4 April 2015 ₹ 100

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"Increased rates of service tax and excise duty will raise operating and capital costs for the power plants..."

The govt. wants to supply uninterrupted power to all by 2022, thus in the Budget 2015-16, it has proposed to set up five new Ultra Mega Power Projects (UMPPs). It has also been declared that all clearances will be in place before the projects are awarded through auction. Also, a transparent auction process will be in place to address the long-standing coal supply issue to the power plants. In the renewable segment, the govt. has revised its target to 1,75,000 MW till 2022. The second unit of the Kudankulam Nuclear Power will be ready in 2015-16.

No additional tax benefit has been offered this time, but the proposal to allow to claim the balance 50% additional depreciation (where assets are used for less than 180 days in the year of acquisition and installation) in the next FY, will be of great advantage. Also, the plan – for appointing a committee to find the possibility of preparing a pre-existing regulatory mechanism to replace the existing process involving multiple prior permissions – is a progressive step.

The increased rates of service tax to 14% and excise duty to 12.5% will raise both operating and capital costs for the power sector. Also, the levies like Swachh Bharat Cess (2%) and Coal Energy Cess (raised to Rs. 200 per tonne) will add to the cost of power production. A partial offset is being foreseen from the proposals like some administrative relief to the Mega and UMPPs by extending the period for giving the bank guarantee while claiming excise and customs exemption – and the reduction in the corporate tax rate (to 25%), which is to be in place over the next four years.

I'm glad to inform you that P. K. Chatterjee (PK) has joined our team recently as the Editor of Electrical India. PK has almost two decades of experience in various B2B publications. I firmly believe that his versatile exposure, long experience and proven leadership quality will definitely add values to your favourite magazine.

Do send in your comments at miyer@charypublications.in

Mahadevan

Vol. 55 • No. 4 • April 2015

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Single Issue: Rs.100
Annual Subscription: Rs. 1000

Printed, Published and owned by Mahadevan Iyer from 311, Raikar Chambers, Govandi (E), Mumbai 400 088 and Printed at Print Tech., C-18, Royal Ind. Estate, Naigaum Cross Road, Wadala, Mumbai 400031.

Editor : Mahadevan Iyer

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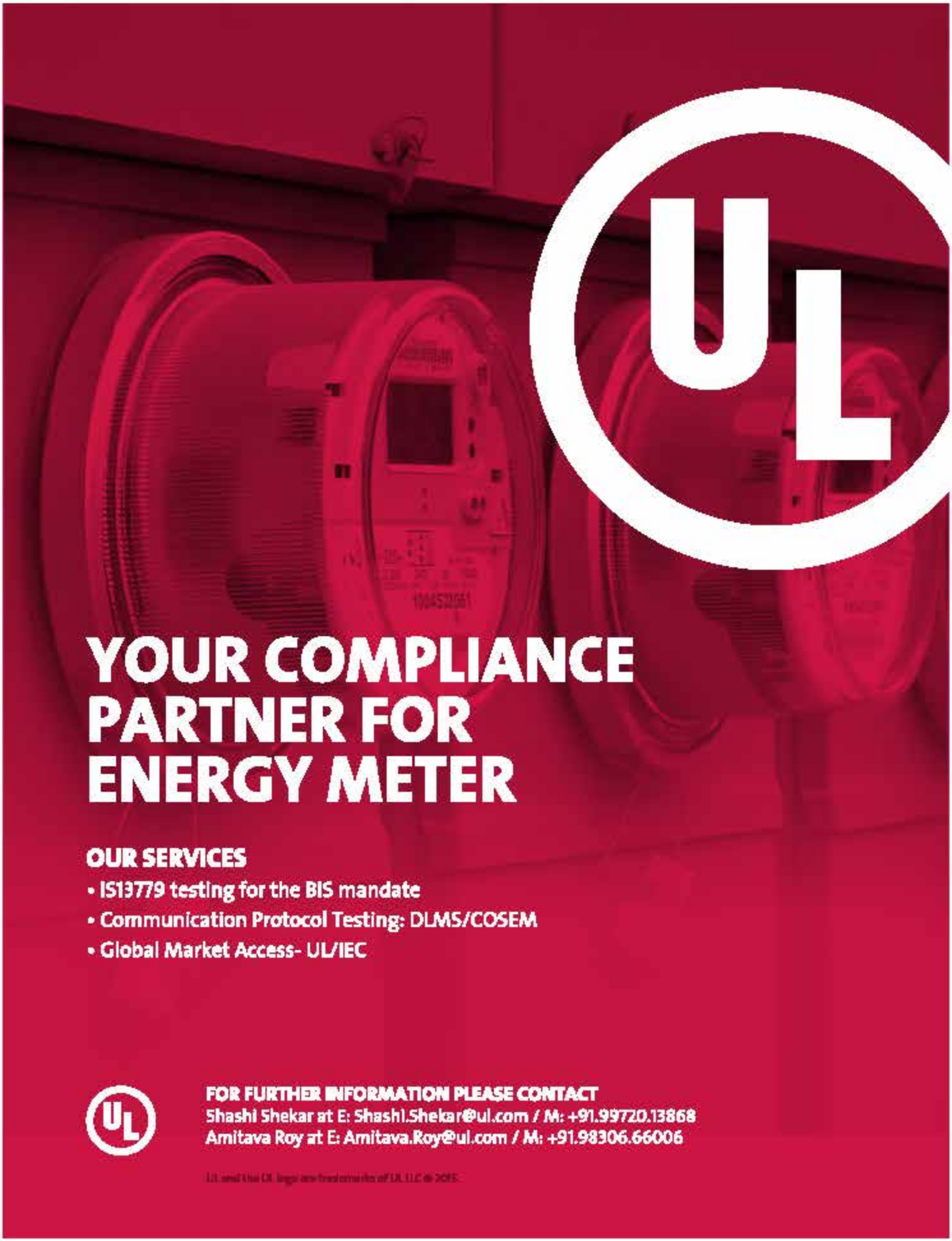

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Additive Manufacturing and the Electrical Machinery Sector

"In many cases, today 3-D Printing is the only effective way to replace the old yet essential electrical part immediately..."

P K Chatterjee (PK)

Although over the last five years or so, the Additive Manufacturing (AM) technology (also called 3-D Printing or Rapid Prototyping) has positioned itself firmly as one of the mainstream technologies, its complete potential is yet to be explored and exploited by the electrical machinery sector, globally. However, it is a good sign that considering the tremendous potential of the technology, a few power giants like GE and Siemens are now investing heavily on adopting this technology in their power equipment manufacturing activities.

With growing acceptance of AM technology in the electrical machinery component segment, design and prototype development of specialised or customised power equipment and components has become far easier, cheaper and less time consuming than ever before. Many of the components of electrical machinery are also being directly manufactured using this technology. As on today, Additive Manufacturing technology is the only solution to any on-demand fast production and delivery of intricate electrical machinery components.

Dr. Nicolas Vortmeyer, Chief Technology Officer, Siemens' Power and Gas division, which manufactures turbines for power plants, says, "3D printing removes the limitations we've had to struggle with in manufacturing and development. This technology allows us to manufacture spare parts even for older power plant turbines we no longer have the plans for – and to do so relatively quickly."

GE is targeting at lowering emissions and reach higher efficiencies with more-effective uses of fuel – and fuel flexibility. The company has been using this technology to improve its combustion systems.

Whether it is in industrial environment or in domestic arena, 3-D Printing can help in the fastest translation of thoughts into products. Also, when it comes to the challenge of replacing the old yet essential parts immediately, today this technology offers the only effective way in many cases. This has also proved its efficacy as a suitable solution for mould making. It drastically reduces waste of materials, which is yet another beneficial side of it. Thus, to make our "Make in India Programme" successful, it is essential that the Indian Power Sector focuses on the adoption of AM technology, and reaps its versatile benefits that are yet unmapped.

P. K. Chatterjee

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MNRE proposes enhancement of budget allocation for green buildings through GRIHA

The Union Ministry of New and Renewable Energy proposed a manifold increase in the allocation for the transition phase from megawatt to gigawatt through the Green Rating for Integrated Habitat Assessment (GRIHA).

Speaking at the 6th GRIHA Summit, Upendra Tripathy, Secretary, MNRE, said that speed, scale and skill sets need to be enhanced to increase the renewable energy mix in our energy production. "The Summit is providing various ideas and is bringing together specialized professionals from different sectors to give a new thrust to renewable energy. We need to expand the number of institutions who are working to take this movement forward." He added that India would soon overtake other countries in renewable energy, as the country has the resources and ideas to make this happen.

Upendra Tripathy IAS, Secretary, Ministry of New & Renewable Energy and Dr Leena Srivastava, Acting Director-General, TERI, at the GRIHA Summit 2015, in New Delhi

Dr Leena Srivastava, Acting Director-General, TERI, said, "Since energy efficiency is at the core of sustainable habitats, renewable energy must be given a head start. We have enormous experience not only on green buildings, but also on renewables. The creation of capacities is going to be vital to achieve clean and sustainable habitats. TERI University has taken the lead by offering various specialized courses to move towards a green economy."

Mili Majumdar, Director, TERI, and Secretary cum Treasurer, GRIHA Council, thanked the supporters of GRIHA Summit, which include Union Ministry of New and Renewable Energy, the US Green Building Council (USGBC) and the Bureau of Energy Efficiency. Tripathy also presented awards to exemplary GRIHA projects and professionals in attaining sustainable habitats. They are Aishwaryam Courtyard, Pune, BPCL, Chembur, Circuit House, Pune, GAIL, Kailaras, Income Tax Commissioners Office, NOIDA, IRICEN, Pune, Neelkanth Park, SIDBI, Bhubaneswar, Sona College, Salem, National Council for Applied Economic Research, Assam Water Research Management Institute and many others.

BHEL achieves unique feat of 270 MW in just 42 days at a single site

With the commissioning of the fifth 270MW unit at the Amravati project of RattanIndia Power Limited, Bharat Heavy Electricals Limited has achieved a unique feat in the country's capacity addition programme by successfully commissioning three units of 270MW each in just 42 days at a single site.

The commissioning of the fifth unit at Amravati comes close on the heels of the commissioning of Units 3 and 4 (270MW each) on 29/01/2015 and 04/03/2015, respectively. Located at village Nandgaonpeth in Amravati district of Maharashtra, the project is being executed in two phases, each of 1,350MW, by RattanIndia Power Limited's. The sets of this rating class, supplied by BHEL, are considered as the workhorse and form the backbone of the Indian power sector. These sets have been performing much above the national average as well as international benchmarks.

BHEL has so far contracted 247 sets of this rating class including 31 sets of 270MW rating. In view of a large number of similar sets in operation in the country, utilities are assured of prompt delivery of spares and services. BHEL supplied thermal sets fully meet the performance standards notified by CEA. As per a recent CEA study on the performance of sub-critical sets in the country, BHEL supplied sets have demonstrated better operating Heat Rate resulting in less coal consumption per unit of power produced.

Alstom bags power supply contract for Kochi metro

Delhi Metro Rail Corporation (DMRC) has awarded a contract worth €9 million to Alstom to provide receiving and auxiliary main substations for the Kochi metro. According to this new contract, Alstom is in charge of the supply, installation, testing and commissioning of 110kV cabling coming from the grid to the new 25 kilometre long metro line (including civil works), 2x GIS3; 110kV Intake Power Substations and their associated Power Transformers 110kV/33kV, & 33kV/415V Auxiliary Transformers.

This contract identifies Alstom as the main supplier of Kochi metro – after it has been awarded previous orders for 25 Metropolis trainsets (contract value: €85 million, signed in October 2014), signaling & telecom (contract value: €34 million, signed in January 2015) and electrification (contract value: €33 million, signed in January 2015). Contextually, Alstom has installed nearly 4,000 kilometre of contact systems throughout the world.

"With this new contract which is by the way the first metro receiving sub-station in India, we are supplying most of the Kochi metro line. It reaffirms the trust that the customer has in our products, technology and capability to provide a complete metro system," said Bharat Salhotra, Managing Director, Alstom Transport India.

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First Indian Oil Gas Conclave inaugurated at New Delhi

First IndianOil Gas Conclave 2015 was inaugurated by B. Ashok, Chairman, IndianOil on 18th March, 2015 at New Delhi in the presence of D. Sen, Director (P&BD), IndianOil and G.K. Satish ED I/c (Gas), IndianOil. The conclave brought together luminaries from global and Indian gas industry to deliberate on the theme 'Gas - Towards Green Future' in view of emergence of gas as an alternate to oil. Delivering the inaugural address, Ashok said that natural gas has become the most favoured fuel in the last three decades with a 24% share in global primary energy sector. Speaking of gas scenario in the country, he observed that the demand for natural gas is rising sharply and its share is likely to reach about 20% in primary energy consumption in the coming decade. He added further that the higher share of natural gas will help resolve key issues such as energy security, environmental concerns and address criticalities of fuel subsidy and currency fluctuation.

B Ashok, Chairman, IndianOil (centre) along with D Sen, Director (P&BD) and G K Satish, ED i/c (Gas), unveiling the Background Paper, titled 'Fuelling a Better Tomorrow' at Gas Conclave 2015

Emphasising on the need for carving a niche presence in the gas infrastructure, Ashok informed that setting up a regasification terminal at Ennore Port and having a joint authorisation for laying 4000 kms of gas pipelines is a step in that direction. He hoped that the experts after attending the conclave would come out with a roadmap for the growth of Indian gas industry which would shape the future of the sector.

Tata Power achieves 20% increase in Mumbai consumer base

Tata Power, has always been a pioneer in providing reliable and uninterrupted power to the city of Mumbai. The Company announced an annual increase in its Mumbai consumer base by 20% reaching the milestone of 6 lakh consumers in February, 2015. Tata Power is one of the fastest growing power utilities in the city of Mumbai, and consumers with a monthly consumption of up to 300 units account for almost 62%, i.e. 3,72,000, of the Company's total Mumbai consumer base of 6 lakhs. The Company is also undertaking steady network expansion within the city and from April 2014 till date has been successful in adding 639 km of cable network. In an endeavor provide the most viable tariff Tata Power Company has proposed an average 6-7% reduction from the MERC approved tariff for FY'16. Speaking on this accomplishment, Ashok Sethi, COO & ED, Tata Power, stated, "Tata Power has been a synonymous name for the Mumbai power utilities for several decades. Tata Power has always strived to provide reliable electricity to all residents of Mumbai. Achieving slums electrification with 24x7 power at the most competitive tariffs is one of the feathers in the cap of our team. In this milestone year of having completed 100 years of our operations, we are happy to have reached this milestone of 6 lakh consumer-base in Mumbai. We stay committed to our consumers, and promise to deliver enhanced services at competitive prices."

Electrical Equipment grows by 1.47% in Q3

The electrical and industrial electronics industry has witnessed a 11.47% growth in Q3 of FY 2014-15. The overall industry has grown by 8.95% in nine months of this fiscal. Although higher imports (Over Rs. 2000 Cr in 2014) still plague the industry but policy changes and various initiatives undertaken by the industry are eventually showing signs of evolution for the sector. The data is compiled by IEEMA, the apex Indian industry association of manufacturers of electrical, industrial electronics and allied equipment. The production and sales data is collected from its member organisations, which represent 95 percent of the entire sector. On one side the major drivers are cable, LV and HV switchgear while on the other side Power transformers and LT Motors continue to show declining trend. Vishnu Agarwal, President, IEEMA says, "There is a positive momentum in sub transmission and distribution of 66kV products and below. The growth in turnover of MCB, Energy Meters and Cables is a good sign as it indicates a vivid pace of development taking place in Power, Infrastructure and Reality sectors of the Country."

Sunil Misra, Director General, IEEMA is of the view that "We still need to watch out for the high rate of imports of EHV transformers, reactors, cables and insulators, which harm domestic production. Indian manufacturers are well equipped and have the capacity to manufacture these products."

Conductors and Energy meters have registered a tremendous growth in their turnover with 44.9 percent and 28.2 percent respectively. The reason for this growth is the procurement of these products by major PSUs and utilities as their inventories are being utilised. As the power industry is opting for Smart and Energy efficient products, growth is also observed in transformer operational meter and single phase multifunctional meters (smart meters). Also, the growth in LV product and FHP motors indicates some industrial activity. Rotating Machines continue to show negative growth as there is low awareness of energy efficient motors.

IEEMA being one of the proud partners of the 'Make in India' campaign has identified a four point agenda and has been vigorously pursuing with the policy makers, so as to positively impact made in India products with state-of-the-art technology.

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Siemens signs MoU on Smart Cities

Siemens is delighted to be part of the CII Smart Cities initiative. Cities drive economic growth, increased investment and job creation for millions of people who are increasingly converging on them with the hope of security and a better standard of living. Only Cities which are able to reach this equilibrium will be capable of meeting today's challenges and can look forward to a more sustainable future. Siemens has the portfolio, the know-how, and the expertise to help Cities become more liveable, more competitive and more sustainable," said Sunil Mathur, Managing Director and Chief Executive Officer, Siemens Ltd.

Siemens has successfully set up smart cities in Vienna and New York, and is already involved in the Restructured Accelerated Power Development and Reforms Programme (R-APDRP) Program of the Government of India for installing Smart Grid solutions in multiple cities in India. CII has set up a "National Mission on Smart Cities" under the Chairmanship of Ravi Parthasarathy, Chairman, IL&FS and the objective of this Mission is to play the role of a facilitator and a thought leader to assist the Government in the process of the development of 100 Smart Cities by 2022. The MoUs are part of the implementation strategy to take forward the Cities initiative.

Sunil Mathur, CEO and Managing Director, Siemens Ltd (left) after signing the Memorandum of Understanding with Chandrajit Banerjee, Director General, CII (right) in the presence of Amitabh Kant, Secretary, Department of Industrial Policy & Promotion (DIPP) and HE Takeshi Yagi, Ambassador of Japan. The MOU was part of the implementation strategy for 'National Mission on Smart Cities' to take forward the Smart Cities initiative.

Since a Smart City initiative in any city would entail a host of sub components. The National Mission on Smart Cities has decided to create industry- led consortia, which could render the full range of services for the development of a Smart City, in which Siemens Ltd and Hitachi India Ltd have consented to be the lead industry partner for the German and Japanese consortium.

CG wins order from PGCIL for the supply of Shunt Reactors

Avantha Group Company CG has bagged a significant order from PGCIL for the supply of 80 MVAR 765kV Shunt Reactors valued at INR 115 Crore. The scope of this contract to be executed in 20 months includes design, engineering, manufacture, shop testing, supply, erection testing and commissioning at site, and other associated civil works.

These reactors will be installed at PGCIL's Vemagiri and Srikakulam Sub-stations in the state of Andhra Pradesh and will add to the existing population of over 100 CG made reactors already in commission in PGCIL's UHV network. This order reinforces CG's existing leadership in the UHV transmission segment in India and its long standing relationship with the Central Transmission Utility. CG won this order beating stiff global competition and its successful track record having partnered with PGCIL for multiple projects. These reactors when commissioned will not only enhance the transmission efficiency of the national grid, but will also improve the quality of power that reaches the consumer.

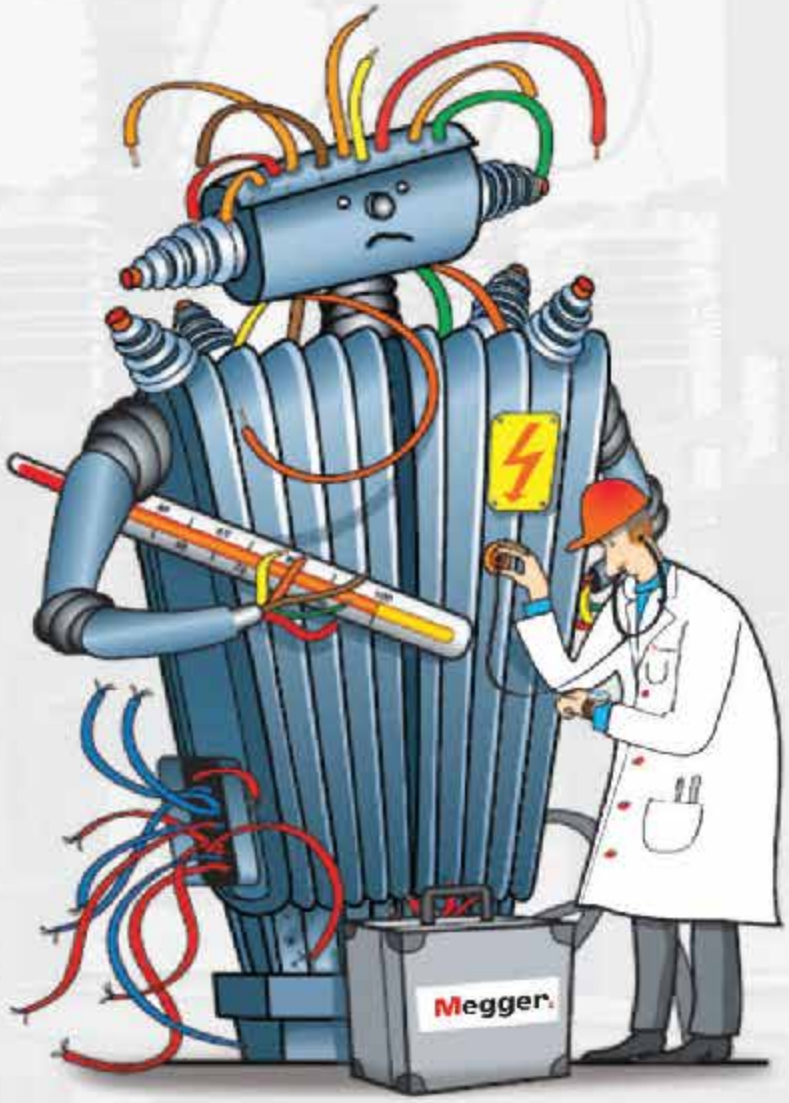
Commenting on this prestigious win, Avantha Group Company CG's CEO & Managing Director, Laurent Demortier said, "We are honoured to receive this opportunity from PGCIL and thankful to them for continuing to repose trust in our products and technological expertise. As rapid urbanisation and industrialisation adds millions of new consumers in the country, a robust UHV infrastructure will be the backbone of the power sector and CG is well positioned to serve the utilities for their future growth plan with its complete UHV range".

ACME installed first LI-ION based Energy Storage Solution

ACME, announced that it has installed its first Li-ion based Energy Storage Solution (ESS) for a leading telecom tower company post successful trials of the solution at various sites across India for more than an year. This installation has been done by ACME under its exclusive and strategic agreement with Korean energy storage system giant to manufacture and marketing of lithium ion based energy storage solutions in telecom, buildings, solar power, defence sectors and other allied industries.

This installation marks ACME's entry into Indian market with vast scope of efficient energy storage solutions. Announcing this feat, Samir Sharan, CEO, ACME said, "This solution is the future of energy storage and holds great prospects for high energy-consuming sectors like telecom, realty, renewables and many more. This green solution has revolutionized the way we store energy by efficiently managing the energy needs in the financially competitive market segment while being challenged environmentally." He further added, "This is another step forward by ACME to solve the biggest challenge of the Indian Telecom industry by offering the right storage solutions from Kilo Watt to Mega Watt class. This will help users to eliminate their diesel generators and cut down on the carbon footprint with higher efficiency." While this new-age ESS has a miniscule share in the overall energy storage segment, it will capture 50% share globally in this segment by year 2020.

The doctor is in...



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Suzlon ranked among the top 10 OEMs globally in 2014

Suzlon Group, announced that it has maintained position as one of the top 10 Wind Turbine (OEMs) globally according to a report by MAKE Consulting. Suzlon Group is the world's 6th largest wind OEM in terms cumulative capacity with 7.1% share and ranked 7th based on market share of 4.9% in 2014. The report also ranks Suzlon Group as 5 among global top 10 players (excluding China). The rankings have been published by MAKE consulting in the annual report the "Global Wind Turbine OEM 2014 Market Share". Suzlon group crossed the milestone of 26,000 MW in terms of global installed capacity during 2014, firmly cementing the Group's position as the sixth largest wind company in terms of cumulative installations.

Tulsi R. Tanti, Chairman, Suzlon Group said, "The rankings reaffirm the confidence and faith of our customers across the globe in Suzlon's technology edge, comprehensive product portfolio, services and end-to-end solutions approach. We continued to focus on delivering excellence and establishing industry benchmarks. We capitalized on the resurgence in our home market and unlocked the wind energy potential in the key markets of Latin America and South Africa. We are also proud that Suzlon achieved the milestone of 26 GW globally during 2014. Going forward, with our 18 years of sustained market leadership in India and governments thrust on renewables and the 'Make in India' vision, we are confident to tap the immense growth opportunities India. Further, Suzlon will also focus on tapping opportunities in USA, Brazil, China and other emerging economies." MAKE Consulting bases its analysis on grid-connected capacity in all wind markets with the exception of China.

Glenwood to deploy Energy Storage Systems in NYC buildings

Glenwood, a leading owner and builder of luxury rental properties in Manhattan, has expanded its commitment to sustainable development practices in announcing the deployment of the first Megawatt (MW) of Distributed Energy Storage Systems across a select group of buildings in their NYC real estate portfolio. Construction will begin this month on systems in the first properties, with commissioning and measurement/verification approvals completed in the first half of the year. The energy storage systems will be operational for the summer peak load season and will support the Indian Point Demand Management Program that Con Ed and NYSERDA are offering to commercial customers.

"We all need to work together to manage our electric grid and intelligently manage load growth in NYC, and this pioneering technology offers a viable solution" said Josh London, VP of Management for Glenwood. "In our mission to expand sustainable practices within the Glenwood portfolio, energy storage is an ideal solution that helps ConEd and NYSERDA solve real and pressing problems in managing the grid, while simultaneously elevating the quality of life at our properties," London added.

Glenwood is an early adopter of energy storage, having installed its first system two years ago at their Barclay Tower property. That system, developed by market pioneer Demand Energy has been operating successfully and delivering above planned economic returns to the building.

Avnet Abacus upgrades product portfolio in distribution agreement with RRC

Avnet Abacus, one of Europe's leading interconnect, passive, electro-mechanical and power distributors and a business unit of Avnet Electronics Marketing EMEA, a business region of Avnet, Inc, has signed a franchised distribution agreement with RRC, a global leader in power supplies, batteries and battery charging technology.

This agreement builds on the existing relationship between the two companies, providing access via Avnet Abacus in Europe to RRC's range of standard and custom battery packs, which are developed using cutting-edge lithium-based technologies. These are complemented by a selection of standard, platform and custom battery chargers. RRC products are targeted for use in diverse sectors, including military, medical, industrial & consumer applications.

"We have been working with the Avnet Abacus sales & application teams for some time, and have been very impressed by the technical knowledge of their product specialists and the efficiency of their logistics," said Michael Müller, Area Sales Manager at RRC. "This formal agreement will enable us to work more closely together to create growth opportunities in Europe for our batteries and battery charging lines."

Left to Right: Michael Muller, Area Sales Manager at RRC, Tim Parker, Battery Products Manager, Avnet Abacus

"RRC develops trendsetting power solutions that provide engineers with distinct competitive technological advantage," said Tim Parker, Battery Products Manager, Avnet Abacus. "Our role as an RRC franchised distribution partner is to introduce these latest product innovations to customers, using our experience and knowledge in battery technology to help them find the best fit for their projects."

Avnet Abacus is a pan-European demand creation distributor specialising in interconnect, passive, electromechanical, power supply and battery products.

L&T Construction Commissions India's first 765kV Gas Insulated Substation

The Power Transmission and Distribution business of L&T Construction has executed and commissioned two benchmark projects in the country. The first being India's first 765 kV Gas Insulated Substation (GIS) in Pune, Maharashtra in partnership with Hyosung (Korea) and the other again a first of its kind 765 kV transmission line on EPC basis and a state-of-the-art 2x1500 MVA 765/400 kV Air Insulated Sub-station in Rajasthan.

The GIS project is part of the transmission system associated with the Krishnapatinam UMPP to strengthen the grid connectivity through 765 kV Solapur S/S as well as to strengthen 400 kV power distribution in Western India. Among some of its standout features, it is the first GIS sub-station with an one and a half circuit breaker scheme in India, it possesses 3449 m of Gas Insulated Bus Ducts in a single substation and for the first time, pre-fabricated steel buildings were used for speeding up the construction process. The order was delivered in 14 months.

The 765/400 kV capacity Air Insulated Substation commissioned and executed by PT&D on a turnkey basis is the largest in Rajasthan. The project will transmit power at 765 kV level from various generating stations and will also act as an interface for the national grid connection to the power grid substations in Gwalior and Bhiwani. The 765 kV transmission line built between Anta (Baran) and Phagi (Jaipur) for the Rajasthan Rajya Vidhyut Prasaran Nigam Ltd is not only the first in the State but also the first transmission line stretched across 213 km on a single circuit line. "We congratulate our customers, the Power Grid Corporation of India Limited and the Rajasthan Rajya Vidhyut Prasaran Nigam Ltd., on this achievement. One of the prime requisites for ramping up infrastructure development to get the economy back into growth mode is power and these projects show that we are moving in the right direction," has said S N Subrahmanyan, Member of the Board and Senior Executive Vice President (Infrastructure & Construction). "I am also delighted that by setting such benchmarks, we are reinforcing our position of pre-eminence and showcasing our end-to-end capabilities in the area of power, transmission & distribution," he added. There have been several green initiatives adopted by L&T while executing the project in Rajasthan.

Tata Power enters into Share Purchase Agreement in Zambia

Tata Power, India's largest integrated power company has entered into a Share Purchase Agreement (SPA) with Tata Africa Holdings (SA) (Pty) Ltd., for formalizing the acquisition of their 50% shareholding in Itezhi Tezhi Power Corporation Ltd (ITPC).

ITPC, a 50-50 joint venture with the Zambian parastatal utility ZESCO Limited. ZESCO, is a special purpose vehicle which has been setup to build and operate a 120 MW hydro power plant in Itezhi Tezhi district in Zambia. ITPC has a 25 year Power Purchase Agreement with ZESCO and is expected to commission the power plant by Q4 2015. The closing will be subject various approvals and consents as required under applicable law.

Speaking on this development, Anil Sardana, CEO & Managing Director, Tata Power stated, "We are happy to announce our formally acquiring this project in Zambia from Tata Africa, which holds the shares as of now. We hope to leverage each of the African venture and our association to become a relevant local player in African Power system. Through this project, we hope to create value for the people of Zambia whilst maximizing shareholder value in line with our vision. We also hope that with this association we can look forward to forging further relationships in Zambia too"

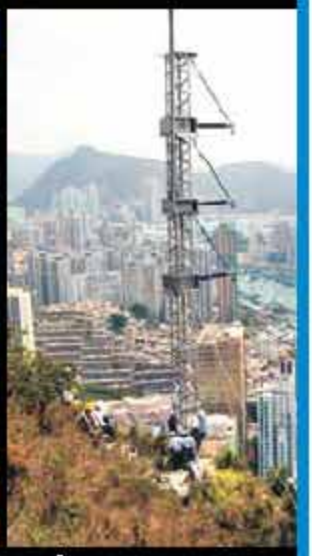
ABB to strengthen power grid in Kuwait

ABB, has won an order worth $12 million from the Ministry of Electricity and Water (MEW) of Kuwait to refurbish and upgrade three existing substations. This is to help ensure reliable power supply in the greater Kuwait City metropolitan area. The order was booked in the fourth quarter of 2014. The three transmission substations, located in Hawalli Governorate and providing power to residential and commercial areas around Kuwait Bay, require modernization in order to enhance their reliability after approximately 30 years in operation. ABB performed a thorough assessment at one of the substations that enabled MEW to select the most effective solution for modernizing the existing facilities to ensure high performance while lowering maintenance cost.

ABB's project scope includes refurbishment of 132 kilovolt (kV) gas-insulated switchgear (GIS) circuit breakers, overhaul of disconnectors and earthing switches, replacement of control cables and upgrading of control panels as well as integration of the new equipment for 33 bays with the existing automation systems.The project is scheduled for completion in 2018. "ABB's retrofit solutions will extend the life of the installations, while helping to strengthen the grid and improve power reliability for consumers" said Oleg Aleinikov, head of ABB's Substations business, a part of the company's Power Systems division. "The substations will deploy our latest GIS technology with an extremely compact footprint and ideally suited for such urban applications."

ABB is the world's leading supplier of air-insulated, gas-insulated and hybrid substations with voltage levels up to 1,100 kV. These substations facilitate the efficient and reliable transmission and distribution of electricity with minimum environmental impact etc.

In emergencies, how fast you restore power can mean how effectively you restore confidence.



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Transmission lines are vulnerable to mechanical failure during natural disasters or acts of sabotage. This has significant economic and political costs as well making it imperative to restore electrical power swiftly, effectively and efficiently. For nearly 65 years and with over 1000 Emergency Restoration Systems working reliably across 20 countries, Lindsey ERS are well-proven in addressing calamities and challenges. In India, Lindsey ERS is available through PCI Limited - the company that, in association with global technology majors has brought hi-tech solutions for various sectors of the Indian economy for 25 years now.

Lindsey ERS are designed to be user-friendly especially during mission-critical situations and can be deployed swiftly - a complete tower can be erected within a matter of hours. All ERS tools and accessories such as insulators, hardware, anchors and gin poles, can be safely stored and transported in standard 20 foot containers. PCI can also provide the necessary orientation and training of your technical disaster management personnel.

These highly reliable and quick-to-deploy ERS have played a significant role in the restoration of normalcy of power supply in the aftermath of various natural calamities in India such as the 1998 cyclone in Gujarat, the 1999 Orissa cyclone and the severe floods that had paralyzed vast districts in Bihar and Assam during 2010.

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Gamesa to build wind farm for Germany energy provider DEW21

The company will install six of its G97-2.0MW turbines at the Horst wind farm being built in the north of the country Gamesa, a global technology leader in wind energy, has received its first order from Germany energy provider DEW 21. Specifically, it has been contracted to build the 12-MW Horst wind farm located in the town of Schneverdingen, in Lower Saxony, under a turnkey arrangement.

