ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
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ISSUE NO. 105	VOL : No. 10/2014	MONTHLY ISSUE NO. 11	PRIVATE CIRCULATION ONLY	NOVEMBER 2014

New Office bearers and Executive Committee members of our association met

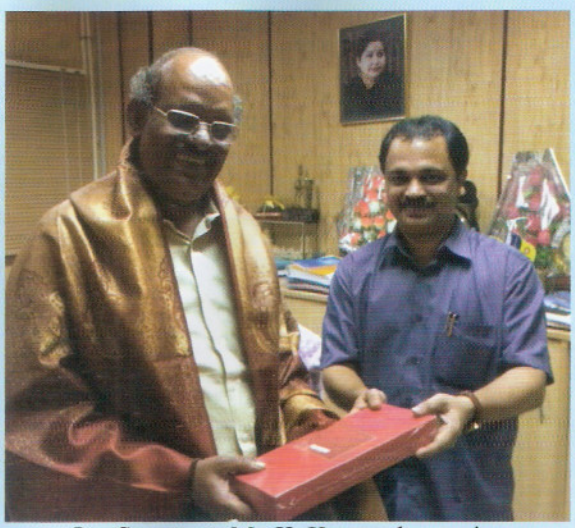
Mr. Rajesh Lakhoni, I.A.S., Principal Secretary to Government, Energy Department,
Er. S.Akshayakumar Chairman, Tamil Nadu Electricity, Regulatory Commission.
Er. S. Appavoo, The Chief Electrical Inspector to Govt., as a courtesy call on 19.10.2014.

Our President Mr. U. Baskaran honouring Mr. Rajesh Lakhoni, I.A.S., Secretary to Government (i/c), Energy Department

Our President Mr. U. Baskaran honouring Er. S. Akshayakumar, Chairman Tamil Nadu Electricity Regulatory Commission

Our Secretarty Mr. K. Kannan honouring Er. S. Akshayakumar, Chairman Tamil Nadu Electricity Regulatory Commission

Our President Mr. U. Baskaran honouring Er. S. Appavoo, CEIG



Our Secretarty Mr. K. Kannan honouring Er. S. Appavoo, CEIG

EVENTS

DESIGN LIGHTING TOKYO 2015

3RD TOKYO DESIGN LIGHTING EXPO & CONFERENCE

Events Profile: DESIGN LIGHTING TOKYO is a venue for business meetings between exhibitors and visitors. Design lightings that enrich the atmosphere will be showcased and plenty of users as architects, designers, etc. that seek stylish design lightings will gather here in Tokyo.

Date: 14th – 16th January 2015

Venue: Tokyo Big Sight, Japan

Website: http://www.design-lighting.jp/en/

intelect

2015 IEEE-IEEMA INTELECT Conference and Exposition
Conference theme: **Smart Electricity for Emerging Markets**

Events Profile: Featuring live, life size experience walk-through pavilions conceptualized and designed by a technical committee from IEEE and IEEMA & supported by leading ecosystem players

Date: 22nd – 24th January 2015

Venue: Bombay Exhibition Centre, Mumbai, India

Website: http://www.ii-intelect.org/

ieema METERING INDIA 2015

.... The Smart Indian Dimension

Events Profile: The seminar is envisaged to strengthen the technological choices and offer the options to empower and utilize existing infrastructure for a result oriented future. In partnership with all stake holders, let us add a Smart Indian Dimension to our future and endeavour to lead the global trend.

Date: 12th – 13th February 2015

Venue: Hotel Le Meridien, Janpath, New Delhi, India

Website: http://www.meteringindia.in

40 YEARS MIDDLE EAST ELECTRICITY

Events Profile: Middle East Electricity is the region's largest power event covering all sectors of the power industry including: Nuclear, Electricity, Lighting, Renewables

Date: 2nd – 4th March 2015

Venue: Dubai International Exhibition Centre

Website: http://www.middleeastelectricity.com

ELECTRIC, POWER & RENEWABLE ENERGY MALAYSIA 2015

The Region's Flagship Event for Power Generation, Transmission and Renewable Technologies.

Incorporating: ASEAN ELENEX 2015

Organiser: MES MALAYSIAN EXHIBITION SERVICES SDN BHD ALLWORLD EXHIBITIONS

Events Profile: The 11th International Exhibition of Transmission & Distribution and Electrical Engineering for the EPRE 2015. The trade Exhibition and Conference is an ideal platform for manufacturers, producers and distributors for the electrical & electronic industry to meet, discuss and converge in business networking.

Date: 25th – 27th March 2015

Venue: Kuala Lumpur Convention Center, Malaysia

Website: http://www.epremalaysia.com

EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings To One And All!

Best Wishes For Better Business, Growth And Contribution!!

November is the month when our First Prime Minister of India, Pandit Jawaharlal Nehru is remembered, who was a Great Patriot, Great Disciple of Mahathma Gandhi and a Great Nation Builder. After our Independence, Nehru, realizing that India being a Country of large population and large needs, went on to plan and build large industries, be it Steel Plants or Fertilizer Plants or Heavy Electricals or Cement Plants or many such. Though there were criticisms for shifting away from the concept of Khadi and rural industries etc, the move of Nehru, with further inputs and developments in many areas like Nuclear, Defense, Space and so on and the growth of ancillaries and small and medium industries all over, helped the Nation to become self reliant and economically strong, in the long run over the decades. With this strong and quality industrial base in place, our present Government is able to launch into "Make in India" movement to further strengthen our economy and increase employment. We can rightly feel proud about the fact that we are fast becoming an Economic Super Power of the World and we should respectfully pay our Homage to all our Nation Builders of the past and the present, remembering that the contribution of each and every one of the citizens of India is important in all the Missions. Cleanliness, both in the surroundings and in the 'minds' of people are also very important and the Government Missions in these need our support and contribution.

Electricity being the most important component of all kinds of growth and activities, be it Industry or Agriculture or the Commerce or the Homes, our role and responsibilities are of great importance in ensuring Safety and Efficiency. Training and skills development are also the areas that require our support and contribution.

November is also a month when the National Law Day is celebrated on the 26th and as we all know that it is the Law and Justice Systems in India that provide and strengthen the hope of every Indian for the Growth and Prosperity to sustain and to be healthy. Though there are some unpleasant happenings now and then, like criticism of judgments and the judges and the legal fraternity taking Law into their hands etc., there is still lot of hope in the Legal Systems of India for helping to sustain the growth and to help provide an atmosphere of fairness and safety.

We have received *Valuable Technical Books* for our Library from **Mr. S. Ramani**, **worked** for **Siemens** as Project Head for 20 years. *We thank him for his Contribution.*

We thank all those members who have helped us by participating in the advertisements appearing for the issue October 2014 – Sivasakthi Electricals, Tandem Enterprises, Blue Sea Power Solutions Pvt. Ltd., EVR Electricals Pvt. Ltd., Power Links, Heat Craft Engineers Pvt Ltd., Faith Power Solutions, Galaxy Earthing Electrodes Pvt. Ltd., Intrans Electro Components Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., Abirami Electricals, Cape Electric Pvt. Ltd., Universal Earthing Systems Pvt. Ltd., FLIR Systems India Pvt. Ltd., Max Electric Co., Ashlok Safe Earthing Electrode Ltd., Telawne Power Equipments Pvt. Ltd., Power Cable Corporation, Sri Bhoomidurga Marketing Pvt. Ltd., EA Facilities Services Pvt. Ltd.

EDITOR

NO Safety KNOW Pain --- KNOW Safety NO Pain

ELECTRICAL INSTALLATION ENGINEER

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SUN EDISON AND RAJASTHAN GOVERNMENT SIGN MEMORANDUM OF UNDERSTANDING FOR 5 GIGAWATTS OF SOLAR PV

Sun Edison, Inc., a leading global solar technology manufacturer and provider of solar energy services, recently signed a Memorandum of Understanding (MOU) with the Rajasthan Government aimed at developing Rajasthan as the global hub for solar energy. Sun Edison intends to establish 5 GWs of capacity in the form of multiple Mega **Solar Projects**, with the expected capacity of each Mega Solar project 500 MW or more. The MOU comes at an opportune time following the new Solar Policy announced by the Government of Rajasthan, which aspires to create 25 GW of solar capacity in the state in the next few years. The MOU was signed by the honorable Chief Minister Smt. Vasundhara Raje Scindia.

"Under the dynamic leadership and vision of the honorable Chief Minister, Smt. Vasundhara Raje Scindia, this MOU paves the way for socially and environmentally responsible economic growth and prosperity in the State of Rajasthan," said Pashupathy Gopalan, president, **Asia Pacific** Operations. "Sun Edison is honored to be able to contribute its world leading technology and deployment capabilities to support the emergence of **India** as a global solar energy leader under the vision and leadership of the honorable Prime Minister, Shri Narendra Modi and the honorable Energy Minister, Shri Piyush Goyal.

Mr. Gopalan reiterated Sun Edison's commitment to **India** by saying: "Sun Edison is committed to the long term development of **India**'s solar program and supports its quest for energy security. In support of this initiative we are building local and global partnerships to ensure **India** is at the cutting edge of solar technology and can provide its citizens with clean, reliable, affordable energy solutions."Sun Edison intends to create state-of-the-art solar facilities to generate and supply solar energy to various organizations inside and outside the State of Rajasthan. Those who will receive renewable energy from the solar projects include nodal entities of the Central Government of the Union of **India** viz. Solar Energy Corporation of **India**, NTPC Vidyut Vyaparan Nigam Limited and Power Trading Corporation. Sun Edison or Sun Edison affiliates, including Yield cos, are envisioned as the ultimate owner(s) of the solar projects.

The Government of Rajasthan will facilitate the identification of government land suitable for the development of solar PV projects as well as allot land on a long-term lease in accordance with the applicable policies of the state government. Additionally, Government of Rajasthan will create and provide the necessary electricity interconnection infrastructure. In order to complete these requirements, the government has tasked the Rajasthan **Renewable Energy** Corporation with expediting and facilitating the allotment of land and all **other** requisite permits and approvals for establishment of the solar PV projects. As a thought leader in the solar industry, Sun Edison will also assist in the development of strategies and policies to facilitate the large scale replacement of existing electric and diesel water pumps with solar powered water pumps via innovative financing and business models. In doing so, farmers will be able to increase their incomes by harvesting crops using the sun's energy instead of falling victim to ground water depletion and electricity subsidy issues. Sun Edison already has a strong presence in Rajasthan, with over 50 MW's of large solar generation capacity and more than 1000 solar water pump installations.

Courtesy: EQ International

Let others lead small lives, but not you. Let others argue over small things, but not you. Let others cry over small hurts, but not you. Let others leave their future in someone else's hands, but not you. - JIM ROHN

KNOW THY POWER NETWORK - 86

Let us reconnect again.

Today one is deemed / treated as not existing if he does not have a digital appliance / device with him or in his house. Such is the strong grip of the Digital technology today. When Digital devices occupy such significant spaces in our life, can ICT accompanied by its virtual world remain far behind? No, it demands its own share! Today if any one does not have a knowledge or information on the virtual world created by ICT, he / she is supposed to be outdated / outmoded. Anything that does not exist in the virtual world today seems not only outdated but also treated as "almost unreal". You can bank, sell, buy, save, insure, invest and get anything you want for daily life, on line. Smart grid can not be an exception to it. It also keeps you in its loop. Now only it slowly extends its arms towards us for its strong embracement. Let us wait and see its behaviour in the near future. All these prompt me to begin any article with "Smart Watch".

I. SMART WATCH

It is one of the products of smart and wearable technology that exists today. Following the introduction of many smart devices like Smart phones, Smart refrigerators and Smart Televisions (TVs), many wearable smart devices like Smart Glasses, Bracelets, Clothes and Watches are on the anvil to invade the consumer's domain. It is their turn now. The launch of these devices enact / create the next stage in the human – machine interface. Smart watches can be treated as an extension of the smart phones. It is nothing but a smart phone foisted on a wrist watch. "Apple Watch" introduced recently had confirmed this aspect. Apart from aiding the consumers to send and receive messages, browse emails, these watches monitor one's heart beats, measures one's calory in take and facilitate cashless payments. But there is a "Catch" in it. It demands the privacy of the users in return for its good services. We have to make compromise on this. By their very nature, these watches are more vulnerable to hacking and malwares. These security and privacy concerns still remain a worry and at any time it can develop into a major liability. Malwares can hijack its sensors and cause serious problems not only to its Direct users but also of those indirect users who interact with them. However, the producers of these watches are confident that the privacy settings made in the watches will help the users to decide what information they could share with others through cloud or remote servers and hence major security and privacy malfunctions will not occur. If everything goes smoothly on expected lines, in the near future, these fashionable, stylish watches can enable the users to "remotely start" their cars or serve as breath analyzer and prevent driver to drive the car, in the event of his high alcohol consumption.

Before completing this topic, I would like to share some more, valuable points, as given below

i. The intrusion of these smart watches will make us to surrender our privacy with passion and at a steep price. our foot print in the digital world can be easily traced, tracked and targeted within the milliseconds of our entering into it. We will be trapped in the tyrannical, technological web of Governments, Google or other service providers for-ever.

ii. These wearable devices will make public all significant details of our existence in this material world like our finance, health, social life entertainment and religion with out our permission / knowledge. This will make us "slaves" to these man-made devices. Soon our human behaviour will be controlled / directed by these devices. In short our daily life will be a "live show" run by these devices. Will it be acceptable?

iii. There is no way to stop the forceful entry / on slaught of this new technology in our life. Though we have our own mind and body, in future we will be kept on "Auto Pilot" status by these smart devices and they will run our "life's journey". It is not an exaggeration. It can be expected in the near future. Let us prepare ourselves for this on slaught or modern digital tsunami that is going to engulf us. Till then, let us sit back and enjoy the potential benefits brought by these devices. Now it's time for me to "touchbase" my regular topic "Smart Grid".

