ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
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ISSUE NO. 129 | VOL : No. 11/2016 | MONTHLY ISSUE NO. 11 | PRIVATE CIRCULATION ONLY | NOVEMBER 2016

EVENTS

L&T Training Programme

Selection of LV Switchgear and Applications	5th – 9th December 2016
Breaker maintenance workshop – C - Power ACB	12th – 14th December 2016
Selection & Application of drives	12th – 14th December 2016
Breaker maintenance workshop – U – Power Omega ACB	15th – 16th December 2016
Introduction to Industrial Electrical Systems	19th – 21st December 2016, 26th – 28th December 2016

Venue: L&T Ltd., Switchgear Training Centre, Nilgiris
Contact Tel.: 0423-2517107 **Fax:** 0423-2517158
Email: stc_coonoor@lntebg.com

WIN
INDIA
WORLD OF INDUSTRY
Integrated Industry –
Get new technology first

Events Profile: 10th International trade fair for Motion, Drive and Automation is the platform where the innovative products available on the global market for Electrical and Mechanical Power Transmission, Hydraulics and Pneumatics are displayed. The exhibition will feature domestic and international companies, who will display peerless state-of-the-art technology and services to the user industry.
Date: 1st – 3rd December 2016
Venue: MMRDA Grounds, Mumbai
Website: http://www.win-india.com/

POWERELEC INDIA
International Power, Electrical & Electronics Expo
9 - 11 March 2017 | B C E C , Mumbai - India

Events Profile: The International Tradeshow and Conference on Power Generation, Electricals and Industrial Electronics
Date: 9th – 11th MARCH 2017
Venue: BCEC MUMBAI
Website: http://www.powerelec.co.in/

ELECTRIC, POWER & RENEWABLE ENERGY
MALAYSIA 2017
The Region's Flagship Event for Sustainable Power Generation, Energy Efficiency, Transmission and Renewable Technologies

Events Profile: EPRE 2017 is organised by Malaysia's leading exhibition organiser. All World Exhibitions members have been organising trade shows for over 30 years and currently organise over 150 trade exhibitions biennially. These include Asian Elenex (Hong Kong), Elenex Vietnam, Power Mongolia and Electric Power & Renewable Energy (Myanmar).
Date: 15th – 17th March 2017
Venue: Kuala Lumpur Convention Centre, Malaysia
Website: http://www.epremalaysia.com/

EDITORIAL

Dear Members, Fellow Professionals and Friends,

Greetings To One And All!

Best Wishes For Better Business, Growth And Prosperity!!

November is a month which is remembered, World over, for Family and Community based concerns. Two of the important problems that affect the communities and the Society are Environment and Terrorism. We have read a lot about the Reports that appeared recently about the high degree of pollution in many cities of India due to Diwali Celebrations. This could probably be taken as a temporary phenomenon, but the major problem of 'Global Warming' and the likely large scale disturbances to the world at large still remains. As we are aware, most of the environment problems are Energy related, both due to the sources of Energy and the uses of Energy. Our role and responsibility in this regard is very high as most part of 'Energy Use' is Electricity related. Communities at large are also affected very badly by Terrorism caused by fanaticism, greed and hatred and the lack of love for humanity at large. Let us all resolve to contribute our might to improve the Environment and Harmony in and around Society.

There are many other problems like Water Disputes between states, corruption and illegal generation of large sums of moneys which are used to destroy the Democracy of the country and so on. We are aware of the activism played by judiciary in many of these matters and it is still the trust and hope of the people of India, as mutual trust is lost between states and communities. November is the month when both World Legal Services Day and National Law Day are observed on the 9th and the 26th respectively and as Law abiding citizens we are all concerned about some of the recent happenings in the Country concerning Law, Legal Services and the Judiciary. We are aware that Judiciary and the Legal System in the Country is one of the important pillars of Democracy which increases the confidence and faith of the people in Democracy and it is absolutely necessary that the Legal System is strengthened and kept intact.

Children's' Day is celebrated all over the country on the 14th November and "Cha Cha Nehru" is remembered this month. It is interesting that the International Children's day also falls this month. There are some comments from some quarters that the more focus on Industrialization by Jawaharlal Nehru was not correct etc, but the fact is that the focus on Industrialization and the Green and White Revolutions later, have really helped to put our Country in a strong position to regain the Economic Leadership which we enjoyed (historically) till about 300 years ago. It is time that we get into higher levels of technologies both in Industries and Agriculture as our potentials are huge. One of the important hurdles in speeding up the progress of our Country is corruption, disturbing both the economy and the democracy. Eradicating corruption is not an easy job as 'Temptations' are too much and in the long run, unless each and every one of the citizens are made to realize that Ethics and Values are much more important, eradication can't take place. Effective and bias less investigations and speedy trials and tough punishments are essential to keep the process of corruption eradication going and strengthening both the Investigating Agencies and the Judiciary are thus very essential.

We are aware that the 'Energy Conservation' day and week are to come in December and let us prepare to Celebrate and initiate more measures towards Excellence in both sourcing and use of Energy.