Given the fact that it is a turnkey contract, Gamesa will handle all the tasks necessary to develop the wind farm, from obtaining the required licences and permits to performing the civil engineering and electrical wiring work needed to build and operate the project, while also transporting, installing and commissioning the wind turbines. The Horst wind farm will be equipped with six G97-2.0MW turbines, slated for delivery from July; the wind farm's commissioning is scheduled for November 2015. Once operational, the facility will generate enough electricity to supply over 8,500 German households.

Gamesa's presence in the German market dates back to 2003. In its capacity as developer, it has developed and commissioned over 263MW in this market where it currently has a pipeline of close to 236MW at varying stages of development. In its capacity as manufacturer, it has installed 185MW of its turbines and operates 57MW under O&M agreements.

TDK's Thyristor Module for power factor correction

TDK Corporation presents the new EPCOS TSM-LC-N690 thyristor module for power factor correction (PFC) with an expanded operating voltage range up to 690 V AC. The module performs two-phase switching of the capacitors, so that a neutral conductor is not needed. Depending on the operating voltage, the new module is designed for a reactive power of 40 kvar to 75 kvar and can switch currents of up to 60 A.

The module continuously monitors voltage, phase and its own temperature, and is thus very reliable. Like all EPCOS thyristor modules, the TSM-LC-N690 operates silently and is wear- and maintenance-free with a short switching time of only 5ms. The module also helps to increase the operating life of the capacitors by switching at the zero crossing of the current. In addition, dangerous overcurrents are avoided and the grid is not exposed to transients. The thyristor module can be triggered by EPCOS dynamic power factor controllers, PLCs or directly from the process.

The EPCOS TSM-LC-N690 thyristor module with the ordering code B44066T3050E690 is suited for dynamic PFC applications with presses, welding machines, elevators, cranes and wind turbines, for example. Expanded operating voltage range of up to 690 V AC, high reactive power of up to 75 kvar silent and smooth switching with no wear and maintenance-free due to thyristors, switching time of only 5 ms, switches at the zero crossing of the current, increasing the operating life of the capacitors, self-monitoring are some of its main features.

Germany a 'Pioneer' of Renewable Energy Deployment, says IRENA Director-General

The global energy elite gathered in Berlin to discuss progress and chart new direction in the ongoing global transition to renewable energy. The two-day Berlin Energy Transition Dialogue - towards a global Energiewende brings together energy policy experts and representatives of politics, industry and civil society to shape new energy policy and drive future progress.

The Director General of the International Renewable Energy Agency (IRENA) Adnan Z. Amin, delivered a keynote address at the event today, highlighting the global impact of Germany's early innovation and continuing commitment to the development and deployment of renewable energy technologies.

"Germany has long recognised technological innovation as a crucial component of its Energiewende," said Amin. "This foresight and commitment has inspired the innovation and investment required for these technologies to become technically and commercially viable in developed and developing economies."

According to IRENA's recent report Renewable Power Generation Costs in 2014, the cost of generating power from renewable energy sources has reached parity or dropped below the cost of fossil fuels for many technologies in many parts of the world. This holds true even without financial support and despite falling oil prices. Solar photovoltaic is leading the cost decline, with solar PV module costs falling more than 75% since the end of 2009 and the cost of electricity from utility-scale solar PV falling 50% since 2010.

The report also indicates that costs for Germany's small-scale residential rooftop solar PV systems fell 64% between 2008 and 2014, achieving the lowest costs in the developed world, second only to China. Germany also has the world's largest cumulative installed capacity of solar PV, the third largest installed capacity for both onshore and offshore wind, and the largest installed biomass capacity. "Germany has one of the most ambitious renewable energy targets in the world under the Energiewende, promising 60% of renewable energy in final energy consumption & 80% of electricity generated from renewable sources by 2050," said Amin "IRENA applauds Germany's leadership in this sector."

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Optimal Inclination Angles of Photovoltaic Panels for Maximum Power Output in Chandigarh Region-a Case Study

The efficiency of Photovoltaic panel can be increased if it is placed in such a manner that incidence angle is null or almost small in respect to solar irradiation. This can be obtained by tracking the sun for movable structure and by proper selection of inclination angle for fixed structure. In this paper, a case study is presented for deciding the optimum inclination angle for maximizing the output power of fixed structure PV panel for Chandigarh region in India.

Manoj Kumar Sharma, Parag Lal and Dr Yajvender Pal Verma

To examine the effect of inclination angle on the output power of the PV panel, three PV panels have been installed at 30°, 40° & 45° angle of inclination. The values of the open circuit voltage V_{oc} and short circuit current I_{sc} were measured on hourly basis for twelve months in the year 2014. The observations have been analyzed for finding the optimum angle of inclination of PV panel. It is concluded that, for Chandigarh, from January to March the inclination angle of PV panel can be 45° as this inclination gives highest power output among the three PV panels. From April to September optimum inclination angle of PV panel is 30° as the sun is overhead during this period and higher power output is obtained. The better performance of PV panel can be obtained by changing the inclination angle twice in a year i.e. in mid April and in mid September.

It is found that no study has been done in India particularly in North India and the estimation of tilt angle of PV panels were obtained through global data

In the view of shortage of fossil fuels and rising pollution concerns, more and more focus has been given to the renew-able energy sources. Solar energy is most promising form of renewable energy. It has many advantages:

- It is one of the least destructive of all the sources of energy.
- It is capable of satisfying the world's major energy demand.
- It can power almost everything with proper modification and set up.

The solar energy can be converted into electricity by a photovoltaic cell or into thermal energy by a PV panel to heat water and air. The amount of solar radiations received on a PV panel depends on the latitude, time of the day, day of the year, slope or tilt angle, surface azimuth angle, & the angle of incident radiation.

The efficiency of PV panel can be increased if the panel is placed in such a manner that incidence angle (angle between the sun rays and the perpendicular line on PV panel) is null or almost small. Such a condition can be obtained in two ways, firstly a tracking system is used so that sun can be followed throughout the day and secondly, the panels are fixed in such a manner that angle of incidence is relatively small for most of time in day. In first case, the efficiency of PV panel increases significantly as a proper tracking system make incidence angle almost null throughout the day. However, it is linked to major disadvantage of energy requirement of tracking system which includes motor drives to move the bulky system. The maintenance is another big issue. Hence, generally such a system is not viable for small power panels. Fixed panels are most commonly adopted PV panel structures. When the PV panels are fixed, it is not possible to obtain the minimum incidence angle throughout the day. However, for achieving the reduced incidence angle for maximum duration the PV panels have to be installed with proper orientation and angle of inclination (also called tilt angle). The paper thus contributes towards an extensive analysis of the solar PV panels' data and presents an alter-native to continuous sun tracking system by changing the angle of inclination biannually.

Sun Earth Geometry & Inclination Angle of PV Panel

The angle of inclination of PV panels depends upon the location of panels (i.e. latitude) and sun-earth geometry. The sun-earth geometry involves the study of earth's rotation and revolution as well as the tilt angle of earth's axis. Earth's rotation refers to the spinning of our planet on is axis, because of rotation, the earth's surface moves at the equator at a speed of about 467 m/s. The earth's revolution refers to the orbiting of the earth around the Sun. This celestial motion takes 305.26 days to complete one cycle. As the earth rotates and orbits around the Sun, there are significant seasonal and hourly positional changes of the Sun (and length of daylight). The relative position of the Sun is a major factor in the performance of the PV panels.

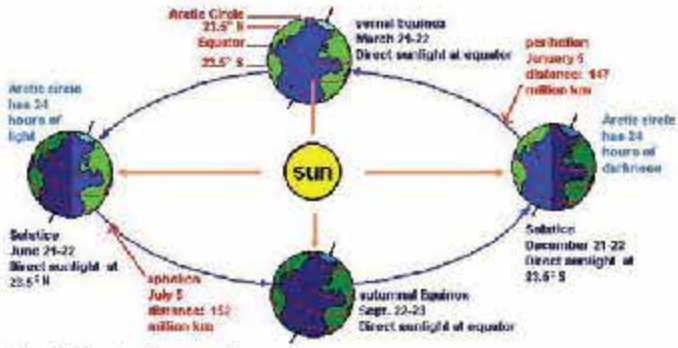

Fig. 1: Sun-Earth geometry

Duffie and Beckman gives 'rules of thumb' that to give maximum annual energy availability, a surface slope to latitude is optimal and the surface should face the equator. It means, a solar collector in southern hemisphere should face to the North with slope equal to its latitude to get maximum solar radiation. Number of studies have been carried out in different countries of the world to obtain the optimum tilt angle of the PV panels. However, it is found that no study has been done in India particularly in North India and the estimation of tilt angle of PV panels were obtained through global data. In this paper, the optimum tilt angle to maximize output power is estimated by PV panels installed in Panjab University Chandigarh, India which has latitude of $30^{\circ}44$.

Studied Photovoltaic System

To overcome the energy shortage in country, Government of India has started Jawaharlal Nehru Solar Mission and under this many cities have been declared Model Solar cities. Under this scheme, Chandigarh has also been declared as the 'Model Solar City'. The latitude of Chandigarh is $30^{\circ}44'$N. PV panels have been installed on many buildings in Chandigarh to harness the solar energy to meet its energy requirements.

Power generation of a PV system depends on various factors such as, solar irradiation, time of day, day of year, power conversion efficiency, PV panel tilt, weather conditions and many more. Among the above parameters the direct solar irradiation is the most significant factor for calculating the power generated by a PV panel. The power generated in a day is a function of power efficiency (η), sunlight intensity (G_s, W/m^2), incident angle (θ), no. of PV panels (n), area of a PV panel (A, m^2.)

$$P = \sum_{\text{Sunrise}}^{\text{Sunset}} (\eta \times G_s \times \cos\theta \times n \times A) \quad (1)$$

To obtain the optimum angle of inclination of PV panels at Chandigarh experimental set up consisting of 3 solar panels has been installed at UIET, Panjab University, Chandigarh as shown in Fig. 2. These PV panels of 100W each have been installed at an inclination angle of 30°, 40° and 45° as shown in Fig.3.

Fig. 2: Installed Photovoltaic panels at UIET, Panjab University

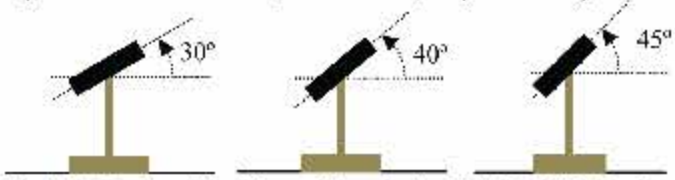

Fig. 3: Inclination of the PV panels installed at UIET, Panjab Univeristy

In this research, a yearlong recorded data is recorded and analyzed to reveal the PV performance from January 1st, 2014 to December 31st, 2014. There are 3 panels installed which are facing south and tilted at an angle of 30°, 40° and 45° with the horizontal. Each panel is connected to a charge controller unit (CCU) which charges a 150Ah, 12V tubular battery. The battery is connected to an inverter through which a load of 40W tube light and a 60W fan is connected in 3 rooms. Block diagram for

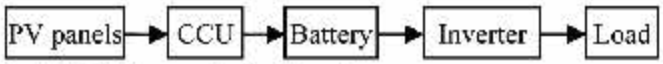

Fig. 4: Block Diagram for the PV system

Fig. 5: Digital ammeter readings

the experimental setup consisting of different ammeters, voltmeters, battery and inverter is shown in Fig. 4 and a photograph for the setup is shown in Fig. 5.

As the voltage is measured at open circuit and current is measured at short circuit so the switching scheme is designed so that there is load cut off while taking the readings. After taking the readings, the load is re-connected to the CCU for the charging of the battery. From the battery, the supply is given to the inverter which is further supplying the AC load.

Results

From the experimental setup various parameters for power calculations were recorded for each hour between 09:00 A.M. to 05:00 P.M. The readings were recorded for various days during different months of the year 2014. The open circuit voltage (V_{oc}) and short circuit current (I_{sc}) were measured and power is calculated on hourly basis for 12 months from January to December. The formula used for calculating power is,

$$\text{Power} = V_{oc} \times I_{sc} \times FF \quad (2)$$

$$\text{Form Factor (FF)} = 0.7267$$

The data recorded was for different seasons in varying weather conditions such as cloud, partially cloudy and clear day and this data is used to calculate the average power generated in a particular month of the year. However for comparison and analysis purpose the readings for a full bright sunny day have been shown in Fig. 5-9. The output power of PV panels with 30°, 40°, 45° of tilt angle have been shown as bar graphs for

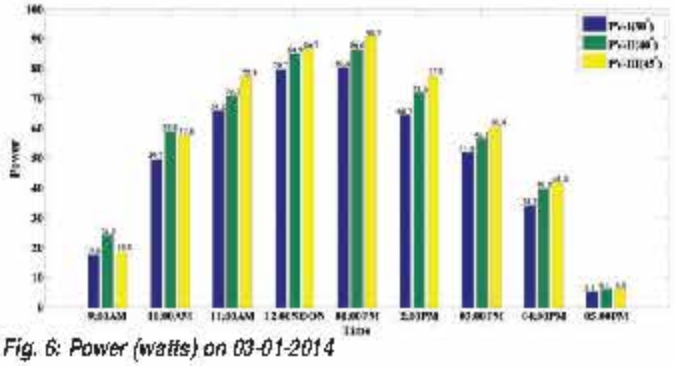

Fig. 6: Power (watts) on 03-01-2014

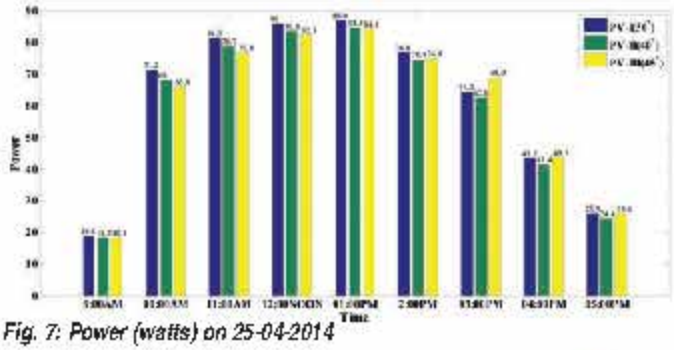

Fig. 7: Power (watts) on 25-04-2014

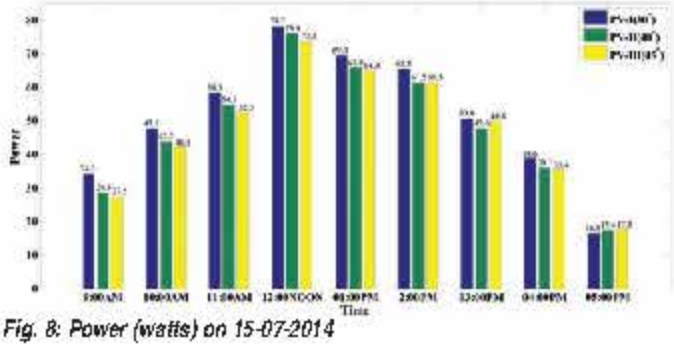

Fig. 8: Power (watts) on 15-07-2014

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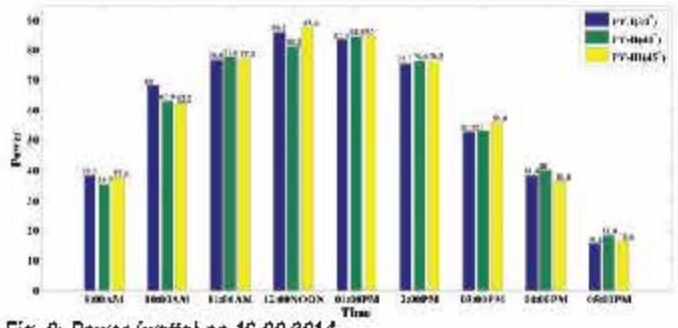

Fig. 9: Power (watts) on 16-09-2014

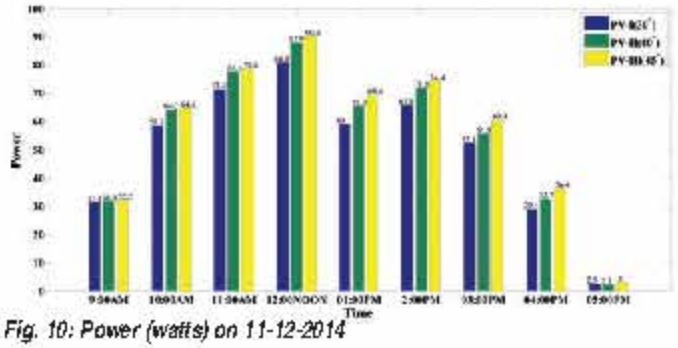

Fig. 10: Power (watts) on 11-12-2014

different day in the month of January, April, July, September & December.

It is observed that power output is highest for 45° inclination in the month of January (Fig. 6). However in the month of April the power generated for 40° and 45° are comparable (Fig. 7). In the month of July the power measured is higher for PV panel at 30° as compared to 40° and 45° (Fig. 8). The values of power at an angle of 30° becomes more in the month of September (Fig. 9). The power generated by the PV panel at an angle of 45° is highest among the three panels in the month of December (Fig. 10).

The measurements are also made for short circuit current (I_{sc}) for the 3 PV panels during different months of the year as shown in the Fig. 10-12. For 30° it can be seen that the average short circuit current (I_{sc}) is higher in the month of April and September whereas it is smaller during the month of July and December. The reason for such outcomes can be due to the impact of changing solar irradiations and climate conditions during these months as the month of April and September has quite even weather whereas July experiences heavy rainfall and December has extremely cold conditions and dew effect in Chandigarh.

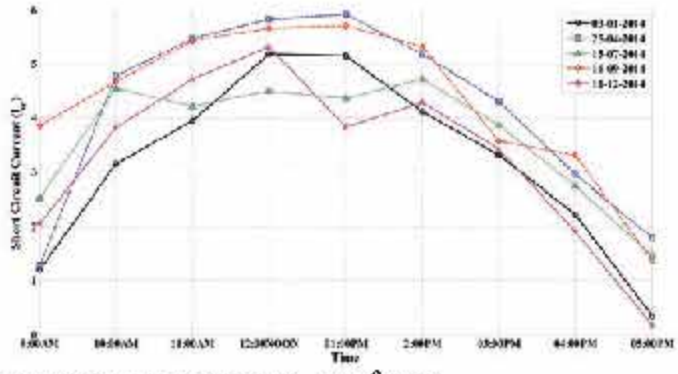

Fig. 11: Short Circuit Current (I_{sc}) at 30° angle

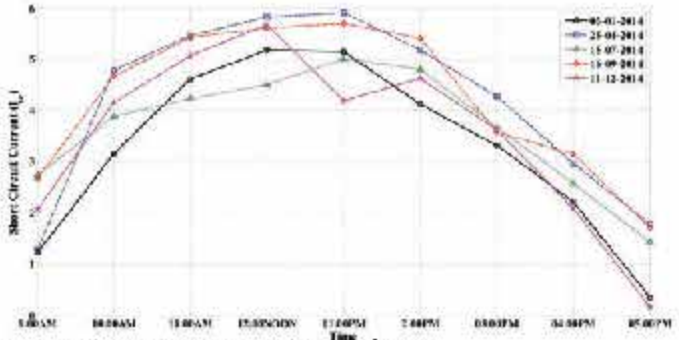

Fig. 12: Short Circuit Current (I_{sc}) at 40° angle

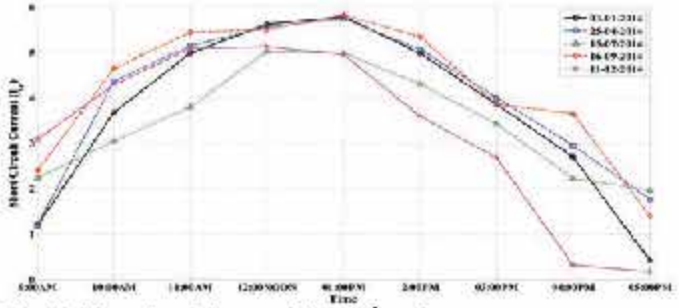

Fig. 13: Short Circuit Current (I_{sc}) at 45° angle

Table 1. below shows the average power calculated during a full sunny day during different days of the year 2014. It is analyzed that the average power calculated during the month of January is more for 45° than 30° PV panel. The average power is more for 30° than 45° in the month of April and continued till the month of July. The average power is almost comparable for both 30° and 45° in September. The average power again becomes more for 45° in the month of December.

Day	Angle of Incidence		
	30°	40°	45°
03-01-2014	48.75	54.13	56.53
25-04-2014	65.10	62.89	62.33
15-07-2014	50.28	47.02	47.36
16-09-2014	64.26	64.15	64.28
11-12-2014	52.63	57.16	59.10

Table 1: Average power (watts) for different days during 2014

In order to find the percentage power difference during different seasons of the year from different season of the year from different PV panels the calculations has been made. The percentage difference (PD) in power output is calculated using,

$$\%PD = \frac{\text{Output Power } (45^\circ) - \text{Output Power } (30^\circ)}{\text{Output Power } (45^\circ)} \times 100 \quad (3)$$

Fig.13-17 shows the percentage power difference (%PD) for 5 days in different seasons i.e., Fig. 13 for 03-01-2014, Fig. 14 for 25-04-2014, Fig.15 for 15-07-2014, Fig. 16 for 16-09-2014 and Fig. 17 for 11-12-2014.

Analysis of these plots shows that, the PD for the month of January as in Fig. 13 show a significant difference in output power throughout the day. There is a power difference of minimum 6% in morning and maximum 18% in evening which is quite significant. This indicates that, a PV panel with 45° inclination is good as compared to 30° inclination for the month of January.

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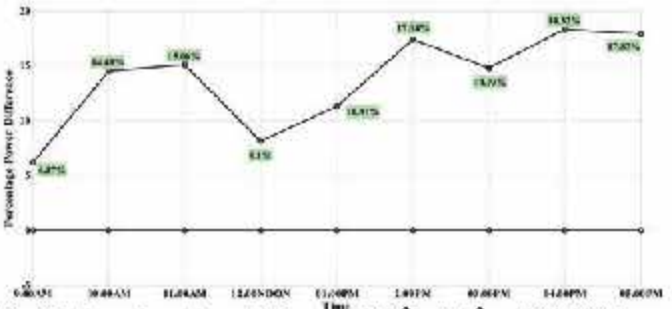

Fig. 14: Percentage Power Difference at 30° and 45° on 03-01-2014

From Fig. 14, it is seen that PD is negative for most of the day time with maximum negative value of 8%. This indicates 30° angle inclination gives better output as compared to 45° inclination angle in April.

From Fig. 15, it is seen that PD is again negative for most of the day time with maximum negative value of 13.81%. This indicates that 30° angle inclination gives better output as compared to 45° inclination angle in July.

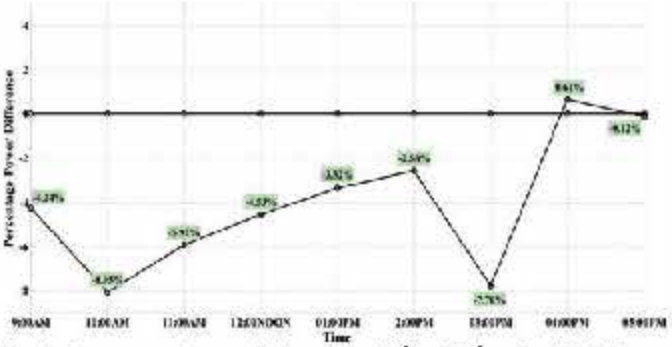

Fig. 15: Percentage Power Difference at 30° and 45° on 25-04-2014

From Fig. 16, it is seen that PD is positive for most of the day time with maximum positive value of 5.88%. This indicates that 45° angle inclination gives better output as compared to 30° inclination angle.

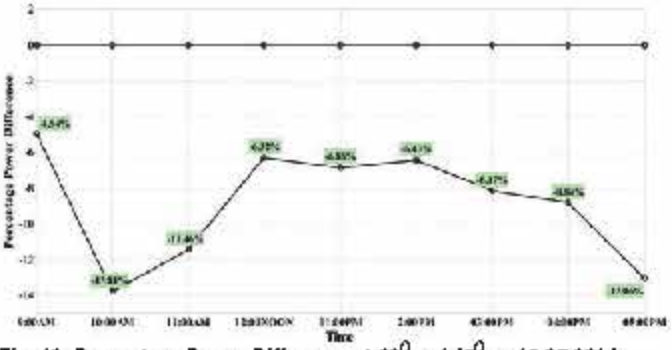

Fig. 16: Percentage Power Difference at 30° and 45° on 15-07-2014

From Fig. 17 it is seen that PD is positive for complete day with maximum positive value of 19.9%. This indicates that 45° angle inclination gives better power output as compared to 30° inclination angle in the month of December.

Therefore from Fig. 13-17 it can be observed that 45° angle is good for months, January to mid April and 30° inclination angle is better for months, mid April to September. The 45° angle is again better for months October to December.

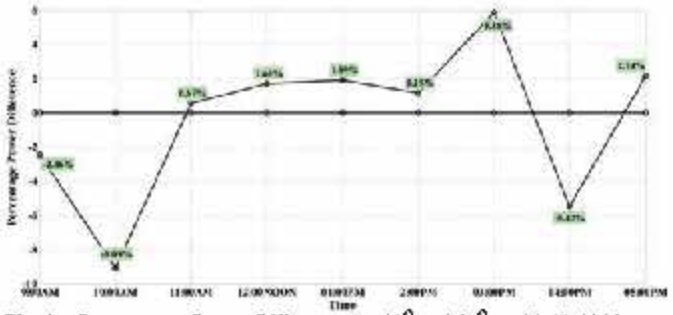

Fig. 17: Percentage Power Difference at 30° and 45° on 16-09-2014

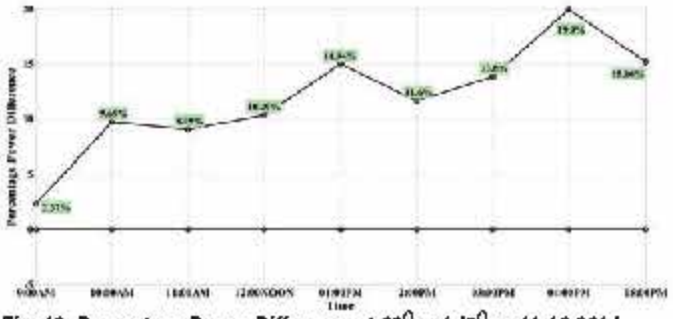

Fig. 18: Percentage Power Difference at 30° and 45° on 11-12-2014

Conclusion

The short circuit current (I_{sc}) and output power vary with the change in position of the Sun from morning to evening. In all the three panels, the short circuit current (I_{sc}) and power output has been observed to be higher for the PV panel with 30° inclination during month of April to September. However, the short circuit current (Isc) is higher for 45° inclined PV panel from January to March. It is concluded that, as per the location of Chandigarh (latitude 30°44'N) the Sun is overhead during summer season starting from April to September. The 30° inclination is optimum, whereas for the rest of the year, the angle of the panel can be adjusted to 45°. So with biannual change the efficiency of the PV panel can be enhanced to great extent.

Profile

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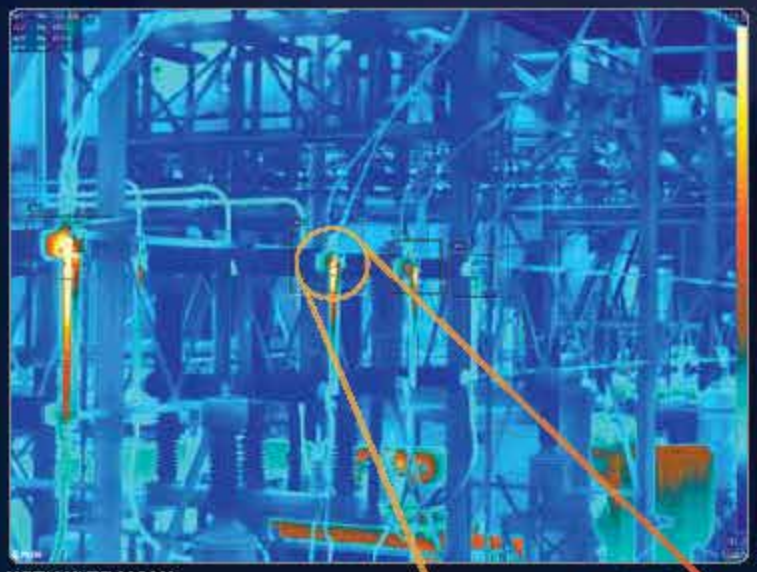

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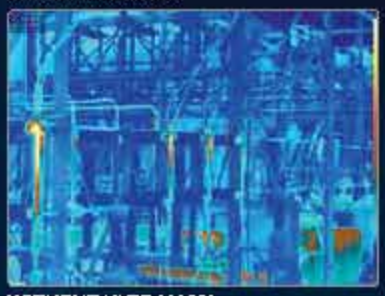

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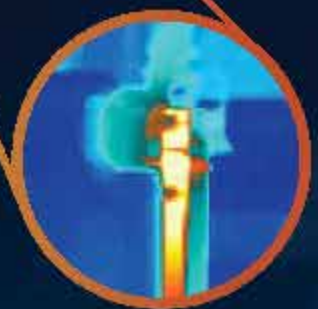

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Qualitative Testing of DLMS/ COSEM ICS compliant Energy Meters

The Device Language Message Specification (DLMS) and Companion Specification for Energy Metering (COSEM) form together the DLMS/COSEM application layer communication protocol and an interface model for metering applications. The requirement of an Open Protocol for energy metering was necessary for bringing in homogeneity among various makes of meters.

V Suresh and V Arunachalam

The openness of the standard will make the Automatic Meter Reading (AMR) and interoperability a reality. One among the many open protocols is the DLMS/COSEM. This open protocol based on IEC 62056 helps to overcome most of the challenges for data acquisition from energy meters. The difficulties faced by the utilities to have successful remote metering deployments and the consequent difficulty in accounting energy losses due to proprietary protocols are well known. The Indian Companion Specification (ICS) is intended to provide a field level basis for efficient and secure transfer of electricity metering data in an open manner with judicious application of features and protocols of the International Standard. The Indian Companion Specification (ICS) was evolved by BIS as an Indian Standard IS 15959 which inherits the IEC 62056 series of standards. This article presents the qualitative testing of DLMS/COSEM ICS compliant Energy meters.

The advent of electronic energy meters with data download capability made Metering Billing Collection (MBC) process to move away from human to a machine dependent. Further the deregulation raised the need for integrating meter data with the business processes of stakeholders.

The MBC process which begins with meter reading / downloading was the starting point of contention due to variety of protocols. With different makes of meters, the data collection for an automated process was a challenge. In order to bring in homogeneous environment and to optimise the business processes, structured data and also embracing all makes of meters was found to be an urgent necessity. This directed to the quest for open communication protocols so that AMR / AMI systems can become a reality. The need for open protocol was very much felt. One among the many open protocols is the DLMS/COSEM which has evolved over a period of time and is adopted by IEC as IEC 62056 series of standards and are adopted in India.

DLMS/COSEM is based on a strict client-server structure. The philosophy is to "model", "message" and "transport" with an object oriented approach. The server is meant to be within the meter while the client accessing the meter could be a gateway or the central office.

The Metering Protocol Laboratory in CPRI is equipped with state-of-art facility complying to International standards for carrying out Compliance testing on DLMS energy meters as per ICS

Other use cases where the server is within the gateway and the client is in the central office are also feasible. Before the actual metering information can be exchanged an association has to be build up, which is initiated by the client. The DLMS client can then access the interface object model inside the server. Once an association exists the DLMS server is also able to send notifications to the client without an explicit request.

DLMS/COSEM supports clock synchronization and transmission of measurement data and profiles. The DLMS/COSEM has been improved and the current version facilitates digital signature and firmware upload. Data objects for firmware updates are already part of the Blue Book Ed. Both are relevant for smart meters.

DLMS/COSEM includes authentication and confidentiality services based on symmetric encryption.

The continuous development of DLMS/COSEM open communications protocols for data retrieval, updation and reconfiguration of metering devices has enabled diverse operators to access safely and quickly data from metering equipment provided by diverse manufacturers.

Among the many open protocols like MODBUS, ANSI, DLMS, the DLMS/COSEM (IEC 62056) was chosen by India.

MODBUS was more towards process instrumentation and ANSI the meter protocol used in North America.

The IEC 62056 is an open protocol exclusively evolved for Metering purpose. It operates at meter level. A wide range of data types can be read either selectively or in groups. The parameters are identified through unique codes. The protocol can work with many common communication medium. The protocol implementation can be verified for conformance with the dedicated test tool.

India has been aligning with IEC for standardization. In the present effort to bring in uniform protocol and based on the relative merits and demerits, IEC 62056 protocol has become the natural choice for metering purposes in India.

The Indian Companion Specification (ICS) was formulated and released by Bureau of Indian Standards (BIS) as IS 15959 : 2011 "Data exchange for electricity meter reading, tariff and load control - Companion specification". This standard supplement the IEC 62056 series of standards. This companion specification spelt out the Indian specific requirements for designing open energy meters based on DLMS/COSEM. With this standardization a homogeneous environment would prevail at metering end for data collection.

The Companion Specification refers to latest updates of Interface classes and OBIS codes available in 12th edition (2014) of the Blue Book of DLMS UA. This also refers to updates of procedures and services available in 8th edition (2014) of the DLMS UA Green Book. These revised Technical Reports of DLMS UA, considered as pre-standards for several parts of IEC 62056, will be adopted by IEC in due course and subsequently by BIS.

Need for Protocol Testing

Testing of energy meters for communication protocol unlike any other equipment is very much essential to make sure that the meter is complying with the said protocol standards. This is to ensure interoperability and easy acquisition of data from the meters using any third party client tool which makes the device operate vendor neutral. This enables every meter reading system to understand a value by its identification system, irrespective of the meter make. The DLMS/COSEM also allows for uploading the Objects supported by a meter, and then reading the meter values, which enable any DLMS/COSEM Compliant Client software to read any manufacturer meter.