Education is the most powerful weapon which we can use to change the world. - NELSON MANDELA

II. SECURITY CHALLENGES FACED BY SMART GRID

It is clear to all that the existing power delivery systems is always exposed to both natural disasters and man-made crisis situations like attacks of anti social elements terrorist attacks / human errors in grid operation. In brief, it can be listed as,

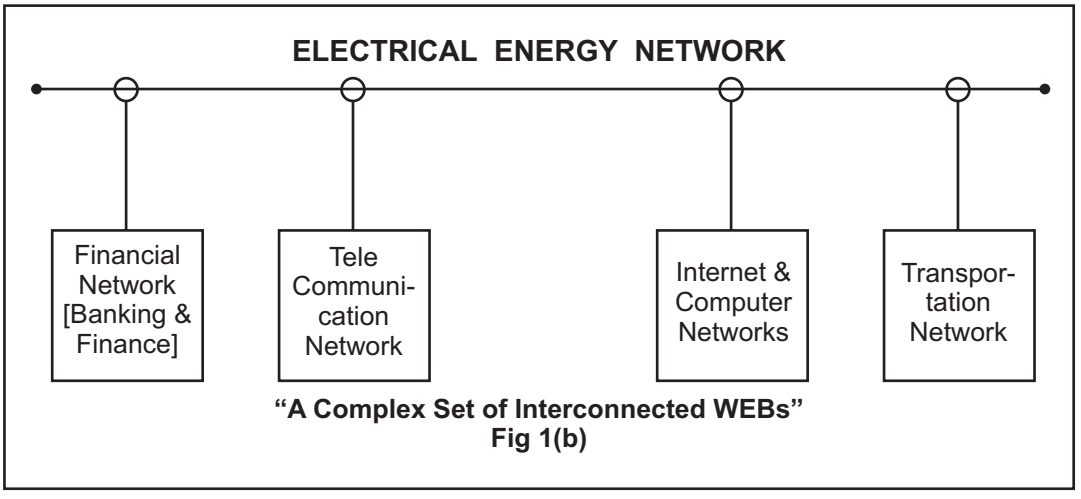
- equipment / Material failure
- Natural calamites
- Intentional attacks by outsiders and
- human – errors

A secure and reliable electric power system is a must for the economic development and security of a state / nation. The significance and difficulty of protecting power system is known to all. So this is not new; the real problem that is faced in a smart grid is the co-existence of physical infrastructure of the electrical grid and its virtual companion which contains many layers like communication, cyber and control systems. Now to make the Smart grid to function correctly and securely, we have to control and manage not only the critical, physical assets like generators, transformers, transmission lines, line reactors and capacitors but also all the assets in the virtual / cyber world. The required features of a quality energy network are indicated in Fig 1 (a).

A quality Power Network:-

- **A secure reliable system**
- **Exceptional power Quality**
- **Integrated with a good communication system**
- **compatible Devices and appliances**

Fig 1(a) – Required features of a quality electrical network



"A Complex Set of Interconnected WEBs"
Fig 1(b)

In the present world, energy, telecommunications transportation and financial structures or systems are "interdependent". i.e. None can exist in a stand alone mode. This kind of inter dependence create new challenges for the secure, reliable and efficient operation of the Smart Grid. One can easily visualize the complex nature of the above mentioned infrastructures, when they are in operation. They are geographically dispersed, non linear and have an interaction amongst themselves with their owners, operators and users. An interaction among the components that form these structures is also discernible. The main significance of these grids or networks lies in the fact that they are the basic foundations of the high standard of living presently enjoyed by the citizens of developed countries (as shown in Fig (1b). It can also be seen that a common thread is linking all the infrastructures. It is nothing but reliable and high quality electric power. No one can deny the basic role of "disturbance-free" electricity in banking, finance sectors and a trouble-free wireless and wired telecommunications networks as well. The main point that requires our attention in this context is that present day electrical energy information and communication systems have reached a very high level of complexity and it makes them exposed to various outages and threats. The failure of these networks, if occur, the potential ramifications will be greater and it may create cascading ripples through out the systems. Thus these lies a key challenge to make these systems secure and trouble-free. Now it is time for me to sign off.

Good bye until I meet you next month.

(To be continued…)

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CENTRE SET TO ROLL OUT POWER REFORMS SOON TO ENHANCE TRANSMISSION, DISTRIBUTION NETWORK

The Centre is set to roll out a set of power reforms over the next few months including measures to fulfill the Govt's commitment to provide uninterrupted electricity supply in cooperation with state governments.

After dealing with the crucial ordinance for coal block e-auction, the government will start dealing with other long-pending issues to boost power sector, officials said, adding that power minister PiyushGoyal will start launching programmes for which the government has made budgetary allocations.

"Power ministry has availed most of the approvals from government departments concerned for strengthening **transmission** and **distribution** networks, separating feeders for agriculture and households in rural areas and promoting ultra mega solar power projects in four states. It is time for Goyal to bring state governments on board to engage them in Centre's initiatives," a power ministry official said.

The official, who did not wish to be named, added that the power ministry will start rolling out various initiatives within a month or two while work is also in progress for reforms in Electricity Act 2003.

The government has sought stakeholders' feedback for the proposed amendments in Electricity Act by mid-November, ahead of the winter session of Parliament. "Fuel supply was one of the most crucial challenges that the power sector was facing.

The government has come up with a road map for e-auction of coal blocks and price pooling for fuels to ensure adequate coal and natural gas supplies for the power plants. While fuel supplies will improve gradually, it is time for the government to reduce commercial losses in the areas of electricity transmission and distribution," said the official.

Finance minister ArunJaitley had in July allocated Rs500 crore each for Deendayal Upadhyaya Gram JyotiYojana and ultra mega solar power projects besides Rs200 crore for strengthening Delhi's transmission network, among other programmes.

Goyal will shortly initiate dialogues with various state governments to ensure "power for all", officials said. Rajasthan, Andhra Pradesh and Delhi have already come on board for the programme while Goyal wants to cover as many states as possible before the next Union Budget, an official said.

Under the initiative, the Centre will provide financial assistance to improve power generation and strengthen transmission and distribution network besides funding energy saving systems.

LIGHTNING PHENOMENA AND PROTECTION

1. The nature of lightning

This title can be summarized by the letters ESD, for lightning with all its power and complex behaviour is no more than an electrostatic discharge. **The awesome crack of a lightning stroke close by is no difference in principle from the faint tick which accompanies a spark from the finger to the fitting cabinet. Both are the shock waves from the sudden thermal expansion of air produced by a static spark.**

As with other electrostatic phenomena, the charging processes in an electrical storm are not completely understood. It is evident that precipitation from a cloud, whether in the form of hail, rain or snow, does not create highly charged conditions. It is only when the precipitation takes place within the cloud itself that the situation becomes more interesting. Thunder clouds reach a height of several kilometers while their base may be less than a kilometer above the ground. They are thus several km deep. Such clouds can be produced by a cold wind driving under an extensive mass of warm moist air and so lifting it, the colder air being more dense. This occurs chiefly in the temperature zones, which are subject to winds of differing temperatures. In the tropical zones moist air may simply rise by local heating effects, causing a single cumulonimbus thunder cloud. **In the Polar Regions, where there is virtually no warm moist air, there is hardly any lightning.**

It is estimated that over the whole world there are up to 100 lightning stokes to the ground every second. For lightning protection design purposes the frequency of lightning storms is generally based on the number of strokes to the ground per square kilometre per year. NG is the number of lightning flashes to the ground per square kilometre per year.

In other regions, such as parts of South America and in Madagascar, values of 140 flashes to the ground square kilometre per year are normal and in parts of equatorial Africa the figure is as high as 180.

The creation of static charges is generally the result of separation or division of insulated bodies and this also seems to be true in the charging of storm clouds. The upper part of a cumulonimbus cloud, being at an altitude of several kilometers, will be tens of degrees Centigrade below zero. The rising warm air will first have formed the cloud by the condensation of water vapour into microscopic droplets and as the air continues to rise the water vapour forms ice crystals. These water droplets and ice parties then coalesce to form rain and hail respectively. The fierce upward draft in the centre of the cloud becomes progressively slower as it rises until the hail is able to fall back down into the cloud, passing through the raindrops. It is believed that the electric charging of the cloud is due to the hail breaking up the water droplets as it passes through a rain zone within the cloud. It is generally agreed that the ice receives a positive charge and that the liquid phase acquires a negative charge. The warmer lower part of the cloud is therefore usually negative although about 5% of lightning strokes are from a positive charge at the cloud base.

The resulting ESD manifests itself in a number of ways. Most discharges take place within the cloud itself or within the cloud system. This is sometimes known as sheet lightning and is seen only as a flickering illumination of the overcast sky. Some discharges which do not reach the ground may be visible where they strike from the base of one cloud to another some distance away. These are termed air discharges. The usual visible lightning stroke is the discharge from a cloud to the ground, or a building or tree. This is the most destructive form and is discussed below in further detail. Before doing so, however, we should perhaps mention ball lightning which is one of the most mysterious and least understood of all natural phenomena.

It is always reported as a luminous sphere about the size of a football or slightly smaller. In most cases it is said to float along near the ground after a lightning stroke and then to 'explode' causing considerable damage. There are stories of ball lightning passing through the walls of a building and reappearing on the other side. In fact there are many anecdotes concerning ball lightning but seemingly no recorded or photographic evidence. It has been suggested that it perhaps represents a state of unstable equilibrium between positive and negative charges. Others have believed it to be a very highly charged suspension of liquid particles.

2. Development and characteristics of a lightning stroke to the ground

The first stage consists of the formation of very high field strength at the cloud base. This intense potential gradient produces some ionization of the air below the cloud with the consequent creation of a corona sheath. From the lower part of the corona, a brush discharge in the form of streamers will then extend progressively downwards in steps of about 50m so that the conducting zone moves closer to the ground. This zone will be pierced by a downward spark of a few metres in diameter, termed a leader. Near the ground the leader penetrates the corona at a speed of about 300 km/s.

"People shouldn't be afraid of their government. Governments should be afraid of their people." - ALAN MOORE, V for Vendetta

The concentration of charge on the boundary of the conducting zone is thus brought closer to the ground, increasingly the field intensity and creating a counter upward charge from the earth and in particular from projections such as buildings and trees.

When a leader has brought a descending charge front low enough to break down the remaining air gap, brush discharges or streamers of opposite polarity are drawn upwards towards the descending charge front A conducting path from the cloud to the ground is then complete and the main or return stroke takes place. This is the moment of discharge and is the first visible evidence of the process. We can say that the leader lowers the charge from the cloud down towards the ground and the return strokes then neutralize all the charge centres in the lower parts of the cloud. There may be several return strokes but they happen in such rapid succession that they usually appear as a single event. Each return stroke will move upwards several times faster than the downward speed of the leader and may carry a current of up to 400 00 amp. It is estimated that of the ground strokes

90% will be	>	3 kA
50% will be	>	28 kA
1% will be	>	200 kA

Or institutions terms, the median value is 28kA, the upper centile is 200kA and the lower centile is 3kA

Because the corona sheath and the boundaries of a thunder cloud have no corners or small radius projections, a far higher potential can be present than on the surface of an angular solid object. By making certain assumptions as to the effective charge C and capacitance F of a single storm cloud, or lightning cell, a value of the potential V of the cloud with respect to earth has been suggested, using the equation.

$$C = FV$$

Where C is the coulombs, F is in farads and V is in volts. For an assumed charge of 100 coulomb and a capacitance of 10^{-7} farad, this gives a value of 1000 MV for the potential.

Even if it is only one thousandth of this, the potential behind a lightning strike is still in the mega Volt range and its destructive power will be liberated whenever the path of the discharge meets an impediment, i.e. electrical impedance. This can be linked to a bullet traveling through the air at high speed where very little energy is librated until it hits something solid. When insulating or semi-conducting materials are subjected to a lightning strike, or find themselves in its path, the energy released will have the effect of an explosion at that part. Masonry can be blown off a building and obviously fires can be started.

The current in a typical lightning discharge will vary with time as shown in Figure 1. No two strikes will have exactly the same characteristics but the rate of rise of current will always be extremely steep. Empirically the maximum rates of rise are found to have a medium value of 30 kA/µs, an upper centile of 200 kA/µs and a lower centile of 10 kA/µs. **After the peak value has been reached, the current will decay approximately exponentially and reach half its peak value in some tens or hundreds of microseconds.** The high rate of rise ensures that the first few major-seconds of the discharge pulse will have a frequency spectrum which includes major components of several megahertz and harmonics of more than 100 megahertz.

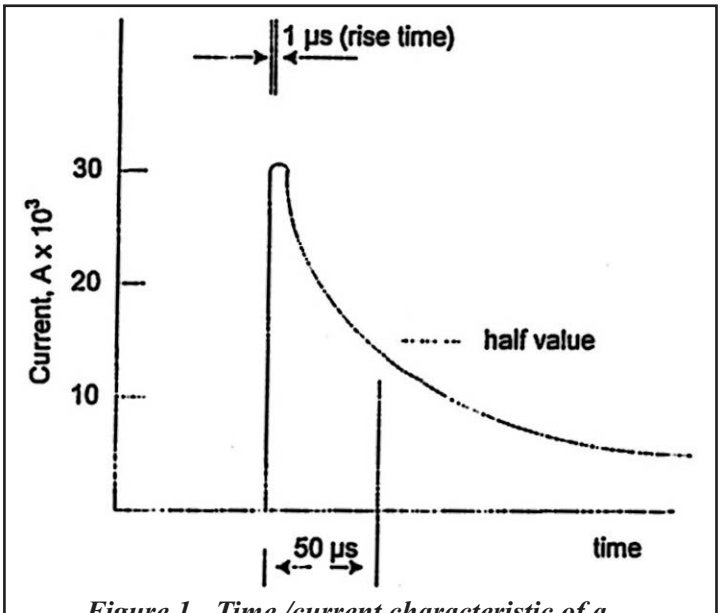


Figure 1 - Time /current characteristic of a typical lightning stroke

With these very steep-fronted pulses, extremely high voltages will appear across inductances of only a few micro-henries and a lightning strike will see any bend or loop in its path as a high impedance which it will have no difficulty in jumping across. By the same token, capacitance will be seen as having relatively low impedance by the high frequency content of the rising current. This will also enable the discharge to be reflected in adjacent metallic objects.

A third errant characteristic of a lightning stroke to a building is known as side flashing. This is due to the sudden potential differences between metal parts resulting from the ohmic volt drop in the initial conducting path, as indicated in

In addition, the mechanical force produced by the high current itself can distort and dislodge

metal conducting parts such as pipes and guttering. This is particularly relevant where two conducting paths run close together in parallel. Consider for example the arrangements shown in Figure 2. The force between parallel conductors in air is given by

$$F = (2 \mu_0 1_1 1_2) / (x) \text{ in Newtons / metre run}$$

where μ_0 is the magnetic space constant which can be taken as 10^{-7}, 1_1 is the current in one conductor in amps, 1_2 is the current in the other conductor in amps and x is the distance between the conductors in metres.

The force is one of attraction between the conductors if the two currents are in the same direction and of repulsion when they are in opposite directions.

Assume a current with peak value of 100 kA produces a side flash to the waste pipe from the lightning conductor so that 20 kA produces a side flash to the waste pipe from the lightning conductor so that 20 kA flows down the pipe and 80 kA through the parallel conductor. The force drawing the two parallel together will be

$$F = (2 \text{ X } 10^{-7} \text{ x } 20 \text{ X } 10^3 \text{ X } 80 \text{ X } 10^3) / (0.1) \text{ N/m}$$
$$= 3200 \text{ N/m i.e. nearly a third of a tonne per metre run}$$

At the moment of the lightning flash, the top of the conductor will assume a potential to earth of over a mega Volt while the water tank is at earth potential unless bonded to the lightning conductor system at roof level.

Similar mechanical forces on single conductors are produced by sudden changes of direction. Side flashes also release disruptive power from an acoustic shock was caused by the explosive local increase in air temperature to several thousand degrees. The supersonic pressure pulse due to direct and side flashes can severely damage or displace building panels and roofing.