We thank all those members who have helped us by participating in the advertisement appearing for the issue October 2016 – Supreme Power Equipment Pvt. Ltd., Elecxpo-5th Edition, Wilson Power and Distribution Technologies Pvt. Ltd., Power Links, Sun Sine Solution Pvt. Ltd., Fomra & Fomra, Galaxy Earthing Electrodes (P) Ltd., Safvolt Switchgears Pvt Ltd., E Power Engineering, SPS Transformers P. Ltd., Universal Earthing Systems Pvt. Ltd., Consul Neowatt Power Solutions Pvt. Ltd., Ashlok Safe Earthing Electrode Ltd., OBO Bettermann India Pvt. Ltd., Dehn India Pvt. Ltd., Pentagon Switchgear Pvt. Ltd., Anchor Electricals Pvt. Ltd.,

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ELECTRICAL INSTALLATION ENGINEER

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Demand Draft be drawn in favour of the "Tamilnadu Electrical Installation Engineers' Association 'A' Grade" payable at Chennai

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153.	Visewham Electricals	Chennai	98402 26290, 94439 25478	EA 2442
154.	Magna Enterprises	Chennai	044-42032732, 98409 51381	EA 1646
155.	Nova Electricals Enterprises	Chennai	99403 29552	EA 2955
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160.	Bharathi Electricals	Chennai	044-26541470, 99520 90490	EA 2998
161.	Spark Electricals	Chennai	044-24897476, 95000 37482	EA 1456
162.	Abhinaya Electrical Services	Coimbatore	0422-2380306, 93440 90620	EA 2081
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165.	Aim Electrical Controls India P. Ltd.	Coimbatore	0422 -4395380, 98940 61800	EA 2213

KNOW THY POWER NETWORK - 110

Let us restart our topic with some more interesting information on tiny Lithium battery cells which offer much services by toiling themselves under stressful operating conditions. The chemical reaction which is responsible for the working of the battery cells invariably produces "heat"; so it can be expected that either over charging or quick charging of the cells will result in undesirable flash points with the consequential fires. More over the simple flouting of the ground rule that requires the operating parts of the battery cell should not touch each other or be placed in close proximity to each other will lead to "Over heating". The constraints in arranging the required space has lead to the violation of this rule during manufacturing of the mobile or smart phone batteries. This measure always keeps the battery cells in question in "high risks zone". Running the batteries just one or two notches below its "maximum capacity level" may not produce the desired end result. Actually it cannot be considered as a valid solution to face off the risks associated with the overheating of the battery cells. Further such a step may compromise / down grade the quality of the concerned high cost phones. All these make it essential for the battery cell manufacturers to balance the safety and efficiency issues carefully.

Another point that need focus in this context is the replenishing / recouping of the battery cells, when it loses its charge after a few discharges. The prevailing popular view is that recharging should be carried out only when the cells reach a near "Zero charge level". It is not a correct practice since it shortens the working life of Lithium cells. To keep the battery cells in a healthy comfortable charged condition, certain quantum of residual charges should always be maintained in the cells; otherwise, no amount of 'recharging' will help to restore the battery's working condition to the acceptable level. When the battery hits the zero level, it suffers much and fails to respond to the subsequent recharging adequately. *In this process it losses a small amount of its capacity and gets "derated". A note of caution:- ideal recharge conditions of lithium battery cells exist only when the battery charge level touches 50 percent or just above it; continue the recharging till it touches 100 percent or little less. Never permit batteries to go below 50 percent of its charged condition; then you are permitting it to enter into a no return zone / alloy.*

Now let us turn our attention to our regular topic. **Specific Gravity** - It is a measure of battery's health; it doesn't have much value while assessing the battery life's risks or failure. It simply indicates its current operating status; its values vary with time and the operating conditions. A low specific gravity value or sudden falls in SG values may indicate that the trickle charger, which functions in parallel with the battery, may not have its voltage at the required level and so plate sulphation starts. In the lead acid batteries, the sulphate ion should either be present in the acid or on the plates because the system is a closed one. When the battery is fully charged condition, the sulphate is present in the acid; when the battery is discharged, it is deposited on the plates. Thus the specific gravity plays the role of a mirror that reflects the voltage level and the state-of-charge of the battery. Recording of specific gravity readings regularly may help to assess the health status of a battery, when it suffers failure or experiences some operating problems. SG is a temperature dependent parameter. Further battery applications and geographics of the battery locations have a say in SG values.

CURRENTS

The battery experiences two currents; (i) a "Recharge Current" that helps the battery to get recharge after a discharge occurs. (ii) float current or trickle charger current which is used to keep the battery at the fully charged condition. The float current is brought by the voltage differential between the charger and the battery voltages. When the battery is fully charged, small float current, which replenishes the self discharge of the battery, alone flows in the circuit. Now the charger voltage attains the voltage level of the battery. The size of the battery also decides the quantum of float current; larger the battery, higher the float current flows in the circuit. This measure will keep the battery in fully charged condition.

At times, the float currents will also show an increasing trend due to some external reasons; one such a significant factor is the presence of ground faults. Internal battery faults can also be listed in this category. In some battery systems, the battery problems are also brought into light by the float current. Among them important is "*Thermal runaway conditions*" experienced in a battery. Shorted cells, ground faults, dry outs, excessive chargings and insufficient / inadequate heat removal / dissipation are some of the basic reasons for the presence of this thermal runaway conditions. As this process requires adequate time before developing into a crisis situation or acquiring a crisis status, the float currents will come to our rescue. On measuring this float current, we can easily pin point the changes that are taking place in the battery and take timely corrective measures.

RIPPLE CURRENT

Another interesting factor that gets associated with the "float charging of the Battery" is "Ripple Current", the alternating current that comes along with the DC output of the charger that aids float charging of the battery. Normally all DC devices prefer only DC imposed on them; they skip away the alternating current component which gets super imposed on their DC output because they bring internal heating of their components with the consequential pre-mature failures. The heating effect of the ripple current alone demands attention and not the ripple voltage of the charger. As a thumb rule, it can be taken 5A (rms) of ripple current for every 100 Ah battery will bring damages to the batteries. One of the significant contributing factors for the enhanced to ripple current is the ageing of electronic components like diodes in the charger. *Kindly note that the presence of alternating current components in the DC battery system always endangers the battery and its associated equipment; it invariably causes damages to the battery and its components – "the lower the AC components is on the battery system, the less the damage is that it faces".*

TEMPERATURE

It is an important factor that gets associated with the life of a storage battery. It forms one of the basic reasons for the pre-mature failure of "Storage Batteries". Higher temperatures will always lead to the reduction in the operating life of batteries. This principle is generally applicable to all electrical equipment because they are always prone to risks brought by higher operating temperatures. Every 10°C rise in battery temperature 50 percent of its operating life is lost. The increased temperature causes faster positive grid corrosion and other failure modes. A battery that is designed for 25°C (77°F) (20 years service life) if operated at a temperature of 35°C (95°F) will last for 10 years only. Further increase at in its temperature by an increment of 18°F (10°C) may make it work for five years only. So the battery temperature is a key determining factor of its life. Greater the temperature, lower will be the operating life of the battery.