Compliance Testing as per is 15959: 2011 Indian Companion Specification

The ICS standard is intended for use as companion to IEC 62056 series of standards on "Electricity Metering – Data Exchange for Meter Reading, Tariff and Load Control", adopted from various parts of IEC 62056. The metering device is evaluated in order to gain confidence

about implementation of declared features of ICS and generic standards IEC 62056.

The compliance testing evaluation is carried out to verify whether the DLMS protocol are implemented correctly in the metering device. The test setup is as shown in Fig. 1. Meters claiming compliance to this Companion Specification will be required to:

- Conform to DLMS/COSEM (IEC 62056) protocol requirements as certified by the Conformance Test Tool (CTT)
- Parameter verification as a part of this:
  - All mandatory parameters applicable to the category of the meter under test are implemented
  - All data types where specified are conforming to ICS
  - All Application Associations are implemented as specified in ICS with all specified services supported
  - Association object lists conform to ICS with access rights and OBIS codes as specified here and
  - Event related DLMS objects are implemented with Event identifiers as specified in the Event reference tables in ICS.

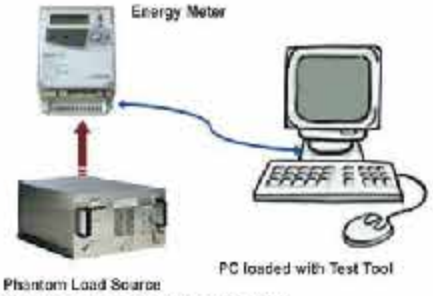

Fig. 1: Compliance Test Setup

DLMS/COSEM Conformance

The objective of conformance testing is to establish whether the Implementation Under Test (IUT) conforms to the relevant specification(s).

The IUT is to be verified for three layers viz.,

- **COSEM layer:** Association, Request/ Response handling.
  - **The COSEM Interface objects:** Testing for COSEM Interface object model implies that the protocol stack is in order.
  - **The COSEM Application layer:** Testing for COSEM Application Layer implies that the mapping and modelling is in order.
- **HDLC layer:** Addressing, Data integrity & verification, Flow Control, Sequencing.

The data link layer using HDLC protocol:- Testing for data link layer using HDLC protocol implies that the physical layer is in order.

- **Physical Layer:** Communication services.

CTT takes as input a text file called the Conformance Test Information (CTI) file that describes the relevant device parameters used during the test.

The CTT test consists of sending messages to the IUT and observing the responses. The conformance assessment process is the complete process of accomplishing all conformance testing activities necessary to enable the conformance of the IUT to be assessed.

The open protocol validation is done using a Conformance Test Tool (CTT).

The preparation for testing phase involves:

- Preparation of the IUT
- Production of the CTI file
- Preparation of the CTT

The test operations include:

- Review of the CTI
- Test selection and parameterization
- One or more "test campaigns"
- Positive & negative cases.

The CTT automatically generates three documents:

- The conformance test report
- The conformance log and
- The line traffic.

Line traffic which gives the actual communication taking place between the CTT and IUT. The line traffic window displays the bytes (in hex-string notation) sent and received over the serial line. This information helps the designer to debug the code whenever required.

A flowchart of the compliance assessment process is given in Fig. 2.

The conformance test report is automatically generated during each test campaign. It is a digitally signed text file, containing the following elements:

- Date of testing
- Identification of the test tool and license owner
- Identification of the manufacturer as declared in the CTI file

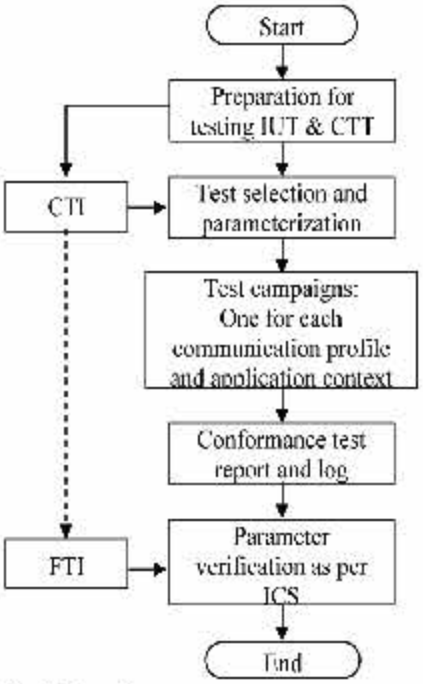

Fig. 2: Compliance assessment process overview

- Identification of the IUT as declared in the CTI file
- A summary of results for each test suite
- The result of each test case
- A copy of the CTI file
- Digital signature, allowing to check the authenticity of the conformance test report.

The test verdict will be Passed, Failed or Inconclusive:

- **Passed:** Means that the observed test outcome gives evidence of conformance to the conformance requirement(s) on which the test purpose of the test case is focused, and is valid with respect to the relevant specification(s);
- **Failed:** Means that the observed test outcome either demonstrates non-conformance with respect to (at least one of) the conformance requirement(s) on which the test purpose of the test case is focused, or contains at least one invalid test event, with respect to the relevant specification(s);
- **Inconclusive:** Means that the observed test outcome could not be judged by the automatic test tool this requires human intervention and the test engineer in this case will analyse the results and declare whether the test is pass or fail.

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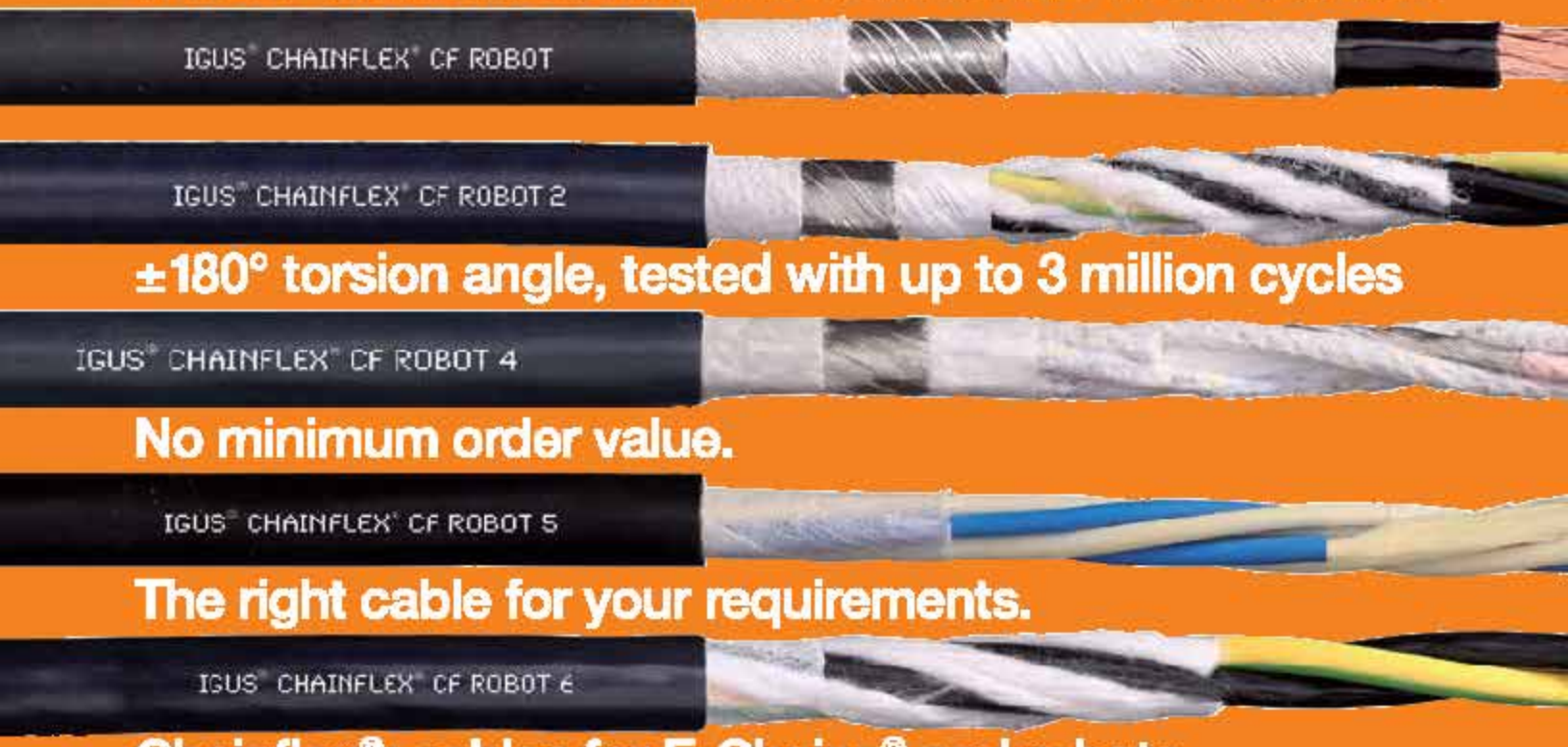

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Parameter Verification

ICS is intended to provide a field level basis for efficient and secure transfer of electricity metering data in an open manner with judicious application of features and protocols of the international standard.

IS 15959: 2011 addresses meters with open protocol for Three phase meters which are broadly classified into three categories viz., Category A for Energy Accounting and Audit Metering, Category B for Boundary/ Bank/ Ring/ ABT Metering and Category C for HV (VT/ CT) and LV (CT) consumer Metering. The parameters namely the Instantaneous parameters, Block Load Profile parameters, Daily Load Profile parameters, ToU, Billing Profile parameters, Billing period, Billing period counter, General purpose parameters, Event parameters are all clearly defined with unique OBIS codes.

The ICS also calls for parameter verification for each category of meters. The ICS lists out the applicable parameters for each category of the meters. The Metering Parameters have been identified and classified as follows:

- SNRM/UA
- Object list download
- Association properties, Mandatory objects & Conformance services
- Selective access by Range & Entry
- Simultaneous operation
- Security
- Instantaneous Parameters
- Block Load Profile Parameters
- Daily Load Profile Parameters
- ToU
- Billing Profile Parameters
- Billing period
- Billing period counter
- General Purpose parameters:
  - Name Plate Details.
  - Programmable parameters.
- Event recording.

SNRM (Set Normal Response Mode)/UA

The SNRM verifies negotiation of HDLC parameters with appropriate values.

Object list download

The OBIS (Object Identification System) provides a unique identifier for all data within the metering equipment. It covers not only measurement values, but also abstract values. OBIS codes identify data items used in energy metering equipment in a hierarchical structure using six value groups A to F. This also referred as COSEM.

The association shall be addressed using the Current association OBIS code (as applicable) and attribute 2.

PC mode OBIS code 0.0.40.0.1.255

MR mode OBIS code 0.0.40.0.2.255

US mode OBIS code 0.0.40.0.3.255

For each Association, the object list parameters are downloaded and verified.

PC: No access for all objects except RTC and Sl. No.

MR: Read only for all objects

US: Read, Write for all objects

Association properties, Mandatory objects & Conformance services

This requirement will verify that the meter is communicating successfully with all the three associations (i.e. Public client – no authentication; Meter Reader – low level security & Utility Setting – high level security).

Current association shall be resolved in meter to appropriate association object (0.0.40.0.e.255) based on SAP address pair (client address, meter logical address). Value of e=1 for Public client; e=2 for Meter Reader & e=3 for Utility setting).

The following parameters of the association request are verified:

- **Application Context:** Logical Name without Ciphering
- **Authentication mechanism:** No Authentication (PC) / LLS (MR) / HLS (US)
- Conformance Block containing:
  - GET
  - SET
  - ACTION
  - GET With Block Transfer
  - SET with Block Transfer
  - Selective Access.

Note: Item 3.1 is applicable for Public Client Association.

Item 3.1, 3.2, 3.4 & 3.6 are applicable for Meter Reader Association.

Item 3.1 to 3.6 are applicable for Utility Setting Association.

Selective access by Range & Entry

The Selective Access by Range shall be supported for Block Load profile and Daily Load profile. The companion specification requires support for Selective Access by Entry for Billing data profile and Event log profiles. The selective access requirement is to verify selective access in profile buffer.

Simultaneous operation

The meter (server) is not required to allow more than one association at any one time. Optical port shall have priority over the electrical port when both ports are accessed simultaneously.

Security

The DLMS/COSEM standard provides three different sign-on authentication mechanisms for each association's access to meter data applied at the time of performing COSEM OPEN operation.

Lowest level security

Open access without any authentication at sign-on. This is for Public Client.

Low level security (LLS)

Password based sign-on where the client authenticates itself to the meter using a password. The Utility settings association shall provide access to write the password for all associations that utilize this authentication scheme.

Meter's LLS secret can be modified from authorized DLMS clients by writing to "secret attribute".

High level security (HLS)

HLS mechanism defines a 4-pass sign-on scheme where the client and server exchange challenges (a random number or code) and then reply to the challenges with a processed response. The processing performed on the challenges is an encryption using a secret "key".

Meter's HLS key can be modified from authorized DLMS clients by executing "change HLS secret" method.

Instantaneous Parameters

The Instantaneous parameters are continuously updated by the meter hardware/ software as per internal sampling and computation time. The energy values are cumulative readings from the date of manufacturing or installation of meter as the case may be. Each of the parameters are readable at any instant by the HOST from remote or by HHU at site. The snap shot of all the instantaneous values of all parameters are readable by the HOST computer.

Block Load Profile Parameters

This is an array of parameters identified

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for capturing and storing at specified time intervals or capture times. The capture times are either 15 or 30 minutes. The capture times can be programmable by the utilities. The ICS lists the parameters whose profile (survey) is to be captured and stored in the meter as per set capture time period. The profiles are readable at any time by the HOST from remote or by HHU (MRI) at site for any specified range and time.

Daily Load Profile parameters

This is an array of load survey data captured as a profile generic at the end of 24 hours. The capture period attribute is statically fixed as 24 hours.

ToU

DLMS/COSEM provide a number of interface classes to deal with ToU metering. DLMS offers different options for modeling time based activities such as schedule, activity calendar, single action schedule etc. ICS uses activity calendar in association with script table to accomplish ToU modeling. The activity calendar is a definition of scheduled actions inside the meter, which follow the classical way of calendar based schedules by defining seasons, weeks & days. Meter follows different time based variable billing rates instead of flat rates.

Billing Profile Parameters

These are parameters identified for accounting/billing purposes. These are generated by the meter for each billing cycle and stored in the memory. The set of data for at least last 6 (six) billing cycles are stored in the memory. At the end of each cycle corresponding set of data are readable by the HOST from remote or by HHU at site.

Billing profile parameters requirement is to verify that billing energy values on time zones which is configured in activity calendar and billing is generated on the time configured scheduled time.

Billing Periods

Billing period resets are driven by an instance of the single action schedule class in conjunction with script table. The data of the billing period is stored in a profile generic object as specified in ICS. Each entry in the profile buffer captures the billing period values for a specific billing period.

Billing Period Counter

The meter shall maintain the cumulative count of all billing happened since installation.

General purpose parameters

- Name Plate Details

These parameters are electrical and non-electrical quantities and are static in nature, grouped as 'Name Plate Details', containing pertinent information about the supplied meter. The parameters identified and grouped as "Name Plate Details" under this classification are applicable for all categories of meters.

- Programmable Parameters

These parameters are non electrical quantities. The parameters identified and grouped as "Programmable Parameters" are programmable by the Utility engineers. For the purpose of setting / altering the values of these parameters, the security and access rights in line with the methodology described in protocol, are mutually agreed between utility and manufacturer. The parameters are programmable by HOST from remote and HHU at site.

Event recording

Any abnormal or a tamper condition is defined as an Event. Meter must have the capability to detect event and store associated information for latter communication to DLMS client. The meters identify and log both occurrence and restoration of such events. The meters also capture some of the parameters at the instance of above said log. ICS has identified the events to be logged and the parameters to be captured for each of those events. The various types of events are:

- Voltage related events
- Current related events
- Power Failure related events
- Transactional events
- Other events
- Non rollover events
- Control events.

The Metering Protocol Laboratory in CPRI is equipped with state-of-art facility complying to International standards for carrying out Compliance testing on DLMS energy meters as per ICS.

Fig. 3 shows the test setup for carrying out Compliance testing as per ICS.

Fig. 3: Test setup

Conclusions

In this paper the general principle, DLMS/COSEM was described. The unique strength also were highlighted especially the testability. The adoption of DLMS/COSEM for Indian needs by way of ICS was explained. The qualitative testing of the protocol implementation was brought out. The DLMS/COSEM test methods for DLMS compliant Energy meters ensures that communication protocol implemented is conforming to Indian Companion Specification (ICS) & enhances the confidence level of the utilities.

The standardisation of meter protocol was a great step forward in rolling out the R-APDRP projects.

Profile

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Make Our Bank A Green Building

Mahatma Gandhi, father of nation and founder of Union bank of India once told – Mother Earth will Provide Every Thing for Human Need but not Greed. Fast depletion of resources like fossil fuels, ore coupled by exponential population growth and aspiration for higher quality of life will slowly make earth – warm, highly polluted, having no minerals or fossil energy resources. So to save this planet from resource crunch – one of the answer is Green Building.

Dr Shivaji Biswas

Green building is a building which will generate it's own energy requirement from renewable resources and will be able to export to grid as and Waste from green building will also be treated in same way that it will generate energy and cause no harm to environment. In India, there are many green buildings certified by a body name Green Building Certifying Authority.

Green practices in the existing buildings can help address national issues like water efficiency, energy efficiency, reduction in fossil fuel use in commuting, handling of waste and conserving natural resources. Most importantly, these concepts can enhance occupant health, happiness and well-being.

Scope of Bank as Green Building

Newly constituted buildings have to obey ECBC (energy conservation building code) / Against this background, the Indian Green Building Council (IGBC) has launched 'IGBC Green Existing Building O&M Rating System' to address the National priorities. By applying IGBC Green Existing Building O&M criteria, existing buildings can be sustainable over the life cycle of the building. This rating programme enables the building owner / developer to apply green concepts and criteria, so as to reduce the environmental impacts, which are measurable. The programme covers

methodologies to cover diverse climatic zones and changing lifestyles.

IGBC Green Existing Buildings (Operations & Maintenance) Rating System

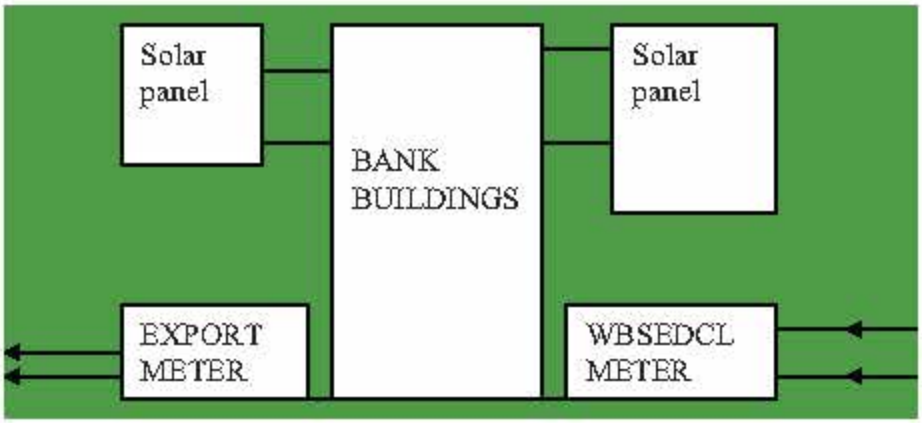
IGBC Green Existing Buildings O&M Rating System is a voluntary and consensus based programme. The rating is focused on sustained performance of buildings with respect to the green features. The overarching objective of this rating system is to facilitate building owners & facility managers in implementation of green strategies, measure their impacts and sustain the performance in the long run. The rating system is fundamentally designed to address national priorities of resource conservation while providing quality of life for occupants. The rating programme uses well accepted National standards and wherever local or National standards are not available, appropriate international benchmarks have been considered.

Unique features of IGBC Existing Buildings (O&M)

- Focus is on implementation and results achieved
- Documentation requirements are minimal. Instead, it is more of evidence like photos and calculations
- The rating can be applied to both air-conditioned and non-air conditioned buildings
- The rating is designed to suit all building types in all climatic zones. Exclusions are residential and Factory buildings for which IGBC's existing ratings can be applied
- Water being of prime national concern, is given higher weightage
- For energy related aspects, Energy Conservation Building Code (ECBC) or the Energy Performance Index (EPI) as recommended by Bureau of Energy Efficiency (BEE), is the reference standard.

Criterion of Energy Efficient Building

The criterion is for office buildings on a 5 star scale with 5 star scale being most efficient. Five categories of buildings – office, buildings, Hotels, Hospitals, retail malls and IT parks located in five Indian climatic zone in the country have been identified for the programme.



Energy performance index (EPI) in kwh/sq meter/year will be considered for rating of buildings –it varies as different climatic zone. For example, a Bank building would get a five star rating if it's EPI falls below 90/kwh/sq meter/year and one star if it is between 165-190 kwh/sqmeter/hr. in mathematical terms.

EPI in Kwh/Sqmeter/Yr = (Electricity Consumption in Kwh+DG Set Electricity Generation in Kwh) in Year/Total Build up Area in Square Meter.

Responsibility of bank to convert it into green building

The energy load of bank are-lighting, airconditioning, pumping, LPG for canteen, fan etc. Most of the banks have changed look by interior decoration and made internal atmosphere more customer friendy. Except regional office, zonal office, local head office, other offices are rented accommodation where water is provided. Some of energy saving strategies are-

- L.1 Replace the existing fluorescent lamps (2x36 Watt and 1x36 Watt) with new technology high efficiency light-emitting diode (LED) lamps (2x18 Watt and 1x18 Watt) in selected areas.
- L.2 Replace the existing downlight halogen spot lamps (35 and 65 Watt) with high efficiency LED lamps (4 and 14 Watt, respectively).
- L.3 Replace existing 26 Watt downlight compact fluorescent lamps (CFLs) with 12 Watt LED lamps in main elevator areas (lift lobby).
- L.4 Replace existing low efficiency 25 Watt incandescent lamps with 5 Watt LED lamps in selected areas.
- L.5 Reduce T5 35 Watt fluorescent lamps in guest room corridors to match international standards for lighting levels.
- AC.2 Control the operation of air conditioning (A/C) systems in rooms to switch off automatically when the balcony door is opened.
- AC.3 Increase the set-point temperature on A/C systems by 2 degrees for unoccupied rooms.
- AC.5 Use variable frequency drive (VFD) to control the operation of air handling units (AHUs) through a temperature feedback signal.
- AC.6 Reduce the effect of lighting on the A/C load.
- O.3 Use door switch to control the operation of cold store refrigeration compressors.

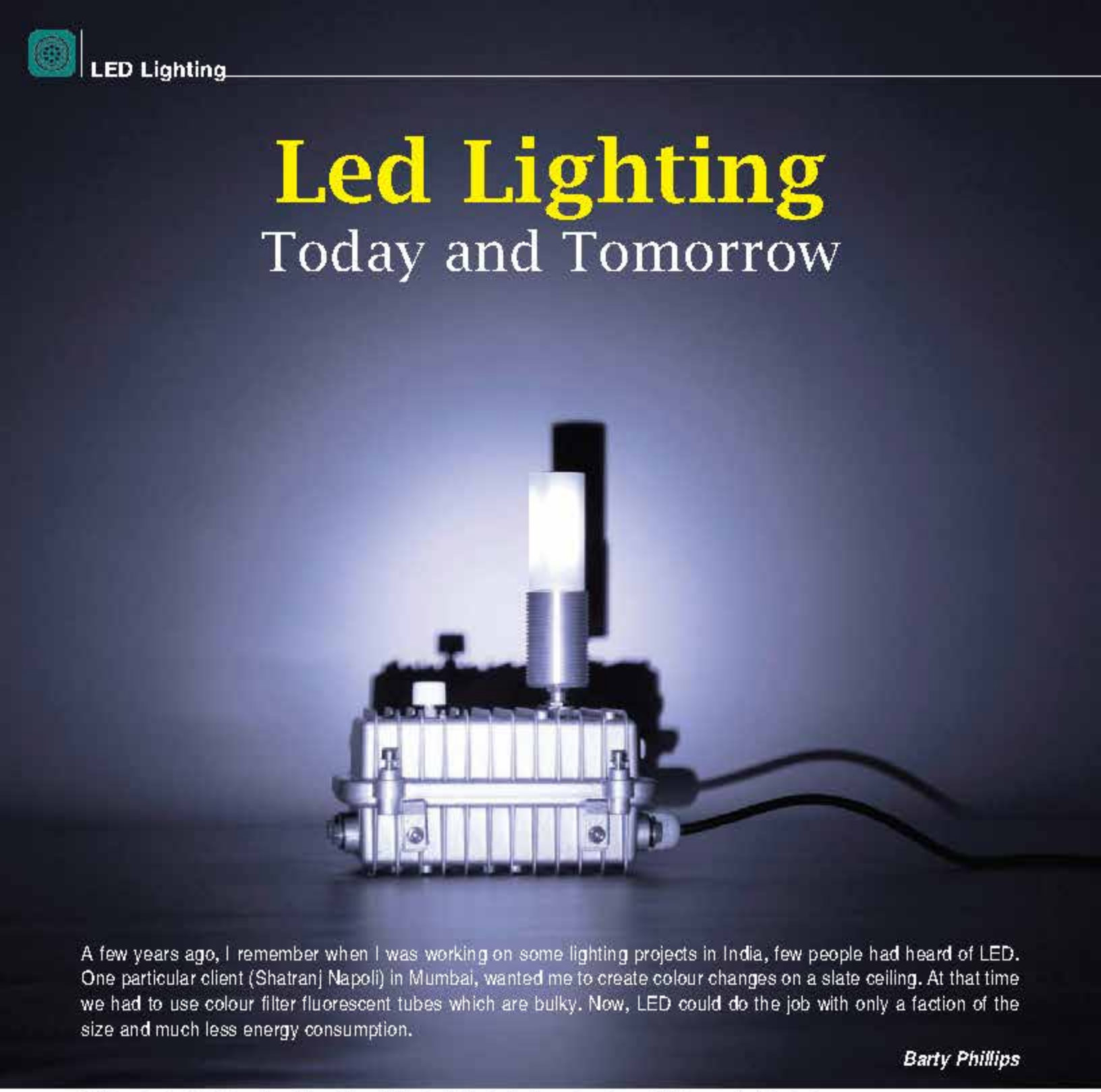
Net metering: Banks can export energy by using solar photovoltaics at design / grassroot constriction stage. Building surface and roof if properly used.

Profile

Dr Shivaji Biswas

Retired as Director - Energy Management. Presently working as PCRA part time consultant and formed own consultancy firm - DS Cube Energy and Enviro Consultants at Kolkata. PhD in energy management from jadavpur university, Kolkata. Accredited energy auditor.

Led Lighting
Today and Tomorrow



A few years ago, I remember when I was working on some lighting projects in India, few people had heard of LED. One particular client (Shatranj Napoli) in Mumbai, wanted me to create colour changes on a slate ceiling. At that time we had to use colour filter fluorescent tubes which are bulky. Now, LED could do the job with only a faction of the size and much less energy consumption.

Barty Phillips

SKK Superbulb - LED Dedicated and Dimmable omni-directional light designed to replace the retro-fit bulbs specifically in hotels. (photographed by Antanas Martinkus)

In Pune, we were asked to light a black marble pyramid for the OSHO organisation. We were working with metal halide which is very white and harsh, whereas now if we used LED we could be more flexible with the possibility of introducing dimmers and colour changes and the whole module could be incorporated into the stonework.

LED lighting SSL is both a new solution and a business opportunity for our modern world. This is because energy prices are rising slowly but surely (by an average of 8 percent) and because of environmental issues as well as political agendas. LED lighting is becoming the starting point for new possibilities. In

Europe there is a building regulation (L - Conservation of Fuel and Power) which stipulates a requirement of 70 lumens per watt. LED can satisfy this requirement better than many light sources.

Now, let us look in more detail at how to tackle a successful LED lighting project.

There are basically two kinds of LED lighting:

- **Retrofit:** This uses LED light bulbs which are fitted into existing lighting fixtures. They have built-in drivers, heat sink and standard lamp holders. Some of them can be dimmed by triac dimmers. When the lamp's life is completed the entire bulb has to be thrown out. The main advantage of retrofit is that retrofit bulbs are widely available and there are already many good looking classing light fittings which may be difficult to replace or remake or redesign and into which a retrofit LED bulb can be fitted.
- **Dedicated:** Dedicated LED uses integrated fixtures, each having a remote driver and built-in heat sink. These are more efficient than retrofit and have replaceable drivers.

So which of these will turn out to be the most economic in any given situation?

Retrofit LED bulbs are relatively less expensive to fit than dedicated LED and are very easy to insert into existing fixtures without the help of an electrician. However, this is a short term solution.

Dedicated LED fixtures are more expensive in initial investment but have the advantage of being more efficient.

Of course, it is necessary to design the scheme well, to look into the performance criteria, the budget, the maintenance aspects and the colour rendition.

In the past, LED colours (measured in Degrees Kelvin, or K) have been considered cold and unfriendly (2600K). However, there are two solutions, firstly, today the colours are much nearer to tungsten colours (2600K) than when LEDs were first introduced; secondly, perhaps we should learn to accept the new LED colours as part of the concept of modern living. There is one stumbling block, however, and that is the warranty issue. Suppliers, via the manufacturers sometimes offer up to ten years to secure a contract. This is not really sustainable, apart from the need to re-supply and re-install, because the industries in this area are rapidly developing LED lighting technology which means that the LED array installed in the system may be out of date.

We have to work out a comprehensive responsibility for this issue which should include-

- Experienced lighting designers
- Reputable LED lighting manufacturers
- Long-standing contractors
- Responsible suppliers with a good warrant contract
- Qualified and LED-knowledgeable electrical installers
- Sympathetic and understanding clients
- Open-minded architects who do not pass the bugs.

There is much good news about LED lighting and I would like to point out some of the important areas in which it can be of benefit.

- **Colours can match the display:** For jewellery shops LED lighting can be programmed to match the reflection of the colour of the stones, the gold and other precious metals. It is possible to regulate the white colours from warm through to cold and very cold. For example if you have a gold and diamond ring, the cold white reflects well with the diamond, and the warm white with the gold.

- **Colours for film making:** LEDs are now available at 4500K indicating a 'perfect white'. This would give more scope to post production colour adjustments.
- **Battery-powered products:** For parties, emergencies, entertainment and safety, clothing design, cycling and road safety.
- **Colours for shop display of fabrics and shoes:** In South Asian countries LED lighting can help women choose fabrics for making party dresses by showing them as they would appear at night or during the day. Good design of LED lighting in shops can help by having a day room and a night room or by switching colour in the changing area.
- **LED for therapy:** It is conceivable now that LED could help to counteract SAD (Seasonal Affective Disorder - caused by lack of sunlight) and light for general medical care
- **LED for children:** Because LED produces much less heat compared with other night light sources, a well designed LED reading lamp is the best solution for parents reading stories to their children or for teachers to help young children to learn to read.
- **Stadiums:** Lighting employed in stadiums within city centres can cause environmental pollution but LED lights can be programmed to be dimmed for non-match activities and perhaps be changed to warmer colours. Preparing for the future challenge of the LED lighting business.
- SKK is opening SKK LIGHTING, a world first 'café' for LED lighting in which all comers are invited to come and discuss LEC lighting and lighting solutions over a 'cuppa'.
- 3D printing can be a good design aid for LED lighting and even produce small batch solutions.
- Education about LED lighting should start with children and young people.
- Joint ventures should be undertaken with government and industries.
- Lighting innovation should be introduced in performance art.

'Thus we can see that LED lighting is an important development for the environment, for the economy and is something that can affect the lives of every person on the planet for the better. Lighting technology is developing at a rapid pace and we need to keep pace with it for the benefit of everybody.'

Barty Phillips

Journalist and Publicist.

Profile

appointment

UGVCL appointed Hareet Shukla, IAS as MD

Pursuant to Notifications issued by the Government of Gujarat, Hareet K. Shukla, IAS, has been appointed as Managing Director of the Company vice N. Srivastava, IFS, by the Board of Directors with effect from 02-Mar-2015. Shukla, IAS has also been appointed as Key Managerial Personnel (KMP) under the Companies Act, 2013. UGVCL Chairman Varun Nath Maira, IAS (Retd.) welcomed Shukla, IAS as Managing Director during the Meeting of Board held on 02-Mar-2015 at Ahmedabad. Chief Engineer (Operation) C. R. Desai, Chief Engineer (P&P) S. R. Patel, General Manager (Finance) R. B. Kothari and Company Secretary N. M. Joshi, among other senior officers and employees, witnessed this greeting occasion.