Lastly, but of increasing importance, we have the electromagnetic radiation from the pulse of high current which will bring about a disturbance at some distance. Lightning discharges at several kilometers distance are noticeable as white noise on amplitude modulated (AM) radio receivers and nearby discharges can upset or corrupt computer and other electronic systems. Man-made sparks, such as from petrol engine spark plugs, can be suppressed, lightning discharges cannot be suppressed and it is accordingly necessary to protect vulnerable electrical apparatus.

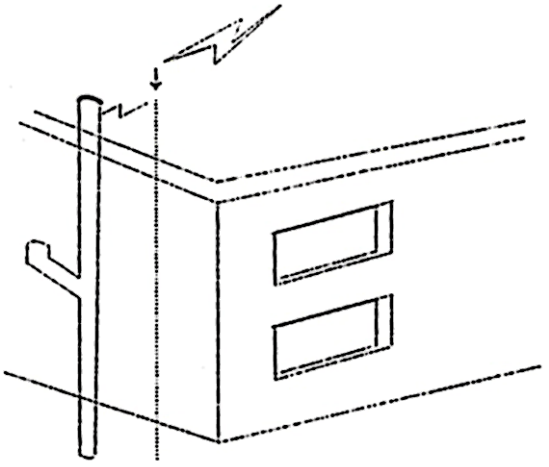


Figure 2 - Example of electromagnetic force on parallel conductors. The waste pipe, 10 cm from the lightning conductor receives part of the discharge current due to a side flash

3. Protection of buildings and services

The lightning conductor for the protection of buildings was invented by Benjamin Franklin (1706 - 1790), the son of a puritan soap and candle merchant who immigrated to Boston. All Franklin's considerable scientific researches were done in his spare time between international political and diplomatic work. Electricity was previously believed to consist of two fluids termed vitreous and resinous respectively. Franklin proposed a single fluid theory and coined the terms positive and negative electricity.

His famous investigation into the nature of lightning, in which he was able to draw sparks from the end of the string of a kite while holding the string above the end, was regarded as convincing evidence that lightning was an electrical phenomenon. As he lived to report on the success of his experiment, it seems fairly certain that his sparks were simply from a charge on the kite itself and not from a storm cloud

The effectiveness of a lightning conductor depends on a number of factors. Firstly it must be of uniformly low resistance. Secondly, loops must be avoided and changes in direction should be kept to a minimum and should not be sudden. Thirdly the conductor must be firmly secured to the building in order to withstand the possible

electromagnetic forces. Lastly, the upper end of the conductor should be slightly above the highest point of the building it is protecting. The screening effect of a lightning conductor is reckoned to be within a cone whose half angle is 45°.

Where a leader stroke comes down well to the side of a building, the return stroke may start from a corner of the structure some metres from the top. For this reason an additional conducting girdle should be placed round taller buildings a few metres below the parapet. The rule of thumb which assumes a protected zone under a 45°. Cone should not be applied further away than 20 metres at the base. This is the same as saying that lightning conductors on buildings over 20 metres high will not protect others over 20 m away. Where buildings of various heights are clustered together an alternative recommended method for the determination of zones of protection is to use a national sphere of 60 m radius.

As regards the cross-section of a lightning conductor, 50mm^2 can be regarded as normal. It may seem surprising that a conductor of this size is sufficient for a current of perhaps 400 kA peak. The reason lies in the short duration of the stroke. When designing electric power wiring installations the temperature rise of cables and its duration before the protection is able to clear the fault. For this purpose the following simple formula is used:

$$I^2 t = kS^2$$

Where I is the fault current in amperes, t is the duration in seconds, S is the cross-section of the conductor in mm^2 and k is a factor depending on the conductor material and the permissible temperature rise. For a copper conductor and a temperature rise of 160°C

$$K = 2 \times 10^4$$

For a lightning strike with a root mean square (rms) value of current of 100 kA, lasting for an equivalent period of 50 ìs, the required conductor cross-section would be

$$S = I (t/k)^{½} = 100 \times 10^3 (50 \text{ X } 10^{6/2} \times 10^4)^{½} \text{ mm}^2$$
$$= 5\text{mm}^2$$

Hence, 50 mm^2 is more than sufficient from a thermal point of view and should be subject to a temperature rise of 160/ 100°C or 1.60°C in the above example.

It is preferable to attach lightning conductors to the outside of a building to avoid side flashing to internal metalwork and electrical apparatus as far as possible. The conductors should be reliably connected to structural and other metalwork for the same reason. This will include steel framing, concrete reinforcement (re-bars), handrails and metallic service pipework. Where the structure is metal-clad additional conductors to the ground may be unnecessary, but a flat roof of non-conducting material should be protected by a grid of conductors not more than 10 metres apart. External aerial support brackets or straps and rooftop air handling plant should also be directly connected to the lightning protection system.

4. Earthing of buildings and lightning conductors

The lower end of a lightning conductor has to be suitably taken into the ground. This can be via concrete foundations containing adequate interconnected steel reinforcement, sheet piling, or by earthing electrodes. In most instances and with older buildings such as churches and brick chimneys it is necessary to install earthing electrodes. These can be in the form of rods, plates, mats or strips. If the soil is suitable for rods to be driven into the ground, they are more practical than plates etc. which always require excavation and reinstatement. The lower the resistance to earth the less the voltage elevation to be expected on the conductor during a lightning strike. Accordingly, it is normal practice to design the system so that the resistance to earth will not rise above 10 ohm. This value is something of a compromise between what is generally achievable and what is to be preferred. **Even so, high soil resistance can present problems in obtaining a value down to 10 ohm. The resistance is usually less at greater depths due to the presence of moisture. Electrodes of about 2 metres length should be used where possible as this depth will in most cases prevent seasonal variations. If bedrock is near the surface it may be necessary to drive a multiple array of electrodes connected to each down-conductor, or to install interconnected copper tape in back-filled trenches.**

The diameter of a rod electrode is determined by the strength required to enable it to be hammered into the ground, 12.5 mm being a common size. If larger sections are used the cost increases as the square of the diameter, whereas the effective resistance is only marginally reduced.

An important consideration in the earthing arrangement of lightning conductors is the possible voltage gradient on the ground. In the vicinity of an electrode one can receive a shock from a lightning stroke. This shows person A

at risk from the potential between points c and d (step potential), person B at risk from the potential between points a and b (touch potential) and person C at risk from the potential between points a and e (transferred potential). The voltage gradients are greatest near the electrode and decrease rapidly with distance. When cattle shelter under trees during a storm, they are subject to greater risk from step potential than a human would be since the distance between their hind and forelegs is greater than a person's stride and the voltage will be applied across the animals' cardiac region.

A practical method of reducing voltage gradients near an earthing electrode is to install the rods so that the tops are about 30 cm deep, with insulated connections.

If the building to be protected has its own sub-station, the earthing of the lightning protection system and of the transformer should be connected together. Opinions differ as to whether the earthing should be combined with electronic system earths. To avoid interference from voltage spikes and surges on the mains supply, sensitive data handling circuits are regarded as requiring so-called clean earth. A separate dedicated earthing system, physically remote from the lightning and power system electrodes is therefore frequently specified for new installations.

5. Protection of tank farms

Each tank should be equipped with atleast one earthing stud near ground level. Each of these must be connected by a copper strap (e.g. 25 mm x 6 mm) to an adjacent earth rod driven through the foundation slab and bonded to the foundation reinforcement. All tanks on one slab should be bonded together.

All foundation slabs should be interconnected by these earth straps and, if there is a sub-station on the site, the whole earthing system should be connected to the main sub-station earth bar.

All metalwork, including structural and access steelwork, metal pipework, deluge systems, bed plates, pipe stanchions, cable trays and any isolated metal items must be bonded to the earth system. Special earthing clamps are available for RSJs, re-bars, pipes etc. For bonding purposes, yellow/green insulated, stranded copper earthing cable, or bare copper strap can be used. Smaller items, such as cable trays, are usually bonded and earthed with 16mm^2 cable, or larger sections where demanded by the prospective fault current of the power cables.

Earthing rods are typically of copper clad steel, 19 mm diameter by 2 metres long, and it is advisable to drive these in at not less than 4 equi-spaced points round each foundation slab. The tops of these should then be bonded to the general earthing system.

The earth for any associated control room containing computerized instruments will normally require two or more earth rods connected together but not connected directly to the main earthing system. These rods should preferably be driven outside the earthed area so that power switching surges do not affect the process control computer.

6. *Summary of lightning protection*

- Where lightning conductors are used, they should be connected to the main power supply earthing system.
- Lightning conductors should have a resistance to earth of not more than 10 ohm. The Electricity Supply Undertaking can usually advise on local soil conditions.
- Lightning conductors protect an area within a cone whose surface is 45° to the vertical
- Lightning conductors should have as direct a route to earth as possible. Their earth rods should therefore be driven into the ground below, as close as possible to the earthing stud of the structure or to the down conductor.
- Reinforcing bars or RSJ pedestal bolts may be used to earth a lightning conductor, provided there are multi-crossing points in the foundation reinforcement ensuring electrical continuity to the general earthing system.

7. Statistical risks

It has been estimated that over 20% of computer failures are the result of lightning strikes. Some, but by no means all of these failures, can be prevented by protection of the building. When lightning strikes a building, however, does protect the occupants from direct electrocution by lightning and most of those killed and injured by lightning have been in the open. The annual risk of death by lightning in the United Kingdom is about one chance in two million. These odds are some 200 times longer than the risk of death on the road. Nevertheless, it implies that about 25 people are killed by lightning every year and probably more than half these will have been electrocuted by the potential gradient in the ground. Many others are 'struck' but survive after suffering various traumas including breathing arrest, paralysis of parts of the body, burns and shock.

Don't be afraid to fail. Don't waste energy trying to cover up failure.
Learn from your failures and go on to the next challenge. It's OK to fail.
If you're not failing, you're not growing – H. STANLEY JUDD

DEHN Academy Seminar
Dec 2014 - Chennai

CERTIFIED TRAINING PROGRAM ON LIGHTNING & SURGE PROTECTION

Seminar Objective

A series of essential one day seminars for any one involved in Surge & Lightning Protection, giving a clear, concise understanding of the requirements of the new standards and how to apply them. These seminars are designed to help you and your company come to terms with both practical and theoretical implementations of IEC 62305 and to take the installer and designer through the process of products election and installation, in the shortest possible time. This technical training program is to share the fundamentals, International guidelines, different available technologies, points of serious concern with respect to protection against lightning and surges. This is to ensure the need of protection with regard to lightning and surge protection as per the latest IEC / IS standards

Date of Training: 2nd & 3rd DEC 2014

10:00 AM to5:00 PM (2nd DEC 2014 / Tuesday)

09:30 AM to 4:00 PM (3rd DEC 2014 / Wednesday)

Place of Training

Chennai (Venue details will be intimated to the registered participants only)

Fee Particulars

Rs.8000.00 for each participant, inclusive of service tax.

Rs.7000.00 for registration before 15.11.2014 / Early bird discount

Rs.6500.00 for registration before 15.11.2014 for a group of minimum three participant

Important Information

Certificate of Participation will be provided to each participant.

Training material will be provided to each participant.

Training Program is very exclusive and Seats are limited.

Registration will be done on first come first serve basis.

Accomodation / Local transport / Travelling arrangements to be done by participants.

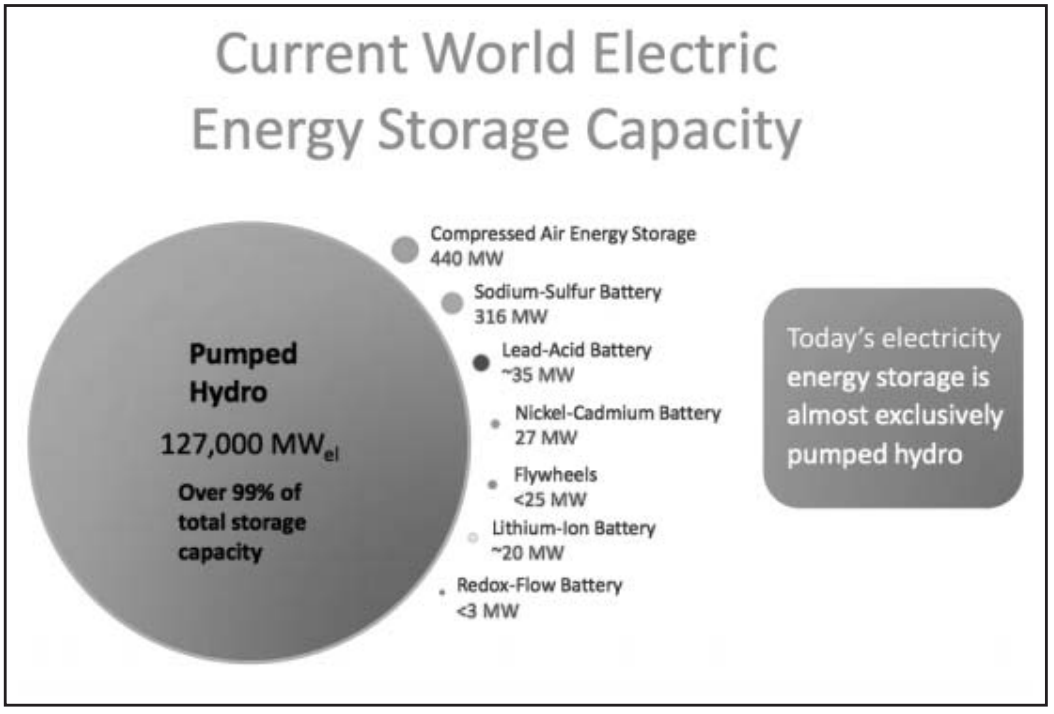
DEHN India Pvt Ltd can help out station participants by identifying Hotel near the venue.

DEHN India at a glance

DEHN India P Ltd is the subsidiary of DEHN+SÖHNE, The DEHN group celebrated 100 years in 2010, during this time it has become a world wide leader in the field of lightning / Earthing and Surge Protection and Safety Equipment. A team of highly technical personnel are employed to help customers make the correct choice for Lightning and Surge Protection. DEHN has been involved in many prestigious projects over the years.

ENERGY STORAGE, BATTERIES FLOURISH AT SPI 2014

Perhaps the most notable among battery and energy storage launches was Enphase's AC Battery unit, powered by Daiwa House-backed ELIIY Power lithium-ion chemistry, and offering 1.2 kWh of energy storage with a 275 Watt to 550 Watt power output. Enphase is rolling out pilot tests in the United States, Europe and Australia and will begin shipping in the second half of 2015. "We want to do for energy storage what we've done for PV," says company co-founder Raghu Belur.



Among many other notable announcements from battery and energy storage companies during the show were the following:

Aquion Energy, which manufactures an aqueous lithium-sodium battery with no hazardous components, plans to ramp up next year from one to three work shifts, heading toward their 240 MW per hour production capability, says Jay Whitacre, the founder and CTO of the Pittsburgh-based company. Aquion's six-stack module, roughly the size of a refrigerator, can produce 10 kilowatt hours. Their larger 100 kilowatt-hour cube module was recently deployed in Hawaii, where 40 units will be shipped during first quarter 2015, he says.