A battery's temperature cannot be kept at a constant level; it varies from hour to hour – during day time it assumes high temperature but at night the temperature falls down. Likewise the average temperature will be on the high side during summer and on the lower level during the winter. If the battery temperature falls below 25°C (77°F) its can never be brought back to its original condition. Once its positive grid gets corroded, it can never be revived; it will lead to further corrosion, high temperature and finally end of the battery, though at a slower pace. Here the speed of corrosion rate alone merits further consideration. So controls are to be put in place so as to keep the battery temperatures well within the 'safer limits'.

Let me 'sign off' here.

(To be continued...)

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NEW METHOD FOR MAKING GREEN LEDS ENHANCES THEIR EFFICIENCY AND BRIGHTNESS

Researchers at the University of Illinois at Urbana-Champaign have developed a new method for making brighter and more efficient green light-emitting diodes (LEDs). Using an industry-standard semiconductor growth technique, they have created gallium nitride (GaN) cubic crystals grown on a silicon substrate that are capable of producing powerful green light for advanced solid-state lighting.

Typically, GaN forms in one of two crystal structures: hexagonal or cubic. Hexagonal GaN is thermodynamically stable and is by far the more conventional form of the semiconductor. However, hexagonal GaN is prone to a phenomenon known as polarization, where an internal electric field separates the negatively charged electrons and positively charged holes, preventing them from combining, which, in turn, diminishes the light output efficiency.

Until now, the only way researchers were able to make cubic GaN was to use molecular beam epitaxy, a very expensive and slow crystal growth method when

compared to the widely used metal-organic chemical vapor deposition (MOCVD) method that Bayram used.

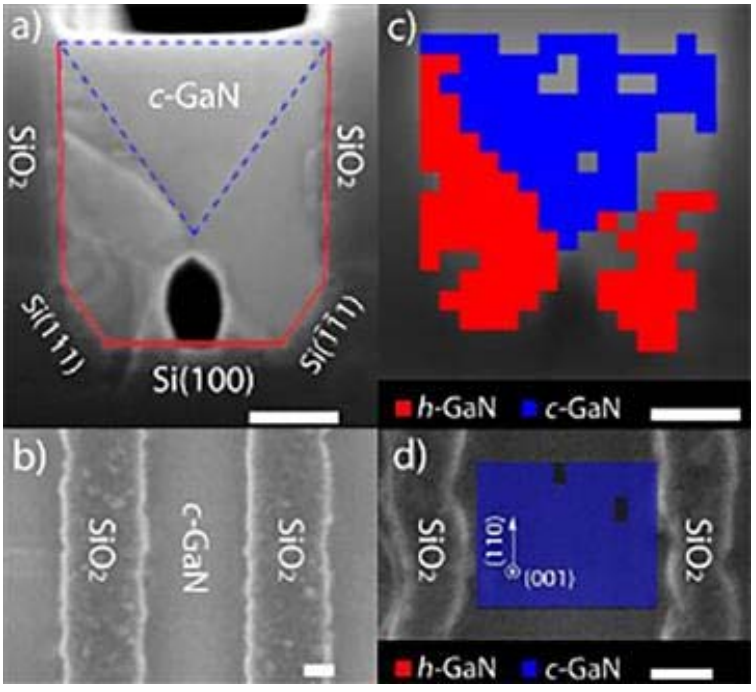
A new method of cubic phase synthesis: Hexagonal-to-cubic phase transformation. The scale bars represent 100 nm in all images. (a) Cross sectional and (b) Top-view SEM images of cubic GaN grown on U-grooved Si(100). (c) Cross sectional and (d) Top-view EBSD images of cubic GaN grown on U-grooved Si(100), showing cubic GaN in blue, and hexagonal GaN in red.

Bayram and his graduate student Richard Liu made the cubic GaN by using lithography and isotropic etching to create a U-shaped groove on Si(100). This non-conducting layer essentially served as a boundary that shapes the hexagonal material into cubic form.

"Our cubic GaN does not have an internal electric field that separates the charge carriers—the holes and electrons," explained Liu. "So, they can overlap and when that happens, the electrons and holes combine faster to produce light."

Ultimately, Bayram and Liu believe their cubic GaN method may lead to LEDs free from a "droop" phenomenon that has plagued the LED industry for years. *For green, blue, or ultra-violet LEDs, their light-emission efficiency declines as more current is injected, which is characterized as "droop".*

"Our work suggests polarization plays an important role in the droop, pushing the electrons and holes away from each other, particularly under low-injection current densities," said Liu, who was the first author of the paper, "Maximizing Cubic Phase Gallium Nitride Surface Coverage on Nano-patterned Silicon (100)", appearing in Applied Physics Letters. "Being polarization-free, cubic LEDs can have thicker active layers eliminating the reduced electron-hole overlap and current overflow. There are recent efforts by other groups to produce cubic GaN LEDs, but they are made on silicon carbide substrates, which is very expensive and have two orders of magnitude higher defectivity compared to our cubic GaN on silicon."



Having better performing green LEDs will open up new avenues for LEDs in general solid-state lighting. For example, these LEDs will provide energy savings by generating white light through a color mixing approach. Other advanced applications include ultra-parallel LED connectivity through phosphor-free green LEDs, underwater communications, and biotechnology such as optogenetics and migraine treatment.