UGVCL Chairman Varun Nath Maira (Right) welcoming Hareet Shukla as Managing Director during the Company's Board Meeting

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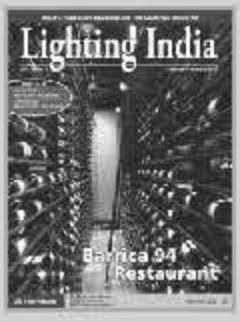

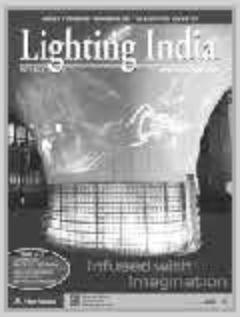

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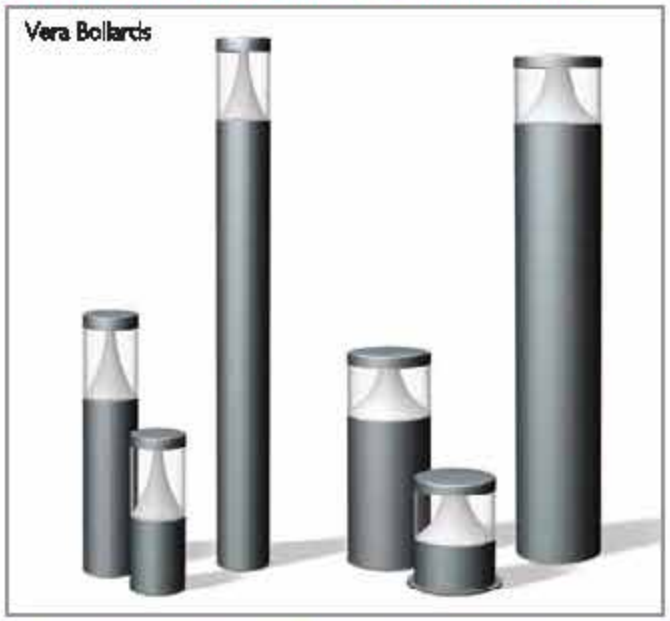

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Energy Conservation
by Self Discipline

A drop in the ocean might look insignificant but many such drops can make a huge difference. That is how I started my training on this topic in February at IIT Research Park in Chennai for PMI Chennai Chapter members.

Energy Conservation

There were more than eighty professionals, mostly engineers, from IT industries and the topic was most relevant to their kind of work place, but not limited to such environment. Every day we do many things either knowingly or unknowingly & intentionally or unintentionally thinking these have no significance at all. In reality these activities have huge significance & can make remarkable impact when we talk about energy conservation without spending any money and with no compromise in comfort level.

Water, light, air- conditioning and fuel for transportation are some of the essential commodities in today's modern life style. None of these are luxuries any more but a must. How often do we think about these essential requirements from the optimal utilization point of view? I am sure none or may be very few people like me who are in minority and cannot make any visible impact. However, spreading awareness about the optimal utilization of such essential commodities can get the tough going. And it is not limited to only these four applications as mentioned above but there are many such applications in our day to day activities which have the opportunities in equal measures in energy conservation.

Light

How difficult it is to save just 50W equivalent power daily? Is it a very difficult task and could cause any inconvenience in our daily lives? In fact there are many things we can do to save 50W power and we will never realize any discomfort for that simply because we over utilize power in most of our daily activities. Open the window curtain & switch OFF the light near the window during the day time, switch OFF the corridor lights during the day time or keep the lights OFF in cafeteria / storage areas when not in use and there are many more like such actions can be done which are simply not required but still routinely in use because it is not anyone's concern. Light is used everywhere for every activities but how often do we evaluate the optimal utilization? Perhaps never.

Air Conditioning

Till IT revolution happened air- conditioner was considered to be a luxury item but not anymore. How often do we spare any thought about our office when we leave in the evening either keeping the lights & air-conditioner ON or switching OFF at the time of leaving. We leave the office in cold condition but no one is there and no activities take place after we left the office. Why the air-conditioner need to cool continuously once the set temperature is reached? What is the impact on air-conditioning load if the door is kept open or window is ajar? How much importance do we give about the impact of ghost loads on air-conditioner? Why don't we run the fan when the air-conditioner is ON? We all know that air-conditioning is needed to feel comfortable but how many of us really know how we feel comfortable. Do we really understand that if the fan is run and the set temperature is increased by 1 or $2^{O}C$, still we will continue to get the same comfort? Increasing the set temperature and running the fan will have a

> ***Ten crores vehicle saving 10 ml equivalent fuel each on daily basis will lead to 1,000 KL of fuel***

trade off and the impact is on compressor Cut-Off time. Compressor consumes about 85-90% of the total power in small air -conditioning system and an increase in Cut-Off time can make a huge difference. List is really big when it comes to doing such small things in the usage of air-conditioner which can save lot of power.

Over the years I have seen HVAC is over designed and the chilled water pump is operated with partially throttled valves. Same thing happens in AHU operations. Over design can easily be overcome if the design engineer visits the site after the civil structure is constructed or the purchase manager asks for an opinion from the HVAC expert. Taking self initiative is a reflection of self discipline. There is an inherited flaw in our purchase system in every organization. We consider only the initial cost for comparison while finalizing the purchase order of any piece of equipment. Do we really know what percentage of life time operating cost is this initial cost? As per thump rule 80-90% of life time operating cost goes only for power / energy bill remaining is for initial cost and maintenance cost. All it requires is just a courtesy call to seek an opinion from the expert and it is nothing but self discipline as such things cannot be imposed at every level by any procedures.

Air -conditioning has huge scope of energy saving just by doing several small things which neither cost any money nor have any negative impact on our comfort level. One can very easily save 50W equivalent power on daily basis who uses air conditioner either at home or in office.

Fuel

How often do we think what is the distance a vehicle can move with just 10 ml fuel? Most of us either use own vehicle, i.e. two wheeler or four wheeler, or public transport system on our daily life. A two wheeler may move 400 – 500M or a four wheeler may move about 100 – 150M with 10 ml fuel. Do we ever evaluate our driving style and skills? If we do then we will realize there are many rooms for improvement which will have a direct impact on fuel consumption. How many of us know the economic speed of our vehicle and how often do we follow that if at all we know the speed?

Water

Some studies have predicted that this century is going to witness conflicts and tensions in different parts of the globe due to water disputes. In my PMI Chennai Chapter training session gave a demonstration on hand wash as that is one activity we all do many times during the day. It was an eye opener for everyone present in the hall to realize that one only needs about 5ml water to wet the hands to apply soap for washing hands. How often do we think about the water that can be re-used in the kitchen when we just rinse the utensils before any usage? Do we really bother about the water level while running the washing machine? It surprises me to see many left over water bottles with water in every seminar hall that I attend. Do we really ever spare any thoughts for wasting drinking water in such manner? How many times do we bother to inform our neighbors when we see their overhead water tank overflowing? If we really think about such small incidents then it is very easy to convince ourselves that

anyone can easily save 5L water on daily basis with absolute ease. One of the participants in PMI Chennai Chapter training session met me after few days and said that he feels guilty every time he uses water since that day. It proves one point very clearly that people are unaware about many facts when we talk about energy conservation by self discipline.

Economic Impact

Let's see the impact that can be created by such so called insignificant and small savings on daily basis. Today there is more than 125 crores people in India. If only 10 crores people save just 50W equivalent power each then the daily savings at the customer end will be 5,000MW equivalent power. Similarly 10 crore people saving 5L water each will lead to 500,000KL of water. Ten crores vehicle saving 10ml equivalent fuel each on daily basis will lead to 1,000KL of fuel. It is not only the monitory savings but much more if we consider the generation cost, capacity building & time etc. Let's try and understand it from 5,000MW power savings point of view. If we consider the transmission & distribution losses and power generation efficiency & losses then to have 5,000MW power at the load end we need to generate about 10,000MW at the power plant level. If everything goes well without any kind of political and environmental difficulties then it will take about 5 – 7 years to make such capacity mega thermal power plant operational. Approximate cost to put up such power plant in today's terms could be about 45 – 50 thousand crores rupees.

Social Responsibility

Someone in the Govt. clothed with appropriate authority need to ask a simple question - what is cheap and easy - energy conservation by self discipline or spending crores of rupees to realize that saving after few years. All it needs is to spread the awareness of opportunity that each one of us have when it comes to energy conservation for the nation. Few well orchestrated campaigns in print and electronic media over a period of time can easily help India save huge amount of energy absolutely free of cost and instantly. Mother Nature has given enough for our need but not for our greed. That is what Gandhiji has said about conservation. Perhaps it is time to ask ourselves whether we are becoming greedy. We have the responsibility to hand over this beautiful world to our future generations, if not in better state then at least at the same state that we inherited from our ancestors.

Shaikh Shamsar Ali

an Ex-Indian Naval Artificer and a Graduate Marine Electrical Engineer with an MBA in marketing, having 32 years of hands-on experience in energy conservation, project management, operations and maintenance, manufacturing and marketing fields. He is BEE certified Energy Auditor & Energy Manager, PMI, USA certified Project Manager and P. Engr. from UK chapter.

Profile

application

Schneider Electric PFC APP helps reduce energy bills up to 10%

Schneider Electric, the global specialist in energy management, has announced the launch of its Power Factor Correction (PFC) App, designed to help businesses better understand and manage reactive energy to reduce energy consumption and CO_2 emissions.

Power Factor Correction is the process of managing reactive energy. In most electrical circuits, reactive energy comes from the creation of an electro-magnetic field necessary in motors and transformers. This impedes the useful electrical current and can have major economic and technical consequences.

The PFC App will use energy consumption data to provide a simple illustration of what can be achieved through effective management of reactive energy, including financial savings, emissions reductions, and the

opportunity for increased supply capacity. Businesses will then be able to act on the calculations, enabling the improvement of energy efficiency across their electrical networks. Companies can expect to see return on the investment in just one to two years, with the benefits of lower energy usage and CO_2 emissions continuing indefinitely. "If a site has high reactive energy, more current has to flow to create the same functional output, which results in higher utility bills. On top of this, the increased network losses along the distribution lines lead to an increased overall energy demand, " explains David Lewis Marketing Manager at Schneider Electric. "Our new App will enable organisations to understand usage as well as calculate the reductions in energy consumption and emissions they could achieve through Power Factor Correction. This typically ranges from between five and ten per cent of the energy bills of most organisations."

The PFC App is available now on Android and iOS, as well as via the Schneider Electric website.

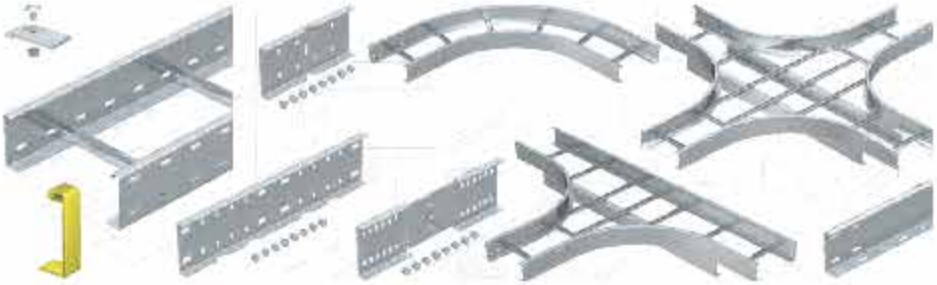
Ensuring Quality, Aesthetics, Easyness and optimizing total cost of ownership

Wide span cable support systems upto 10 meters

Wide span cable trays

Wide span cable ladders

Key accessories



Wide span systems – Features and Merits

- Supports span distance upto 10 metres
- Reduced installation and accessories costs
- Strip galvanized - EN 10327
- Hot dip Galvanized - EN ISO 1461
- SS 304 Grade
- Side height – 110, 160 and 200 mm
- Widths of 200 to 600 mm
- High load capacity with parallel wide span
- Ventilation for cables and circuits
- Side rail perforation for heights of 110 mm, 160 mm
- Wide Span cable ladder with C-profile rungs for adequate cable fitting with OBO BBS clamps.

Key application areas (Heavy and medium duty)

Any PEB building,
Tunnels, steel, cement, food, textile, railways, power stations, airports, healthcare and automobiles,etc

Compliant towards CE

Existing practice - Metallic supports are installed between steel columns and cable trays are fixed in these supports.

Wide span installation - Supports distance up to 10 meters. Fixed directly in two columns without supports in between.

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OBO BETTERMANN

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Eco Friendly LED & CFL

A Comparative Statement

LED lamps now compete with CFLs for high-efficiency house lighting. The desire to reduce electrical loading by using energy efficient lighting has resulted in a high level of interest in replacing conventional incandescent lamp with Compact Fluorescent Lamps and LED lamps. However, their high harmonic content was always a problem for the power quality of the power system networks, especially the ones with a considerable share of nonlinear loads.

Shridhar Shantaram Khule, Haridas M Kakad and Dhanshri P Birar

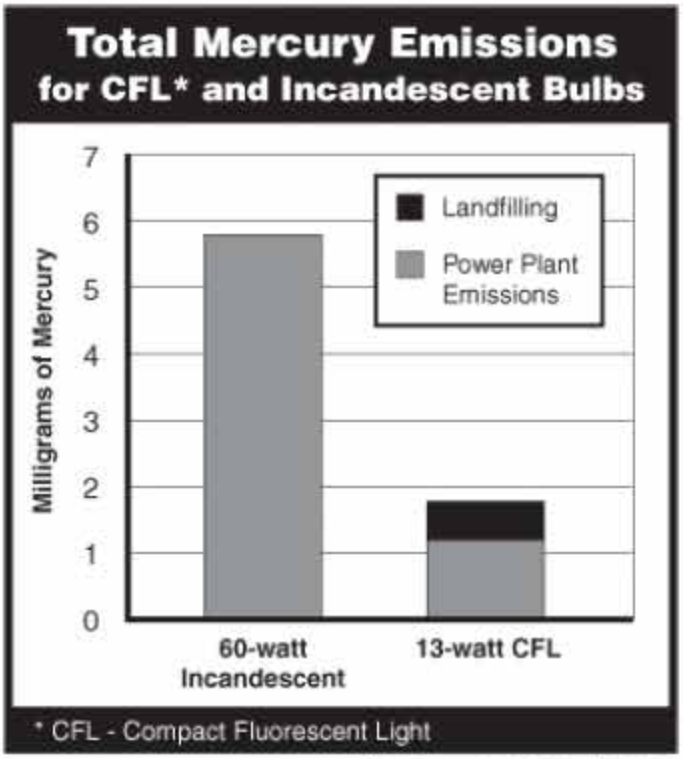
The problem of harmonics cannot be neglected in cases of installations with high lighting load. This article presents an analysis of harmonics in a network where lighting is one of the main loads. CFLs and LED lamps with electronic gear are characterized by extremely distorted current, with high total current harmonic distortions. Hence they cause a significant voltage distortion in electrical installations. A comparative analysis is performed on the power quality, maximum loading and economics of CFL lamps and LED lamps.

Greenhouse gases & LED

The heat generated by conventional electric light bulbs may have been significantly reducing the release of greenhouse gases from natural gas. If all homes switch from (incandescent) bulbs to CFLs, there would be an increase of almost 220,000 tonnes in CO_2 emissions in the province, equivalent to the annual emissions from more than 40,000 automobiles. As CFL Contains Mercury, Net mercury emissions for CFL and incandescent lamps is 0.012 mg of mercury per kilowatt-hour and 14% of CFL mercury contents escapes to environment after land fill disposal. CFLs, like all fluorescent lamps, contain mercury as vapor inside the glass tubing. Most CFLs contain 3–5 mg per bulb. As mercury is poisonous, even these small amounts contribute to air and water pollution.

According to the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) in 2008, CFLs may pose an added health risk due to the ultraviolet and blue light emitted. This radiation could aggravate symptoms in people who already suffer skin conditions that make them exceptionally sensitive to light. The light produced by some single-envelope CFLs at distances of less than 20 cm (7.9 in) could lead to ultraviolet exposures approaching the current workplace limit set to protect workers from skin and retinal damage. However, industry sources claim the UV radiation received from CFLs is too small to contribute to skin cancer and the use of double-envelope CFLs 'largely or entirely' mitigates any other risks.

An LED lamp is a light-emitting diode (LED) product that is assembled into a lamp (or light bulb) for use in lighting fixtures. LED lamps have a lifespan and electrical efficiency that is several times better than incandescent lamps, and significantly better than most fluorescent lamps, with some chips able to emit more than 100 lumens per watt.



Soure: www.energystar.gov

Like incandescent lamps and unlike most fluorescent lamps (e.g. tubes and compact fluorescent lamps or CFLs), LEDs come to full brightness without need for a warm-up time; the life of fluorescent lighting is also reduced by frequent switching on and off.

Some governments around the world have passed measures to phase out incandescent light bulbs for general lighting. The aim is to encourage the use and technological development of more energy-efficient lighting alternatives, such as Compact Fluorescent Lamp & LED lamps. Consumers are being encouraged to switch outdated incandescent bulbs to these more energy efficient alternatives. LEDs are more efficient than CFLs but the initial cost is higher so it takes longer to recoup the cost of the bulb. However LEDs last much longer-over 20 years-so they will pay for themselves many times over their lifespan. While an 11w CFL bulb costs $1.25 in bulk, an 8w LED (which produces the same number of lumens as a 40w incandescent bulb) can run anywhere from $10 (available at local hardware stores) to $20.

Environmental impact of LED lamps compared to halogen lamps

- The environmental benefits of using LED lamps to replace Halogen lamps are unquestionable.
- At least 4 times less impact on all environmental impact categories throughout its product life cycle.
- Still significantly lower than that of low voltage halogen lamps even when, extremely high halogen specs are considered.

The environmental impact calculations are corrected for flux or central beam intensity differences. The LED lamp power is doubled and life-time of the LED lamp is reduced by half (sensitivity analysis).

Why Only LEDs

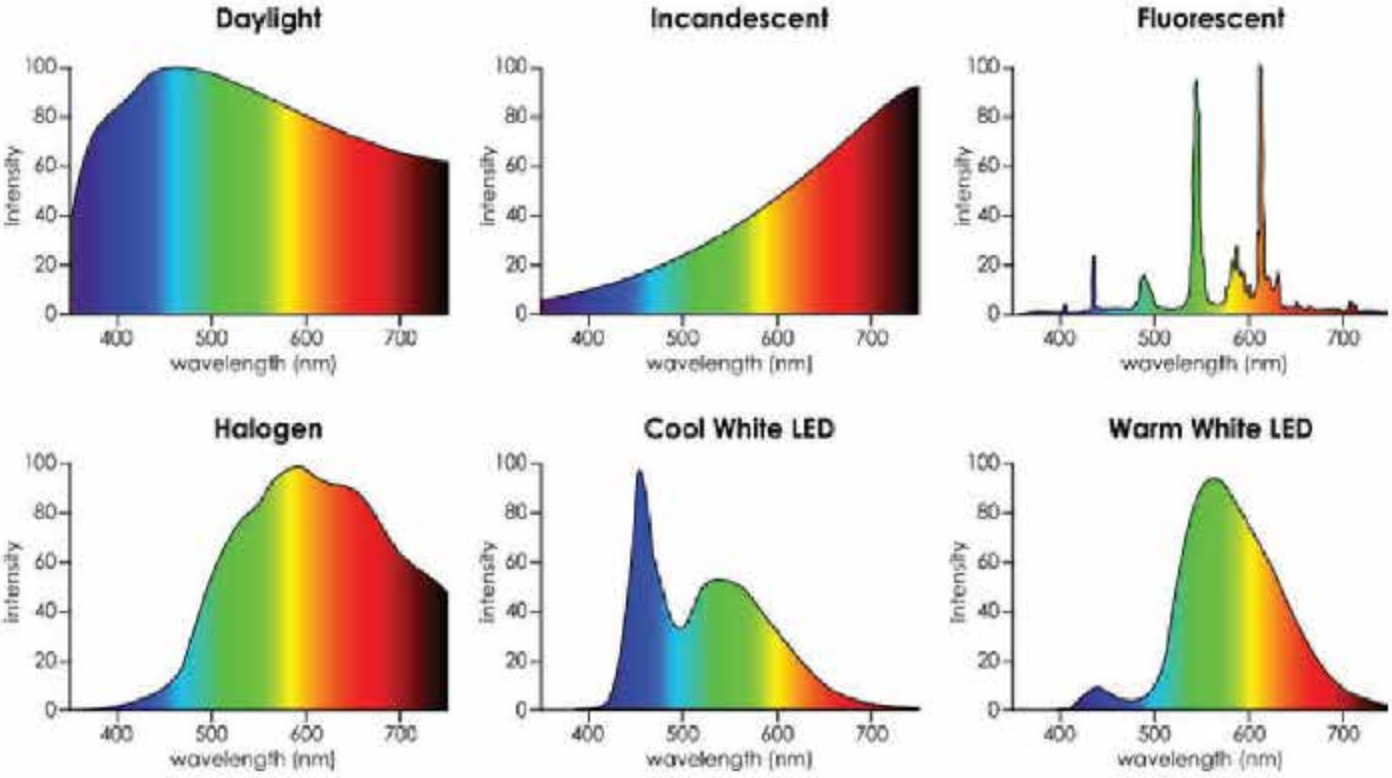
- LEDs are ideal for use in applications that are subject to frequent on-off cycling, unlike fluorescent lamps that burn out more quickly when cycled frequently, or HID lamps that require a long time before restarting.
- LEDs can very easily be dimmed or strobed.
- LEDs light up very quickly. A typical red indicator LED will achieve full brightness in microseconds.
- LEDs mostly fail by dimming over time, rather than the abrupt burn-out of incandescent bulbs.
- LEDs, being solid state components, are difficult to damage with external shock, unlike fluorescent and incandescent bulbs which are fragile.
- LEDs can be very small and are easily populated onto printed circuit boards.
- LEDs do not contain mercury, unlike CFL

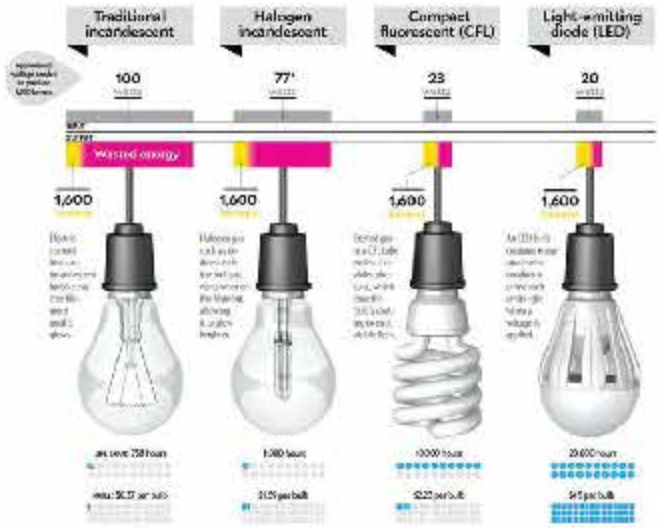
Basic advantages of LED Light

- **Energy efficient:** LED's are now capable of outputting 135 lumens/watt
- **Long Lifetime:** 50,000 hours or more if properly engineered
- **Rugged:** LED's are also called Solid State Lighting (SSL) as they are made of solid material with no filament or tube or bulb to break
- **No warm-up period:** LED's light instantly – in nanoseconds
- **Not affected by cold temperatures:** LED's "like" low temperatures and will startup even in subzero weather
- **Directional:** With LED's you can direct the light where you want it, thus no light is wasted
- **Excellent Color Rendering:** LED's do not wash out colors like other light sources such as fluorescents, making them perfect for displays and retail applications
- **Environmentally friendly:** LED's contain no mercury or other hazardous substances
- **Controllable:** LED's can be controlled for brightness and color.

Energy efficiency

Energy usage for different types of light bulbs operating at different light outputs. Points lower on the graph correspond to lower energy use Because the eye's sensitivity changes with the wavelength, the output of lamps is commonly measured in lumens, a measure of the power of light as perceived by the human eye. The luminous efficacy of lamps is the number of lumens produced for each watt of electrical power used. The luminous efficacy of a typical CFL is 50–70 lumens per watt (lm/W) and that of a typical incandescent lamp is 10–17 lm/W. Compared to a theoretical 100%-efficient lamp (680 lm/W).





Comparison Between Different Light Sources

CFL lamps have lighting efficiency ranges of 7–10%, versus 1.5–2.5% for incandescent Because of their higher efficacy, CFLs use between one-seventh and one-third of the power of equivalent incandescent lamps. Fifty to seventy percent of the world's total lighting market sales were incandescent in 2010. Replacing all inefficient lighting with CFLs would save 409 terawatt hours (TWh) per year, 2.5% of the world's electricity consumption. In the US, it is estimated that replacing all the incandescent would save 80 TWh yearly.

Since CFLs use much less energy than incandescent lamps (ILs), a phase-out of ILs would result in less carbon dioxide (CO_2) being emitted into the atmosphere. Exchanging ILs for efficient CFLs on a global scale would achieve annual CO_2 reductions of 230 Mt (million tons), more than the combined yearly CO_2 emissions of the Netherlands and Portugal.

Conclusion

LEDs are Competitive, Eco Friendly & Likely to Get Better. Conclusion is that based on eco-friendly, life-cycle assessments and competitiveness, LEDs are about as energy efficient as CFLs as far as their whole life-cycle is concerned. But that seems likely to change, since LED lighting technology is still growing and improving its own performance day-by-day.

Profile

Shridhar Shantaram Khule

Matoshri College of Engineering & Research Centre, Eklahare Near Odha, Nashik is BE Electrical, ME Electrical Power System with teaching and industrial experience. Currently he is Associate Professor and Head of Electrical Engineering Department.

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Go Green

with LED Lights

Green technology has a very positive impact on the environment and it is very cost effective. The rise of environment friendly technologies is closely linked to the resource-conscious mindset that has emerged since the global oil crisis of the 1970s. In achieving the strategy for sustainable growth objectives, environment friendly technologies and energy efficiency will be a key as they apply cutting edge knowledge & non-technological innovations to improve existing products, processes & business models.

Nikhil Malhotra

LED lights are the most energy efficient and eco-friendly by nature. The field of lighting has witnessed dramatic technology developments in the past few decades, especially in the sub-fields of solid state lighting and other energy efficient lighting technologies. India's demand for energy is forecast to grow exponentially in line with India's urbanization over the coming decades. Industries are rapidly embracing energy efficiency as the key to increasing their energy security and improving their economic productivity and competitiveness. The usage of electricity is increasing day-by-day to meet growing energy demands. These days energy efficiency assumes greater importance because it is most economical and reliable way of meeting the particular global local climate change. Hence utilization of energy for productive lighting is important and happens to be an important portion of the modern society. Today, energy efficiency is at the forefront of our company policy. Concern about global climate change and the environment has brought the issue of energy efficiency front, GlacialTech is more focusing on producing high energy efficient products which have low energy loss and high efficiency for instance we have LED Drivers which have efficiency higher than 90-95% like our LS series and RS series, these models are with higher efficiency and minimal loss of energy, this helps lamps to perform better & the total lighting system efficacy increases.

LED lights are multilayered semi-conductive materials forming lattice that allow nano phosphors to stick on the surface through a process called solid adsorption. The LEDs are pollution free and provide viable lighting option. LED Lights have super long life span of up to 80,000 hours and have no filaments so it can withstand a greater intensity of vibration and shock than standard lights making them durable with less risk of breaking and need to replace. LED Lights will start at full brightness, instantly; every time; therefore there is no need for backup lighting and they are also an eco-friendly form of lighting as they do not contain mercury or other harmful gasses.

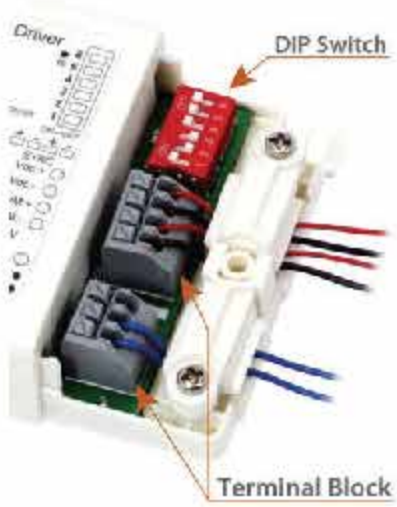
When we talk about the benefits of LED lights, the first thing that comes to our mind is the longer life-span, more durability, no hazardous materials to clean up if you break one etc. The long operational life time span mentioned above means also that one LED light bulb can save material and production of 25 incandescent light bulbs. These lights are ecological-friendly as they are free of toxic chemicals. Most conventional fluorescent lighting bulbs contain a multitude of materials like e.g. mercury that are dangerous for the environment. LEDs are extremely durable and built with sturdy components that are highly rugged and can withstand even the roughest conditions. As they are resistant to shock, vibrations and external impacts, they make great outdoor lighting systems for rough conditions and exposure to weather, wind, rain or even external vandalism, traffic related public exposure and construction or manufacturing sites.

LED's are currently a very well known trend in the lighting business, but the industry is experiencing a high number of players and it is very competitive. Therefore it is not easy to gain new business prospects, especially for the SME's like Glacial Light. So our approach is to offer more functional lighting solutions by improvising the technical background in our product line, offering high-end and eco-friendly lighting with higher wattage, and strengthening our marketing strategies. GlacialTech recently comes up with innovative products of LED Lights in market:

- **Thermal Heat Sinks:** GlacialTech is currently developing cold forging technology for LED thermal modules. Cold forging produces heat sinks that have better heat dissipation than die-casting and aluminum extrusion. Using AA1070 aluminum, thermal conductivity can be improved 2.36x compared to die casting from 96.2 W/mK to 227 W/mK. GlacialTech's unique copper/aluminum cold forging seamless joining technology greatly enhances thermal conduction and reliability when copper is embedded to make sure the two materials are joined together seamlessly during the manufacturing process. The two materials work together to improve heatsink performance. The copper component conducts heat quickly from the bottom to the entire transverse surface. The high thermal conductivity of the aluminum fins lets heat dissipate quickly. GlacialTech's new copper/aluminum cold forging technology is the most cost effective and lightweight thermal solution when space is at a premium.
- **DALI Interface Converter with PWM and DC Output:** GlacialLight, a division of the Taiwanese technology manufacturer GlacialTech Inc., introduced the GL-DA02 DALI interface converter to its product lineup. As an open standard, DALI is

internally recognized as the premier new lighting control interface and is cross-compatible across lighting components from different manufacturers. Highly scalable, it simplifies wiring compared to conventional lighting control systems, making installation easier and reducing maintenance costs. DALI can not only control lighting but also monitor it, allowing for intelligent lighting systems that maximize service life and save energy. Compared to legacy solutions, a DALI network is more precise and allows fine grain control over the individual components in a complete lighting system. GlacialLight's DALI Interface Convertor is fully IEC62386 (102, 206) compliant. Taking a digital DALI signal, it can output either PWM, 0-10V DC, or 1-10V DC signals and is suitable for controlling 3-in-1 (DC/PWM/Resistor) LED drivers. Dimming can be set on a linear or logarithmic curve. With a built-in relay, devices down the line can be turned off completely, giving complete lighting control and reducing energy costs. As an indoor digital lighting control system, the GL-DA02 convertor is well suited for applications including office buildings, conference rooms, factories, and intelligent home lighting.

- **GP-LC7028-Q5D:** GlacialPower, a division of technology manufacturer GlacialTech, announces today a new dual-mode LED driver powering LED lighting from 7W to 20W. Featuring either constant current or constant voltage operation, the LED driver mode and power output can be easily adjusted to fit a variety of lighting and signage applications. Power input and output lines are connected via robust and easy-to-use clips.



- **2-in-1:** The GP-LC7028 LED driver is two LED Drivers in one, with easy DIP switch configuration to either constant current or constant voltage mode for enhanced functionality. It can be easily customized to specific LED lighting needs with 8 modes of constant current operation from 250mA to 700mA, and constant voltage modes from 12V, 24V and 28V output available. For constant current mode with 1-10V dimming and push dimming can also easily be enabled with a dimmer.
- **GP-LC Series:** GlacialPower, a division of Taiwanese technology manufacturer GlacialTech, announces two new wall mount LED adapters for desk lamps, floor lamps, strip lighting and other indoor lighting applications under 9 watts. The 8W GP-LC3536-0A and the 9W GP-LC7021-0A are compact wall mount power supplies providing constant current for LED lighting. These fully-isolated LED adapters feature a compact two-prong design with Overload Protection (OLP) and Short Circuit Protection (SCP).
- **Universally Compatible:** GlacialPower's GP-LC LED adapters are worldwide compatible, with universal AC input from 90 to 264V AC power accepted. Input plug adapters can be customized to US or EU electrical outlet standards. The power supply output plug to the device can be selected by the customer to suit their needs.
- **Low Bay Lights GL-BL50:** GlacialLight, the lighting division of GlacialTech Inc., is introducing the Arcturus series of GL-BL50 Low Bay Lights. These dimmable 50 watt LED low bay lights come in three colors, and an artistic design making them suited for a variety of indoor environments. Shopping malls, restaurants, offices and even homes can all benefit from the even lighting and contemporary styling of the GL-BL50. The GL-BL50 is compatible with international mains voltage from 100-240V and comes in a variety of configurations for almost any indoor environment. A choice of 3 color temperature options are available– Warm White(3000K), Neutral White(4000K), and Cool White(5000K). The GL-BL50 can be hanged with a pendant rod, cable, or chain type installation. IP54 rating means it's tough enough for restaurant, garage, or kitchen use. And, we hope to see better results for the coming year ahead.

Profile

Nikhil Malhotra

Regional Sales Manager of GlacialTech Inc., Taiwan, handles India Subcontinent and Middle east market for GlacialTech. He has focused interest in LED power supply, Indoor and Outdoor LED Lighting Technologies and providing customer service excellence and focused environment. He is Masters in Technology Management from Taiwan's famous National Chung Hsing University and having a good mandarin language skill.

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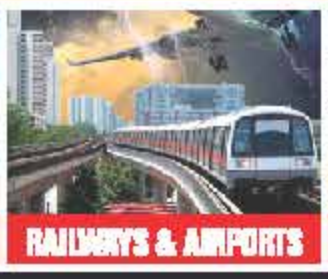
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'Act'-ing on Energy Conservation now is our collective responsibility

Energy conservation Initiatives and the Implementation Measures is the collective responsibility of the Govt and the Industry. First the Govt needs to promote the ECON Initiatives to the industry & society by mandatory approach now and that is the need of the hour. All along, the Govt thro BEE was suggesting only, the ECON measures to the industry. The same Govt through BEE had thrust five star ratings of gadgets in the domestic & commercial segment and the point is driven home already.

Ashok Sethuraman

But compared to domestic & commercial segment energy consumption, the industry is a Energy Guzzler. But the Govt till date, has promoted ECON measures for namesake only. If the same is enforced on the industry, then the industry also will take up the ECON issue practically and achieve the energy reduction year after year through ECON & Energy Efficiency measures through Energy Audit route. Also the industry needs to showcase in detail, their value added ECON & energy efficiency measures in their Company Annual Reporting.