Stem was awarded a $935,000 Sun Shot grant from the U.S. Department of Energy during the show to develop an advanced software platform for energy storage evaluation and automated system control to improve the application of distributed storage in areas with high PV penetration, notes John Carrington, the CEO of the company. The grant continues Stem work with the Sacramento Municipal Utility District in analyzing the impact of high penetration solar PV on the grid.

Just before the show, Millbrae, California-based Stem announced a strategic partnership with Kyocera Solar to pursue energy story markets in California, Hawaii, New York and other jurisdictions. Thus far, only about 10% of Stem's project business is linked to PV capacity, but that number is expected to rise, Carrington says. The company plans to roll out a larger format version of its product during first-quarter 2015.

S&C, based in Chicago, touted its recently-installed 150 kW frequency response storage system built to provide grid service to the PJM market. The Pure Wave Community Energy Storage product line features a proprietary control system for the battery stacks, typically housing LG or NGK batteries, notes David Chiesa, S&C's director of business development for commercial, industrial and microgrid sales.

S&C also announced a contract for the sale of 20 PureWave systems to Ergon Energy, the Australian utility, for grid utility support of their single wire earth return (SWER) network. Each of the 25 kW Pure Wave units provides 100 kilowatt hours of energy, which could power an average home for five days during an outage. "We recently doubled the size of our plant in Franklin, Wisconsin, in anticipation of this market demand," Chiesa says.

Outback Power, based in Arlington, Washington, launched its FLEXpower Three and Four models at SPI, which support larger power installations. Model Three is a 120/208VAC 60Hz design for three phase applications,

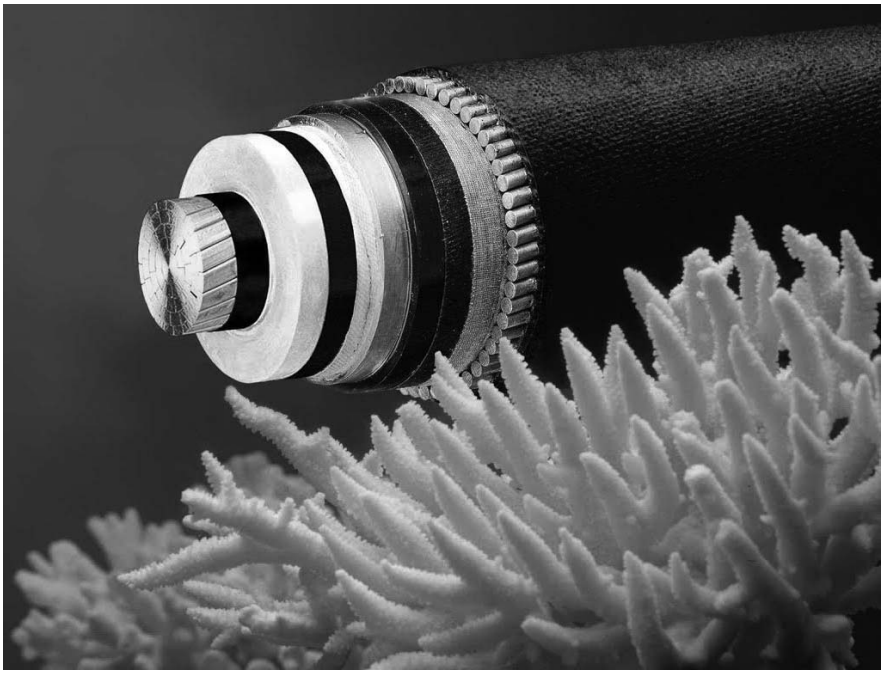
available in 9 kW and 10.8 kW configurations. Model Four is a 120/240VAC split-phase design for larger installations including residential, commercial, or community systems, available in 12 kW and 14.4 kW configurations. The company also launched its OPTICS RE monitoring system that is Internet based, permitting remote energy arbitrage operations.

Among other standout battery manufacturers displaying systems at the show were BYD, Maxwell Technologies, Rolls Battery Engineering, Saft America, Samsung, Sonnenbatterie, Trojan Battery and Varta Storage, within a field of over two dozen companies exhibiting.

Among the many other high-profile energy storage companies at the show, ABB, Eaton, Green Charge Networks, NEC Energy Solutions, Princeton Power, SMA and True South Renewables were among the field of nearly four dozen exhibitors.

Read more: http://www.pv-magazine.com/news/details/beitrag/energy-storage—batteries-flourish-at-spi-2014_100016929/#ixzz3Huhk0i61

ABB TO PROVIDE CABLE SOLUTION FOR OFFSHORE WIND CONNECTION IN GERMANY

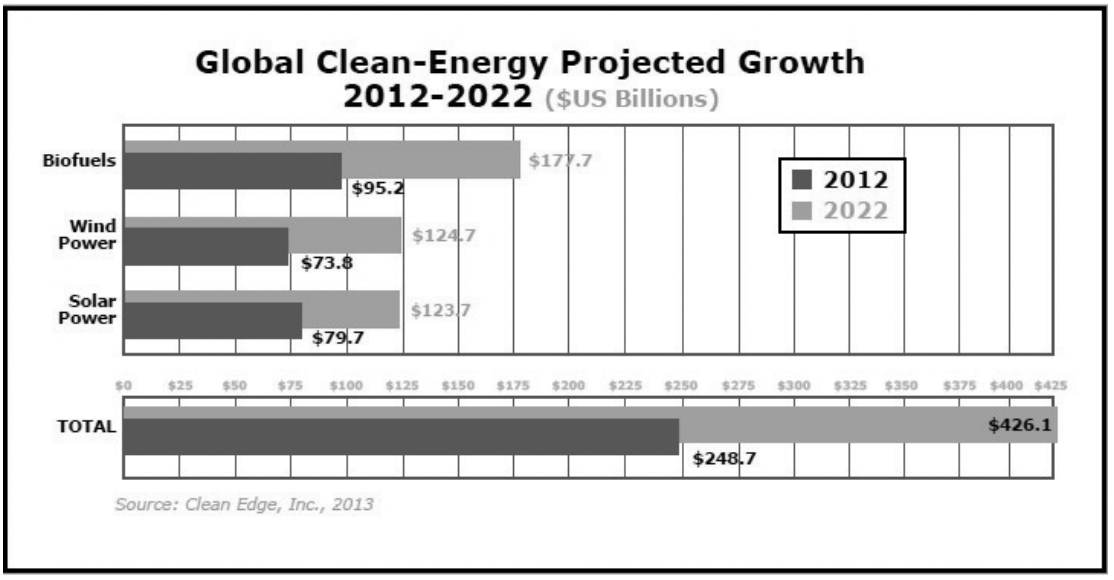


ABB, the leading power and automation technology group, has won a significant order from the Dutch-German transmission grid operator TenneT to design, engineer, supply and install an Alternating **Current** (AC) power transmission cable system that will connect Butendiek, an offshore **wind** farm in the German North Sea, to the HVDC (high voltage direct current) converter platform Syl Win alpha.The cable will link the AC platform of the Butendiek offshore **wind** farm to the HVDC converter platform Syl Win alpha. The Butendiek **wind** farm is situated around 30 kilometers (km) off the island of Sylt. The cable system to be supplied is a 3-core 155 kilovolt (kV) AC submarine cable, approx. 38 km long. It is scheduled to be installed and commissioned in 2015. The high voltage cable originally destined for this project was lost in an incident in the Mediterranean Sea in July and ABB was requested to step in and help to support the project schedule.

The cable system will have a capacity to transmit 144 megawatts (MW) of **wind** power – enough to meet the electricity needs of approximately 150,000 German households. The use of clean, renewable **wind** energy as an alternate source is equivalent to the abatement of almost 750,000 tons of carbon dioxide emissions per year that could have resulted from fossil fueled generation."Germany is among the world's leading proponents of renewable energy and continues to push for lowering environmental impact", said Claudio Facchin, Head of ABB's Power Systems business. "We have a vast array of technologies and considerable experience in this domain and are pleased to support TenneT with this fast track project. ABB has successfully commissioned more than 10 AC cable projects around the world for offshore **wind** projects and **others** are under execution. Butendiek is the sixth offshore **wind** connection project in Germany awarded to ABB by TenneT. ABB is presently executing the Sandbank AC cable link, which also connects an offshore **wind** farm to the Syl Win alpha HVDC converter platform. As one of the world's leading high-voltage cable manufacturers ABB has extensive domain knowledge and experience across a range of applications including offshore **wind** farm connections, powering oil and gas platforms from shore, and underground or subsea interconnectors.

INDIA RANKS FOURTH IN CLEAN ENERGY INVESTMENT

India ranks fourth among 55 developing nations in clean energy investment, according to a new country-by-country study which is topped by China.



Released by Inter-American Development Bank, the results of the new study Climatescope 2014 suggest renewable technologies can be just as cost-competitive in emerging parts of the world as they are in richer nations.

The study offers the clearest picture yet of clean energy in 55 emerging markets in Africa, Asia and Latin America and the Caribbean.

According to the report, China ranks number one followed by Brazil. China received the highest ranking as the largest manufacturer of wind and solar equipment in the world and the largest demand market for said equipment.

India has a score of 1.85 points against China's 2.23. "Climatescope is a critical resource for the Power Africa initiative and our partners, providing an in-depth and objective evaluation of low-carbon energy opportunities in emerging markets, including Africa," said Dr Rajiv Shah of the US Agency for International Development Administrator

India also had its best performance on Low Carbon, the report said adding that business and Clean Energy Value Chain Parameter III developed clean energy value chains and service providers.

Steadily rising power demand, good-to-excellent renewable resources and often-impaired fossil fuel supply chains make India a growth market for clean energy.

The country received USD 6bn in clean energy investment in 2013, out of a total of USD 62bn from 2006 to 2013.

Wind is the largest renewable energy sector, with 60 per cent of capacity and 53 per cent of all investment from 2006 to 2013.

The report said Coal is still the backbone of the country's power system, providing 71 per cent of its 1,088 TWh of total generation in 2013.

However, renewable power is an important and growing part of the country's energy matrix at 33GW. It comprised 14 per cent of installed capacity but only 5.5 per cent of generation in 2013.

South Africa, Kenya and Uganda were among the top scorers, it said.

All have significant clean energy projects and programs; South Africa has surged ahead with nearly USD 10bn of clean energy investment undertaken in the last two years, said the report.

A country's ranking depends upon various factors like clean energy investment policy, its market conditions, the structure of its power sector, the number and makeup of local companies operating in clean energy, and efforts toward reduction of greenhouse gas emissions, the report said. ***Courtesy: IEEMA***

The One who loves you will never leave you because even if there are 100 reasons to give up he will find one reason to hold on.

PRODUCT OF THE MONTH

FLUKE CNX i3000 iFLEX AC WIRELESS CURRENT MODULE

The CNX i3000 iFlex AC Wireless Current Module is part of the Fluke team of wireless trouble shooting tools.

Connect the CNX i3000 iFlex AC Wireless Current Module to your test point, and view the results up to 20 meters away on the CNX Wireless Multimeter. You'll save time, with less run-around, collecting multiple measurements. Use multiple modules for measurements on three-phase systems. Or use as a stand-alone measurement tool or combine with other CNX modules as a system for multiple measurements. From short distances, you can even view readings from modules through closed electrical panels. Plus, no more writing down data as the CNX i3000 Current Module captures up to 65,000 sets of time stamped min/max/avg readings, using the optional PC adapter. CNX wireless test tools also offer increased safety by letting you view readings in a separate location from the test point. Now you can take readings on moving machinery, with only the measurement module in harm's way.

The CNX i3000 iFlex AC Wireless Current Module has all the essentials to help you conveniently take current measurements.

- True-RMS AC current measurements to 2500 A
- 3% accuracy
- Memory recording up to 65,000 readings
- iFlex current probe allows you to get into tight, awkward spaces
- Backlit LCD display
- CAT IV 600 V, CAT III 1000 V
- Using the optional PC adapter, the CNX wireless trouble shooting system can track up to 10 measurement modules simultaneously, with results downloaded for further analysis.

Specifications	
Range	2500 A AC
Resolution	0.1 A
Accuracy	3 % ± 5 digits
Crest factor (50 Hz/60 Hz)	3.0 at 1100 A, 2.5 at 1400 A, 1.42 at 2500 A, add 2 % for C.F. > 2
Display	3 1/2 digits, LCD w/backlight
Log rate/interval	1 sec minimum/adjustable by PC or front panel
Battery type	2 AA, NEDA 15 A, IEC LR6
Battery life	400 hours
Memory record	up to 65,000 readings
Unbound listen interval	5 seconds
RF communications	2.4 GHZ ISM Band
RF communication range	20 Meters
Operating temperature	-10 °C to +50 °C

Storage temperature	-40 °C to +60 °C
Operating humidity	90 % at 35 °C, 75 % at 40 °C, 45 % at 50 °C
EMC	EN 61326-1:2006
Safety compliance	EN/IEC 61010-1:2010 to 1000 V Measurement Category (CAT) III 600 V Measurement Category (CAT) IV EN / IEC 61010-2-030:2010 EN / IEC 610101-2-031:2002 EN/IEC 61010-2-032:2002
Pollution degree	2
Temperature coefficient	Add 0.1 X (specified accuracy) / °C (<18 °C or >28 °C)
Safety rating	CAT IV 600 V, CAT III 1000 V
Certifications	CSA, FCC T68-FWCS IC:6627A-FWCS
Ingress Protection (IP) rating	IP42
Size (HxWxD)	16.5 cm x 6.35 cm x 3.56 cm (6.5 in x 2.5 in x 1.4 in)
Weight	.22 kg (8 oz)
Jaw opening	25.4 cm (10 in) coil

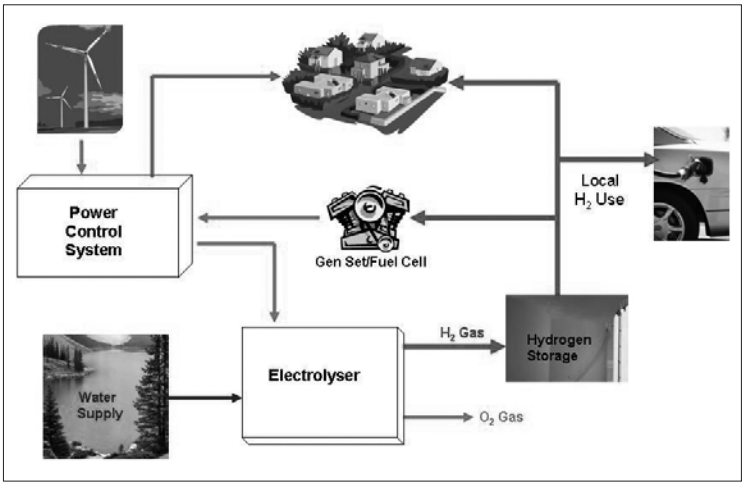
For more information contact: **M/s. FLUKE TECHNOLOGIES PVT. LTD.,**
Toll-free number: 180-0419 3001

SIEMENS PLANS ELECTROLYZER SYSTEM TO STORE WIND POWER AS HYDROGEN

In the German city of Mainz, Siemens, together with the public utilities of Mainz, Linde and the RheinMain University of Applied Sciences, has laid the foundation stone for a new type of energy storage system.