Enhanced green LEDs aren't the only application for Bayram's cubic GaN, which could someday replace silicon to make power electronic devices found in laptop power adapters and electronic substations, and it could replace mercury lamps to make ultra-violet LEDs that disinfect water.

Can Bayram

"This work is very revolutionary as it paves the way for novel green wavelength emitters that can target advanced solid-state lighting on a scalable CMOS-silicon platform by exploiting the new material, cubic gallium nitride," said Can Bayram, an assistant professor of electrical and computer engineering at Illinois who first began investigating this material while at IBM T.J. Watson Research Center several years ago. "The union of solid-state lighting with sensing (e.g. detection) and networking (e.g. communication) to enable smart (i.e. responsive and adaptive) visible lighting, is further poised to revolutionize how we utilize light. And CMOS-compatible LEDs can facilitate fast, efficient, low-power, and multi-functional technology solutions with less of a footprint and at an ever more affordable device price point for these applications."

SHELL OUTLINES WAYS FOR THE WORLD TO ACHIEVE NET-ZERO EMISSIONS

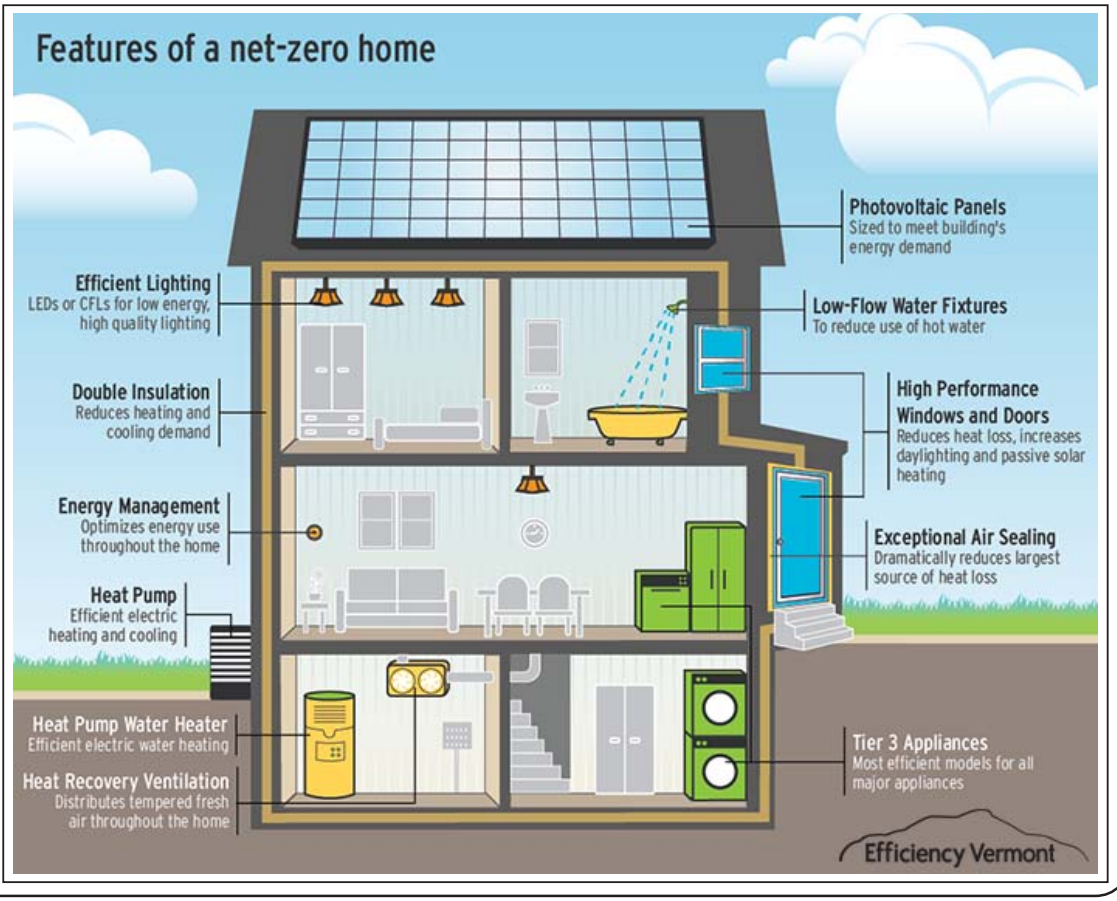
Energy giant Shell has identified a need to transform four sectors of the energy system - power, industry, transportation and buildings - for the global economy to achieve net-zero emissions. The four areas currently generate a large proportion of energy-related CO_2 emissions. The power sector, for example, accounts for 40 per cent of global energy-related CO_2 emissions.

CARBON & CLIMATE

Shell outlines 'below 2C' climate change scenario

Shell's new report "A Better Life with a Healthy Planet: Pathways to Net-Zero Emissions" was a supplement to its earlier report "New Lens Scenarios" published in 2013, which looked at alternative energy scenarios for the future. Speaking at last month's Asia launch of the supplement in Singapore, Jeremy Bentham, vice president of global business environment and head of Shell scenarios, said understanding how to bring different forms of energy together was very important. "There is going to be a co-evolution of the established forms of energy such as oil and gas, which currently keep our factories and supply chains working, with the emerging forms of energy such as solar, wind, bio fuels and hydrogen, which are currently mainly electricity based," he said.

The report also states that the global drive to achieve net-zero emissions is likely to be accelerated due to the Paris Agreement inked by the world's nations in December 2015, which sets a limit for the global rise in temperatures to well below 2 deg Celsius. The report, though, does not provide a time period in which this net-zero emissions target can be achieved. Shell said that for more than four decades, it has continued to explore and build alternative energy scenarios. These scenarios provide possible alternatives and paints different scenarios for the future of the energy industry. However, they are not a prediction of what will happen, the report highlighted. The energy scenarios will help to set the context and direction Shell is heading towards, as of Shell of Shell it further explores its own energy mix and pursues efforts to combine renewables such as solar, wind and bio fuels with oil and gas, shared Bentham.