How the Industry Views the Energy Audit Program

We are surprised at the slack approach of some industries towards energy audit. The big industries do conduct energy audit program for the whole year. That is, they give a call to many energy audit firms in the First quarter starting April. In the second quarter they will discuss with all the energy auditors about the percentage of savings achievable before conducting the audit. i.e. the auditor is supposed to give % reduction in their energy bill by first conducting a preliminary random energy survey. In the third quarter, the process of issuing a work order to the energy auditor happens. In the fourth quarter only, the energy audit will be completed and the post energy audit discussions will take place before the end of March. So one financial year is gone in between just to complete the energy audit formality.

In the next year, the industry plans to implement the zero & low cost energy conservation measures. The same industry will do the paper workings on high cost energy conservation measures for the whole year discussing with the Retrofit vendors related to energy and process segments. Now in the second year after energy audit, the industry will decide to put money on the high cost proposals.

Industry Waits for Energy Conservation to Happen to them

Let us study the statistics of HT electricity consumers in all the States, to know how many industries have done at all energy audit in the last FIVE or TEN years and if at all done, the frequency between any two energy audits will be more than five years. How many of the

The industry top management feels why they should try first, when others in the segment have not attempted energy audit route to energy conservation

industries feel that the energy audit will be definitely helping them to trace their breakdown of energy consumption and find out the amount of energy losses draining silently visibly less first and invisibly more next.

First of all, how many industries are in possession of portable clamp on Power Analyzer costing Rs.10,000 to measure the breakup of electricity consumption. They talk for many years about buying Hi End Power quality Analyser for Rs.2 Lakhs Plus and till date have not even purchased still. Also they are not aware of Infrared Thermal Imager costing Rs.50,000 & Less to measure and reduce the Hot Spots in Electrical and in the Process & utility as a part of Predictive Energy Monitoring. Apart from EB meter, no other KWH meter costing Rs.2000 plus exists in the industry to monitor the consumption.

Industry groups normally don't take initiative to proceed on the energy conservation proposals. Unless the industry receives the FIR about the Energy Saver product & its first workings, the industry will not try the energy saving gadget/retrofit. There is no point in trying energy saver at any machine in the industry unless the same industry has a in-situ KWH meter or portable Power meter to measure the electricity consumption before & after installing the retrofit device or fine tuning the same.

Here we must state the energy conservation device vendors including the MNC over-charge the industry due to the delayed response & acceptance from the industry, when their ECON saver is introduced. Take the case study of LED tubelight sold for Rs.6000 few years back, is now available for less than Rs.1000 that too on BOOT basis.

Here many industries are avoiding the Servo stabilizer for the lighting circuit because the management feels that their transformer is already voltage regulated by the with OLTC retrofit and that they don't need the Servo. Now the lighting circuit must be fitted with servo stabilizer (because of their Fast response in voltage correction in seconds), along with Surge Protection Device to avoid Switching Surges to the lighting soft loads. Many industries have gone for bulk purchase of 1000s of LED tubelights. But in each year around 50 no LED tubelights fail due to the above reasons. Having invested in Million Rs in LED lighting, the industry postpones to spend within a Lakh Rs towards the above incoming protections.

In the industry Electrical networks, HT switching, power electronic drives, non linear active loads working etc, target to attack the weak spots in lighting distribution and other soft electronic loads and hence SPD are becoming mandatory in many of the sophisticated equipment incoming side. The image shows that monthly failures of tubelights in a textile mill and after putting the stabilizer, the failures came down drastically. Similarly, we come across many branded motors IE3, IE 2 versions taken on trial basis; from the motor vendors are running for many months in the industry. A week study before and after can be extrapolated to study the new motor efficiency compared to the decade-old-few-times-rewound motor running in the industry. But still, industries have not initiated replacing their existing motors.

Why Industry Needs a Liason to Interact with Energy Auditor?

Even today, the big Industries, with thousands of Crores turnover, still show in their Annual Reports; the most common ECON measures year after year; the Power Factor Improvements, or the compressor leakage losses arrest, or changing their T 12, T 8, or T5 to LED tube lights. The industry which talks of energy conservation in lighting etc, constant Watt loads even today does not

show value addition in their ECON measures achieved through energy audit route.

If they had not done still, the practice now is that an ISO Auditor will suggest the industry to change the light fittings and they also religiously follow his words. We observe many industries are acting obediently to their new 5S implementation team. They are trying to showcase the improvements to others by this 5S activity and we want the same enthusiasm to be given to the ECON implementation through Energy Audit route.

The industry does not need an ISO Auditor or Cost Auditor to show them that the industry is losing internally due to energy losses. Presently, the Finance/ERP/IT related auditors do tell the industry about the abnormal variation in specific power consumption in full/ lean production schedules.

One to one correspondence of industry management to Energy auditor in the energy conservation is very much essential. Here, Finance auditor, A grade Electrical contractor or a Process Expert etc, do the liasoning. On the contrary, all of the above to work in unison like a team to achieve energy conservation. But this is possible only in the case of industry Management taking the initiative to approach the energy auditor directly & transparently.

Govt to Promote Star Rated Equipments to the Industry

- World Bank was planning to fund to Indian Project in 2013, 50 Million $ towards promoting BLDC ceiling fans instead of conventional fans. When they care for our energy efficiency, what we in our country, can do together to reduce the ceiling fan landed cost to the consumer. But unfortunately the Less star rated fan costs Rs.1000 plus sells more than branded 5 Star fan which costs Rs.2000 plus. Above all this, the latest BLDC fan costs around Rs.5000.
- The vast price difference between 1 star to 5 Star plus rated fan is Rs.1000 to Rs.5000 for a ceiling fan shows the need for the Govt to minimize the taxes on 5 Star rated gadgets, appliances and Energy saving devices and equipments to the industry.
- For the sake of Electricity saving and safety, the Govt can mandate the industry and commercial establishments to use Servo stabilizers for the Lighting loads to regulate the lighting voltages precisely.
- For the sake of LPG saving and safety, the Govt can approve & mandate the domestic cylinder user to use Two stage LPG regulator cum Gas Fuse device for LPG cylinders and this will help to save Rs.5000 Crores Annually by curtailing the domestic subsidized cylinder quantity from 12 to 9.
- For the sake of reducing the Link Electricity losses and safety against excess motor current, the Govt can mandate the capacitor to be fixed at or near to the motor end for any motor above 3 HP running without any VFD drives. The Agriculture sector has understood this because this retrofit had been mandated by the authorities.
- For the sake of reducing the motor to load Belt Link losses & production improvements, the Govt can mandate the motor to machine linkages through Raw Cogged Edge belts instead of conventional V belts.
- For the sake of safety and comfort to the industrial sheds, the Govt can make the turbo vents to be installed on all the industry roofs to improve the attic ventilation and especially in their utility areas like DG sheds, compressor house & canteens etc.
- For the sake of safety during electricity switching line surges, the Govt can mandate the Surge Protection Devices at the Industry Incoming, Lighting distribution boards etc.

Govt Initiatives is the First and Fore Most Prequisite

Till now the pro-active industry which thinks itself that it is losing energy in the process between the end to end say from raw material to finished product, are into energy conservation actively. But for the typical Indian industry, unless the Govt mandates this annual energy conservation plan, the industry will not implement this voluntarily. The industry top management feels why they should try first, when others in the segment have not attempted energy audit route to energy conservation. They feel that these ECON procedures are to be done for namesake and do not attach any weightage. Atleast from now, the Govt must bring to books, the energy intake by the individual HT industry, the breakup of energy consumption and target on reducing the same.

Profile

Ashok Sathuraman

BEE Accredited Energy Auditor has 35 years of Field Experience in India and Abroad. He conducts Energy Audits under POWERON Projects Coimbatore. He writes & publishes energy articles in national magazines.

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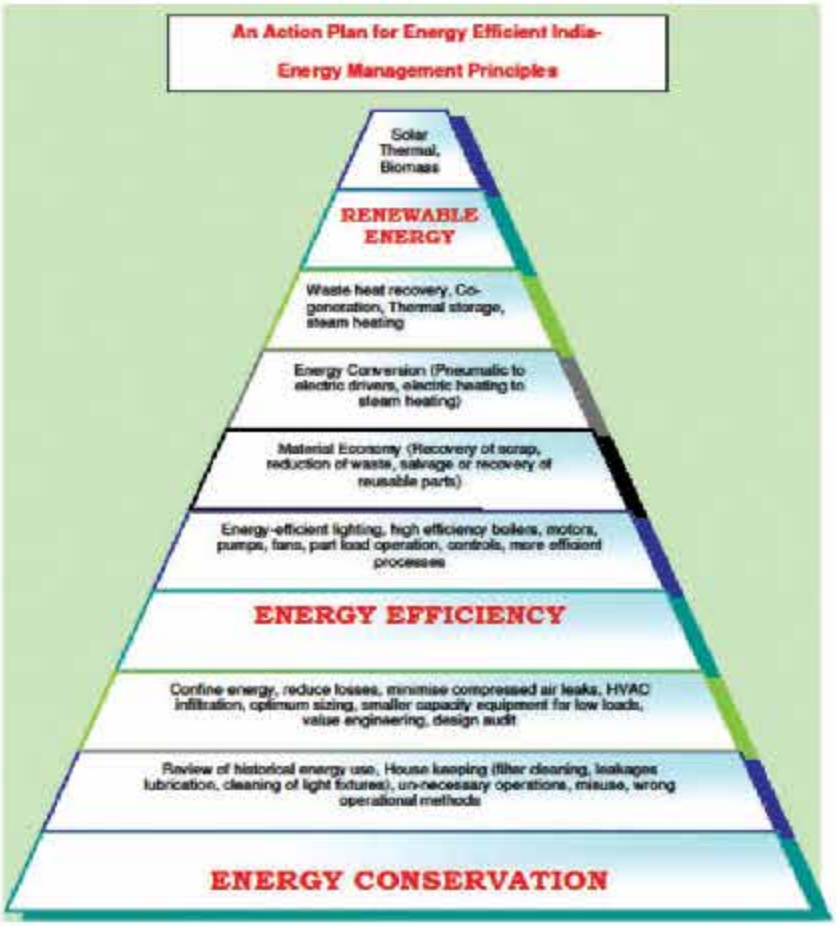

Fig. 3: The Energy Pyramid for Industries

Energy Pyramid and other concepts for appropriate application of Renewable Energy

The Energy Pyramid helps us fix priorities and action plans. It interlinks the roles of energy conservation, efficiency and renewable energy to minimize the dependence on fossil fuels. It also helps in our understanding of conservation and efficiency. 'Conservation' and 'Efficiency' are separate concepts although closely related.

S K Sood

Energy Efficiency is making something that does the same function, but uses less energy, for example a BEE 5 star rated refrigerator consumes less energy than a 1 star refrigerator. Energy conservation requires being modest and smart in use of appliances, gadgets and equipment consuming energy to the desired levels as per the need.

It is possible to use an inefficient appliance/equipment intelligently and smartly to reduce energy consumption; while at the same time an efficient appliance can be used carelessly to actually increase the overall energy consumption. Conservation techniques require productive use of resources and the ability to do something well or achieve a desired result without wasted energy or efforts. Energy conservation and Energy efficiency are presently the most powerful tools to realize our dream of 'Energy Independence'. As depicted in Fig.1, if we have to switch over entirely to renewable energy in future, (A mix of Hydel, Wind, Biomass, and Solar etc.) then we must build it on 'Conservation' techniques and 'Efficiency' as the foundation blocks. 'Unlimited Renewable Energy' is just a wishful thinking. Whatever form of energy we use today, or tomorrow; it has to have the support and backing of "Conservation' and 'Efficiency'. This concept has been explained with the help of an 'Energy Pyramid' (Fig.1). The applications of the this concept in our homes and industries has been shown in Fig.2 and Fig.3.

Net Energy Gain

Net Energy Gain (NEG) is a concept used in energy economics that refers to the difference between the energy expended to harvest an energy source and the amount of

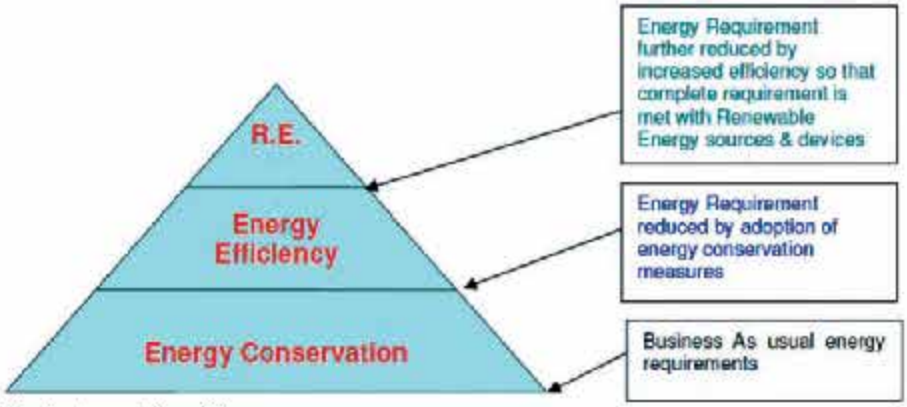

Fig. 1: Energy Pyramid

energy gained from that harvest. The net energy gain, which can be expressed in joules, differs from the net financial gain that may result from the energy harvesting process, in that various sources of energy (e.g. natural gas, coal, etc.) can be priced differently for the same amount of energy.

Example: During the 1920s, 50 barrels (7.9 m3) of crude oil were extracted for every barrel of crude used in the extraction and refining process. Today only 5 barrels (0.79 m3) are harvested for every barrel used. When the net energy gain of an energy source reaches zero, then the source is no longer contributing energy to an economy.

Calculating NEG

A net energy gain is achieved by expending less energy acquiring a source of energy than is contained in the source to be consumed. That is,

Factors to consider when calculating NEG is the type of energy, the way energy is used and acquired, and the methods used to store or transport the energy. It is also possible to overcomplicate the equation by an infinite number of externalities and inefficiencies that may be present during the energy harvesting process.

The term net energy gain can be used in slightly different ways:

- **Non-sustainable:** The usual definition of net energy gain compares the energy required to extract energy (that is, to find it, remove it from the ground, refine it, and ship it to the energy user) with the amount of energy produced and transmitted to a user from some (typically underground) energy resource. To better understand this, assume an economy has a certain amount of finite oil reserves that are still underground, un-extracted. To get to that energy, some of the extracted oil needs to be consumed in the extraction process to run the engines driving the pumps, therefore after extraction the net energy produced will be less than the amount of energy in the ground before extraction, because some had to be used up. The extraction energy can be viewed in one of two ways: profitable extractable (NEG>0) or non-profitable extractable (NEG<0). For instance, in the Athabasca Oil Sands, the highly diffuse nature of the tar sands and low price of crude oil rendered them uneconomical to mine until the late 1950s (NEG<0). Since then, the price of oil has risen and a new steam extraction technique has been developed, allowing the sands to become the largest oil provider in Alberta (NEG>0).
- **Sustainable:** The situation is different with sustainable energy sources, such as hydroelectric, wind, solar, and geothermal energy sources, because there is no bulk reserve to account for (other than the Sun's lifetime), but the energy continuously trickles, so only the energy required for extraction is considered.

In all energy extraction cases, the life cycle of the energy-extraction device is crucial for the NEG-ratio. If an extraction device is defunct after 10 years, its NEG will be significantly lower than if it operates for 30 years. Therefore, the energy payback time (sometimes referred to as energy amortization) can be used instead, which is the time, usually given in years, a plant must operate until the running NEG becomes positive (i.e. until the amount of energy needed for the plant infrastructure has been harvested from the plant).

For photovoltaic cells, the NEG of their production depends on the operating lifetime, and the amount of sunlight available in the operating location. Today the break-even energy payback time (the amount of time required to produce an amount of energy equal to that originally used to manufacture the array) is around one to four years, compared to an effective production life of over 20 to 30 years (e.g. many manufacturers now provide a 25-year warranty on their products). However, the NEG of Solar PV systems may become negative if the actual life is considerably less or the application is wrong and the system is not installed and operated properly.

Embodied Energy

Embodied Energy is the sum of all the energy required to produce goods or services, considered as if that energy was incorporated or 'embodied' in the product itself. The concept can be useful in determining the effectiveness of energy-producing or energy-saving devices (does the device produce or save more energy that it took to make it?), of buildings, and, because energy-inputs usually entail greenhouse gas emissions, in deciding whether a product contributes to or mitigates global warming. Embodied energy is an accounting method which aims to find the sum total of the energy necessary for an entire product life-cycle. Determining what constitutes this life-cycle includes assessing the relevance and extent of energy into raw material extraction, transport, manufacture, assembly, installation, dis-assembly, deconstruction and/or decomposition as well as human and secondary resources. Different methodologies produce different understandings of the scale and scope of application and the type of energy embodied.

Energy Cannibalism

Energy cannibalism refers to an effect where rapid growth of an entire energy

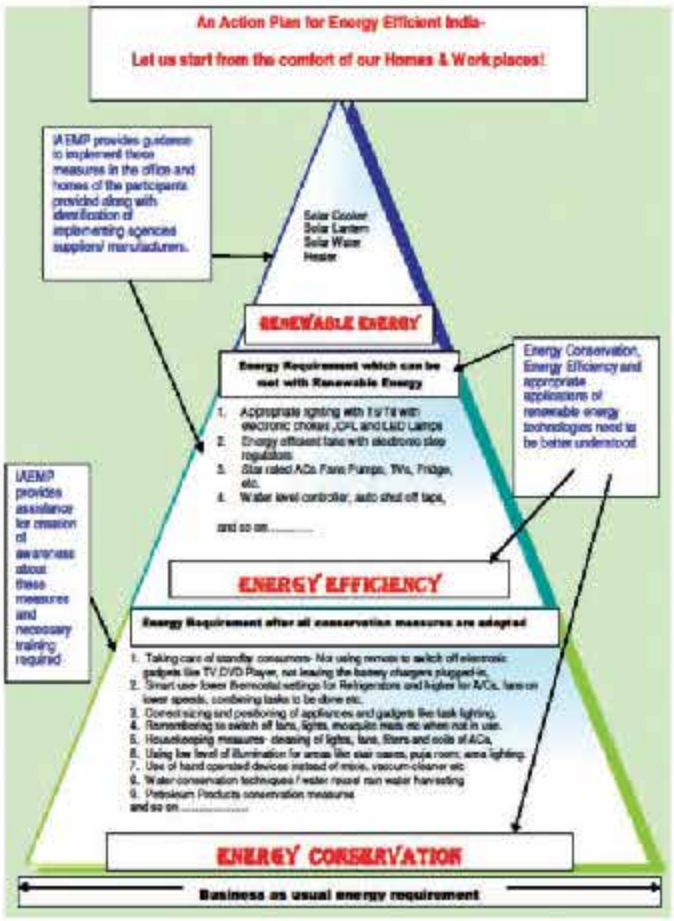

Fig. 2: The Energy Pyramid for Homes

producing industry creates a need for energy that uses (or cannibalizes) the energy of existing power plants. Thus during rapid growth the industry as a whole produces no energy because new energy is used to fuel the embodied energy of future power plants.

Energy cannibalism in this context is also true of any other energy source such as wind power, solar power, etc.

Energy payback time (EPBT)

EPBT is the time in which the energy input during the life-cycle of an energy generating system like Solar PV. Wind etc, is compensated by electricity generated by the same system.

EPBT = Einput / (Eoutput /year)

Energy Return on Energy Investment

Energy Return on Energy Investment (EROEI) is the ratio of energy delivered by an energy technology to the energy invested to set the technology up.

Energy Yield Ratio (EYR)

EYR means how many times the energy invested is returned or paid back by the system in its entire life.

EYR = Eoutput in lifetime / Einput

Energy Yield Ratio of a system shall be calculated when reliable data about system lifetime and system degradation become available (Performance project)

Energy Yield Ratio is a better metric for comparisons because it is based on lifetime energy output

Rebound Effect

In conservation and energy economics, the rebound effect (or take-back effect) refers to the behavioral or other systemic responses to the introduction of new technologies that increase the efficiency of resource use. These responses tend to offset the beneficial effects of the new technology or other measures taken. While the literature on the rebound effect generally focuses on the effect of technological improvements on energy consumption, the theory can also be applied to the use of any natural resource or other input, such as labor. The rebound effect is generally expressed as a ratio of the lost benefit compared to the expected environmental benefit when holding consumption constant. For instance, if a 5% improvement in vehicle fuel efficiency results in only a 2% drop in fuel use, there is a 60% rebound effect (since (5-2)/5 = 60%). The 'missing' 3% might have been consumed by driving faster or further than before.

The existence of the rebound effect is uncontroversial. However, debate continues as to the size and importance of the effect in real world situations. There are three possible outcomes regarding the size of the rebound effect:

- The actual resource savings are higher than expected – the rebound effect is negative. This will normally occur if the government mandates the use of more resource efficient technologies that are also more costly to use, but not if the increase in efficiency reduces costs
- The actual savings are less than expected savings – the rebound effect is between 0% and 100%. This is sometimes known as 'take-back', and is the most common result of empirical studies on individual markets.
- The actual resource savings are negative – the rebound effect is higher than 100%. This situation is commonly known as the 'Jevons paradox', and is sometimes referred to as 'back-fire'.

Profile

Sunil Kumar Sood

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Is an Energy Conservation lead to more Green Energy Production

In today's world, we depend on energy for almost everything. We wish to make our lives comfortable, enjoyable and energy is playing a vital role to achieve this. But approximately 85% of energy today we get comes from fossil fuels and they are reaching to an extinction level. Generation of electricity from fossil fuels also leads to release of high levels of carbon dioxide which is increasing greenhouse effect. There are two possible ways to tackle the problem of energy crises.

Vivek Pal & Anuradha Tomar

First is to generate energy from Renewable/Alternate Energy resources and second is to utilize the already produced energy in the most optimum manner. So to prevent temperature rise of earth and energy crisis, we have started using various renewable energy resources e.g. solar, wind, ocean energy, bioelectricity etc, and researches are made to harness the electricity from these sources easily and effectively. Second solution leads to the issue of Energy Conservation. In other words, Conservation of Electricity is almost equal to its production. Proper awareness and implementation of Energy conservation solutions leads to reduce the energy demand.

Like food air and water, now energy is one of the basic need of humans to survive on this earth. From the beginning of the energy era we are using non-renewable energy resources for the generation of energy but now they are reaching to an extinction level. The fossil fuels, which we depend on to power our cities, will run out sooner than many of us realize. At the same time, our energy consumption is also drastically affecting the planets climate patterns. Now CO_2 is produced vigorously which is affecting earth's climate and the effect can be seen as major floods, rise in sea levels, exposure to higher levels of UV light resulting skin cancer, extinction of animals and

plant species. Now it's impossible to ignore the headlines telling us to do our bit for the environment, that's why we are switching from non-renewable energy resources to renewable or alternative energy resources. Here are some of the unique energy saving and producing concepts that are going to help us to protect our environment and solving the problem of energy crisis.

Kymogen Wave Energy Generator

To use the energy from the oceanic waves in earlier days we have to build up large sized dams that contain the large sized turbines. These dams need large construction work and human labor to operate it. Now a days we can use the energy generated from oceanic waves via simple equipment. Such equipment is called "Kymogen Wave Generator" and is designed by the mechanical engineer David Hartmann and craftsman Jasonballash. This kymogen wave generator consists of portable 8'x8' platform which is tethered to a mooring on the sea floor. It has a system which spins flywheel when the wave rise has a system which spins flywheel when the wave rise and falls. This provides constant power between the waves. According to the observations performed Kymogen is able to generate 2 hp from a 12 inch wave while it generates 8 hp from 4 foot wave on an average Kymogen generates 25-100 Kwh per day.

Power Electronics Role in Saving Energy

In earlier days silicon was used in manufacturing the power electronics and computer equipment. They were not very efficient and were also consuming large energy. But now days in era of modernization, new inventions are taking place with time. Now because of hard work done by the researchers silicon carbide came into existence which is withstanding 8 times higher voltage than the pure silicon . The current through the silicon carbide flows100 times more freely than silicon. The thermal conductivity of silicon carbide is far better than gold and the current leakage problem is 16 times less in magnitude than silicon. These characteristics have improved the ability of silicon devices to help save energy.

> ***Scientists claim that they can produce 0.5 GW energy at a cost of $2.5 per GW***

E.g. Sic dram is a computer memory chip. It holds its charge for about 100 years. Sic Schottky diodes, run 10 times faster than the normal diodes made up of silicon and they occupy 1/10th space than the silicon circuit. Sic material is also used in the led's and ultra fast diodes.

Endothermic Energy Saving Glasstiles

Energy saving glass tiles is gaining very popularity now days. These glass tiles are developed by the Swedish company and these are very efficient than the traditional solar water heater which converts solar energy to heat energy and warms the water. These tiles are mounted on the roof of the houses and they heat the circulating water. These are very efficient in the sense that these tiles does not absorbs any form of energy or heat, while the black nylon laying under it absorbs the heat energy during sunshine and hence increases the temperature rise of air nearby to heat water within glass tiles which is entering into the room heating systems. These tiles are very popular in Sweden and other regions. According to the observations performed these glass tiles on average produce 350 Kwh heat energy in 1 square meter area under the normal conditions.

Algae Cells

Researchers have made their efforts towards producing energy from the biological things to solve the problem of energy crisis in future. The energy produced from the biological things is 100% pure and green energy with no harmful or unwanted by products or harmful gases. Scientists are producing energy from the algae cells. Basically what happens naturally is that when the sunrays fall on leaves and reach chloroplasts the electrons get excited and attain higher state of energy level. In this production of energy from the algae cells, we will use these excited electrons. Engineers put gold electrodes inside the chloroplasts of algae cells and hence these excited electrons are intercepted. These electrons are tapped to create tiny electrical current. It's beginning of bioelectricity.

Solar Power in Space

Companies are undertaking project in which they have to design and develop a space based solar farm that would generate1 GW of power. The cost of this project is around $21 billion and Mitsubishi electric corporations and IHI corporations have joined their hands for this. This project will require an area of 4 square km and will consist of rows of solar panels. Various companies are investing in this idea of harnessing solar power from the space. This interest of companies is due to certain reasons that harnessing solar power form the space is 10 times more effective than harnessing it on the earth. This solar panel will be located 36000 km above the earth surface. Since there will be no nights and no weather changes hence energy will be produced all the time independent of climate and time. Along with this there will also be less wear and tear too because of lack of humidity and rain storm or friction. The expected time period of this project is 3 decades but before this japan aerospace exploration agency (JAXA) is going for a small 10 mw trial satellite which would have their solar panels and this project will complete in year 2015. This demonstration will be revealing all the difficulties arising in the way of achieving goal of 1 GW power and will also be test the system that will beam the energy from space to ground. This 10 mw prototype is prepared by institute of space and aeronautical science (ISAS), a division of JAXA. Scientists say that on the basis of current knowledge, they are going to transmit power from space to the earth via radio frequency. For this they will convert power to radio frequency and after transmission, a receiving station built on earth will again convert this radio frequency to power.

Piezo Tree

Piezo tree concept is originated in Cornell University by its researchers taking inspirations from the nature. In this tree, the movement of the leaves is responsible for generating energy. They convert wind energy to electric energy. The main constituent of the

Piezo tree is Polyvinylidene fluoride (PVDF) which is flexible piezoelectric material. When the Piezo tree faces breeze, the flexible plate and film oscillate just as a flag or leaf. The flapping motion is generated due to the instability of the aero elastic system. They have attached 1 end of Polyvinylidene fluoride (PVDF) to bluff body and left other end free. When breeze blows, 2 touches this bluff body and this leads to vortex shedding. The AC signal is obtained from the Piezo tree and is stored in the capacitor. The researchers attached a plastic film along the direction of air blow. This modification resulted in increment of power 100 times. Before this modification the Piezo tree was not even able to light up a led.

Generating Wind Energy via Kites

Scientists say that energy contained in the wind is 100 times more than the amount needed by everyone on the planet. The kite wind generator simply known as Kitegen is an Italian company. These kites are mounted on giant poles and these kites sprout from funnel like structures. When wind blows these kites come out of funnels. For each kite, winches release a pair of high-resistance cables to control direction and angle. These kites are very light and ultra-resistant. These kites are capable of flying up to a height of 2,000 meters. Basic working behind the Kitegen is that the swirling kites prompt Kitegen's core in motion, and the rotation activates large alternators producing a current. They also have a control system on autopilot. This control system manipulates the flight pattern so that maximum power can be generated be it night or day. The height of the kite can also be controlled. E.g., If the large wind is blowing at 1000 meters then this height can be set by operator operating kite. Also these kite will not pose any problems in the path of the birds since they have radar which detects any bird flying around and set its location accordingly .the cost of this technology is around $750000 and space of 100 meters will be needed to install the machinery. They don't need large farms like wind farms to generate energy. Hence they results in large amount of land saving also. Scientists claim that they can produce 0.5 GW energy at a cost of $2.5 per GW.

Reduction in Truck Fuel Consymption via Aerodynamics

Studies are being done to get the maximum output from the minimum fuel input .due to this various engines came into existence with their different abilities and fuel consumption. Now researchers found that aerodynamics can also help in reducing fuel consumption. This fuel consumption is possible due to the dramatically improved aerodynamics. It has been verified by road tests conducted by the Dutch platform for aerodynamic road transport (part) .in this method of reducing fuel consumption, a simple tapering protrusion is attached at the back of the truck. It's also called boat tail. The feasibility of this arrangement is already demonstrated by the wind tunnel experiments and computer simulations. This is also tested on public highways and the comparison of fuel consumption is done between a boat tail truck and a simple truck running for a year. The results were reduction in 7.5% of fuel consumption in case of the boat tail truck. And since fuel consumption is reduced hence the carbon dioxide emission is also reduced. Part prepared a common ground where academicians, road transport, manufacturers and transport companies huddled together to achieve a common goal.

Solar Roadways

To get the energy from the sun, solar panels are installed in the solar farms. But now researchers are trying to convert normal roads to solar roads. This will result in large space saving. A solar roadway is an Idaho based company which is trying to solve the problem of energy crisis by adapting the innovative and unique methods. They say that they can convert 25000 miles of petroleum based asphalt highways and byways of lower 48 states into solar roadways. They say they can do similar things to the stadium, malls, airports, parking lot etc. They are getting universities, research labs interested in their venture. This company is also working on 45 mile prototype. These solar roads will power homes, businesses, street lights etc. They will cut 50% greenhouse gases as explained by the researchers, solar roadways will work in a 3 layer system. The surface layer will be tough enough to bear onslaught of weather and vehicles. The upper layer will be translucent in nature and because of this it will let sunlight to pass by. While the middle layer will consist of large array of solar collecting cells or PV cells. These cells will store energy for later se. This middle layer will be fitted with microprocessor that will control lighting, communication and monitoring etc. The third base layer will distribute the power collected by the electronics layer to the units connected to the solar roadways. This project will also help in employment, generating green jobs and give a required push to the solar manufacturing industry.

Energy from Bumps in Roads

Normally people driving vehicles don't like bumps in between the path, but this invention will even make you like the bumps. The MIT undergraduates have devised a shock absorber that can smoothen your ride as well as harvest energy from bumps that will generate electricity. The shock absorber that they have designed employs a hydraulic system that forces fluid through a turbine attached to a generator. The system optimizes the damping. The students are mostly targeting those companies who operate large fleets of heavy vehicles. They have contacted U.S. Military and several truck manufacturers who are showing keen interest in this project. The manufacturers of hummers for army have also loaned them a vehicle for the testing purpose. Students so far have tested a 6-shock heavy truck, and according to observations, on an average each shock absorber produces 1kwon standard road. This power will be enough to displace large alternators load in heavy truck and military vehicles.

Gravity Light

The inventors of gravity light are martin Riddiford and Jim reeves. Gravity light generates electricity by involving gravity as its basic principle. Gravity light consists of a heavy bag and a led light connected with string looped over a dynamo. To make it work, the user have to raise the bag and as it comes down, it activates the dynamo because of force of gravity and generates electricity and lights up led. This energy is 100% clean and

pure without any harmful by products and can be best solution for powerless masses in remote corners of our country and world. According to the observations, inventor claims that lifting the weight once can create enough electricity to power a room for 30 minutes. This will not have any running cost once purchased, and its cost price is around $5 or Rs 300, and this will be available commercially from next year onwards.

Citylight Cconcept

People going to gym actually waste their energy completely into nothing. Here is an innovative design in which the exercise equipment that are used in gyms are attached to the street lights or other lights and these lights uses the kinetic energy created by the people doing workout. This energizes led lamp. This is a very good concept and is very helpful. By doing work out here, they are actually using their energy to create electrical energy along with their workout.

Conclusion

Various green technologies came into existence and countries are adopting these green technologies to generate energy and prevent the temperature rise of earth and reduce the carbon footprint. Now energy star labeled products are used in the offices and rule of 3 Rs i.e. reduce, recycle and reuse is also being adopted. Now more and more companies, universities and research and development organizations are investing in the green technologies. This means that people are now aware of what they have done to the environment and are trying to make up for that loss. But there is a intense need to aware people more to about Energy Conservation in day to day life usage as less effort is till now put in this area. More focus these days is how to produce more green energy. As producing more without proper utilization will not make a proper sense and that will ultimately leads to wastage of all efforts carried for production of green energy.