From spring 2015, the system, equipped with an electrolyzer from Siemens, will convert surplus electricity from wind farms to hydrogen. The hydrogen will then be stored locally in tankers or fed directly into the natural gas grid for subsequent power or heat generation.

In this way, it will be possible to store electricity from renewable sources over longer periods of time. The tankers will also be able to supply the growing network of hydrogen filling stations for emission-free fuel-cell vehicles.



The system will have a peak rating of up to 6 MW. The project, which will cost 17 million, is being financed with the support of the German Federal Ministry of Economics and Technology as part of the Energy Storage Funding Initiative.

The principle of electrolysis has been tried and tested for decades. What is special about the Mainz system is that it involves highly dynamic PEM high-pressure electrolysis that is particularly suitable for high current density and can react within milliseconds to sharp increases in power generation from wind and solar sources.

In this electrolyzer a proton exchange membrane (PEM) separates the two electrodes at which oxygen and hydrogen are formed. On the front and back of the membrane are precious-metal electrodes that are connected to the positive and negative poles of the voltage source. This is where the water is split. The system in Mainz will thus have a capacity relevant for bottlenecks in the grid and small wind farms.

INDUSTRY MUST USE PORTABLE CLAMP ON POWER METER NOW

- The existing practice in the industry is that we are now guess-timating the energy losses in the routine check up of machine / process parameters. Our approximation of energy consumptions will vary by 10 to 20 % to arrive at the macro specific power consumption of the process / machines because we do neither have the time to micro level monitor the individual machine consumption, nor plan the time to analyze the macro power consumption.
- One of the reasons for this gap in assumption of power consumption is that either we don't have the power analyzer or even if have that, we don't have time to install & take measurements.
- Having visited hundreds of industries who are energy guzzlers in this region in the recent years, I am surprised to find many industries in the segment have bought POWER ANALYZERS costing Rupees 2 to 3 Lakhs, few years back but the same is idling in the industry office shelf and sparingly put to use during routine maintenance.
- The reason attributed to this poor usage of this power analyzer is that, it takes say 2 to 3 staff say Electrical Engineer, Supervisor & Electrician to hook up and it takes around half to one hour time to take out the first measurement of machine with this analyzer and then the trending starts.
- After visiting the above industries few years back, I suggested them to buy a CLAMP-ON POWER METER costing less than Rs.10 K to at least be aware of the instantaneous power parameters of KW, KVA, KVAR, PF and THD, harmonic levels etc apart from the routine basic parameters like V, A, etc.
- With this meter, I explained to them both the Maintenance & the Management, that they can take many instant power readings immediately in any machine, within 10 minutes. They can measure the motor input power in the 3 phases one by one phase with respect to neutral and individually each phase power parameters and sum the same for total power consumption.

ACTIVE POWER (KW)		
Range	Resolution	Accuracy
0.000 to 600.0 KW	0.01 KW	**± 2.0% rdg**
APPARENT POWER (KVA)		
Range	Resolution	Accuracy
0.00 to 600.0 KVA	0.01 KVA	**± 2.0% rdg**
POWER FACTOR (PF)		
Range	Resolution	Accuracy
-1.000 to 0.000 0.000 to 1.000	0.001	**± 10% rdg on** ± (0.0+0.20)
		± 5.0% rdg on ± (0.20 to 0.50)
		± 3.0% rdg on ± (0.50 to 1.00)

- We talk KW, KVA measurement accuracy of 0.5 % in meter & *spend later only, lakhs of Rs!*
- *But today, we can walk the talk with 2 % accuracy & spend Rs.10 K to measure!*
- In my next visit to the above industries, to my pleasant surprise, I found that 90 % of them, not only the small & medium scale industries bought one clamp-on power meter per industry immediately, but even large power consumers bought 2 to 3 of the above meters for their shift maintenance crew at least to know the instant power parameters at load ends and at the SSB.
- Later, I was given to understand that the above type of meter was very much user friendly, even the Electrician uses it easily. And both the electrical & process managers talked to me about KW, KVA loading issues, optimum power consumption / machine during my next visits, there.

- Inside the industry, this process of routine sharing of instant power parameters of machines between production and maintenance allowed the industry, to know that they were operating the machines safely and were to able to achieve the optimal energy conserving patterns on machines.
- This metering practice, I wanted to share with you all in the industry that some basic power *monitoring routinely & monthly can be added along with Sophisticated & Accurate monitoring* every year over a long time gap with dedicated manpower and micro-studying for long man hours.
- Reg. the accuracy part of measurement, when no routine power readings were done, the industry manager talks only at 10 % accuracy, but not acts. Now after buying this clamp on meter measurements, today the same industry manager can pin point the losses now at 2 % accuracy.
- To circumvent the problem of low PF measured during motor no load parameters, I have suggested them that we can connect across the motor terminals, the sized capacitor and take the power readings so as to improve PF & maintain the accuracy in no-load KW measurements.
-

- The sophisticated metering used with single CT mode or with 3 CT mode again depends on the dynamic load variations which normally happen in electronic driven non linear machine loads. Hence we have to plan to use the above meters to suit to the application and process variables.
- For the given linear load of motor, though the theory says it is a balanced load, but still 3 phase 4 wire method of measurement gives an accurate individual and sum of power parameters in 3 phases. So a single CT probe measured as above, gives motor parameters in few minutes, is OK.
- This article is addressing the power metering application to small and medium scale industries who find it difficult to meet both the ends that is how to maximize the usage of sanctioned quota of KWH, KVA so as to get better production with the rationed quota. This exercise may sound trivial to large scale industries since they have already MODBUSSED the Integrated Power & Production parameters and are dynamic monitoring, trending by windows compatible mode.
- What we are paying to EB is in KWH, KVA etc every month. Presently the EB power is the cheap and best as it is subsidized < Rs.5/-. Compare this Kwh rate to the Kwh generated per litre of diesel in our captive DG sets. The Kwh from our own DG set has made all of us, think that electricity unit is costly near Rs.20/- This forces us to conserve the subsidized EB units usage now.
- Now the industry is getting only Rationed Electricity. This makes us to use the Electricity rationally and we want to maximize the use of sanctioned KVA & KW given to us, by reducing the losses. Priority to the industry now is to run our *existing equipment efficiently and next comes the thinking of energy efficient equipment later*.
- *By energy conservation in the industry, we try to recover the losses which go as waste*. By Energy Measurement, we draw a line between Avoidable and Unavoidable Losses and plan to minimize same. *So Measurement is the first step to Conserve Energy*, first the instant power & then Trend.
- *Hence we have to see that our motor is matched to load now*. The industry can *visualize the motor is not like 1000 watts bulb* which draw always only 1 KW during its usage, but 1 KW motor consumes power to match to its load demand say from 300 watts to 1300 watts. *Lighting load is constant and visible to us where as motor loads are varying & the losses not visible to us.*

- Looking thro an aerial eye view of the industry power consumption pattern, the invisible losses that is seen between the cup and the lip from the transformer up to motor terminals and beyond that at the inefficient loadings, *it is my personal view that it is mandatory for the industry to have more instant power clamp-on meters than being content with one Hi Fi trend power analyzer.*
- What the best operating practices call for and as per the BEE guidelines is that any motor 10 HP & above operating at two shifts a day or 6000 hours an year, needs mandatory KWH metering.
- Many rules are framed by Electrical Inspection Authorities and followed by the industry. Though the rules are followed because of mandatory requirements, they intend to keep the Electrical House keeping safe.
- 'To use the above meter or in-situ power meter readings monthly or routinely' can also be made mandatory. This metering is a must not only for the HT consumers but also for the LT consumers as well. Ultimately this helps the consumer to know precisely what he consumes at each of his loads in KW, KVA, PF etc; sump up and then he can optimize the loads accordingly.
- The power data displayed in this type of Low end clamp-on power meter can reach the bottom most ITI trained Electrician inside the industry and he is made aware of what is he measuring in each of the machines compared to the machine power ratings. *In fact, the harmonic levels THD in volt & current up to 24 levels are displayed in these meters now.*
- Energy conservation can be achieved in an industry only by Energy Education to the bottom most employee. When the same employee measures the power parameters and compares this to ratings, then automatically he will come back to the Electrical Engineer with more avenues for saving.
- *The Good Things & Bad Things HAPPEN TO US BECAUSE OF US ONLY and others can only Catalyze*. So Cultivate good House Keeping Habits to visualize & *reduce Internal Invisible Losses than* showing to others that we reduced the visible losses externally.

S.ASHOK, BEE
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Conserving OUR ELECTRICITY is OUR Collective Responsibility, for a Better Tomorrow.

CHINESE IMPORTS HURTING ELECTRICAL EQUIPMENT UNITS

Valued at more than Rs 1.40 lakh crore in 2013-14, India's small- and medium-enterprise-dominated electrical equipment industry is under severe pressure. Sluggish demand in the domestic market and a consistent increase in imports of electrical equipment from China are threatening its growth. With capacity utilisation at less than 70 per cent, the industry registered miniscule growth of 3.5 per cent in production in 2013-14.

The industry comprises two segments - generation equipment (boilers, turbines, generators) accounting for 28 per cent of revenues, and transmission & distribution (T&D) and allied equipment like transformers, cables, rotating machines, switchgears, capacitors and energy meters, which accounts for the rest. In India, there are over 1,000 manufacturers in the organised sector, 80-85 per cent of them SMEs.

"The built-up capacity of the electrical equipment industry is currently under-utilised across several products due to sluggish domestic demand on account of the slowdown in the power sector and surge in imports of electrical equipment in recent years. This has significantly impacted the commercial viability of the domestic electrical equipment industry, and affected the top-line and bottom-lines of manufacturers," said Sunil Misra, director general, Indian Electrical & Electronics Manufacturers Association (IEEMA) - the lobby group of the power transmission and distribution equipment industry.

He added, "For the first time in 10 years, the T&D equipment sector witnessed negative growth of 7.8 per cent in 2012-13. In 2013-14, there has been miniscule growth of 3.5 per cent in production. The T&D equipment sector and equipment manufacturers are broadly working at less than 70 per cent of their production capacity."

In addition, according to IEEMA, during the years 2005-06 to 2012-13, India's imports of electrical equipment have increased at a compound annual growth (CAGR) of 24.67 per cent in rupee terms, touching Rs 64,674 crore in 2012-13.

Vishnu Agarwal, chairman and managing director of Technical Associates Ltd, said, "China's share in Indian imports of electrical equipment has dramatically increased in the last few years and stands at 44.92 per cent of the total in 2012-13, from 15.26 per cent in 2005-06. Imports from China have grown at a CAGR of 45.46 per cent in the last seven years. Imports of electrical equipment have assumed very threatening proportions and have now captured a 38.26 per cent market share of electrical equipment in India, whereas there is significant under-utilisation of installed domestic capacity, resulting in loss of employment."

According to IEEMA, there is no respite visible for the next two to three quarters. So, there is an urgent need to improve fund availability to the power sector and provide fuel linkages and faster regulatory clearances for timely completion of power projects.

Furthermore, industrialists said that to stimulate demand for the domestic electrical equipment industry, the government should provide a level playing field in the domestic market for Indian manufacturers to compete with imported equipment. "The government needs to provide greater encouragement to indigenous manufacturing by

initiating time-bound action like limiting participation in tenders for domestically funded projects to domestic manufacturers only; and secondly, by raising the basic customs duty on all electrical equipment products to a uniform 10 per cent," said Raj Eswaran, president, IEEMA.

He suggested the framing of model procurement guidelines for utilities with standardised and fair contract terms and conditions, with due weightage given to the lifecycle cost of a product (rather than just the initial cost), and to past performance and reliability, as well as opportunities for new domestic manufacturers, and reforms in the tendering process to increase transparency and speed.

However, Indian manufactures also need to focus on product innovation, technology, research and development, packaging and cost competitiveness, he added.

Read more: http://www.business-standard.com/article/sme/chinese-imports-hurting-electrical-equipment-units-114072801129_1.html

SUZLON SIGNS MOU WITH TERI FOR MTECH IN RENEWABLE ENERGY ENGG.

Suzlon Energy Limited, the world's fifth leading wind turbine maker, entered into a Memorandum of Understanding (MoU) with TERI University for setting up and offering an MTech Programme in Renewable Energy Engineering and Management. This MoU will facilitate Suzlon Energy to contribute to the Programme through exchange of ideas and expertise, and guest faculty.

Since its inception in 1999, TERI University has developed and evolved as a research university exploring the frontiers of knowledge in the fields of environment, energy and sustainable development, amongst others. The aim of this degree programme is to produce engineering graduates who have a strong grounding in the renewable energy engineering subject, and also equip them with a good understanding of the social and economic aspects of energy policy. Backed by an advisory committee constituting of a senior Suzlon executive, this programme will enable them to provide inputs to the curriculum, monitor the quality of the programme, determine and facilitate access to experimental facilities, equipment, etc and oversee the proper conduct.

Speaking about this initiative Mr. Tulsi Tanti, CMD, Suzlon Energy Ltd. said, "Suzlon today is the evolving face of renewable energy. By joining hands with TERI University we clearly demonstrate our vision and commitment towards green energy. We are proud to extend our support to this course that will give birth to a young dynamic generation of engineers who will inherit the challenge of creating a sustainable future."

Dr RK Pachauri, Chancellor TERI University and Director General The Energy and Resources Institute said, "TERI University is a unique institution which is focusing on the challenges that humanity is facing today and would continue to face in the future particularly in respect of unsustainable use of natural resources. Against that background we are pleased and proud to receive support from Suzlon Energy, an organization which has been a pioneer in promoting and implementing renewable energy solutions in India and several other parts of the world. We believe the graduates of the TERI University who benefit from support being provided by Suzlon Energy will help take the world towards a sustainable energy future."

Commenting on the partnership Dr Rajiv Seth, Registrar, TERI University said "In the light of a worldwide recognition of the need for clean energy, there can be little doubt that the growth of renewable energy technology will continue to escalate. By introducing a program in Renewable Energy Engineering and management, in partnership with Asia's leading wind turbine manufacturer, Suzlon Energy, TERI University will be able to impart first hand knowledge and expertise, making it one of the most prestigious programs of its kind."

Read more: http://kseboa.org/news/673-suzlon-signs-mou-with-teri-for-mtech-in-renewable-energy-engg-0204673.html

DEFORESTATION AND THE RISE OF INDUSTRIAL-SCALE FARMING IN AFRICA COULD LIE BEHIND EBOLA OUTBREAK

The growing Ebola virus outbreak not only highlights the tragedy enveloping the areas most affected but also offers a commentary on they way in which the political ecology in West Africa has allowed this disease to become established.

The narrative goes that the virus appeared spontaneously in the forest villages of Guinea in December 2013. But this is debatable given that there is evidence of antibodies the Ebola virus in human blood from Sierra Leone up to five years previously. Previously only one case of Ebola had been reported in the region, and it was the Ivory Coast strain of the virus. The strain detected in the blood samples is of the more virulent Zaire strain of Ebola, the same strain responsible for the current epidemic.