Zero emissions technologies that include renewables

and nuclear need to gradually displace coal to become a significant source for the power sector. The design and operations of buildings, which are responsible for nearly one-third of global energy consumption, will require high energy efficiency standards and should increasingly be powered by renewables. With 90 per cent of transport powered by oil, individuals will need to increase the use of battery-electric or hydrogen fuel cell cars, as oil and gas are likely to be of dominant use in the foreseeable future of aviation, shipping and long-haul distances.As for industry, the report suggests that there are no "easy replacements" for heavy industries such as cement, steel and iron. It suggested that technologies such carbon capture and storage (CCS) seems the way forward to reduce emissions from these industries.

Shell's analysis revealed that by 2035 to 2050, some actions could bring the world to the halfway point of this transition.This will involve redoubling energy efficiency, continuing renewable energy development - in particular solar and wind - and accelerating the switch from coal to gas to reduce power sector emissions. The report also emphasised the importance of significant improvements to city infrastructure in order to create low-energy service demand.

To achieve all these, leadership from society, government, and industry is required, especially in pushing for change in alternative energy sources and solutions, the report stressed.

When asked if Shell would lead the industry in changing consumer behaviour in order to move to the net-zero emissions scenario Bentham responded that "Shell never wants to and never can dictate consumer behaviour or choice but can encourage and nudge". "We can produce cleaner fuels and better operating lubricants, we can make liquefied natural gas for transport applications… We can work with governments on policies that shape consumer behaviour by bringing what we know of consumer behaviour. "But we don't have the right in society to tell people what to do. It comes from a societal dialogue that involves business, government and civil society," he said.

Net Zero Energy Building Certification

Net Zero Energy is a sought-after goal for many buildings around the world. All such buildings rely on exceptional energy conservation and on-site renewable generation to meet all of their heating, cooling and electricity needs. Yet, many buildings that claim to be Net Zero in fact are not; actual Net Zero Energy buildings are still rare. The Institute's Net Zero Energy Building Certification™ (NZEB) is the only program in the world that verifies net zero energy building performance. NZEB is one of three certification paths under the Living Building Challenge.

Zero energy building versus green building

The goal of green building and sustainable architecture is to use resources more efficiently and reduce a building's negative impact on the environment. Zero energy buildings achieve one key green-building goal of completely or very significantly reducing energy use and greenhouse gas emissions for the life of the building. Zero energy buildings may or may not be considered "green" in all areas, such as reducing waste, using recycled building materials, etc. However, zero energy, or net-zero buildings do tend to have a much lower ecological impact over the life of the building compared with other "green" buildings that require imported energy and/or fossil fuel to be habitable and meet the needs of occupants.

Because of the design challenges and sensitivity to a site that are required to efficiently meet the energy needs of a building and occupants with renewable energy (solar, wind, geothermal, etc.), designers must apply holistic design principles, and take advantage of the free naturally occurring assets available, such as passive solar orientation, natural ventilation, daylighting, thermal mass, and night time cooling.

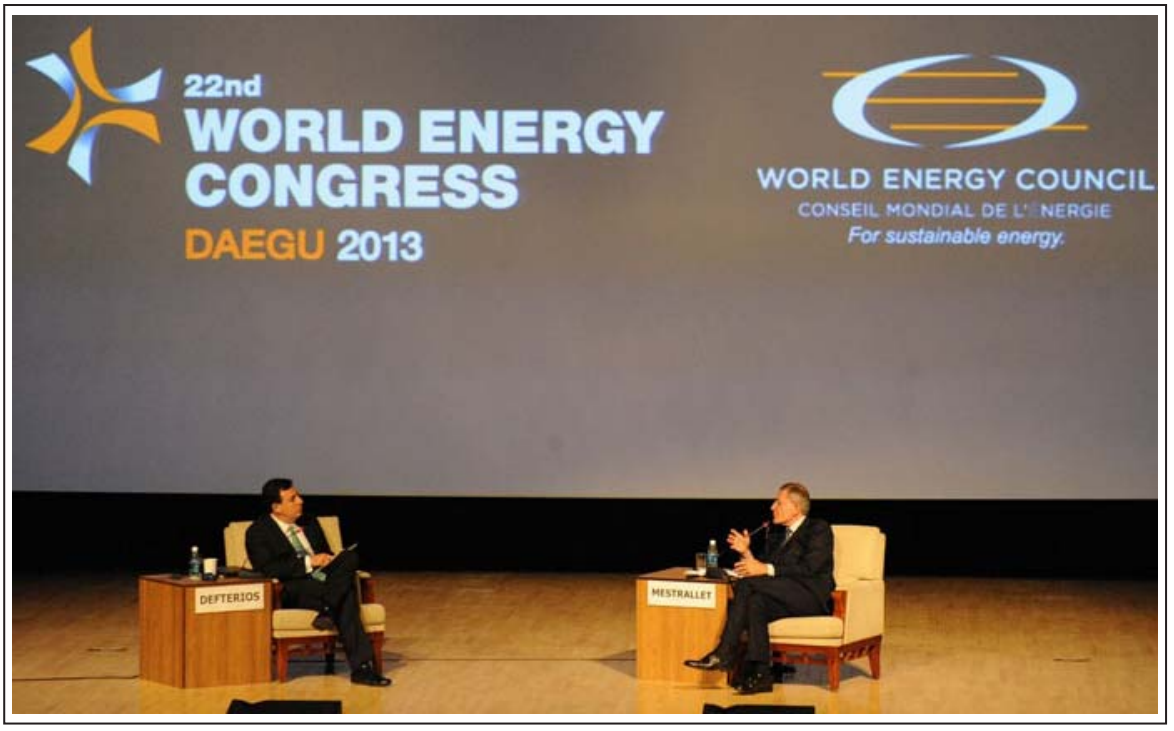
Certification

Many green building certification programs do not require a building to have net zero energy use, only to reduce energy use a few percentage points below the minimum required by law. Green Globes involves check lists that are measurement tools, not design tools. Inexperienced designers or architects may cherry-pick points to meet a target certification level, even though those points may not be the best design choices for a specific building or climate.[citation needed] In November, 2011, the International Living Future Institute developed the Net Zero Energy Building Certification. Designed as part of the Living Building Challenge, Net Zero Energy Building Certification is simple, cost effective and critical for integrity and transparency.