Profile

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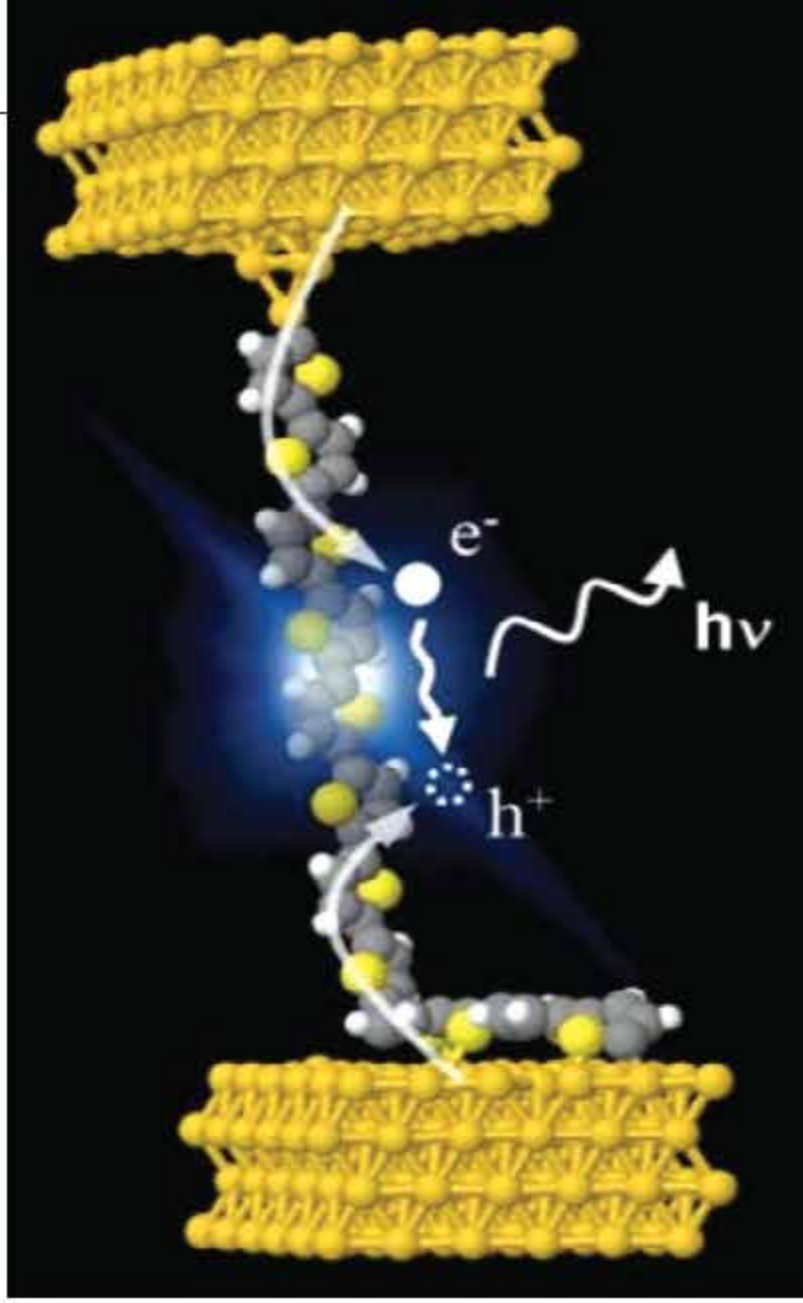
Single Molecule Light Bulb



In general concept, a light bulb or electric light or electric lamp is a device that produces light from electricity. In addition to lighting a dark space, they can be used to show an electronic device is on, to direct traffic, for heat, and many other purposes. Improved vacuum pumps and better materials made them shine longer and brighter late in the century.

Dr S S Verma

Electric generator stations brought electricity to urban & later rural areas to power them. Later gas discharge lights including fluorescent lights use less electricity to make more light. Energy demand with its rising cost and environmental consciousness have motivated inventors & users to look for green yet environmental friendly lighting products and many First Single-molecule LED people have already changed their house lighting system, from the compact fluorescent lights to the energy-efficient LEDs lights. The LEDs, especially the organic LEDs, are becoming increasingly popular in these days. For information, the organic LEDs are mostly thin films made from organic polymers. It can be easily coated onto large areas at a very low cost. Energy-efficient LEDs are widely tipped to become the predominant lighting source of the next decade and beyond, replacing the fast-disappearing incandescent bulb, as well as the compact fluorescent lights that are replacing them.

It's like there is not any engineering problem that can not be solved with carbon nanotubes. Now, it turns out it can solve problems we didn't even anticipate, like making the world's smallest light bulb. It's so small, it's only a few molecules in size. With the going on pace of development in this direction, future light bulb will be one glowing molecule. A single molecule that reliably emits white light and could speed the development of low-energy LEDs has been developed. A single molecule that reliably emits white light could speed the development of low-energy LEDs for the next generation of light sources and displays, say researchers. The nano-bulb consists of a special molecule trapped in the microscopic gap in a carbon nanotube. When current is applied to this molecular circuit, we get light. Scientists have built a molecule, which is able to behave like two separate light-producing molecules. It produces orange and blue light, when it is stimulated with a voltage. The mix of orange and blue light will turn into white. This means, with this technology, it allows the manufacturers to create white emission in much the same way, as creating white light

from independent lights. In this case, we're not only can save much money but it greatly reduces the carbon offset too.

In recent years, many countries have begun looking to switch from incandescent lighting to compact fluorescent bulbs because the latter are so much more energy efficient. There has also been a lot of interest in using light-emitting diodes (LEDs) for displays and general lighting, again because of the potential energy savings they offer. But with both fluorescent and LED lighting, the quality of white light produced has always left something to be desired. Fluorescent lighting can make people appear unhealthy because less red light is emitted, while most white LEDs on the market today have a bluish quality, making them appear cold. In contrast, OLEDs can be made from a wide range of materials, so achieving good-quality white light is less challenging. It has not been the quality of light that has let OLEDs down but rather their efficiencies. Fluorescent lighting typically operates at around 60 to 70 lumens per watt, while incandescent bulbs operate at about 10 to 17 lumens per watt. In contrast, the best reported power efficiency of an OLED until now was 44 lumens per watt. OLEDs have the potential to grow into a really very energy-efficient light source. One involves reducing its operating voltage by doping the organic material that connects the light-emitting material to its metallic contacts. The efficiency of the device is highly reduced if it is near a metal contact because of a phenomenon called quenching. Another trick was to make the outer surfaces of the device from types of glass that have optical properties that more closely match those of the device substrate.

Otherwise, much of the emitted light is reflected and either reabsorbed or lost through heat. The most novel aspect of this new OLED, however, is the organization of different light-emitting materials within the device. Three materials are used–one each for emitting blue, green, and red light–along with a host matrix material in between. Indeed, a major drawback of OLEDs is their longevity. Although companies like Philips are able to make devices with life spans equivalent to fluorescent bulbs–in excess of 10,000 hours–materials that yield higher efficiencies tend not to last so long.

Previous attempts using the same basic concept involved linking together two separate molecules into one. But, because energy is able to flow between the two molecular sub-units, one unit typically emits more light than the other, resulting in an unwanted tint. The new molecule does not suffer that problem, and only contains one light-emitting chemical group. When connected to a voltage, this group switches to a high-energy form that emits blue light as it reverts to its original state. Roughly half the time, though, the high-energy form picks up extra oxygen and hydrogen atoms, becoming a short-lived form that produces orange light before reverting to the original state. A large population of the molecules reliably produces equal quantities of orange and blue light that mix to produce an even white. This allows creating white emission in much the same way as creating white light from independent lights.

Light emitting diodes are components that emit light when an electric current passes through them and only let light through in one direction. LEDs play an important role in everyday life, as light indicators. They also have a promising future in the field of lighting, where they are progressively taking over the market. A major advantage of LEDs is that it is possible to make them very small, so point light sources can be obtained. With this in mind, one final miniaturization hurdle has recently been overcome by researchers as they have produced the first ever single-molecule LED. A single molecule, in contrast, is better measured in nanometers, a unit just a thousandth of the size. Shrinking the light-emitting element of a pixel by the order of hundreds could, then, make for insane, molecular-scale resolution.

The device is formed from a single polythiophene wire placed between the tip of a scanning tunneling microscope and a gold surface. It emits light only when the current passes in a certain direction. They observed that the thiophene wire acts as a light emitting diode: light was only emitted when electrons went from the tip of the microscope towards the gold surface. When the polarity was reversed, light emission was negligible. The researchers showed that this light was emitted when a negative charge (an electron) combined with a positive charge (a hole) in the nanowire and transmitted most of its energy to a photon. For every 100,000 electrons injected into the thiophene wire, a photon was emitted. Its wavelength was in the red range. Therefore, the ultimate challenge in the race to miniaturize light emitting diodes (LED) has now been met. From a fundamental viewpoint, this device gives researchers a new tool to probe phenomena that are produced when an electrical conductor emits light and it does so at a scale where quantum physics takes precedence over classical physics. Scientists will also be able to optimize substances to produce more powerful light emissions.

Finally, this work is a first step towards making molecule-sized components that combine electronic and optical properties. Similar components could form the basis of a molecular computer. Single molecule light bulb needs an efficiency boost before it can be used in commercial lighting and displays. Currently, the molecule converts electrons into photons at least 30 times less efficiently than commercial LEDs.

Profile

Dr S S Verma

working as Professor in the Department of Physics, Sant Longowal Institute of Engineering and Technology (Deemed university), also worked as Assistant Professor in the Department of Physics, Gondar University, Ethiopia. He is MSc from Shimla and PhD from IIT Delhi. He did postdoctoral studies under Japanese Govt. fellowship with Prof. Ken Okazaki at Toyohashi University of Technology, Toyohashi (Japan). He has published about 70 research papers in national/international journals and about 400 science and technology related articles towards science popularization in various magazines/news papers.

Scope of 3D Printing Lighting

According to Bloomberg report 3d printing business for both service and product will reach up to $8,000 millions in revenue by the year 2020 on world wide basis. With the latest desktop 3d printer of less than $3500, one can easily use the technology help to design and to manufacture a lamp. The method is simple, using 3d printing, we can make a lighting development model of printing components, interface parts, housing, decorative enclosure, coloring and testing temperature of led. Now, high yield smd led, because of relatively low heat output, we can use the plastic base material for well designed lampshades, housing and parts without worry about heat dissipation.

A customer came in to our newly installed light HUB in london, he wants to give his young son, a light which is fun to look at he can use to read, and use as a night light to help to sleep. It is hard to find this kind of lamp. SKK has developed files based on images of imagination, comics, cartoons, or sole creativity to develop lamps that fits the bill. It is a dinosaur head object, with a gooseneck that can be adjusted in every position, a retro 4.2 watts 12v led lamp that gives 300 lumens to read, and dimmed it down to 50 lumens to sleep without fear of darkness. Recently jewellery brand FAEERGE has asked SKK to develop a lamp for precious stone inspection for a prestigious show in Harrods London and in New York. SKK has used the 3dp to make a working prototype to show to the sales executive to inspect with. And after constructive comments, SKK has developed a twin color (2900 & 4500 K) narrow spot lamp for the job. The final lamp is made of brass and finished in antique bronze to go with the style of Faberge.

The twin color led lamp can be adjusted, it intensities individually and together to give a color way that gives much responses with the actual stones and its metal surroundings; i.e. the warm color reflects well with gold, and day light white enhances the diamonds & even pink diamonds. Nevertheless, SKK approach lighting design with 3dp is very different from others. What is in the market now is kind of large expensive shades with lot of complexities is shapes and texture and mainly for suspension purposes. SKK 3dp lighting is about, a design philosophy, a style evolved with customers, not solely the designers, it is not design for design sake, it has to make a statement too on contemporary time frame, it has to tell the history of technology, the theory behind it and serving a very useful task for modern societies without destroying employment. SKK uses the technology to help to finalize a good product. With the social network internet world, the magic part of 3dp industries is that, medium scale mass production of either components or final product can be gradually done with the help of networking.

Apart from that there are now 3dp manufacturers springing up in the us and Europe to produce medium size products as a well for that when files are processed, it can be distributed for a network of printers, even consumers all over the world at home or workspace to complete the process unlike traditional manufacturing methods and establishments.

Profile

Shiu-Kay Kan

is founder & MD of SKK Lighting. He studied at Telford College, & went to University of Westminster, to study architecture and got RIBA qualification. He studied garbage architecture at Architectural Association, London, and won a scholarship to go to seminar at Tallahassee University in Florida. In 1983 he won the Philips lighting award on PL lamps.

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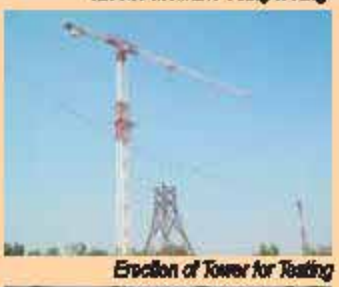

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project

ACME Won First Solar Rooftop Project

ACME, bagged their first solar rooftop project with a capacity of 30 MW in the state of Punjab.

The energy generated from this installation will be fed to the local grid through a power purchase agreement (PPA), which got signed with the state distribution company. The tariff for the project has been fixed at Rs 7.57 per kWhr.

Speaking on this development, Manoj Kumar Upadhyay, Founder & Chairman, ACME said, "We are extremely happy to bag this order, which is the first ever large scale solar rooftop project in the country. This order reflects the hard work and dedication of our team member and state's vision to reduce the carbon footprint. The potential & benefits of the solar rooftop segment in India are huge and the market is just getting started. It is indeed encouraging to see that the state governments are now taking many sincere efforts to promote the solar projects in their respective states".

Recently Ministry of New & Renewable Energy (MNRE) has included Punjab in the ambitious "Green Corridor Mission" project. With this, Punjab will now be in line to receive funds for further strengthening of its transmission and distribution infrastructure to ensure efficient evacuation of solar power to the central grid.

As per industry reports, the realizable potential in India for solar generated from residential rooftops will be 35 GW by 2024; correspondingly for industrial and commercial rooftops the realizable potential in the next ten years is up to 41 GW. These projections clearly indicate the growing importance and opportunity that the solar rooftop segment presents in the Indian context.

Manoj Kumar Upadhyay, Founder & Chairman, ACME

> *"The potential & benefits of the solar rooftop segment in India are huge and the market is just getting started"*

The ACME Group is a leader in the field of energy management and innovative solutions for the wireless telecommunications and alternate energy sector. It prides itself as a pioneer in the development of green technology solutions that are environment friendly, energy efficient, & cost effective and also capable of delivering a quick return on investment.

award

BHEL wins DSIJ Award 2014 for the Most Efficient Maharatna PSU

For its superlative performance in fiscal 2013-14, Maharatna company Bharat Heavy Electricals Limited (BHEL) has been awarded the DSIJ Award 2014 for the Most Efficient Maharatna PSU. The award was jointly received by B Prasada Rao, Chairman & Managing Director, BHEL and Atul Sobti, Director (Power) from K D Tripathi, Secretary, Department of Public Enterprises. Significantly, BHEL has been conferred this award for the sixth successive year and has been winning this prestigious award since inception.

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"A local place with global trends, technology and culture is worth value for money to showcase product and company directions. A launch, promotion of product, branding of company being a perfect venue and excellent support of IED make this platform a global platform and local presence. Being company in remote location and away from the power center city, this difficulty is very well solved by automation exhibition as we are recognized by activity, product and market segment where we easily win the market now. This also works as a single window to the industry, their requirement trends, and culture changes so it helps to bring in new product, new ideas back to the industry. Due care is required to nurture company and Automation exhibition is helping us in a big way. We wish that automation exhibition go real global now and take us with them in every new beginning. In short automation exhibition gives wings to companies, industries, local and global market. We always wish automation would grow leaps and bounds."

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ABB takes Transformer Intelligence to the Next Level

ABB, the leading power and automation technology group, launched Transformer Intelligence™, its innovative sensor based monitoring solution for transformer assets, at its US Automation and Power World event in Houston, Texas.

Making transformers more intelligent enables condition-based maintenance and reduces costs. At the same time, the improved insights help enhance performance, reduce failure risks and extend lifetime.

ABB's solution is based on the next generation of its online monitoring system CoreTec™ which keeps a close watch on a transformer's mission-critical functions and performs a complete evaluation of its operating conditions. It can also simulate future service conditions and forecast their impact on transformer lifetime, enabling predictive maintenance.

ABB has now enhanced its Transformer Intelligence™ solution with the CoreSense™ sensor which continuously records hydrogen and moisture and provides CoreTec with real-time data to optimize transformer management. ABB's latest innovation can be deployed with existing and new transformers.

"This is yet another example of ABB's transformer lifecycle support philosophy and commitment to service" said Markus Heimbach, head of ABB's Transformers business, a part of the company's Power Products division. "Our domain knowledge and century long experience as a global leader in transformer technology enables us to develop innovative solutions that support our customers in managing their assets more efficiently and help drive the evolution of smarter grids."

ABB offers a complete range of power and distribution transformers designed for reliability, durability and efficiency. ABB is a major transformer manufacturer throughout the world and offers both liquid-filled and dry-type transformers as well as services for complete lifecycle support, including replacement parts and components.

Alstom signs with Danish Power Plant for GRT in UK biomass project

Alstom has signed two contracts with Danish power plant specialist Burmeister and Wain Scandinavian Contractor (BWSC) for Geared Reaction steam turbines (GRT) to be used in two UK biomass projects.

The first contract uses a 23MW GRT for a waste wood combined heat and power (CHP) biomass plant in Widnes, Merseyside that is being developed by BWSC and UK logistics company Stobart Group. While the second is a 50MW GRT for the Snetterton Biomass Plant, in East Anglia, which will burn energy crops such as straw, cereals and oilseed rape.

This news follows on from two previous contracts signed in 2013 & 2014 by Alstom and BWSC for the UK, for the Lisahally CHP biomass plant in Northern Ireland and the Brigg renewable energy plant in Lincolnshire.

Daniel Wahler, VP of Industrial Steam Turbines, said, "Alstom is delighted to be working with BWSC in the UK once again, having already built a close working relationship with them on the Lisahally and Brigg projects."

CGI GRT45-M100 rotor for biomass power plant

Plainfield

The project specific design, engineering & manufacturing will be done at one of Alstom's specialist facilities, with support offered by the UK team. The GRTs are preassembled as result saving money & time during installation and commissioning. Alstom has optimized the GRT for efficient and flexible power production, covering renewable and traditional fuel types in addition to industrial applications for process steam.

The Widnes facility is expected to become operational by the end of 2016 and will provide enough power to supply 35,000 homes a year, as well as supplying heat to Stobart's adjacent wood-drying facility. The Snetterton scheme is scheduled to be running by Spring 2017 & will produce energy to power up to 68,000 homes.

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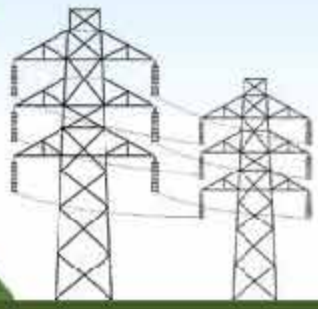

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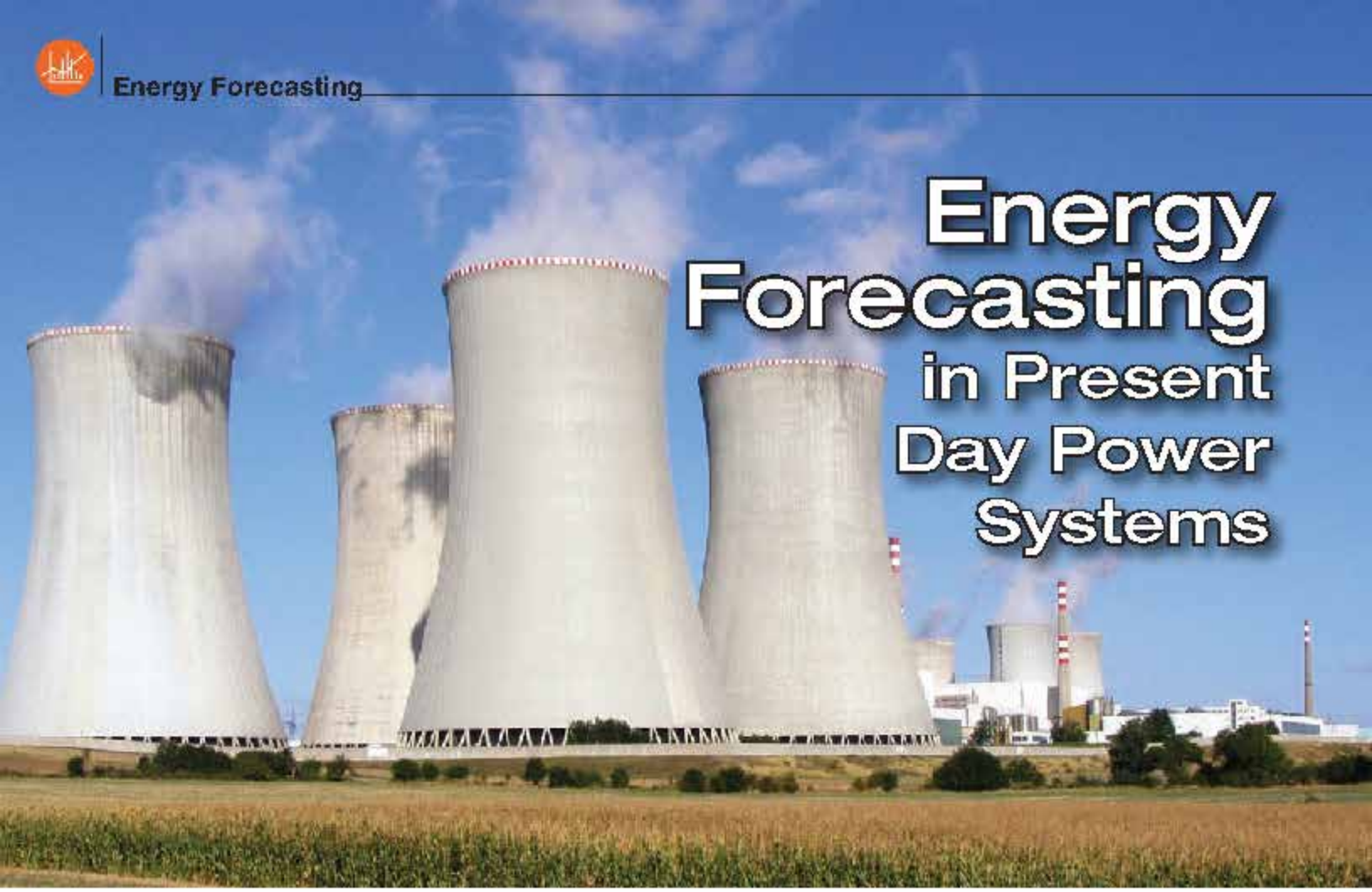

Energy Forecasting in Present Day Power Systems

Since last many years, electricity supply industry across the world is undergoing a structural and systemic change because of two main reasons: adoption of market oriented reforms in many countries (so called deregulation) and a shift towards renewable, clean and pollution free energy sources instead of fossil fuels.

Sanjeev Kumar Aggarwal and Sumit Saroha

These two major changes have increased the uncertainties in the power system planning, operation and control.

Today, electricity has been traded as a commodity in various markets and in modern power exchanges, various market participants take part in bidding exercise and price is determined through an auction process. However, electricity has distinct characteristics from other commodities, like the electricity cannot be stored in huge economically in an efficient manner, maintaining demand supply balance and problem of transmission congestion. Thus, electricity price movements can exhibit a major volatility, which may affect the financial well-being of the market participants.

Besides this, the electricity based on renewable energy sources perceived as alternate source of energy and their penetration within the power system is rising at a very fast rate. Among new sources of renewable energy, wind energy is the one that has seen tremendous growth over recent years; thus becoming, in various countries, the true alternative to fossil fuels. At the end of 2013, worldwide installed wind nameplate capacity with a growth of 12.5% was 318,137MW. It is estimated that the wind power will be 61GW at the end of 2017 with an annual growth rate of 7%.The major utilization of these wind capacity installations is in large grid connected electric power systems. Another fast growing generation technology is solar energy.

On the other hand managing power system requires accurate estimation of electric load, without which power system operation tasks such as economic load dispatch and unit commitment cannot be performed. These considerations have led to the emergence of four areas that have attracted the attention of engineers and forecasting experts working in ESI which are electric load, price, wind power and solar power forecasting. Other forecasting issues which are of interest are water resource forecasting and congestion prediction in transmission networks.

It is estimated that the wind power will be 61GW at the end of 2017 with an annual growth rate of 7%

However, in this article discussion is limited to load, price and wind power forecasting only. While electricity load and price forecasting are jointly intertwined activities, wind power forecasting has emerged as an independent area of research. Load forecasting is important from operation planning and scheduling point of view; whereas, price forecasting is important due to strategic reasons and protecting financial interests of the power generation companies. On the other hand, renewable power penetration has added one more dimension of uncertainty in the power system operation and control due to their intermittent and variable nature. A lot of researchers and academicians are engaged in the activity of developing forecasting tools and algorithms in these areas.

Forecasting Issues

In deregulated electricity market, for real time operation of power system and taking part into bidding in power exchange the prediction of MCP (Market Clearing Price) or electricity price and MCV (Market Clearing Volume) or electricity load is required. Fig. 1 shows the online bulletin board inside the power exchange and there is block bidding scenarios for both demand & supply side and an equilibrium point is reach where market is clear; the price at equilibrium point is called MCP and volume at intersection point is called MCV. However, at the time of congestion, the zonal market clearing price (ZMCP) or the Locational Marginal Price (LMP) comes into play. ZMCP is always same for a zone but it may be different for different zones. It may also be different for different buses.

In India after inaction of electricity act 2003 two power exchanges come into play Power Exchange of India Limited (PXIL) and Indian Energy Exchange (IEX). Both exchanges are in the early stage of development. In Fig. 2, the MCP and MCV curves for PXIL have been shown. On the other hand various curves of Ontario Electricity Market (OEM) have been shown in Fig. 4, which is a highly liquid and well developed market working since 2002. The main difference between the load curves in the two markets is due to the level of volumes, which are low in PXIL; whereas, high in OEM.

Market Clearing Volume Forecasting

The MCV or Load forecasting is a process to predict MCV for a future time period. It encompasses forecasts on several time scales, ranging from hourly to yearly depending on the requirement of power system. Forecasting load is quite complicated job to perform, because the load series has the following characteristics: non-linearity, non-stationarity, calendar effect, exhibits several levels of seasonality, dependence on weather related effects and historical data. All these factors come into play because the electricity has storage problem. The modeling can be done in consecutive time-series framework or variable segmented framework and different sets of physical patterns.

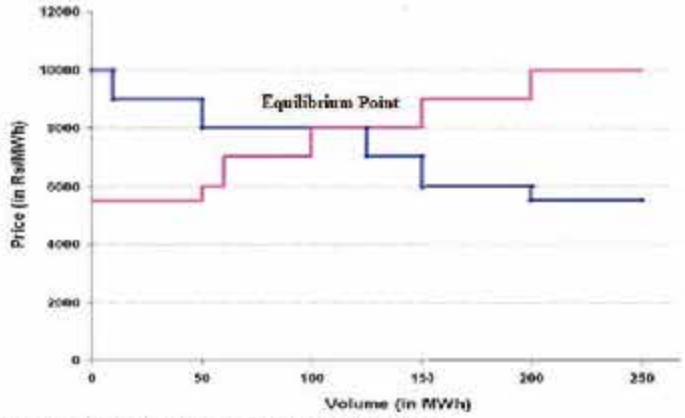

Fig. 1: Online Bulletin Board Power Exchange

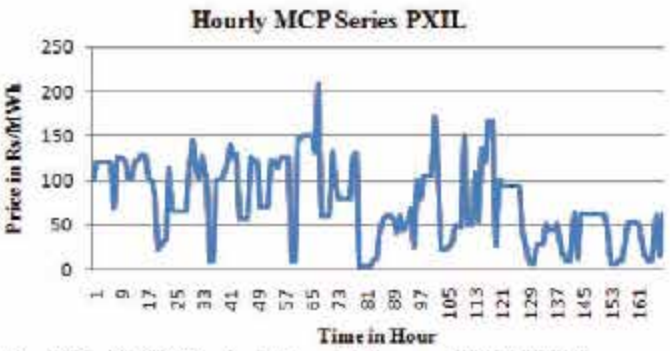

Fig. 2: Hourly MCP Series at Power Exchange of India Limited

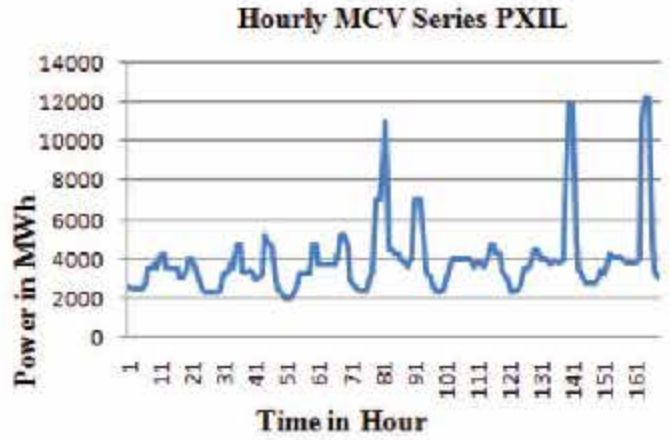

Fig. 3: Hourly MCV Series Power Exchange of India Limited

Market Clearing Price Forecasting

It is a process to estimate the electricity price or Market Clearing Price (MCP) for a future time period depends on load requirement for unit commitment, economical load dispatching and scheduling in electricity markets. The main objective of electricity market is to maximize social welfare to both suppliers & consumers with high reliability of supply. Like MCV, the MCP series has also special characteristics like non-linearity and non-stationarity, high volatility, calendar, seasonal effects and its correlation with MCV. The main difference between load and price is that price series is more volatile and suffers from large price excursions as shown in Fig. 4, whereas load series has lower stochastic component. Similar to load series, the modeling of price series can be done in consecutive time-series framework or variable segmented framework.

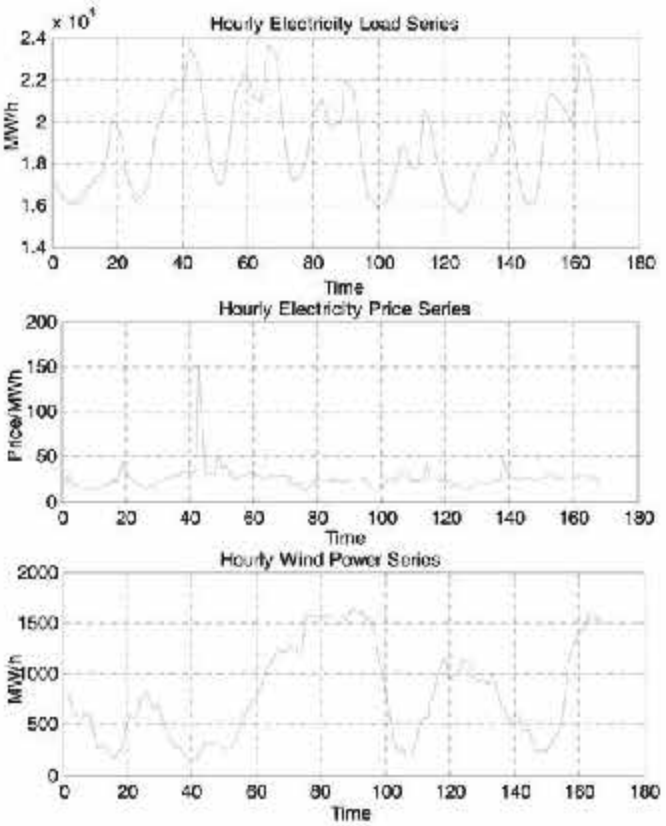

Fig. 4: Hourly Curves for Load, Price & Wind Power in OEM

Wind Power Forecasting

The wind blowing is a natural process that depends on the uneven heating and cooling of earth surface. Since wind power depends on this natural process, it is highly uncertain as shown in Fig. 4 and its variation originates from uncertainties of the wind speed. However, if forecast reliability of wind power is high then operational cost of wind power plant will be lower which is desirable in case of large-scale integration of wind power to grid which can imply substantial savings for the wind farm owners as well as better overall efficiency of the system. However, predicting wind is a tedious task; because blowing wind is a natural process and wind speed time series is having some special characteristics like high volatility, non-linearity, non-stationarity and high complexity depending on the various physical conditions like direction of wind, terrain roughness and height above the ground etc.

Variable selection and data pre-processing

For developing a forecasting model, some input variables need to be selected on which the forecast variable depends. Uncertainty associated with a forecasting model originates from uncertainty associated with its input variables. The higher uncertainty results in the poor forecast accuracy & reliability.

For the prediction point of view the selection of appropriate input variables and their past behavior is quite important task for the accuracy criteria. The input variable for a prediction model may be exogenous (external variables) and endogenous (forecast variable itself). Usually variable selection is done based on correlation analysis.

The input data obtained from the site is in raw format i.e. it does not have sufficient characteristics to use in a forecasting model. The data collected may have missing values, prone to outliers and may have different scale as compared to forecast variable. These characteristics may distort the learning of a forecasting model and as a result poor forecast accuracy. Pre-processing means scale up or down the dimensions of input, clean up and classify the input data. It may also be needed to classify the data according to seasonal as well as weather variable variations. Some of the advanced techniques which have been utilized for preprocessing are: Wavelet Transform (WT), The Kalman & Unscented Kalman filter (UKF), Principal Component Analysis (PCA), Empirical Model Decomposition (EMD), & Self Organizing Map (SOM).

Forecasting Models and Techniques

Main forecasting models for different energy forecasting issues have been discussed below:

Wind Power

Two main methodologies used for wind power forecasting are: statistical and physical models such as Numerical Weather Prediction (NWP) models. Statistical models can be divided into 2 major categories:

Time Series Methods

Among these, persistence or naïve models and moving average models are used as benchmark models which are used to compare the forecasting performance of the more advanced models. There are other advanced time series models such as auto regressive integrated moving average model (ARIMA). Generalized Auto regressive Conditional Heteroskedastic (GARCH). The main steps in a time series forecasting model are:

- Model identification
- Parameter estimation
- Model checking and
- Prediction.