After months of very little concerted action it's clear that the disease is now seriously in danger of spreading out of control. The global health community has declared it a crisis of international importance, which has led the host nations to implement draconian preventions strategies, tantamount in some places to martial law in terms of surveillance, quarantine, border controls and other logistical aspects of control. But this is too little, too late.

There are several mechanisms through which the virus may have emerged, and it is unlikely that this latest outbreak was spontaneous. It is poverty that drives villagers to encroach further into the forest, where they become infected with the virus when hunting and butchering wildlife, or through contact with body fluids from bats – this has been seen with Nipah, another dangerous virus associated with bats.

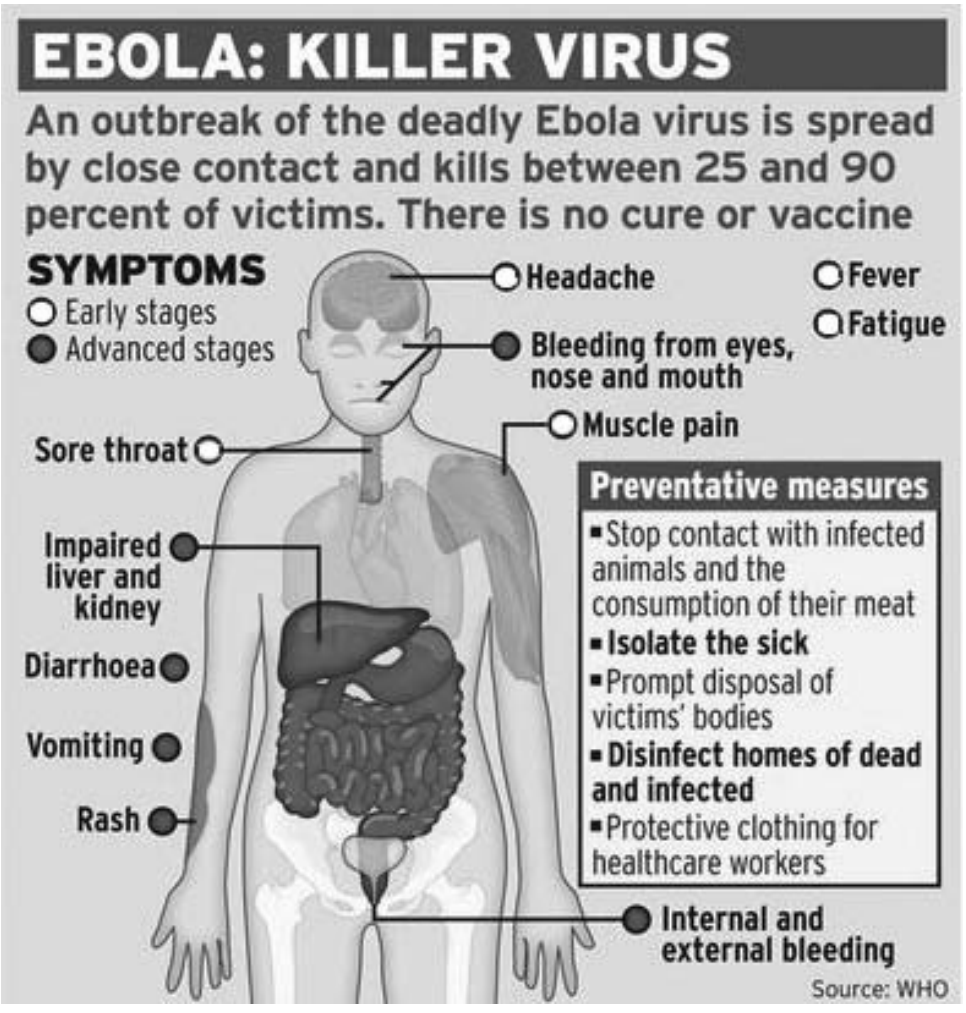
The likelihood of infection in this manner is compounded by inadequate rural health facilities and poor village infrastructure, compounded by the disorganised urban sprawl at the fringes of cities. The virus then spreads in a wave of fear and panic, ill-conceived intervention and logistical failures – including even insufficient food or beds for the severely ill.

Take for example the global palm oil industry, where a similar trend of deep-cutting into forests for agricultural development has breached natural barriers to the evolution and spread of specific pathogens. The effects of land

"The whole history of the world is summed up in the fact that, when nations are strong, they are not always just, and when they wish to be just, they are no longer strong."

grabs and the focus on certain fruit crop species leads to an Allee effect, where sudden changes in one ecological element causes the mechanisms for keeping populations – bats in this case – and viruses in equilibrium to shift, increasing the probability of spill over to alternative hosts.

This is not unheard of; the introduction of fruit tree crops in cleared forests and agricultural expansion in Malaysia was associated with the emergence of Nipah virus. Bats feeding on fruit trees infected pigs in pens, which provided a vector for the virus to humans. Another example is with vector-borne diseases such as the Japanese Encephalitis, a virus carried by wild birds which expanded its range due to growing rice and pig farming.



Chikungunya and Dengue Fever viruses exploited deforestation for secondary epidemiological cycles, which increased at the forest edge until the virus was able to adapt to secondary hosts and expand globally.

Certainly the complexity of the agro-ecological changes in West Africa warrant scrutiny. Guinea's new agriculture is in an early stage of development, identified by the World Bank as the highest investment potential for industrial agriculture. As global markets shift – and tariffs and taxes on multinational companies are removed, farmers with small land holdings are faced with a choice: either sell off or scale up to meet the competition. Forests are one of the first casualties.

Alongside this subtle effect is the dismantling of traditional governance, violence under colonial, neo-colonial and more recent kleptocratic governments and the economic movements of people towards urbanisation. Such turbulence, poverty, the influx of refugees from neighbouring wars and crumbling health systems have all created an ecosystem in which the natural friction that prevents Ebola from gathering pathogenic momentum has been all but eroded.

Any international response can do little to remedy these contributing factors. In fact the response has been little more than a recognition of the complete failure of neo-liberal development strategies to contain the virus.

The "success" of the Ebola virus is fundamentally based on the sociological factors and population biology of those it infects. But the data required to test the hypothesis – detailed records about what people eat, where they go and how they interact – is presently unavailable. Instead research has focused on virus hunting, and with little success: more than 40,000 samples have not yet conclusively determined where the natural reservoir of Ebola lies. All the while, the socio-ecological factors that are critical to the spread of any disease are ignored.

Courtesy: The Conservation

THE INVENTORS OF BLUE LED LIGHTS JUST WON THE NOBEL PRIZE

The inventors of blue LED lights just won the nobel prize. Here why?

The 2014 Nobel Prize in physics was awarded to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura — three scientists who helped develop blue light-emitting diodes, or LEDs, in the early 1990s.

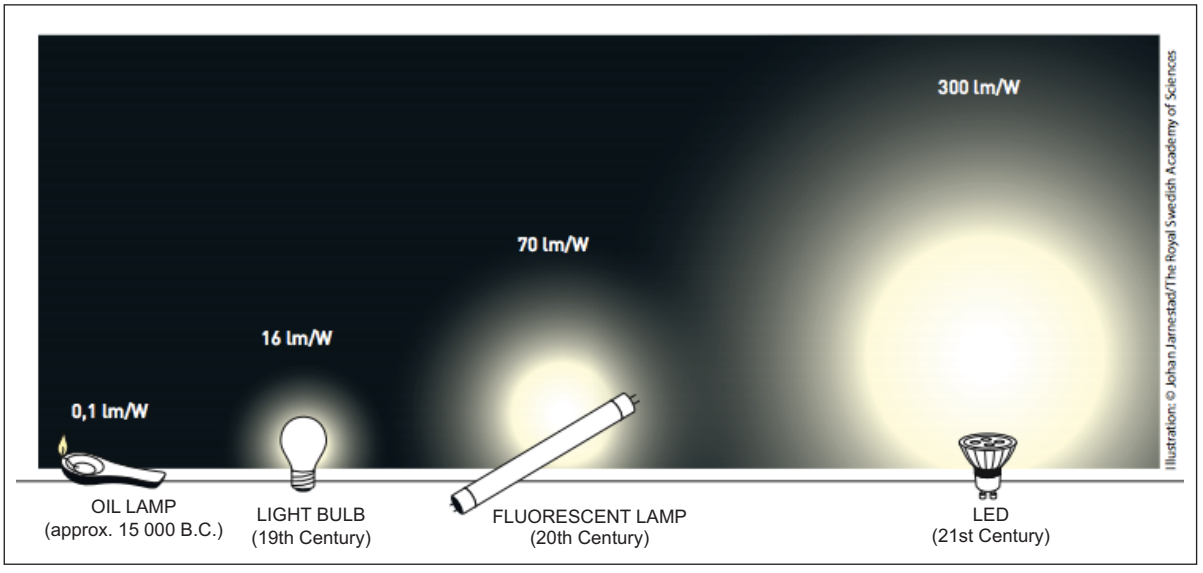
LEDS COULD BRING LIGHT TO THE 1.5 BILLION PEOPLE WHO CURRENTLY LACK IT

So why did the Nobel committee think LED lights are such a big deal? In part, they said, because of the technology's potential to change the world: "The LED lamp holds great promise for increasing the quality of life for over 1.5 billion people around the world who lack access to electricity grids: due to low power requirements it can be powered by cheap local solar power."

One big virtue of LEDs is that they're roughly 15 times more efficient than regular bulbs — and they *keep* improving at a remarkable clip. If they continue to get cheaper, they could replace fluorescents and incandescent lights in places like the United States and Europe, potentially cutting down on a major source of energy use and helping to tackle global warming (although if lighting gets more efficient, we could just end up using *more* of it).

So how important are LEDs, really? Here's an overview:

A short history of LEDs



(Nobel Prize committee)

LEDs are often viewed as the next generation of lighting technology. First we had fire. Then gaslight in the 19th century. Then Thomas Edison developed his filament bulbs. More recently, we've had the fluorescent and compact fluorescent bulbs most people now have in their offices and homes.

THE COST OF LIGHTING SERVICES HAS DROPPED 3,000 FOLD SINCE THE EARLY 1800S

Those innovations all helped us get more and more lighting with less and less energy. The cost of providing a given amount of light has dropped 3,000-fold since the early 1800s.

Now LEDs look more promising still, since they use less energy and don't contain harmful mercury, like fluorescent bulbs do. But it wasn't always obvious that LEDs would be the next step. Back in the 1980s, diodes could still only emit red or green light, which isn't very handy for lighting a room. But in the 1990s, Nakamura helped develop the first high-brightness blue LED — building on the work of Akasaki and Amano in Japan. Now it was conceivable that LEDs could be used for everyday purposes.

Since then, LEDs have advanced further and become used for an array of different sources. They're in streetlights and traffic lights. They're used for displays in computers and smartphones. But the big, idealistic hope is that they could help bring light to the 1.5 billion people who don't have it.

How LEDs could help light up the developing world

It's worth remembering that there are about 1.2 billion people in the world who still lack access to electricity. And many people who *do* have electricity barely have enough power for reliable lighting.

A LACK OF LIGHTING IN THE DEVELOPING WORLD ISN'T JUST INEFFICIENT — IT'S DEADLY

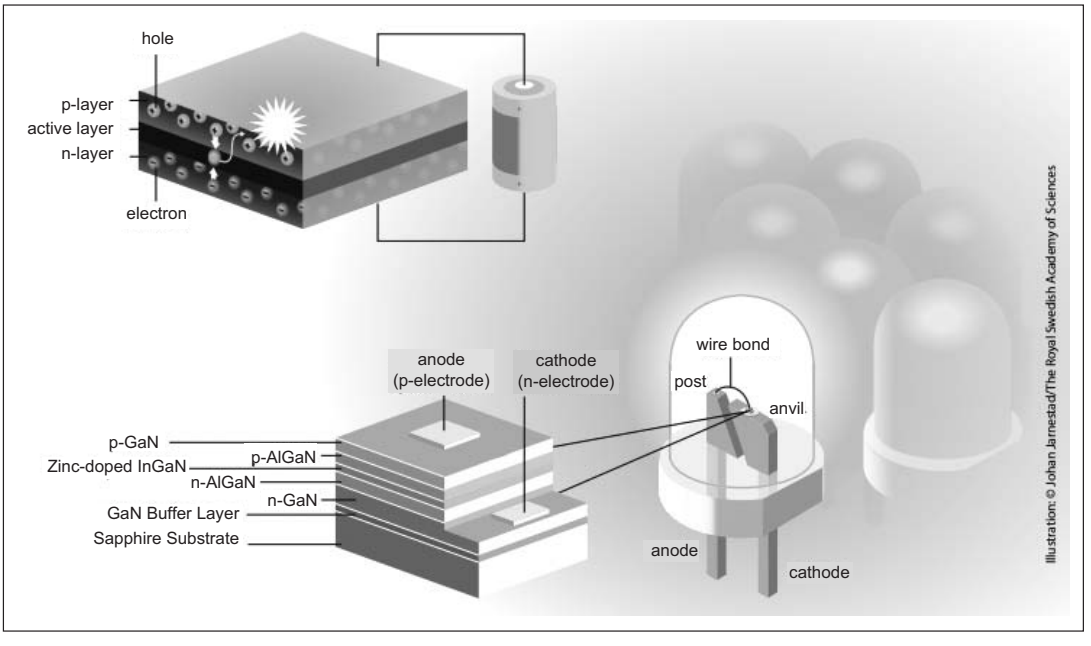
As a result, many households still burn either wood or gas for lighting. Not only is that inefficient, but the resulting indoor air pollution is killing millions and millions of people. Plus there are all sorts of knock-on effects — it's much harder for kids to study for school if they can't even read their books.

Now enter LEDs. One big thing these lights have going for them is efficiency. Incandescent lightbulbs are extremely inefficient — it takes a lot of energy to heat up the filament inside, and only a fraction (2 percent or so) of that energy is given off as light. LEDs do considerably better. Engineers can now get about 300 lumens of light from the most advanced LED bulbs for every Watt of electrical power used — compared to just 70 lumens from a compact fluorescent bulb and just 16 for a filament bulb.

In other words, LEDs are about 4 times as efficient as CFLs and 15 times as efficient as filament bulbs. As Charles Kenny explained in *Foreign Policy*, those low energy demands for LEDs mean that many households that aren't currently connected to the grid could use solar panels and small batteries to power LED lights.

The biggest obstacle is cost: LEDs often have a higher upfront price tag than other types of light bulbs. But that price has been steadily falling over time, to the point where we could start to see wider adoption in poorer countries. (The other advantages? LEDs last longer than compact fluorescent bulbs, they don't break as easily, and they don't contain mercury — so they're easier to dispose.)

Could LEDs help tackle global warming?