"Animals are reliable, many full of love, true in their affections, predictable in their actions, grateful and loyal. Difficult standards for people to live up to." - ALFRED A. MONTAPERT

WORLD ENERGY COUNCIL

The World Energy Council is the principal impartial network of leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all.



Formed in 1923, the Council is the UN-accredited global energy body, representing the entire energy spectrum, with more than 3000 member organisations located in over 90 countries and drawn from governments, private and state corporations, academia, NGOs and energy-related stakeholders.

The World Energy Council informs global, regional and national energy strategies by hosting high-level events, publishing authoritative studies, and working through its extensive member network to facilitate the world's energy policy dialogue.

WORLD ENERGY COUNCIL | ISTANBUL 2016 23rd WORLD ENERGY CONGRESS
Embracing New Frontiers

Since it was created in 1923, when visionary Daniel Dunlop brought together 40 countries to discuss the problems facing the global energy industry, the WEC has been non-governmental and non-commercial. Founded in the aftermath of war, it has withstood many changes, from geopolitical and economic upheavals to a complete shift in the way people understand and use energy. It has had to adapt to a changing world without ever straying from the initial concept of an organisation that is impartial, objective and realistic in its analyses and in its agendas for action in order to promote sustainable energy for all.

Today, the WEC has almost 100 national member committees, and its member list includes governments, businesses and expert organisations. The World Energy Congress, held over 20 times since the WEC's founding, is recognised as the world's premier energy gathering. As we move forward through the 21st century, the WEC continues to grow and expand, building on its long and stable history as one of the key players on the global energy scene.

Mission

"To promote the sustainable supply and use of energy for the greatest benefit of all people"

The World Energy Council (WEC) is a uniquely positioned organisation which actively supports intergovernmental organisations, governments and companies to deliver sustainable energy systems. The WEC brings together all

of the world's economic areas, every kind of energy ranging from renewables to fossil fuels, and every kind of organisation.

The WEC's studies are world-renowned. They communicate knowledge across a wide range of fields and support the decision-making process in policy making and industry strategy. Thus, the WEC has a key role to play in helping the world rethink and resolve its energy challenges and in addressing the energy trilemma.

WEC's mission is carried out through the Objects, which were approved at WEC's founding in 1923 and modified over the years to adapt to the changing energy industry and the changes within WEC. WEC's Objects are to promote the sustainable supply and use of energy for the greatest benefit of all people, by:

- collating data about and undertaking and promoting research into the means of supplying and using energy having, short and long term, the greatest social benefit and the least harmful impact on the natural environment, and publishing or otherwise disseminating the useful results of such research;
- undertaking actions, including but not limited to the holding of Congresses, workshops and seminars, to facilitate such supply and use of energy; and
- collaborating with other organisations in the energy sector with compatible goals.

Simply put, the World Energy Council is the largest global network of energy leaders and practitioners dedicated to delivering a sustainable energy system for the greatest benefit of all. Originally intended as an organisation to manage a gathering of energy experts, the World Energy Council has evolved into one of the world's most influential energy organisations.

The World Energy Council continues to deliver on its original goal by organising the world's largest all-energy event, the World Energy Congress, and undertakes a wide range of activities to help further the vision of a sustainable energy future.

As the UN-accredited global energy body, the World Energy Council works with governments, agencies and companies to help inform policy development and strategic decision-making and planning. The Council works with partner organisations to facilitate access to our network of experts and provides impartial advice to intergovernmental organisations and national governments on specific issues affecting what we call the energy trilemma.

The World Energy Council organises one of the most complete range of events covering all aspects of the energy sector, from small workshops on specific technologies, to regional and global events aimed at supporting policymakers, experts and industry leaders as they seek solutions and develop policies and strategies to address the energy trilemma.

- **World Energy Congress** takes place every three years and is the world's largest all-energy event. It provides a platform for energy leaders and experts in all aspects of the sector to gather and address the challenges and opportunities both for energy suppliers and users.
- **World Energy Leaders' Summits (WELS)** are organised twice a year by the World Energy Council for its global energy leaders community to enable an ongoing high-level dialogue on critical issues affecting the energy world. WELS are generally held in countries of critical interest to the global energy situation and are co-hosted with the energy minister of the host country.
- **Regional events** are held annually or bi-annually. They are organised by the World Energy Council's national member committees working in partnership to create a platform to address the challenges facing neighbouring countries, regional blocks, and companies seeking solutions in a multilateral environment.
- **National events** are organised regularly by our national member committees. They aim to share knowledge, update members on the latest World Energy Council studies, and provide an opportunity to address the challenges facing the national sector in detail, while leveraging our global network to engage with internationally renown experts.
- The World Energy Council has a privileged network of industry leaders and practitioners who meet regularly to share their expertise and work on the globally renowned **World Energy Council Studies**.

For over 80 years, the World Energy Council has been producing highly regarded studies and publications which are seen as essential tools by governments, industry, investors, IGOs, NGOs and academia looking for impartial information to inform their decision-making processes.