In addition to its own lagged values, other external variables can be incorporated in a time series model such as ARMAX model. The problem of slow decay in auto correlation function for ARIMA can be overcome by a more advanced technique such as f-ARIMA. For the selection of lagged values Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF) of hourly wind power time series are plotted such as those shown in Fig. 5. The higher is the value of ACF more is correlation between those lags.

Artificial Intelligence

The neural networks and the other machine learning algorithms are the non-linear models that fall under this category. Feed Forward Neural Networks (FFNN) along with back propagation (BP) as the learning algorithm is the most popular. Fig. 6 shows the basic structure of a FFNN, which consist of input nodes, hidden nodes with hidden layer & a single output node, where is the associated weight parameters. The other networks are Recurrent Neural Networks (RNN), Radial Basis Function Neural Networks, Support Vector Machine (SVM) and adaptive neuro fuzzy inference system (ANFIS).

The performance comparison of the above linear, non-linear and hybrid techniques has been discussed in various research articles by

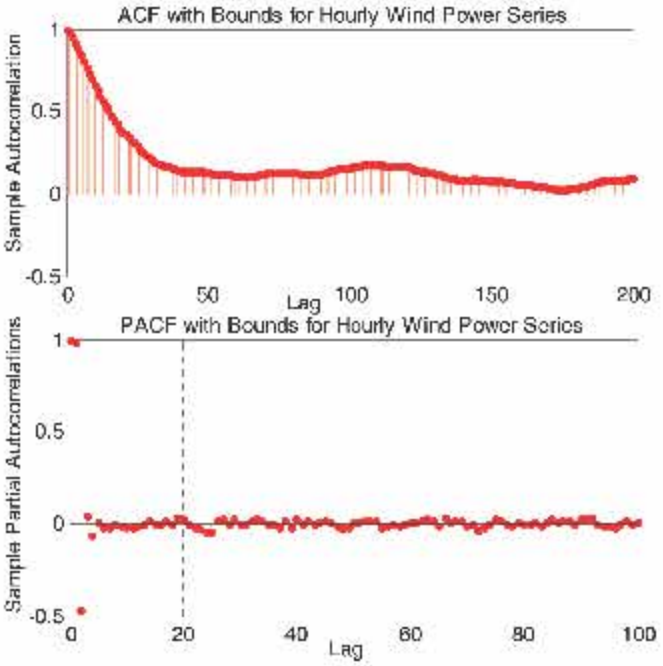

Fig. 5: ACF & PACF for Hourly Wind Power Series

various researchers on short, medium and long term time scale for single as well as multiple step ahead basis. Mean Absolute Error (MAE), Root Mean Square Error (RMSE) & Mean Absolute Percentage Error (MAPE)

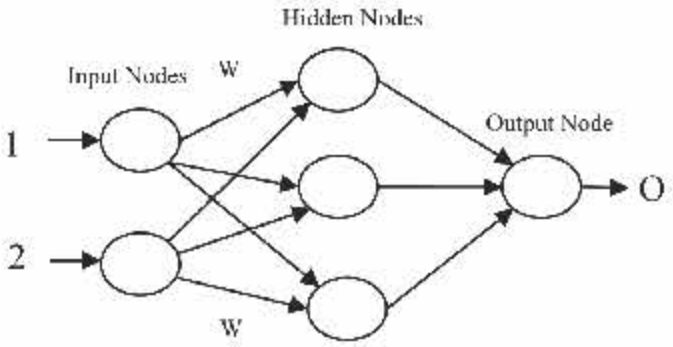

Fig. 6: Basic Structure of Neural Networks

are the accuracy criteria adopted for performance comparison. In Fig. 7, plots of predictions by various neural networks have been shown.

Electricity Price & Load

The MCP and MCV are highly correlated with each other. As the demand increases the price is also increased. Various time series & AI models can be applied for their prediction.

Time Series Models

The scope of various stochastic time series method like autoregressive (AR), moving average (MA), autoregressive moving average (ARMA), autoregressive integrated moving average (ARIMA), and generalized autoregressive conditional heteroskedastic (GARCH) can also be extended to load and price forecasting since both of these series exhibit

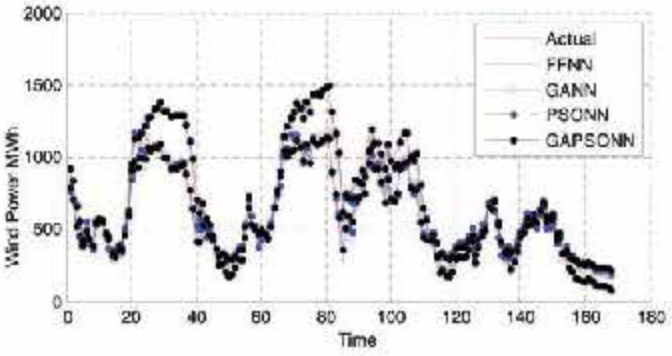

Fig. 7: Wind Power Forecasting by Artificial Intelligence

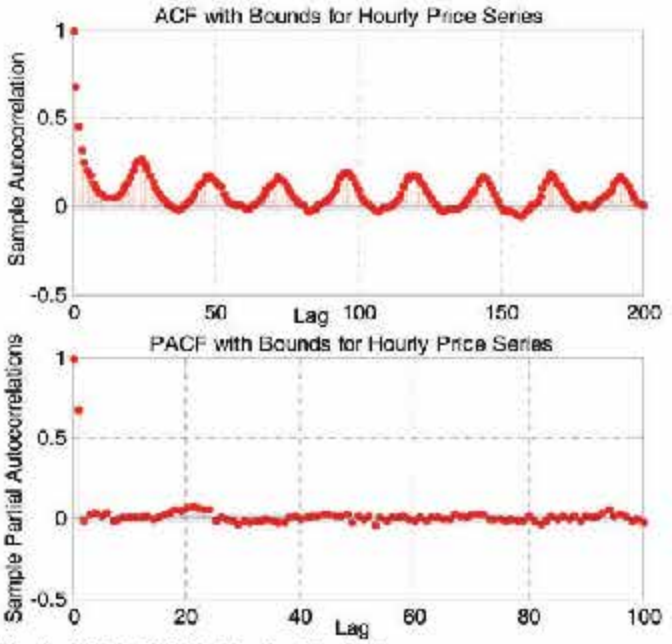

Fig. 8: ACF & PACF for Hourly Price Series

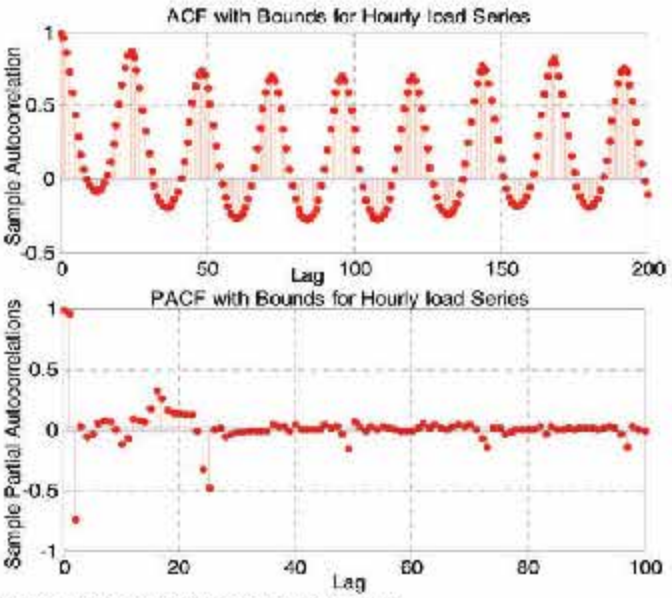

Fig. 9: ACF & PACF for Hourly Load Series

serial correlation similar to wind power, which is evident in Fig. 8 and 9.

Artificial Intelligence

The main characteristics about load forecasting models is that they are dependent on weather variables such as temperature and humidity; whereas, price forecasting models take forecasted load as the main input variable. All AI based models can be applied to load and price forecasting such as FFNN with Back Propagation learning algorithm, Radial Basis Function Neural Networks (RBFNN), Support Vector Machine (SVM), Recurrent Support Vector Machine (SVM), Recurrent Neural Network (RNN), Extreme Learning Machine, Adaptive Neuro Fuzzy Inference System (ANFIS) and Adaptive Wavelet Neural Networks (AWNN) etc. MCV prediction by various AI models is shown in Fig. 10.

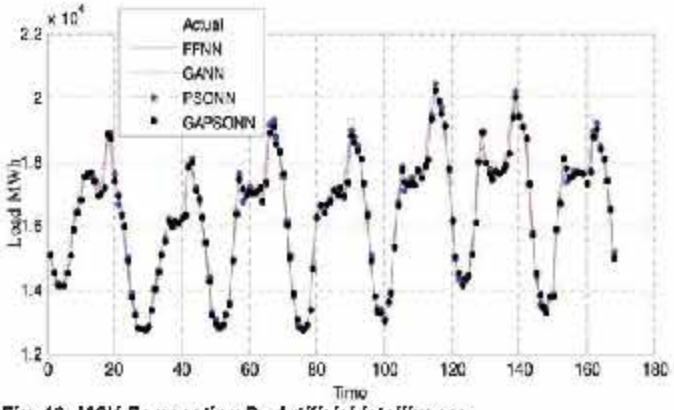

Fig. 10: MCV Forecasting By Artificial Intelligence

Modelling Framework

Modelling can be done in three frameworks: single step ahead, multi-step ahead and recursive framework. For longer forecasting horizon, multi-step ahead and recuresive frameworks are used. Recursive is a step-by-step approach in which the current step's predicted value is used to determine its values in next step. However, the recursive modelling suffers from error accumulation and complexity of data problem when the prediction period is long. This is because the bias and variance from previous steps are propagated into future predictions. On the other hand multi-step ahead prediction suffers from loss of information. Therefore a judicious choice of modelling framework is necessary for obtaining a good forecast. Moreover, these days' ensemble techniques such as random forest are also becoming popular in which outputs from different forecasting models are combined in order to improve the forecasting accuracy.

Importance of Forecasting

The security of power system is one of the most important aspects of real time operation of power system under restructured market structure. In a restructured environment,the Independent System Operator (ISO) takes care of all the settlement of bidding and real time operation of power system on the basis of present and future forecasted bidding scenarios with taking care of security of power system with all the technical and economic constraints. Fig. 11 shows the market time line for the bid submission in a typical Day Ahead (DA) electricity market. Therefore accurate and reliable forecasting tool is

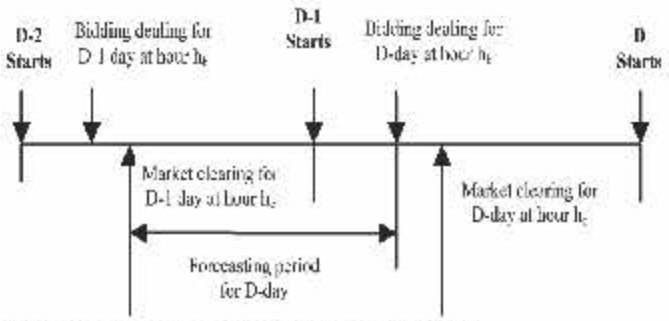

Fig. 11: Electricity Settlement at a Power Exchange

required for bid preparation & reducing the financial risk in the DA market by both the ISO as well as market participants.

Conclusion

Nowadays the demand of electricity is increasing very quickly, therefore, increasing the efficiency of the already existing structure and incorporation of renewable energy sources is desired. In order to improve economy of the system, market oriented reforms are being adopted and on the other hand, wind power has emerged as a major technology to full-fill the gap between generation and demand. In order to participate and manage the day ahead deregulated electricity markets it is necessary to know the future demand of energy and its price well ahead of time. Moreover, renewable generation needs to be predicted in order to operate the power system reliably. In recent years, a large number of energy forecasting methodologies have been developed by many researchers achieving a varying level of accuracy. Each technique has its own characteristics and must be used according to available historical data pattern & type of accuracy desired. The basic requirement of energy forecasting is to provide basic generation scheduling functions, for assessing the security of system operation, and for timely dispatch information with economic constraints.

Sanjeev Kumar Aggarwal

received the BE from MD University, MTech & PhD from NIT, Kurukshetra. He worked for five years for NTPC Ltd. Presently, he is working as Professor and Head of Department, Electrical Engineering Department, Maharishi Markandeshwar University, Mullana, Ambala, India.

Sumit Saroha

received the BE in Electrical Engineering from MD University, MTech in Power System from DCR University of Science & Technology, Murthal. Presently, he is pursuing PhD in the area of forecasting issues in present day power systems from Electrical Engineering Department, Maharishi Markandeshwar University, Mullana, Ambala, India.

Profile

TATA Power's first Cross Border Hydro Power Project in Bhutan

During inauguration of 126 MW Dagachhu Hydro Power Project in Bhutan

Tata Power, India's largest integrated power company, achieved successful commissioning of 2nd unit of 63MW of its 126MW Dagachhu Hydro Power Corporation (DHPC) in Bhutan. The project has achieved full commissioning and clean power generated by this plant will be sold to India, thereby helping to reduce carbon emission.

The Dagachhu project is a Joint Venture initiative between Tata Power (and Druk Green Power Corporation, owned by Royal Government of Bhutan (RGoB), and National Pension & Provident Fund of Bhutan. It is a run of river hydro project located in Dagana Dzongkhag, Bhutan. DHPC has entered into a 25 year Power Purchase Agreement (PPA) with Tata Power Trading Company Limited (TPTCL, a company of Tata Power) for sale of power from the project. The power generated from the project shall be sold by TPTCL in the Indian power market. The Unit-2 of 63MW was commissioned within few days of commissioning of the Unit-1 in February 2015. The commercial flow of energy generated from the Unit 2 of Dagachhu project to India officially started at 09:54 am (Bhutan time) on 15th March, 2015 in a ceremony by Lam Neten as a Chief Guest.

Being the first PPP in infrastructure investment in Bhutan, Dagachhu Hydro Project serves as a model for other countries - particularly those with a low GHG-emitting grid - to harness the benefits of CDM towards enhancing the socioeconomic development of the country while meeting the escalating energy demand in a sustainable way. With the commissioning of the project, Tata Power's total hydro generation capacity today stands at 576MW and overall capacity at 8747MW.

It is the first cross border project registered under UNFCCC's Clean Development Mechanism. Through this project, India will be able to pave way for essential clean energy development process, which is a much-needed requirement for the power sector and is also in line with Tata Power's commitment towards promoting clean and renewable energy.

Speaking on the development, Anil Sardana, CEO and Managing Director, Tata Power, said, "It is indeed an honour to announce the successful commissioning of the 2nd unit of the Dagachhu hydro project in Bhutan, after the commissioning of the 1st unit few weeks ago. The power generated from this project will provide a much needed boost to the power market in India. With Tata Power's centenary year's celebrations, we had committed to 120MW of Hydro Power this year and we have achieved the same. We now aim to develop another new project of another 450MW in 2015. Being the first cross border project registered under UNFCCC's Clean Development Mechanism (CDM), it reinforces our commitment towards promoting clean and renewable energy sources. We would like to thank the Royal Government of Bhutan, Druk Green Power Corporation, Ministry of External Affairs of Bhutan & India, Ministry of Power, GoI and all the stakeholders, for the support extended in setting up this project in Bhutan."

Chhewang Rinzin, Chairman, DHPC, and Managing Director, DGPC, said, "We are happy about the smooth commissioning of Unit 2 and in a timely manner. The successful commissioning of both the units of the 126MW Dagachhu project, showcases the robustness and ability to undertake big projects in Bhutan and we will continue to build the suitable atmosphere to take up similar projects. Druk Green hopes to achieve similar successes with its future projects and would like to thank the Tata Power and Tata Power Trading for helping Dagachhu project to achieve this commissioning."

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Power market continues to witness low prices

Decrease in demand for power and reduced prices characterised the spot power market at IEX in February, 2015. Despite the summer season approaching, there was no significant increase in demand for power across States. Instead, the Northern States saw reduction in power demand by 29% over the previous month, while the Eastern and North-Eastern States also saw reduction of 21% over the last month.

With average daily trade of 72 MUs – 5% lower than 75 MUs traded last month, almost 2.03 BUs (Billion kWh) was traded in February whereas 2.34 BUs was traded in January, 2015. With sell bids at 3.40 BUs and buy bids at 2.89 BUs, the supply of power exceeded the demand.

The average market clearing price (MCP) in February was Rs 2.85 per unit, a marginal increase of just 1% over the previous month.

The Exchange continued to experience severe congestion on Inter State Transmission System, especially on the WR-SR, WR-NR and also between S1 and S2 bid areas. About 281 MUs could not be traded this month as compared to 190 MUs in January, highlighting an increase of 48%. On an average, 1047 participants traded in the day ahead spot market on a daily basis in February.

Volumes

A total of about 2.03 BUs were traded in February. The key highlights are as given below:

- Total Sell bids – 3.40 BUs
- Total buy bids – 2.89 BUs
- Northern States bought - 763 MUs, 29% less over the previous month.
- Western States sold 1002 MUs, 27% lower over the previous month due to severe congestion.
- North-Eastern and Eastern States bought 53 MUs and 27 MUs respectively, both 21% less over previous month's purchase
- Net Sellers: North-Eastern, Eastern and the Western States
- Net Buyers: Northern and Southern States along with Punjab

The area-wise buy and sell volume trend in February vis-a-vis January is summarised in the table above:

Region	BUY (MU)			SELL (MU)			NET
	February'15	January'15	Change (%)	February'15	January'15	Change (%)	
North East	52.95	66.96	↓ -21%	70.15	80.59	↓ -13%	Sell
East	27.48	34.78	↓ -21%	409.09	338.68	↑ 21%	Sell
North	763.16	1068.40	↓ -29%	314.06	318.75	↓ -1%	Buy
West	715.94	692.89	↑ 3%	1002.94	1372.65	↓ -27%	Sell
South	468.66	481.08	↓ -3%	231.94	233.44	↓ -1%	Buy

Prices

The average Area Clearing Prices (ACP) reduced across all the States except in South. In Andhra Pradesh and Karnataka (S1 bid area), price rose by 18% to Rs 4.62 per unit while in Tamil Nadu and Kerala (S2 bid area), price increased to Rs 4.92 per unit, an increase of 4% over last month, mainly due to the unavailability of Inter-State transmission corridor. ACP in North, North-East, East and Punjab was Rs 2.60 per unit, a decrease of 4% over January.

In the West, ACP was about Rs 2.32 per unit, a decrease of almost 11% over last month. The average area prices in February vis-à-vis January are as summarised in the table below:

Transmission Congestion Analysis

- East-South (ER-SR) corridor was congested 90% of the time
- West-South (WR-SR) corridor was congested 92% of time
- West-North (WR-NR) corridor was congested 49% of the time during the month
- S1-S2 corridor was congested almost 18% of time through the month.

Participation

1047 participants traded in the spot market on an average daily basis with highest participation on 20th February, 2015 when 1092 participants traded at the Exchange.

Bid Areas	Average Prices (Rs./kWh)		
	February'15	January'15	Change (%)
North-East (A1, A2)	2.60	2.70	↓ -4%
East (E1, E2)	2.60	2.70	↓ -4%
North (N1, N2)	2.60	2.70	↓ -4%
Punjab	2.60	2.70	↓ -4%
South (S1)	4.62	3.91	↑ 18%
South (S2)	4.92	4.73	↑ 4%
West (W1, W2)	2.32	2.59	↓ -11%
West (W3)	2.31	2.59	↓ -11%
MCP*	2.85	2.82	↑ 1%

*MCP (Market Clearing Price) refers to the price discovered before accounting for congestion in Inter-State transmission network

*ACP (Area Clearing Price) refers to the bid area prices discovered after accounting for congestion in the Inter-State transmission network

Egypt and Siemens to massively increase Power Generation Capacity

Siemens and the Egyptian government have reached firm agreements to build a 4.4GW combined-cycle power plant and install wind power capacity of 2GW. Siemens will build a factory in Egypt to manufacture rotor blades for wind turbines, creating up to 1,000 jobs and therefore nearly trebling Siemens' footprint in the country. Including two further Memorandums of Understanding (MoU) which were signed at the event, Egypt's power generation capacity will be massively increased by up to one third mostly by 2020.

Under the agreements, Siemens will propose to build additional combined cycle power plants with a capacity of up to 6.6 GW and ten substations for reliable power supply. The agreements were signed at the Egypt Economic Development Conference in Sharm el-Sheikh in the presence of Egypt's Minister of Electricity Shaker al Markabi, Germany's Vice Chancellor Sigmar Gabriel, and Joe Kaeser, President and Chief Executive Officer of Siemens AG. "Egypt needs a powerful and reliable energy system to support its long-term, sustainable economic development, and experienced partners who understand the specific challenges facing the country", said Joe Kaeser. "Siemens' technology and expertise has been supporting Egypt's growth for more than 150 years, and our track record shows that we deliver what we promise - also in challenging times. We are part of Egypt's society and proud to shape Egypt's future together. We have also agreed to continue the well established practice of dual-education apprenticeships, a success-story between Germany and Egypt for decades."

According to the agreement, Siemens will be the contractor responsible for engineering, procurement and construction (EPC) for the Beni Suef power plant in Upper Egypt, and will work together with local partners. The 4.4 GW power plant will be built in four modules, each consisting of two H-class gas turbines, two heat recovery steam generators, one steam turbine, and three generators. Siemens H Class technology is matching Egypt's requirements, combining high output with record-breaking levels of efficiency.

"Wind power is clean and renewable, and will strengthen Egypt's energy security at this important point in its history. Adding two gigawatt will be a significant step towards diversifying the country's energy mix", said Markus Tacke, CEO Siemens Wind Power and Renewables Division. "Egypt has great potential for wind power generation, especially in the Gulf of Suez and the Nile Valley", Tacke added. "We are proud to be working with the government and people of Egypt to tap this potential."

Siemens has class-leading technology for both onshore and offshore wind power technology, and substantial global experience in the construction and delivery of wind energy projects. The Egyptian government plans to expand wind capacity over the coming years as part of a plan to increase wind generation to 7.2GW by 2020.

Siemens has been working in Egypt since 1859, & has maintained a continuous presence in the country since opening its first office in Cairo in 1901. The company's technology has been implemented in the Nubaria, Talkha, Damietta, Midelec and El Kureimat power plants, and Siemens is also a key technology supplier to major projects in the transport, healthcare and industrial sectors. Siemens has been a reliable and trusted partner throughout more than 100 years in Egypt.

Signing of agreement: (from left to right, sitting):
Gaber el-Dessouki, *Head of Egyptian Electricity Holding Company, and*
Lisa Davis, *Member of Management Board, Siemens AG, (upright)*
Hany Azer, *Advisor to the Egyptian President,* **Mohamed Shaker**, *Minister of Electricity,*
Sigmar Gabriel, Vice Chancellor of Germany;
Joe Kaeser, *President & Chief Executive Officer, Siemens AG and*
Ilse Aigner, *Economy Minister of Bavaria*

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Bentley takes over as the new Sales and Distribution director for Perkins Asia

Daniel Bentley

"This is an exciting time for Perkins in India, as we continue to focus on developing our customer relationships, raising awareness of our product offering and prepare to open our purpose built, state-of-the-art 4000 Series manufacturing facility in Aurangabad"

Perkins appointed Daniel (Dan) Bentley as the new sales and distribution director for the Asia Pacific region, which includes India, following Jaz Gill's move to the post of global marketing director. Dan, who has already spent time talking to and meeting Perkins Generator Original Equipment Manufacturers (GOEMs) in India, is responsible for engines sales in the region and the development of the aftermarket business.

"This is an exciting time for Perkins in India," said Dan, "as we continue to focus on developing our customer relationships, raising awareness of our product offering and prepare to open our purpose built, state-of-the-art 4000 Series manufacturing facility in Aurangabad." Over the years, Dan who joined the company in 1994 has held a number of roles which have focused on our customers and their requirements from our electric power and industrial products.

"Perkins has a strong brand reputation in the power generation market, where we really have become the engine of choice for today's generator set manufacturers. The recent GOEM meeting in Bangalore was a good opportunity to discuss the customer benefits of working with Perkins, our ongoing product developments and investment in the parts and service network and share the latest information on our Aurangabad facility, which will manufacture a range of dependable, powerful and cost effective engines for this region."

Tanuja Randery joins Schneider Electric as President of UK & Ireland

Tanuja Randery

"I am very excited to be joining a company that is investing in both R&D and talent globally"

Schneider Electric, appointed Tanuja Randery, former President of Strategy, Marketing and Transformation at BT Global Services, as its UK & Ireland President.

Randery, who has held a number of leadership roles in global technology and telecommunications firms both in the USA and Europe, is joining Schneider Electric at a time when advances in cloud connectivity, big data and services can enable more efficient and advanced energy distribution and consumption. Tanuja joined Schneider Electric in 2015 from BT Global Services, where she served as President, Strategy, Marketing & Transformation responsible for the growth transformation agenda. "The challenge of the world's growing energy needs combined with the necessity to be more economical and sustainable, places Schneider Electric in a unique position to help build a smarter world," said Tanuja Randery. "I am very excited to be joining a company that is investing in both R&D and talent globally to shape the transformation of the industry."

CG selects K N Neelkant as Executive VP and President of Industrial Business Unit

K N Neelkant

"Neelkant will also supervise CG's EPD business in India and the company's distribution franchise in Jalgaon"

Avantha Group Company CG has appointed K N Neelkant as Executive Vice President and President of Industrial Business Unit. Neelkant will also be a member of CG's Executive Committee. He will be taking over the reins of the Industrial business of CG from Anil Raina.

Neelkant brings with him twenty years of rich experience in Strategy Formulation and Deployment, Project Management, Supply Chain Management and Manufacturing across sectors including infrastructure, power transmission and distribution and engineering. He was associated with SIEMENS prior to joining CG in 2005. In addition to his role as the head of the Industrial business unit, he will also supervise CG's EPD business in India and the company's distribution franchise in Jalgaon, Maharashtra.

Neelkant is an electrical engineer from the University of Pune. He has also completed multiple management programmes from institutes such as IIM-Bangalore and ASCI-Hyderabad.

FLIR Systems promotes Shane Harrison as Senior Vice President, Corporate Development and Strategy

Shane Harrison

"Shane will be responsible for sourcing corporate development opportunities and execution of the Company's merger and acquisition strategy"

Flir Systems, Inc., announced that Tony Trunzo, Senior Vice President, Finance and Chief Financial Officer, has resigned effective March 2015 and that Shane Harrison has been promoted to Senior Vice President, Corporate Development and Strategy, effective immediately.

Shane will be responsible for sourcing corporate development opportunities and execution of the Company's merger and acquisition strategy, and will report directly to Andy Teich, FLIR's President and Chief Executive Officer. Andy Teich said, "I would like to thank Tony for more than a decade of dedication and outstanding service to Flir. His leadership and contributions played an important role in the growth of our company during his tenure. We appreciate all that he has done for Flir and wish Tony all the best in his future pursuits."

Teich added, "I would like to congratulate Shane on his recent promotion. In addition to Shane's involvement in our shareholder communication efforts, he has played an important role in the Company's acquisition activity. I look forward to working with Shane directly, and am excited to see the great work that he produces in this new role.

Wipro appoints Abid Ali Neemuchwala as Group President & Chief Operating Officer

Abid Ali Neemuchwala

"I am honored to join Wipro, a company with a rich heritage of technology innovation and unflinching commitment to values"

Wipro Ltd, announced the appointment of Abid Ali Neemuchwala as the Group President and Chief Operating Officer of the company, effective April1, 2015. In his role, Abid will head the Service Lines of Global Infrastructure Services, Business Application Services, Business Process Services, and Advanced Technology Solutions. He will also head Business Operations; the geographies comprising Continental Europe, Africa, and LATAM; Strategic Engagements, Advisor Relationships as well as the Marketing function. Welcoming Abid to Wipro, TK Kurien, Chief Executive Officer and Member of the Board said, "Abid brings invaluable experience with his track record of building and scaling businesses. I am confident his deep understanding of technology and expertise in all facets of IT & BPS businesses will help power our businesses to greater heights." Commenting on his appointment, Abid said, "I am honored to join Wipro, a company with a rich heritage of technology innovation and unflinching commitment to values. I look forward to contributing towards the company's next phase of growth." Abid was, until recently, with Tata Consultancy Services where he headed Business Process Services globally.

R N Misra assumes the role of Chairman & MD, SJVN

R N Misra

"Misra has varied experience in Planning, Project Appraisal, Environmental issues related to Hydro Power Projects"

R N Misra has been appointed Chairman & Managing Director of public sector SJVN Limited by Govt. of India. Prior to this Misra was holding the post of Director (Civil) and since 06th January 2015 he had been holding the additional charge of Chairman & Managing Director.

R N Misra joined SJVN on 21st of May 2010 as Director (Civil). Prior to joining SJVN, Misra was Executive Director with NHPC Limited.

He has about 35 years experience in power sector. He has varied experience in Planning, Project Appraisal, Environmental issues related to Hydro Power Projects, Project Monitoring, Contract Management and Execution of Large Hydro Power Projects. Misra did his Bachelors of Engineering in Civil discipline from MNNIT, Allahabad and MTech from IIT, Delhi. He also holds a degree in Management from Indira Gandhi Open University.

Government to expand the T&D Network

Investment in the construction, utilities and renewable energy sectors is driving the Indian Low Voltage (LV) switchgear market. With the residential segment witnessing robust growth to meet the rising demand for real estate in the country, lucrative opportunities for LV switchgears will emerge from this sector too.

New analysis from Frost & Sullivan, Indian Low Voltage (LV) Switchgear Market, finds that the market earned revenues of $929.7 million in 2014 and estimates this to reach $1,405.2 million in 2020. The study covers air circuit breakers, molded case circuit breakers, motor protection circuit breakers, changeover switches, contactors and relays, miniature circuit breakers, residual circuit devices, distribution boards, and switching devices.

"The Indian Government's plans to expand and develop the T&D network and augment power capacity are expected to fuel the need for LV switchgears in the country," said Frost & Sullivan Energy & Environmental Senior Research Analyst, Venkatesh Ganji. "Schemes such as Rajiv Gandhi Grameen Vidyutikaran Yojana and Restructured Accelerated Power Development and Reform Program that have been designed to encourage investments at the distribution level will be among the initiatives that will boost the demand for LV switchgears."

Venkatesh Ganji,
Frost & Sullivan Energy & Environmental Senior Research Analyst

> *"The Indian Government's plans to expand and develop the T&D network and augment power capacity are expected to fuel the need for LV switchgears in the country."*

On the downside, energy-intensive industries such as oil and gas, which have traditionally driven the primary demand for LV switchgears, are holding back future investments due to the weak macroeconomic environment, tightening liquidity, and a lack of policy reforms. These industries have adopted a wait-and-watch strategy, creating a lull in productivity and the demand for LV switchgears.

"With industry sentiments and overall economic conditions anticipated to improve by the middle of this year, the Indian LV switchgear market is likely to witness higher growth rates over the next five to six years," noted Ganji. "Fast-paced reforms planned by the Government will play a pivotal role in getting the market back on track."

LV switchgear manufacturers will still have to contend with increasing pricing pressures due to intense competition. The revenue-generating potential of market participants will suffer to some extent due to curtailed investments and the long approval process for utility and infrastructure projects.

Suzlon powered 65 MW Wind Energy Park in Uruguay

Suzlon Group, the wind turbine maker announced commissioning of Rouar S A's Wind Energy Farm at Artilleros for 65.1MW. The Wind Farm is located 170km east of Uruguay's capital Montevideo and was inaugurated by the President of Brazil, Dilma Rousseff and President of Uruguay, Jose Mujica. This is the first of its kind joint venture between Brazil and Uruguay to harness wind energy for energy security. Suzlon is responsible for complete Engineering, Procurement and Construction (EPC) and life-time service thereon of the Wind Energy Park at Artilleros. The 65.1MW Wind Energy Park is located on state-owned land near Tararitas city in Uruguay's Colonia province. The energy farm includes Suzlon's 31WTG's (Wind Turbine Generators) of S95-90 make with a rated capacity of 2.1MW.

Rouar S A is a joint venture set up by Brazilian federal power company Electrobras and Uruguayan partner Administración Nacional de Usinas y Trasmisiones Eléctricas (UTE). The power generated from this project will be fed into Uruguay's national grid to meet the region's energy needs. Uruguay aims to increase its energy from renewables in its total primary consumption to 50% by 2015 as compared to about 40% in 2012.

Tulsi R Tanti,
Chairman, Suzlon Group

> *"Suzlon is committed to contribute to Uruguay's energy basket by reducing its carbon footprint and achieve the country's vision of energy security and low carbon economy."*

Construction of the Artilleros wind farm started in January 2014 and is Electrobras's first international investment. UTE is building another 468.1MW at six wind farms. Uruguay ended 2014 with 700MW of installed wind power capacity, up from 59MW a year earlier. The country is expected to end 2015 with 1GW of wind and meet its target to source 15% of its power supply from renewables. The Uruguay government with its focused approach on enhancing its renewable energy portfolio is aligned to the dual objective of sustainable development by ensuring Uruguay's energy security.

Suzlon's state-of-the-art S95-90 2.1MW WTG'S are designed to harness the optimal available wind resources and deliver higher energy, productivity, improved serviceability. With an investment cost of USD 107 million, the project will contribute to reducing Uruguay's carbon footprint by eliminating approximately 0.11 million tonnes of CO_2 emissions per annum. The 65.1MW project will light up ~20300 households in Uruguay with clean energy.