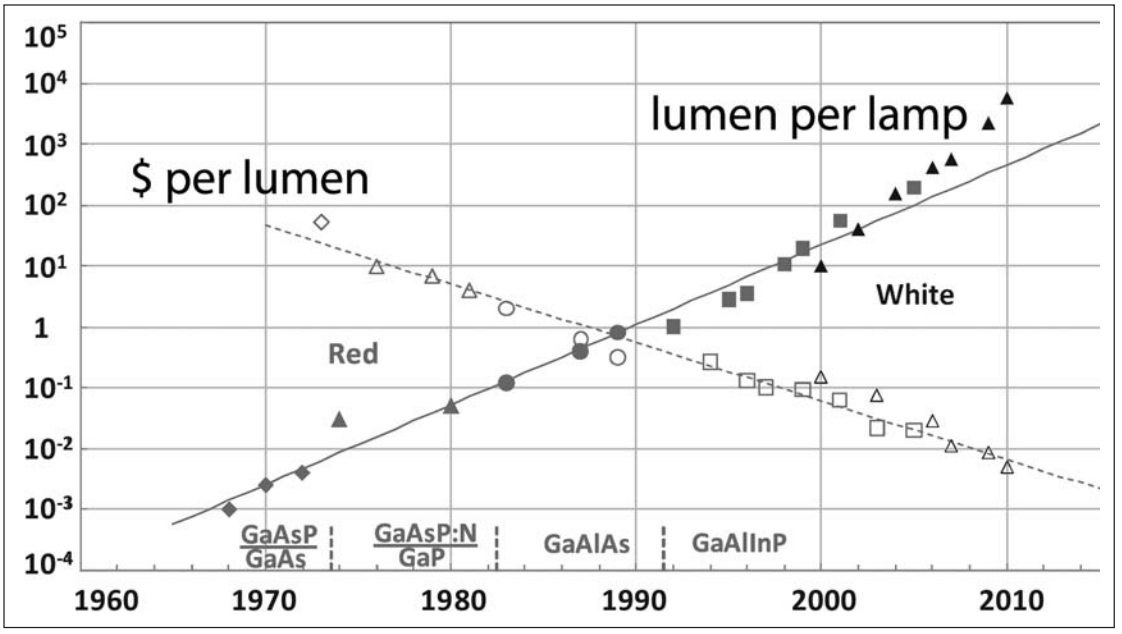


(Nobel Prize committee)

The other big potential application for LEDs is in the developed world. It's worth remembering that lighting is a massive source of energy use — it makes up about 17 percent of US electricity consumption. (The Indian Percentage will almost be similar)

In theory, LEDs could help change that. Most plans to boost energy efficiency and reduce greenhouse-gas emissions in the United States and Europe envision LEDs replacing all existing lighting technologies by 2050 or so.

The one hitch, however, is what's known as the "rebound effect." Historically, as lighting has gotten cheaper, we've used more and more of it — so that overall energy use for lighting has actually gone up, not down. That's one big consideration here. LEDs could well bolster lighting efficiency and make us all better off. But it's not guaranteed that energy use — and greenhouse-gas emissions — will go down as a result.



(**University of Wisconsin**)
Tim Lee's Chart on the amazing efficiency progress that LEDs have made over the years.

Compiled by
Mr. S. Mahadevan, B.E., F.I.E., M.B.A.
Consultant, Energy and Energy Efficiency,
Mobile: 98401 55209

REGEN POWERTECH LAUNCHES MADE-FOR-INDIA WIND TURBINE

Chennai-based ReGenPowertech has come up with a made-for-India wind turbine with a capacity of 2.8 MW.

The machine's blades will sweep a circle of a diameter of 109 metres. The wind turbine has been developed by ReGen's wholly-owned R&D subsidiary in Germany, Wind Direct GmbH, and the company intends to make the machine available for sale by the end of next year.

A prototype of the turbine is currently undergoing testing at ReGen's test site near Coimbatore.

Unique feature

A unique feature of this (permanent magnet, gearless) turbine is that it comprises two independent power systems of 1.4 MW capacity each. This allows operation of the turbine at half the rated power, so that when one segment is working, the other could be taken up for maintenance.

Besides, the box that sits on the top of the tower – the nacelle – weighs 156 tonnes, compared with 250 tonnes of other machines of similar rated capacity, says a press release from ReGen.

ReGenPowertech, set up by MadhusudhanKhemka, has been in the Indian market for the last six years and has about 1,500 MW of standing machines in India and Sri Lanka behind it.

It currently manufactures 1.5 MW synchronous permanent magnet gearless wind turbines with a technology agreement with Vensys, Germany. Its clientele includes names such as Tata Power, Renew Power, NSL Power, Green Infra, Greenko, Mytrah, NuPower, Orange Power and Bhilwara Energy.

Courtesy: Business Line

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16	A Treatise on Power Quality with a Focus on Harmonics	300

OTHER PUBLICATIONS

1	National Electric Code 2011 (NEC 2011)	4,070
2	National Lighting Code 2010 (NLC 2010)	3,370

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13 HEALTHY FACTS ABOUT FRUITS AND VEGETABLES

Most of us eat fruits and vegetables on a daily basis. After all, they have been a part of our diet since the dawn of history. We eat them raw, cooked, frozen, drink them as juices and combine them with just about any other food we eat. But just like anything else that's been around for so long, there are many things you don't know about fruits and veggies that can be very useful and important to know.

1) Never mix grapefruits with medications.

Grapefruits are among the most nutritious fruits out there but they can also be bad for you if you are taking certain medication. The chemicals in a grapefruit can cause a bad reaction with some drugs that can even have fatal results. If you're on medications, be sure to check with a medical professional before drinking or eating any amount of grapefruit.

2) Fruits and veggies have a lot of fiber.

The benefits of fiber include keeping your bowel movements regular, helping lower cholesterol, regulate blood sugar, and help you feel fuller for a longer time. Even if you don't need any more of the vitamins, minerals and other healthy ingredients in fruits and vegetables, they are still one of the best things you can eat on a daily basis.

3) The skin is usually the best part

In many fruits and veggies, such as carrots, apples, and cucumbers, a high percentage of the nutrition is actually stored in the skin. This means that when you peel it off, you're actually peeling away nutritious benefits. Make sure to wash your fruits and vegetables well before eating them and I guarantee you'll get used to eating them with the peel in no time.

4) Bananas are fascinating

Two incredible things you never knew about these delicious sources of potassium and vitamins: First, bananas are technically herbs and belong to the same "botanical family" as mint or basil. Secondly, in 1950 almost all of the banana species in the world where wiped out by the Panama Disease. Today, most of the bananas sold and eaten around the whole world are direct decedents of the same Asian breeds that survived the disease.

5) Eating fruits and vegetables hardly affects your weight

All fruits and all vegetables are low in calories, this is why you hear nutrition professionals and doctors tell you to eat them for snacks. While a bag of chips contains fat, oil, and a lot of calories, a handful of carrots contains none of those things. It is absurd how much fruit and vegetables you can eat before the calories start stacking up so don't be afraid to eat them. That said, some fruit may carry a high amount of sugar, so don't over-do it on sweet fruit.

6) Broccoli has more protein than a steak

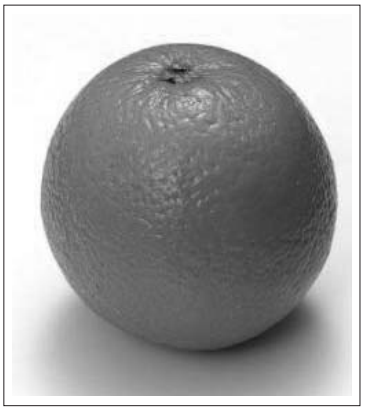
Calorie for calorie, there is more protein in broccoli than there is in an average steak, and with no saturated and trans fats or cholesterol, you can get all the protein you need with a significantly lower risk of cardiovascular disease.

So if you are trying to grow and strengthen your muscles, broccoli is the food for you.

7) The most hated vegetable in the world is one of the best

Brussels sprouts reign supreme as the least enjoyable vegetable by children, and also some adults. It might be because of their bitter taste, the repungnant smell or even just its bad reputation. However, Brussels sprouts are among the most nutritious veggies you can ever find. They have no fat, no cholesterol, hardly any calories and plenty of vitamins and minerals. It's a shame that none of these facts make them taste any better…

8) Orange peels are amazing



It's been said before that the skin of the fruit can be better than the fruit itself. Orange peels have over four times the amount of fiber then the actual fruit, and contain more antioxidants than the "flesh" inside. The only drawback is that it's difficult to find a way to eat it. The best way to do it is to grate it up like cheese into an orange zest. You can use is to season all sorts of foods, add to baked goods or mix with your yogurt or cereals.

9) Peppers encourage clotting

While most people use them as spice and not as a whole food, peppers (spicy ones in particular) can work wonders to promote the clotting of blood over wounds. According to some experts, you can even sprinkle some cayenne pepper into a wound where it will act as gauze.

10) "Negative calorie foods" are a myth

You may have heard that some fruits and vegetables require more calories to digest than they actually give, meaning eating them will actually make you thinner. Unfortunately this is wrong. While there are foods that have very few calories, you still only burn about 10% to 20% of their calorie intake. Let's take for example a stalk of celery that's about 10 calories. While eating and digesting it you will burn about 2 calories which means you still had an intake of 8 calories.

11) Onions are ridiculously healthy

Sure they can make you cry and they make your breath smell terrible, but you should forgive them for all of that. The reason onions do those things is the exact same reason why they are good for you. Onions contain over 100 sulfide compounds which give a number of health benefits such as the prevention of asthma and some types of cancer. You don't have to eat it raw, just eat it.

12) Pineapples are bad for your taste buds

Pineapples contain an enzyme called bromelain which breaks down proteins in your mouth, namely your taste buds. After eating a pineapple your palate will be much less sensitive until your mouth can heal itself, which takes about a day. Pineapple is still a great fruit for you, but you should probably let a freshly sliced pineapple sit in the fridge for a bit before eating it. This will give time for the enzymes to break down and they will have a much weaker effect.

13) Apples can wake you up better than a cup of coffee

It's hard to believe this fact so just try it for yourself and see. If you're finding yourself a little low on energy during the afternoon then consider eating an apple in the morning. Thanks to its high carbohydrate, vitamin, and mineral content, an apple can give you a steady supply of nutrition to help you stay energized all day.

God, our Creator, has stored within our minds and personalities, great potential strength and ability. Prayer helps us tap and develop these powers. - ABDUL KALAM

KALKI SADASIVAM

Born	September 4, 1902 Aangarai, Tiruchirapalli District, Madras Presidency, India
Died	November 22, 1997 (aged 95) Chennai, Tamil Nadu, India
Occupation	writer, journalist, freedom fighter, singer, film producer
Spouse(s)	Apithakuchambal, M. S. Subbulakshmi
Relatives	Radha Viswanathan (daughter), Vijaya Rajendran

In this Indian name, the name *Thiagarajan* is a patronymic, not a family name, and the person should be referred to by the given name, *Sadasivam*. "Kalki" Thiagaraja Sadasivam (4 September 1902 – 22 November 1997) was a leading freedom fighter, singer, journalist and film producer who was one of the founders, along with Kalki Krishnamurthy of the Tamil magazine Kalki. He is well known as the husband of famous classical carnatic singer M.S. Subbulakshmi

Life

Kalki Sadasivam was born on September 4, 1902 at Aangarai in Tiruchirapalli District, the third of 16 children. Impressed by the fiery speeches and writings of Lala Lajpat Rai, Bipin Chandra Pal, Lokamanya Tilak and Sri Aurobindo Ghosh, Kalki Sadasivam joined the freedom movement at an early age and being a disciple of Subramaniya Siva desired to kill an Englishman and court imprisonment for the sake of it. As a result, he quit school and enlisted in the Bharata Samaj, serving Subramaniya Siva who was afflicted with leprosy and ardent involving himself in the Swadeshi Movement. On listening to speeches by Rajagopalachari and Mahatma Gandhi he later adopted non-violence.

Sadasivam had two daughters named Radha and Vijaya from his first wife, Smt. Apithakuchambal. In July 1936, Sadasivam met M.S. Subbulakshmi, who subscribed to his ideological and political views. The two eventually married on July 10, 1940 after his first wife died. Sadasivam was also close to journalist and writer Kalki Krishnamurthy with whom he co-founded the popular magazine Kalki in 1940.

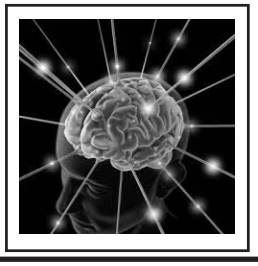
Thiagarajan Sadasivam

T. Sadasivam and M.S. Subbulakshmi

POWER YOUR MIND

WHO IS HYPOCRITE?

Those who search
For eternal joy
But never care for
Anything high
Attached to the world
With all their might,
People call them
Rank hypocrite.



Courtesy: Swami Srikantananda

WHO REALLY CARES

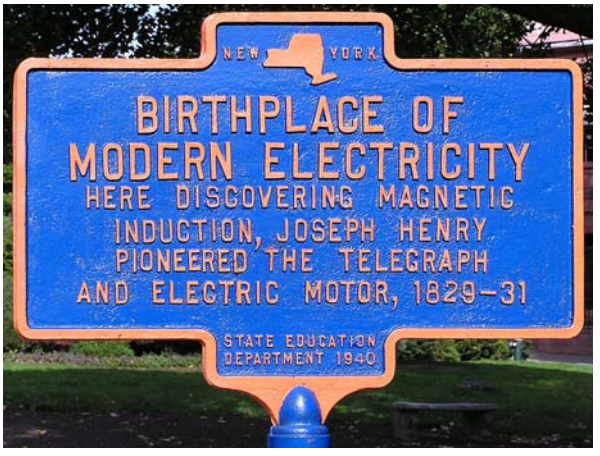
How many of us really 'care'
Only a few are ready to share.
Some try to care only out of fear.
Some only care for the dear,
Those who care moved
By the tears are indeed rare.
That's why we call them
Great seers.

JOSEPH HENRY (1797-1878)

Biography

Henry was born in Albany, New York to Scottish immigrants Ann Alexander Henry and William Henry. His parents were poor, and Henry's father died while he was still young. For the rest of his childhood, Henry lived with his grandmother in Galway, New York. He attended a school which would later be named the "Joseph Henry Elementary School" in his honor. After school, he worked at a general store, and at the age of thirteen became an apprentice watchmaker and silversmith. Joseph's first love was theater and he came close to becoming a professional actor. His interest in science was sparked at the age of sixteen by a book of lectures on scientific topics titled *Popular Lectures on Experimental Philosophy*. In 1819 he entered The Albany Academy, where he was given free tuition. Henry excelled at his studies (so much so, that he would often be helping his teachers teach science) that in 1826 he was appointed Professor of Mathematics and Natural Philosophy at The Albany Academy by Principal T. Romeyn Beck. Some of his most important research was conducted in this new position. His curiosity about terrestrial magnetism led him to experiment with magnetism in general. He was the first to coil insulated wire tightly around an iron core in order to make a more powerful electromagnet, improving on William Sturgeon's electromagnet which used loosely coiled uninsulated wire. Using this technique, he built the strongest electromagnet at the time for Yale. He also showed that, when making an electromagnet using just two electrodes attached to a battery, it is best to wind several coils of wire in parallel, but when using a set-up with multiple batteries, there should be only one single long coil. The latter made the telegraph feasible.