Our regular flagship studies are:

- **World Energy Resources**, a survey of global resources and technologies**.** It identifies what energy resources we have and what technologies are being used to exploit these resources.
- **World Energy Trilemma** report, an independent assessment of national energy and climate policies. This work seeks to identify how we can make better policies to improve our energy systems.
- **World Energy Issues Monitor**, an annual monitor identifying what issues are affecting the global energy leaders' community**.**
- **World Energy Scenarios**, an in-depth explorative energy scenarios**.** This work seeks to identify what may happen in our future energy systems based on quantitative computer modelling and the knowledge of our global network of energy experts.

Our studies all help to guide policy makers and industry leaders to deliver a more sustainable energy system.

Our **World Energy Perspectives** reports and studies are based on the expert insights from our network of leaders and practitioners. They provide a bottom-up assessment of key issues and technologies impacting the energy sector.

The true strength of the World Energy Council comes from its network of over 3,000 organisations and from its member committees in over 90 countries. The World Energy Council's autonomous member committees provide a powerful forum for debate and knowledge-sharing within a country and offer neutral, high-level interaction across borders to facilitate the world's energy policy dialogue. This network ensures that the World Energy Council is the most representative and knowledgeable energy organisation in the world.

World Energy Congress

The World Energy Council hosts the World Energy Congress, which is the world's largest and most influential energy event covering all aspects of the energy agenda. Running since 1924, the triennial World Energy Congress enables dialogue among Ministers, CEOs and industry experts on critical developments in the energy sector world map

As the world's premier energy gathering, the Congress offers a unique opportunity for participants to better understand energy issues and solutions from a global perspective.

Over the 90-year history of the World Energy Council the Congress has been key to the value of the organisation. The Congress has been staged in 21 cities across the world and the **23rd World Energy Congress will take place in Istanbul, Turkey in 2016**.

Ms. Nadeau is Chair of the World Energy Council since 2012. As such, she is a regular speaker in international energy conferences.

She sits on UN Secretary-General Ban Ki-moon's Advisory Board on Sustainable Energy for All, on the Advisory Council of the United Nations' Department of Economic and Social Affairs (UNDESA) and China Energy Fund Committee, on the Advisory Council – Women Sustainability, Environment and Renewable Energy (WiSER) Program (UAE) and on the selection committee of Sheik Zayed's Energy Prize (UAE).

Marie-José Nadeau is also a Director on the Boards of ENGIE (ex-GDF SUEZ) (GSZ:Paris), METRO Inc. (MRU:TSX), Churchill Falls and Labrador Corporation Limited (CF(L) CO), the Montréal Council on Foreign Relations, and is Vice President of the Board of l'Orchestresymphonique de Montréal (OSM). Moreover, she has led numerous fund raising activities in the fields of health, education and culture.

Ms. Nadeau graduated in Law (Bachelors and Masters Degrees) from Ottawa University (Canada). She served as a Senior Policy Advisor and then Chief of Staff to the Ministers of Energy and Environment of the Government of Quebec. In 1993, she joined Hydro Quebec, Canada's largest electric utility, where she was Secretary General and Executive Vice President for Corporate Affairs until her retirement in 2015.

Ms. Nadeau was appointed a Member of the Order of Canada (C.M.) in December 2015.

Energy leaders gather in Ghana to drive momentum within energy sector

More than fifteen energy leaders from the Ministry of Power, Ministry of Energy, ECOWAS, and the Volta River Authority (VRA) attended an event chaired by Professor Akabzaa, Honorary Chair of the World Energy Council **Ghanaian member committee**. Sophie Rose, Manager Member Services & Head of the **Future Leaders Programme**, gave a presentation about the Council, FEL programme and World Energy Academy, which generated a lot of interest with many of the stakeholders requesting information on how they could participate in the Academy.

Fruitful discussions were also had by the core team of the Ghanaian member committee, in a separate meeting. Participants included Mr. Addy, MC Secretary, five young professionals including a FEL-100 and 3 people from Volta River Authority, as well as Mr. Kalitsi and Mr. Negbegble formerly part of the MC leadership.

They discussed the main challenges faced by the MC in particular; the potential for a new structure the MC could take. It was agreed that the ideal solution would be to have the Energy Commission hosting the MC, with support of the Petroleum Commission and VRA, as well as the involvement of the Institute of Engineers.

The group also discussed the MC's participation at the **23rd World Energy Congress**, the potential for new MC activities as well as how to involve young professionals more within the committee, who are very keen to get involved.

In addition to the invitation already sent to the Minister of Petroleum, the committee are currently in the process of preparing Congress invitations to the Minister for Power, Energy Commission and VRA.

William Horsu, from the Ghanaian member committee, who will be attending Congress, said: "Being part of the 23rd World Energy congress will be an opportunity to bring national multi-stakeholders in the energy sector together to accelerate access to modern energy services.

"Through research, exhibitions and knowledge sharing platforms, stakeholders can learn from each other. We would also be able to establish a platform for Business to Business partnerships that can attract investment into the energy sector in Ghana and establish potential public private partnership for scale up of energy projects. I hope to engage the international community in promoting access to modern, affordable and efficient energy solutions to households and small enterprises in Ghana as this is essential for sustainable development."

ABB ENERGIZES TRANSFORMER AT WORLD RECORD VOLTAGE LEVEL OF 1.2 MILLION VOLTS

Pioneering 1,200-kilovolt alternating current transformer technology for India's ultra-high-voltage grid plan

ABB has developed, manufactured and energized a 1,200-kilovolt (kV) ultra-high-voltage power transformer to support India's plans to build a 1,200 kV transmission system, supplementing the existing 400 kV and 800 kV transmission grid as demand for electricity increases. The transformer was manufactured and tested at ABB's state-of-the-art Vadodara facility in India.