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Central Electricity Authority
Grid Operation & Distribution Wing
Operation Performance Monitoring Division

All India / Regionwise Power Generation Overview 10-Mar-2015

All India/ Regions	Installed Capacity (MW) **	Monitored Capacity (MW)	Annual Target (MU)	Generation 2014-15 (MU)					
				Today's Program	Today's Actual	Apr 1 Till Date		Deviation	% Deviation
						Program	Actual		
NORTHERN									
Thermal	43787.75	40154.26	213312.00	616.96	461.65	200345.16	199450.96	-894.20	-0.45
Nuclear	1620.00	1620.00	10479.00	30.10	36.78	9846.00	9859.48	13.48	0.14
Hydro	16529.44	16740.27	61804.00	114.70	113.05	59394.60	63184.19	3789.59	6.38
TOTAL	61937.19	58514.53	285595.00	761.76	611.48	269585.76	272494.53	2908.77	1.08
WESTERN									
Thermal	68397.40	74889.41	315914.00	930.79	914.12	296466.30	318712.27	22245.97	7.50
Nuclear	1840.00	1840.00	11056.00	28.90	40.04	10449.00	13049.49	2600.49	24.89
Hydro	7447.50	7392.00	15918.00	39.69	39.51	15084.90	14889.55	-195.35	-1.30
TOTAL	77684.90	84121.41	342888.00	999.38	993.67	322000.20	346651.31	24651.11	7.66
SOUTHERN									
Thermal	32494.57	32302.80	170936.00	517.65	525.15	160057.50	161313.38	1255.88	0.78
Nuclear	1320.00	2320.00	13765.00	43.59	53.97	12792.90	10574.13	-2218.77	-17.34
Hydro	11398.03	11432.45	31603.00	76.69	76.83	29990.90	29664.15	-326.75	-1.09
TOTAL	45212.60	46055.25	216304.00	637.93	655.95	202841.30	201551.66	-1289.64	-0.64
EASTERN									
Thermal	26195.13	31345.05	152475.00	442.57	442.68	143242.51	140478.63	-2763.88	-1.93
Hydro	4113.12	4078.70	10884.00	24.04	21.01	10378.40	11752.33	1373.93	13.24
TOTAL	30308.25	35423.75	163359.00	466.61	463.69	153620.91	152230.96	-1389.95	-0.90
NORTH EASTERN									
Thermal	1411.24	1643.30	5966.00	19.35	18.05	5559.50	6653.78	1094.28	19.68
Hydro	1242.00	1242.00	4088.00	4.47	3.16	3993.70	3481.06	-512.64	-12.84
TOTAL	2653.24	2885.30	10054.00	23.82	21.21	9553.20	10134.84	581.64	6.09
ALL INDIA									
Thermal	172286.09	180334.82	858603.00	2527.32	2361.65	805670.97	826608.92	20937.95	2.60
Nuclear	4780.00	5780.00	35300.00	102.59	130.79	33087.90	33483.10	395.20	1.19
Hydro	40730.09	40885.42	124297.00	259.59	253.56	118842.50	122971.28	4128.78	3.47
R.E.S.	31692.14								
Bhutan Imp		0.00	4800.00	4.74	1.20	4700.40	4963.39	262.99	5.60
TOTAL	249488.32	227000.24	1023000.00	2894.24	2747.20	962301.77	988026.69	25724.92	2.67

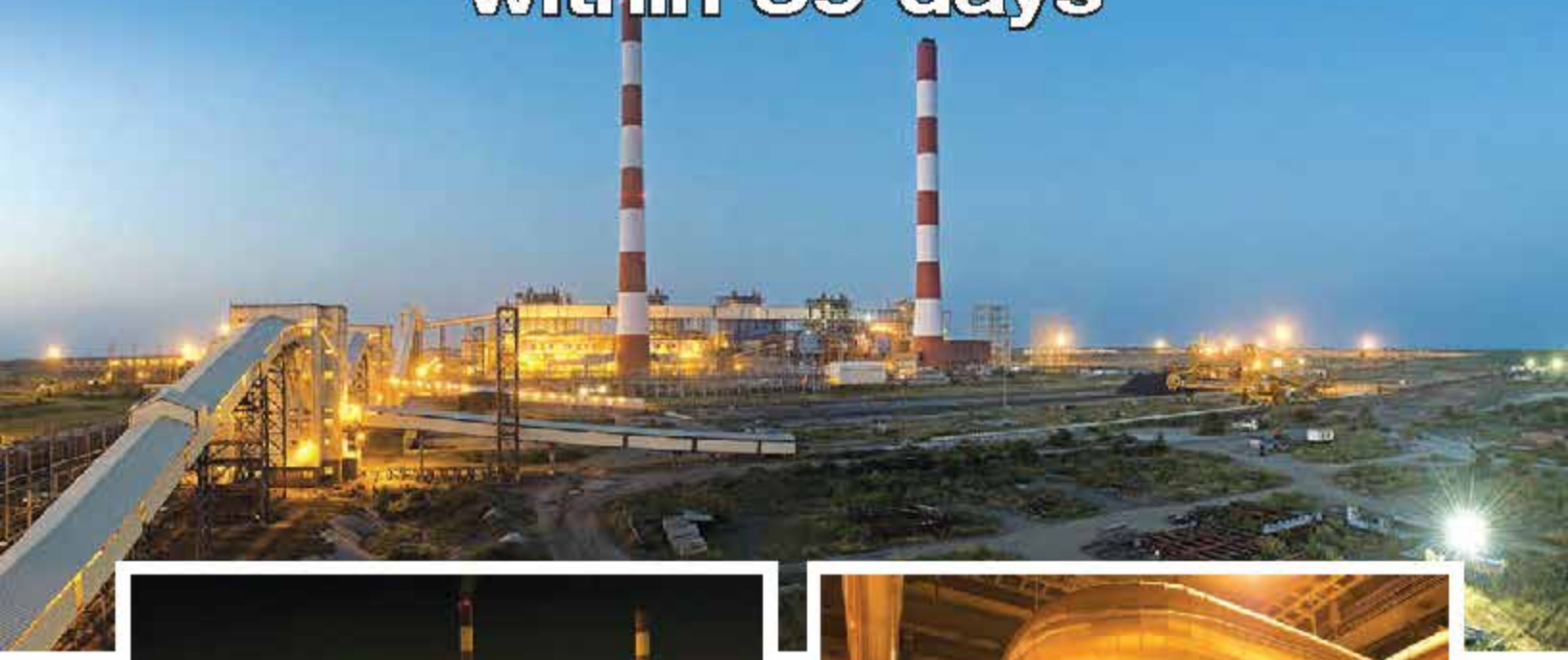
" ** " Capacity figures are taken from Monthly Report of D/M.L.F. Division as on the last day of the previous month

* 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."

Source: CEA

RattanIndia sets a new record within 39 days



RattanIndia Power Ltd, formerly Indiabulls Power Ltd, has commissioned Unit-5 of the 1,350MW Amravati Thermal Power Plant in Maharashtra. This marks the completion of entire 1350MW at Amravati Thermal Power Plant. Each unit has a production capacity of 270MW. RattanIndia has set a new benchmark in power plant construction and erection history of India by commissioning 3 units within a time span of 39 days at one site. Unit 3 and Unit 4 of Amravati power plant had earlier achieved COD on 03/02/2015 and 08/03/2015 respectively. This demonstrates the unparalleled execution prowess of the Company. Also, Amravati Power Transmission Company Ltd. (APTCL), a wholly owned subsidiary of RattanIndia Power Ltd., has commissioned the transmission system for evacuation of power from Amravati power plant. The transmission system includes 104 km 400 KV D/C Quad Moose line from Amravati Project to Akola Substation.

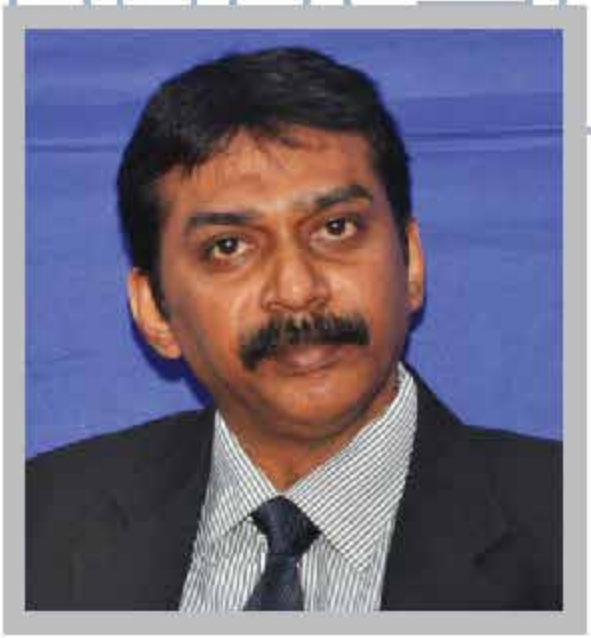
RattanIndia Power Ltd. has also completed the railway line between Walgaon and Amravati power plant. With the completion of this railway line, Amravati power plant will be able to get coal directly at its captive siding. The plant has assured coal linkage from South Eastern Coalfields Ltd, subsidiary of Coal India Ltd.

The Amravati Thermal Power Plant will supply the entire power generated to Maharashtra State discom under a 25 year Power Purchase Agreement. Company will replicate the execution success of Amravati plant at its Nasik power plant and is confident of commissioning the 1350MW Nasik power plant by December 2015, thereby taking the total installed capacity to 2700MW. The completion of the Amravati power plant will contribute towards achieving the goal of Government of India of supplying 24x7 reliable and affordable power to all by 2019.

Rajiv Rattan

Chairman, RattanIndia Group. RattanIndia Power Ltd has been founded by Rajiv Rattan. Rajiv Rattan had earlier co-founded Indiabulls Group in 1999, with interests in financial services, real estate, power generation and information technology.

Interview



"Energy saving technologies like LEDs are gaining popularity"

Ramesh Kumar
Global Sales Head - Consumer Business
Head - Lighting Division
Crompton Greaves Ltd.

The market for LED lighting is growing at a very fast pace in India. Alongside, there is a growth in its application areas and customers' demands for variety. **Crompton - a consumer division of Crompton Greaves Ltd.** is present in LED lighting, Fans, Pumps and Applinaces. In an exclusive interview with **Electrical India, Ramesh Kumar,** Global Sales Head - Consumer Business and Head - Lighting Division, Crompton Greaves Ltd. focuses on the increasing popularity of LED lighting in India – and how the company is extending its service to the Indian consumers.

➢ **What is your perception about the LED lighting market in India?**

The LED market has emerged as one of the fastest growing industries in India. This industry has been majorly driven by factors such as price of LED lights, increasing initiatives taken by the government and rising concerns with respect to energy conservation.

There are a few barriers existing for LED market like high initial cost of LEDs, absence of National Standards, low consumer awareness, lack of testing protocols, facilities and accredited laboratories at the national level, no incentive either to set up manufacturing facilities in India as is the case with China.

However, with the rise in standard of living and increase in awareness of the new energy saving technologies like LED, a swift shift towards energy saving and preference to enhanced quality of light is being witnessed. The market is also witnessing growth in premium lifestyle lighting segment with preference towards ambient lighting solutions. The revenue generated by LED market in India has displayed a CAGR of 56.1% over the past 5 years. This shows India has a huge potential in lighting market.

➢ **What are Crompton's latest offerings for the residential lighting segment? What kind of after-sales service do you extend?**

Crompton has solutions across the residential market segment for various applications – ranging from living rooms, bedrooms, kitchens, bathrooms, lobbies, porches, gardens and residential complexes – lighting comprising incandescent to fluorescent, and energy saving CFL and LED technologies. With increase in awareness of LED through Industry, the demand is growing in the market. To keep pace with the growing market, Crompton has introduced smart LED panel, a perfect solution for mood lighting. With changing color temperature through remote, consumers can set the ambience to match individual moods. Introduction of LED lamp at affordable

prices is helping in LED penetration in masses. Crompton products and solutions are in line with global standards and the BIS standards. Crompton is very quick and efficient in after sales services for its lighting solutions pan India. Its network of 450 Authorized Service Centers with skilled technicians provide services to end consumers within 24 hours of receiving complaints through toll free number.

➢ What are the factors one should remember while buying lighting solutions for residential use?

While buying the residential lighting solution, one should keep in mind the amount of energy is being saved. The total light output, the burning hours guaranteed and the reliability of the product in maintaining colour over lifetime are important points to check before decision making. Off course the look and décor of the residence is also important.

➢ What are the recent dynamic changes in LED technology? How are you coping with those?

With continuous research in LED technology, a lot of dynamic changes are occurring like rapid increase in the efficacy of the chip, change from emitter technology to COB [Chip on Board] technology, different soldering processes for different chip manufacturers, driver requirements for various wattages etc. This is a continuous process and the manufacturer need to adopt and absorb these changes quickly. Partnerships and collaborations with leading LED eco system partners, we are able to absorb the dynamic changes and be ready for future technologies. This also gives us edge in terms of offering better solutions ahead of competition. The partnership also helps in setting up manufacturing facilities required for technology and cost leadership.

➢ As a global sales head, what sales strategies are you applying to boost the sales level for this year?

The lighting business has changed tremendously with the growing demands and aspirations of customers by changing and improving lighting design and creating a cost effective solution. Lighting has progressed over the last century from Edison's light source to today's energy efficient and economic offering.

To focus on this dynamic and growing market, we have created exclusive LED Experia showrooms in western India. More such showrooms are planned across India this year. These showrooms give consumers and interior decorators actual experience of using different LED products or solutions. The customers can experience the vast product portfolio under one roof and can take experts' advice that help him/her to make the buying decision.

We are also focusing on Modern Retail.

E commerce is showing us good results in reaching new and younger customers.

The adequate training to the channel partners and continuous introduction of innovative products are helping us in creating value for Crompton as well as for channel partners.

The ambitious "Make in India "campaign by the current government has started attracting huge investments in electrical manufacturing. Coupled with low labour cost and high demand for LED globally, India has a great potential of becoming a manufacturing hub for LED lighting. This will help increasing the focus on export business.

➢ What are the various possibilities that can be explored with LED street lighting in the domestic sector?

The only application of street lighting in residential complexes is for periphery and landscape lighting. Crompton provides a complete range of landscape lights along with low wattage street light solutions – apt for the application. Solar based LED streetlight solutions further provide the scope for Energy Savings.

➢ Overall where would you envision the company in the next two years?

We will be offering complete LED solutions to match the taste of each individual buyer from lower income group residences to state of the art residences. We are also looking at providing Home Automation solutions integrating other appliances in addition to lighting.

Crompton is gearing up to come closer to the customers by continuous development in the existing products and launching new products and solutions in line with market requirements. We are also increasing our footprint by expanding the distribution network and rolling out exclusive show rooms.

Venture Lighting offers Pulse-Start Metal Halide Tubular Lamp

Venture Lighting introduces Uni-Form Horizontal Tubular Pulse-start Metal Halide lamp. The first pulse-start Metal Halide systems specifically designed for horizontal orientation in fixtures. Uni-Form Horizontal tubular lamps features Uni-Form arc tube technology, which follows the shape of the arc stream for improved thermal characteristics, resulting in greater light output and 80% lumen maintenance. The lamps have a rated life of 20,000+ hours, which means that 70% of lamps installed will still be operating at the end of rated life.

Features

The lamp has longer life; enhanced lumen maintenance; it has excellent system color uniformity; hot restart in less than half the time of standard pinch body metal halide systems;

50% faster warm-up.

Uni-Form Horizontal tubular pulse-start metal halide lamps use patented weld less technology for robust, reliable construction. As a result 200 Uni-Form Energy Saving lamps are designed to replace standard 250. Total system energy saved for 365 days-12 hrs operation is 241 Kwhr, average savings per

luminaries at Rs 11 Per Unit is Rs 2651, available range 70-1000 w.

Applications

Flood lighting; security lighting; street lighting; energy retrofits and sports lighting.

For further details contact:
marketing@vlindia.com

Polar Lighting Poles by K-LITE

K-LITE surface mounted Polar Lighting Pole, integrated with LED Lighting Module, blended with architectural appeal is an exclusive choice of designers for city beautification lighting. It is designed for a complete range of contemporary designs with single arm, double arm, L-arm, V-Arm, Square arm and Parallel arm. The pole is engineered to meet the adverse conditions and the pole sections are duly welded using special grooving techniques and high end MIG/ TIG welding process. The control box is integral and built-in with service door, locking arrangement and safety chain. The galvanized pole is coated with epoxy zinc phosphate primer and finished using environmentally stable polyurethane based paint. The pole is supplied with necessary foundation hardwares for normal soil condition. The Polar Lighting Pole lighting arms are integrated with

the LED modular lighting system, which is environmental friendly under green lighting category. The LED lighting offers more lumens with lesser power consumption The luminaire is IP 68 protected and the various models were evaluated by an extensive research and understanding of illumination requirements for urban spaces. Choice of drivers for LED takes into consideration the harmonic distortion level (not exceeding 10 %) power factor greater than 0.9 and surge protection. The LED modules are individually rated 45 watts. The control gear tray is prewired with terminal connectors, MCB and loop-in loop-out arrangement and located in the control box, integral with the pole.

Features

High Brightness, LED Light source do not pose any environment risks.

Designed for highest efficiency in terms of more lumens at reduced wattages contributing to a Greener World.

Customised for your delight: Creating the entire product portfolio - Right from concept to completion, merging the best technology and practices in lighting.

Setting new standards by offering IP67 level of protection. The solutions offered are backed by extensive understanding of illumination in urban spaces.

The Fixture and the driver are designed to provide value technology ideally suited to Indian conditions.

For further details contact:
info@klite.in

Aggregator AG1000 from ElMeasure

ElMeasure's Aggregator is a web based, it functions as a high-end data concentrator which has a multi-protocol communication interfacing unit that supports the modbus protocol over different types of communication channels for local as well as remote data collection. Introduction of the Aggregator allows for flexibility to cater to wired or wireless environments with built in storage, providing the end user with a robust solution for Energy Management. One of the biggest advantagesis, the data storage capacity of 64 GB which can be transferred to a remote server at pre-determined intervals that allows for built in data redundancy. The same data can be directly viewed and can also be pushed to the cloud with the built in web server software enabling the user to collect and monitor the system without geographical boundaries. The product has multiple communication options such as RS 485, Ethernet, Wi-Fi, Zigbee & GPRS (2G & 3G).

For more details contact:
marketing@elmeasure.com

Siemens new 3VA molded case Circuit Breakers

Siemens has added new versions and product features to its 3VA series of molded case circuit breakers (MCCB) from its Sentron portfolio. The 3VA1 series is now available for a higher rated current of up to 250 A and has been expanded to include starter protection variants. Siemens also now offers the 3VA2 series in motor protection and starter protection variants that protect the electric drives against short-circuits and overloads.

The company also improved the selectivity characteristics of the devices. The 3VA series thus meets all energy distribution requires for protecting cables, electrical loads and industrial equipment against electrically induced damage and down times.

3VA molded case circuit breakers with new features and variants

As part of updating the portfolio, Siemens developed a new electronic trip unit (ETU) with an optimized tripping characteristic that improves the selective grading of 3VA2 MCCB with downstream fuses. The rated current intervals between the molded case circuit breaker and the fuse can thus be selected based on need, so that molded case circuit breakers with low rated currents can also be used, thus saving money. Since the characteristic is steeper compared to common trigger characteristics, the protection devices switch off earlier in the event of an overload. The electrical load of the equipment is thus reduced in the event of an overload or short-circuits. The series' new ETU is also easier to parameterize, since the only value that needs to be set is the tripping current of the overload protection system.

As an integrated, variable system, the 3VA MCCB are designed to provide optimum support for every step, from planning and installation to ongoing operation of the electrical energy distribution system. This is also supported by the range of accessories, which is standard for all series and multiple sizes and includes more than 500 components. These accessories can be used to add around 70 functions to the circuit breakers in modules and thus adapt them to nearly all requirements.

An online product configurator as well as comprehensive CAx data, such as 3D models and EPLAN macros, make the devices easier to engineer. With the aid of an integrated measuring function, data such as current, voltage, energy values and system states can also be recorded with the 3VA2 MCCB and transmitted to higher-level automation systems via common bus systems such as PROFIBUS and PROFINET. The molded case circuit breakers thus help increase system transparency and energy efficiency.

Depending on the size and series, 3VA MCCB are available in one-pole to four-pole versions and are designed for rated currents of 16 A to 630 A as well as rated voltages of up to 690 volts (VA) AC.

Website:
www.siemens.com

FLIR E-Series Thermal Imaging Camera with MSX® Technology

FLIR Exx Series troubleshoot more efficiently, create detailed reports easier, and share images and findings faster with FLIR's latest E-Series thermal imagers. Featuring a fresh array of imaging, communication, and productivity tools to help you get more done in a day. Its an ideal tool for electrician, plant maintenance engineer/technician for predictive maintenance and planned inspections of electrical and mechanical systems to ensure they operate at maximum efficiency and safety with minimal energy consumption.

Now Featuring MSX Technology

See numbers, labels and other key visual details not normally apparent in a regular thermal image with an all-in-one thermal picture that instantly orients you to right where heat issues are.

Features

Touchscreen control & auto orientation; onboard digital camera; picture-in-picture; multiple measurement; interchangeable lenses and manual focus; higher temperature range and sensitivity; MeterLink® connectivity.

For more details contact:

flirindia@flir.com.hk

igus brings cables for robotics

Robots have already become an indispensable element in industrial production. Because of them, the demand is steadily increasing for Ethernet cables that secure data transfer from machine to machine, even with multi-dimensional movements. Belonging to the igus robotic cable range, the chainflex CFROBOT8.045 cable has withstood more than 22 million torsional motions in the igus standard test.

The chainflex CFROBOT8.045 cable has withstood over 22 million torsional motions in the igus standard test. (Source: igus GmbH)

Special tests guarantee a reliable statement about the service life even in torsionable cables. (Source: igus GmbH)

In the intelligent production system, automation continues to rise. About three million industrial robots control and monitor the manufacturing processes, whereby the autonomous machine-to-machine communication and with it the need for special torsionable data cables also increase. Since these robotic cables must successfully carry out multidimensional movements, special materials, design and manufacturing processes are necessary. But the main decisive factor consists of the final tests, because only a long series of tests reveal in practice what materials and which structures really withstand the high demands of the robot. The cable and energy supply specialist, igus GmbH, has almost 25 years of experience in developing, manufacturing and testing cables for moving applications under the name of chainflex. The company has been constructing copper-based Ethernet cables for permanently moving energy chains for the industry for a decade.

Service life of robotic cables predictable through standard test

'From the beginning it was clear to us that a secure communication of the machines can only take place if the most sensitive Ethernet signals are transmitted smoothly without disturbances even in the presence of high mechanical stress,' says Rainer Rössel, head of chainflex cables division at igus. igus has developed its own test standards for torsion and operates its own test facility for the standardised test series, in addition to carrying out tests on robots of various manufacturers in its own test laboratory. 'We mount the robotic cables on both sides with a rotary and fixed-point distance of one metre and twist them at an angle of ±180 in our triflex R e-chain series that are particularly designed for the torsion,' says Rainer Rössel. 'In the process, the chainflex cable CFROBOT8.045 withstood 22 million torsional motions.' All test results are stored in a database and made freely available online for the calculation of service life. igus is the only manufacturer who can conduct a transparent and reliable calculation of the service life of torsionable robotic cables.

Compensating elements and special liners for balancing the torsion

Cores, stranded structures, shields and jacket materials are constantly exposed to highly fluctuating loads with torsions. In order to keep the cables stable and ensure data safety, igus relies on a combination of very glidable and simultaneously highly stable films and special filler elements that function like shock absorbers in cars and thus systematically absorb the occurring forces. Different shielding concepts are followed depending on the electrical requirements, and thus for the chainflex CFROBOT Ethernet cable, the concept with shields braided in pairs and special liners has proven to be the best in the test series. Thus igus is the only supplier to offer a robotic cable range from stock with a service life that can be predicted online.

For more details contact:

info@igus.in

Compaq International Pvt Ltd

Compaq International Pvt Ltd is established in the year 1996 entered into business of low voltage & medium voltage cable management products. CIPL is an ISO 9001:2008; 14001: 2004 certified organization engaged in production of heat shrinkable, cold shrinkable, composite polymeric insulators, metal oxide surge arrester and other associated electrical products for power distribution up to 66kV.

The company established itself as first enterprise in India as original manufacture of full package of cable accessories & polymeric insulators up to 66kV. The company employs most experienced and qualified engineers and managers to handle every activity in compliance with any top leading quality standards available globally. Research and activity is an on going activity process. CIPL state of the art in house design facilities guarantees there performance of their systems including security & integrity of the applications.

Website:
www.compaqinternational.com

Hyosung Group

Hyosung Power & Industrial Systems Performance Group, a comprehensive energy solution provider, leading technology in the global power industry. In 1992, Hyosung was the first in Korea, and the sixth in the world, to develop a 765kV ultra-high voltage (UHV) transformer, and, in 1999, was the first in the world to manufacture the 800kV gas insulated switchgear (GIS), which has put Hyosung on an equal technological ground as its top global competitors. Hyosung Power & Industrial Systems Performance Group is divided into four business areas or performance units, depending on the types of flagship products: Power Systems Performance Unit, Industrial Machinery Performance Unit, Hyosung GoodSprings Performance Unit, and the Wind Energy Business Division. Company has achieved outstanding increase in sales over the past few years due to the enhancement in Hyosung's quality, technology, and brand recognition among overseas clients, which include North America, Europe, the Middle East, and Asia.

Having such world-class technology, they established Baoding Hyosung Tianwei Transformer Co. Ltd., a joint venture with the Baoding Tianwei Organization, to hold the largest share of the market in Baoding City, China. This venture was established in 2003, and by the end of 2004, we established a production plant producing 11,000 transformers per year.

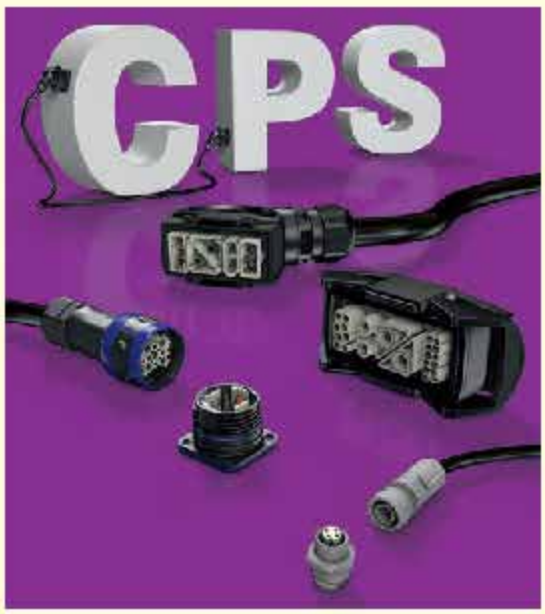
Website:
www.hyosungpni.com

Connected Industry

Industry 4.0's use of Cyber-Physical Systems has radically altered the face of industrial production. Still, Industry 4.0 will only become a reality when the cyber world and physical world are connected. This is as much a mission as it is a vision. Until today, industrial facilities have largely followed a simple concept, a concept that is all about automation tasks that are performed by automation devices. These devices need to be connected to a central controller. That's it - nothing more is necessary for this undoubtedly extremely powerful concept.

The network is merely the vehicle for the industrial Ethernet fieldbus, or – stated in even more trivial terms – just the connecting line. From the perspective of automation, this is completely understandable and sufficient.

Industry 4.0, however, entails new demands on network technology, and by extension on connection technology – production in Industry 4.0 needs to be more effective, more flexible and more powerful. Control functions shift from a central controller over to the system itself. This entails a radical conceptual change in the structure of production facilities: a strictly hierarchical system gives way to a decentralized one. Plans and systems are constructed in modular form, while control tasks are relocated in the system itself. The network becomes the crucial component.



What does industry 4.0 mean for the field level?

For something that admittedly sounds so simple and logical, the implementation is dependent on a number of conditions, among which the integration of Cyber-Physical Systems (CPS) with the material world of production holds center stage.

Industry 4.0 is characterized by the integration of CPS (Cyber-Physical Systems) into IT applications. This integration should be as flexible as possible, meaning that the rigid arrangement employed in conventional production is broken up. This results in two areas that need to be melded.

The initial implementations (e.g. the smartfactoryKL) revealed that the crucial interface lies between the autonomous system modules. These may be of conventional design, i.e. with central controller and decentralized I/O, however they can also be constructed from CPS. In any case, what distinguishes them is that the modules perform a completely self-contained service on the real object in the production process. The set-up of the modules can still be performed conventionally without compromising the advantages of Industry 4.0.

Modules at a production facility need to be able to be integrated into the production process at different locations in an extremely easy fashion – and above all quickly. And different modules must be able to be deployed at these sites. These two key requirements mean that cabling takes on a different character. Deployment at varying locations becomes basic setup, while its use with various modules means it constitutes a basic service. Cabling is transformed into an infrastructure.

What will infrastructure look like in Industry 4.0 manufacturing?

Smart Factory infrastructure is currently in the definition phase. Ethernet will be used both for IT as well as automation. In addition, office buildings will employ application-neutral cabling according to ISO/IEC 11801, the standard provides specifications for setting up passive network infrastructure.

If one applies this view to a production plant, this will entail integrating different modules into the network. In addition, all the lifelines that supply industry need to be considered, i.e. communications, 400 Volt power, compressed air, auxiliary power and other signals. Consequently, the required connections are numerous, which means that simple plug-and-produce will only become possible when the connections are integrated in one interface, i.e. in one connector. Thanks to its modular construction, Han-Modular® can make all lifelines available. The standardization of the module interface means that a decisive step has already been taken. Still, infrastructure development requires more than just this. In the case of industrial production, the module interface must be capable of offering a wide variety of functions in order to ensure simple and – above all – more secure operation. In addition to the module connector interface, this includes management with respect to diagnosis, identification of modules, energy measurement and energy switching, protection for power (400 Volts) as well as safety and real time communication. These functions can be ensured by using active network components.

HARTING is intensively driving the development of these Industry 4.0 infrastructure components forward. By way of example, HARTING's smart Power Network Unit brings together the topic of the administration of communications and power. This infrastructure component supports industry-typical topologies via line and ring, thereby enabling infrastructure to be put in place which facilitates the flexible use of different production modules.

Andreas Huhmann
Strategy Consultant Connectivity & Networks, HARTING Technology Group

ELNet Multi Data Meter with Graphics Wave Form Display

AVR

ELNet GR/PQ Energy & Power Quality Analyzer

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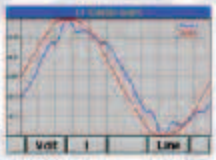

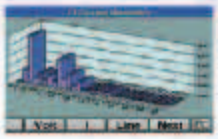

Standard Approvals:
IEC 62053-22, IEC 62053-23, IEC 62052-11

Other Products

ELNet MC	**Multi-Channel Power Quality & Energy Power meter**
ELNet LT	**Power Quality & Energy Power meter**
ELNet LTE	**Energy Power Meter**
ELNet LTC	**Power Quality and Power Factor Regulator**
ELNet PFC	**Power Factor Regulators**

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Borouge & Borealis showcased innovative solutions at MEE 2015

Borouge and Borealis, leading providers of innovative, value creating plastics solutions to the global wire and cable industry, underlined their position as long-term reliable partners by showcased innovations of advanced insulation, semi-conductive and jacketing materials at the Middle East Electricity exhibition held in Dubai from 2-4 March 2015. Reinforcing their significant contribution to the development of the wire and cable industry, Borouge and Borealis participated at the exhibition to show their commitment to the development of the wire and cable industry by continuing to provide quality productivity solutions that enable cable makers to manufacture premium cables as per the highest industry standards. With the Borouge 3 plant up and running, Borouge will further contribute to the advancement of the wire and cable industry with its new production of low density polyethylene (LDPE) and cross-linked polyethylene (XLPE) solutions.

As an important part of the Borouge 3 expansion plant in Abu Dhabi, Borouge's new 350,000 tonnes per year (t/y) LDPE plant will be an integral addition to the recently inaugurated Borealis high pressure LDPE plant, dedicated to the production of highly specialised and super clean products for the wire and cable industry. Borouge's new LDPE production plant is tailored to manufacture unique Visico™ and Borlink™ XLPE solutions for the global wire and cable market, thereby applying the same technology and quality standards applied by Borealis. With Borstar® and the Borlink™ Supercure technology, the product range of both companies is able to meet the industry's most stringent needs.

"With our new investments in the production of LDPE and XLPE grades, we are further committed to provide the wire and cable market with innovative solutions that add value to the industry, enhancing our position as a long-term reliable partner of choice."

> *"The Middle East Electricity provides a significant platform for Borouge to showcase our innovative solutions for wire and cable applications such as power and communication cables," said* **Hazeem Sultan Al Suwaidi**, *Senior Vice President Middle East Africa (MEAE), Borouge.*

Borouge and Borealis highlighted their Borlink™ LS4201EHV at the exhibition. Building on the excellent track record of Borlink™ LS4201S for high voltage application, the introduction of Borlink™ LS4201EHV brings the benefits of the Supercure technology to the most demanding Extra High Voltage applications including sub-marine cables.

The grade is recognised with its outstanding cleanliness with lower degassing burden and improved scorch performance. It also provides valuable benefits for the cable manufacturers in terms of improved processing and optimised production cycle. "The exhibition provides Borouge with an opportunity to meet with our customers in the region, discuss their needs and introduce them to our latest innovative solutions and grades tailored for the wire and cable industry," said Roland Janssen, Vice President Marketing Centre Wire & Cable, Borouge. "We will continue providing the local and regional wire and cable markets with sustainable solutions that are recognised for their processing characteristics, lower maintenance, lower installation costs, longer product lifetimes and increased safety." Borouge and Borealis are recognised throughout the global wire and cable industry as trendsetters for innovation in technology and products that support the growth of modern infrastructure. With more than 50 years of experience in polyolefins, they are the long-term reliable partners of choice for the global wire and cable industry providing high quality plastic solutions for a wide range of power transmission cables as well as electrical and fibre optic communication applications.

Business Discussions at Borouge and Borealis stall


Professionals and experts at Borouge and Borealis stall

Index to Advertisers

Companies covered in this issue

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For over 100 years Megger is the premier provider of electrical test and measuring equipments in Power applications.

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Posted at Patrika Channel STG. Office, Mumbai - 400001 on 5th of Every Month, Date of Publication 5th of Every Month