Using his newly-developed electromagnetic principle, Henry in 1831 created one of the first machines to use electromagnetism for motion. This was the earliest ancestor of modern DC motor. It did not make use of rotating motion, but was merely an electromagnet perched on a pole, rocking back and forth. The rocking motion was caused by one of the two leads on both ends of the magnet rocker touching one of the two battery cells, causing a polarity change, and rocking the opposite direction until the other two leads hit the other battery. This apparatus allowed Henry to recognize the property of self inductance. British scientist Michael Faraday also recognized this property around the same time, Since Faraday published his results first, he became the officially recognized discoverer of the phenomenon. In 1848 Henry worked in conjunction with Professor Stephen Alexander to determine the relative temperatures for different parts of the solar disk. They used a thermopile to determine that sunspots were cooler than the surrounding regions. This work was shown to the astronomer Angelo Secchi who extended it, but with some question as to whether Henry was given proper credit for his earlier work.



Historical marker in Academy Park (Albany, New York) commemorating Henry's work with electricity.

Influences in aeronautics

Prof. Henry was introduced to Prof. Thaddeus Lowe, a balloonist from New Hampshire who had taken interest in the phenomenon of lighter-than-air gases, and exploits into meteorology, in particular, the high winds which we call the Jet stream today. Henry took a great interest in Lowe's endeavors, promoting him among some of the more prominent scientists and institutions of the day.

Legacy

Henry was a member of the Lighthouse Board from 1852 until his death. He was appointed chairman in 1871 and served in that position the remainder of his life. He was the only civilian to serve as chairman. The United States Coast Guard honored Henry for his work on lighthouses and fog signal acoustics by naming a cutter after him. The *Joseph Henry*, usually referred to as the *Joe Henry*, was launched in 1880 and was active

until 1904. In 1915 Henry was inducted into the Hall of Fame for Great Americans in the Bronx, New York.

Statue of Henry before Smithsonian Institution

Bronze statutes of Henry and Isaac Newton represent science on the balustrade of the galleries of the Main Reading Room in the Thomas Jefferson Building of the Library of Congress on Capitol Hill in Washington, D.C. They are two of the 16 historical figures depicted in the reading room, each pair representing one of the 8 pillars of civilization.

At Princeton, the Joseph Henry Laboratories and the Joseph Henry House are named for him.

After the Albany Academy moved out of its downtown building in the early 1930s, its old building in Academy Park was renamed Joseph Henry Memorial, with a statue of him out front. It is now the main offices of the Albany City School District. In 1971 it was listed on the National Register of Historic Places; later it was included as a contributing property when the Lafayette Park Historic District|Lafayette Park Historic District was listed on the Register.

Curriculum vitae

1826 – Professor of Mathematics and Natural Philosophy at The Albany Academy, New York.

1832 – Professor at Princeton.

1835 – Invented the electromechanical relay.

1846 – First secretary of the Smithsonian Institution until 1878

1848 – Edited Ephraim G. Squier and Edwin H. Davis' *Ancient Monuments of the Mississippi Valley*, the Institution's first publication.

1852 – Appointed to the Lighthouse Board

1871 – Appointed chairman of the Lighthouse Board

HUMOUR

INNOCENTS

MELANIE (age 5) asked her Granny how old she was. Granny replied she was so old she didn't remember any more. Melanie said, "If you don't remember you must look in the back of your panties. Mine say five to six".

STEVEN (age 3) hugged and kissed his Mom good night. "I love you so much, that when you die I'm going to bury you outside my bedroom window".

BRITTANY (age 4) had an earache and wanted a pain killer. She tried in vain to take the lid off the bottle. Seeing her frustration, her Mom explained it was a childproof cap and she'd have to open it for her. Eyes wide with wonder, the little girl asked: "How does it know it's me?

SUSAN (age 4) was drinking juice when she got the hiccups. "Please don't give me this juice again," she said, "It makes my teeth cough."

THE CHEATER

Sitting at a table in the clubhouse after a game, Joe said to a fellow club member, "I'm not about to play golf with Jim Walsh anymore. He cheats."

"Why do you say that?"

"Well, he found his lost ball two feet from the green."

"That's possible."

"Not when I had it in my pocket!

THE CLEVER ONES

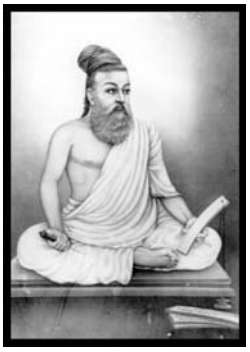
Two drunks are driving down the highway, drinking their beer. All of a sudden the driver notices lights flashing in his mirror; the cops are on his tail. His buddy says, "What are we going to do?" The driver says, "Don't worry. Just do exactly what I tell you and everything will work out perfectly. First, peel the labels off our beer bottles and we'll each stick one on our forehead. Then shove the bottles underneath the seat, and let me do the talking." They pull over and the cop walks up to the car. He looks at them kind of funny, but asks to see the guy's driver's license. And he asks him, "Have you been drinking?"

"Oh, no, sir," the driver replies. "I noticed you weaving back and forth across the highway. Are you *sure* you haven't been drinking?" the cop asks.

"Oh, no, sir," the drunk answers. "We haven't had a thing to drink tonight".

"Well, I've got to ask you," says the cop, "What on earth are those things on your forehead?" "That's easy, Officer," says the drunk. "You see, we're both alcoholics, and we're on the patch".

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' 19



"Business is Marketing" is a famous Business Quotation, which explains the very basic of Business, as businesses revolve around Customers or Clients and their Needs and fulfillment of the same. Marketing, in brief, is explained as CCDV or Creating, Communicating and Delivering Value. Tiruvalluvar deals with this concept briefly and beautifully just in one Kural.

Tirukkural provides scope for varieties of interpretations, ultimately clarifying and establishing a comprehensive solution to the question or the context in which we are analyzing. In the Kural we have taken, it is addressed to the King or the Government, but it can easily be taken as addressing the CEO or the Head of the Business. He deals with four basic concepts that decide the capability of a Good Business. Valluvar deals with the 'Four Concepts" as below:

Creation: Creation of a Good Business Blue Print of Products or Services or Ideas and the Systems for Designing, Manufacturing and Delivery of Solutions or Value to the Customers who are in need of them. Systems must include ways to identify the customers with needs and communicating with them.

Earning: The essential element of Business is earning reasonable profits which will only help sustain the Business and Grow.

Protection: Profits need to be retained and the Customers and our Business are also needed to be protected from being swept away by Competition. Guarding your Market Share and Retaining your Customers are important dimensions around which Businesses revolve today.

Distribution: The earnings that are protected need to be distributed properly between the Share Holders and the Developmental Needs, so that the Business retains its Health and Growth Objectives.

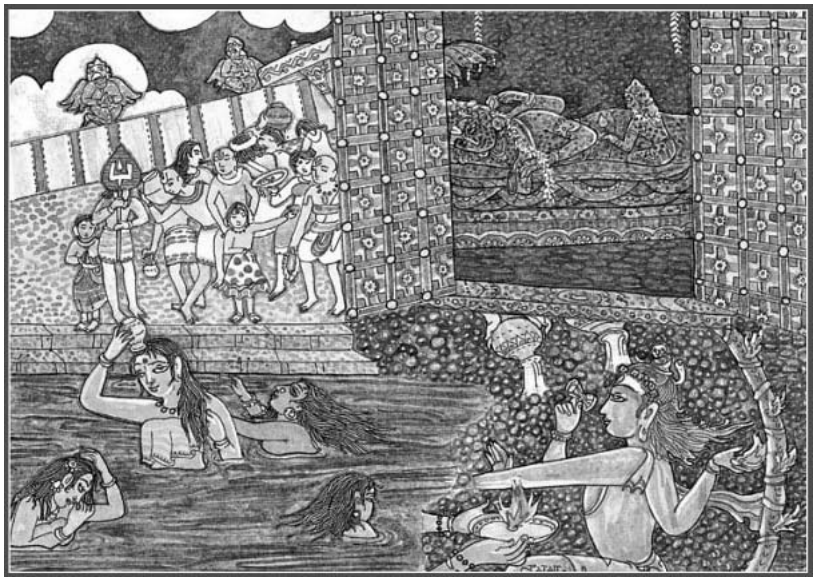
Iyatralum Eettalum Kaththalum Kaththa
Vaguththalum Vallathu Arasu ***Kural 385***

இயற்றலும் ஈட்டலும் காத்தலும் காத்த
வகுத்தலும் வல்லது அரசு. குறள் 385

"The Prince shall know how to develop the resources of his Kingdom and how to enrich his treasury; how to preserve his wealth and how to spend it worthily".

HOME FESTIVALS

Markazhi (December/January)



During Tirupuval (below, in upper left of painting), people bathe (lower left) and gather in the early morning to go on procession singing devotional Vaishnava songs (upper left). Especially popular are those of the 9th century lady saint Andal, venerated as one of South India's greatest devotional poets. On Vaikunth Ekadasi, the 11th day of the lunar month, the doors of the huge temple of Srirangam are opened to devotees from morning to night for darshan of Rangam, an aspect of Lord Vishnu, sleeping on Adishani, the serpent king (upper right). Another famed festival is Ardra Darshana, when Siva Nataraja is decorated and taken from the temple in procession throughout the community (lower right). Especially the ill and those of old age seek to have a glimpse of Nataraj. A renowned sweet, aurudra kalli, is made with vegetables on this day.

"All of these festivals are earnestly conducted. People wait for the day with their mind on God. The purpose is to gather in the home and worship for the prosperity of the family and of all mankind."

When matters which should remain in the realm of unwritten law, a law observed by convention rather than by compulsion, are put in writing, all sorts of difficulties may crop up in the matter of enforcement and interpretation. So, it has been wisely said that you may say a thousand things, but do not commit even one to writing. - H.H. SHRI PARAMACHARYA

CRYSTAL HALL

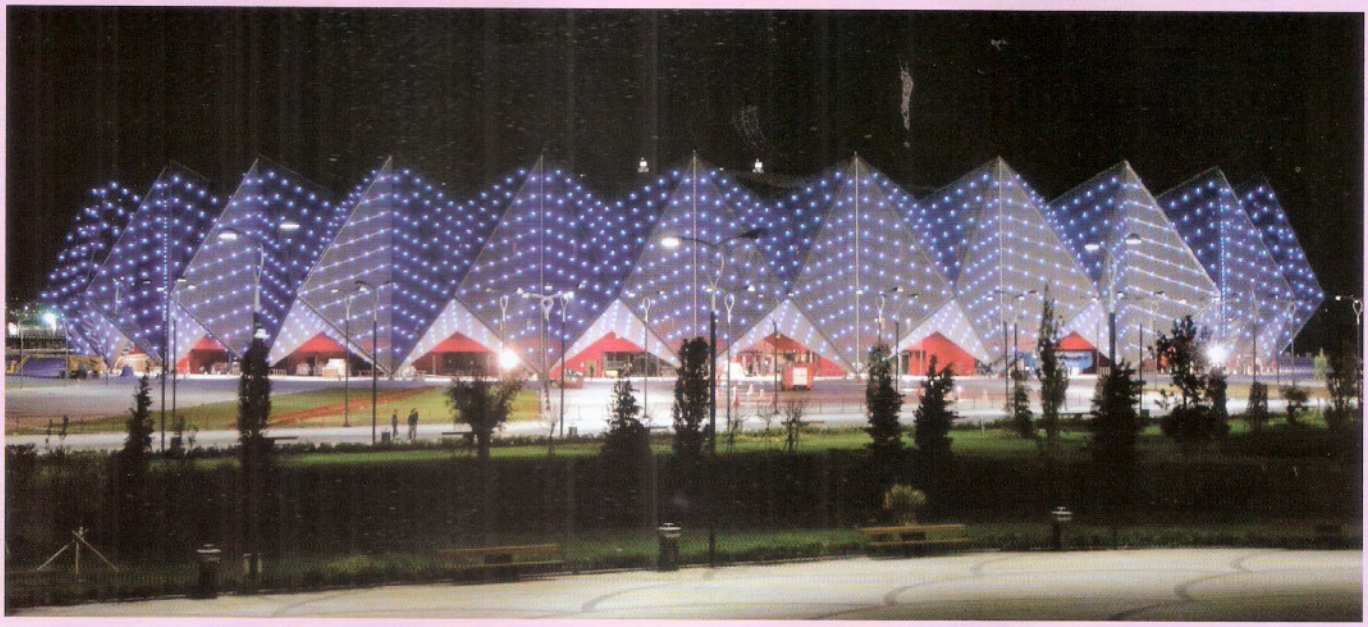
Designed by German architecture firm GMP, the Baku Crystal Hall is a crystal-shaped multi-purpose indoor arena, which has been built on a peninsula near the city centre, right in the Caspian Sea. The arena has been built for Eurovision song contest 2012. Conceived as both a concert hall and a sports stadium, the 25,000-seat stadium comprises a lightweight steel structure with a faceted membrane facade intended to resemble cut crystal.

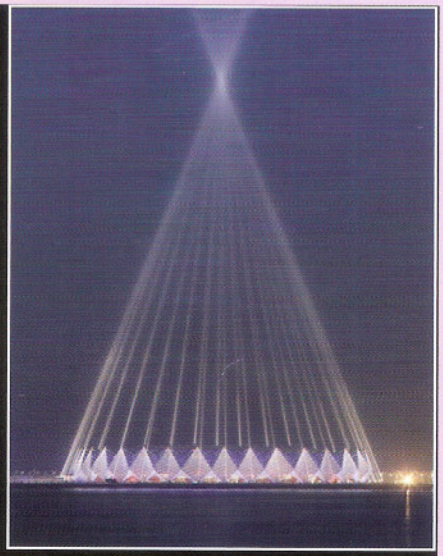
It was originally planned as a temporary structure, but was subtly altered during construction to enable it to remain in place for longer. Built using steel, the arena comprises three independent segments including a membrane façade, the modular stadium and the interior roof. The arena is 230m long and 160m wide. The transparent membrane will offer protection from the elements of nature. Its facade is covered with 9500 LED lights, which bring the structure to life after dark.

This was already evident from outside the building, for the spectacular light show was by no means confined to the interior. The stage provided by the unique location on the shore of the Caspian Sea was also illuminated and rendered visible for miles around. The Baku skyline was the richer on the three evenings the competition lasted for an illumination at once vibrant and informative, as the diamond-like facade of the Crystal Hall, studded with lighting elements, was bathed in the national colours of whichever country's performers were at that moment on stage. In addition, the hall, which is over 200 metres long and 160 metres wide, was ringed by FALCON BEAM xenon searchlights, for which an elaborate choreography had been programmed in which the beams opened, closed, flickered and created impressive patterns.

GMP Architekten has worked on several venues for international events. In 2011 the firm completed four stadiums for the World University Games in Shenzhen, while three of its stadiums featured in the 2010 FIFA World Cup.

CRYSTAL HALL





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