This 1.2 million volt transformer represents the highest alternating current voltage level in the world and is installed at the national test station at Bina, Madhya Pradesh in Central India, as part of a collaborative initiative by the country's central transmission utility, Power Grid Corporation of India Limited (POWERGRID).

India's geographic span means that resource-rich generation centers and urban and industrial load centers are often far apart therefore requiring efficient power transmission. Along with the country's commitment to enhance the contribution of renewables, these factors are driving the development of an ultra-high-voltage transmission infrastructure.

The 1,200kV transmission system will help strengthen the grid and enhance load capacity up to 6,000 megawatts (MW). Transmission at higher voltages enables larger amounts of electricity to be transported across longer distances, while minimizing losses. At the same time, less space is needed for fewer transmission lines, which reduces the environmental impact and overall cost.

"ABB has a pioneering track record in India and this 1,200 kV achievement is another concrete example of our commitment to support the country in the ongoing development of its power infrastructure" said Claudio Facchin, President of ABB's Power Grids division. "This project also underlines how ABB delivers differentiated value through innovation and customer collaboration, both key elements of our Next Level strategy."

In addition to the transformer, ABB has also developed a 1,200 kV circuit breaker that was previously commissioned at the test station. This was the first hybrid gas insulated switchgear in the world to be energized at this voltage level. The uniquely designed circuit breaker is safely housed with the disconnector in a tank filled with insulating gas – resulting in a space saving potential of up to 60 percent compared with conventional designs.

ABB (ABBN: SIX Swiss Ex) is a pioneering technology leader in electrification products, robotics and motion, industrial automation and power grids serving customers in utilities, industry and transport & infrastructure globally. For more than four decades, ABB is writing the future of industrial digitalization. With more than 70 million devices connected through its installed base of more than 70,000 control systems across all customer segments, ABB is ideally positioned to benefit from the Energy and Fourth Industrial Revolution. With a heritage of more than 130 years, ABB operates in more than 100 countries with about 135,000 employees.

CHALLENGES OF UHV TRANSFORMERS

UHV transformers are essentially large rating transformers both interms of voltage and current. Transport limitations pose the biggest challenge. Problems related to dielectric design of UHV Transformers are to be addressed meeting the dimensional limitations for the transport. Because of high current magnitudes, the problems related to dynamic stability under effects of short circuit currents, hot spot generation etc. get magnified and are to be taken care of adequately. And, above all, "Reliability is a keyword" for such transformers.

A. Transport Limitations

In India, road transport is the established mode now. Hydraulic trailers on modular concept are used for heavy consignment. Suitable number of axles are assembled to form the trailers of desired capacity. Pay load per axle allowed is 13.5 tonnes and requisite number of axles can be combined longitudinally. Permissible transport height is the most important dimension as this decides the winding height which is critical since 1200kV lead entry is at the centre. Standard axle height is 1.1m. Allowing for some packing, a max consignment height (transport height of tank containing active part) can be 5-5.3m for a max. height from ground level<6.5m. 4.5m width of consignment should also be permissible. In case of higher width, basic axle units can be combined side by side. These units being single phase, length is not the issue. However, in some cases, spreader plate may be required to distribute the load. Transport weight of the prototype shall be of the order of 250 T sans oil. A size of 7.5m(L)x4.5m(B)x5.3m(H) consignment appears to be feasible. It may, however, be desirable to get a road survey done to assess the maximum moving dimensions en-route before designing such massive transformer.

During transport, a transformer experiences shocks which lead to undue forces at different heights and may cause damage to active part fixing points. They have similar effects as in case of seismic conditions. The intensity of these forces may be limited below 2g in x, y & z directions.

B. Di-electric Design

The insulation design presents many challenges since it cannot be simply achieved by extrapolating designs for lower voltage ratings. Due to transport restrictions there is not much freedom on insulation distances. The di-electric design therefore calls for much more controlled stress distribution. The first problem is that for 1200/400kV auto transformer, the winding end insulation clearance is large and minimizes the possible length of the series & common winding. The 400kV common winding is made with line end entry insulation but the 1200kV winding line end stresses are so high that centre entry insulation is exclusively adopted. This, then requires 400kV class clearance at top and bottom of the winding. For a maximum practical core height of 5m (for the permissible transport height) and resultant window height of typically 3.5m, the series winding lengths for a centre entry arrangement may be only of the order of 1m. The stresses along the winding for both AC and impulse tests are exceptionally high and special stress control techniques are required to provide adequate voltage distribution.

As far as winding design philosophy is concerned, full interleaved disc configuration seems to be the ideal choice. The interleaved winding, however, involves complications as regards the electric stresses between turns and between discs due to the service voltage stresses that are present during the normal operation. The problem turns out to be of considerable importance both because the HV terminal is provided at the centre of the winding and because transport ability requirements made it impossible to choose a higher winding height.

Special studies are therefore required:

a. Insulation between turns and between adjacent discs
b. Insulation between windings and towards earth
c. Insulation towards earth of the outgoing connections

The insulation design between windings and towards earth is not a simple scaling up from 765 kV techniques. The oil insulation has much larger volumes than in conventional insulation structures. It is, therefore, necessary to understand the performance of such large gaps and stressed oil volumes to allow an optimum dimensions of the insulation. The voltage stress distribution in each of the oil ducts and along the pressboard barriers is calculated precisely and the insulation is optimized to give stresses with in proven acceptable PD free stress levels. This allows the insulation structure to be optimized without compromising quality and reliability. The electrical breakdown strength depends up on the quality of oil and particle content. The voltage withstand of oil is reduced with increasing number of particles. The particles are inherently produced from the insulation materials which are to be controlled in addition to ensuring absolute clean lines in manufacturing and processing technology

C. Thermal Design - Hotspots

Conduct or insulation may require thicker paper to achieve adequate inter-turn, inter-disc voltage withstand strengths because of the limited winding lengths. This presents additional problems for thermal performance. It is required to calculate precisely the losses and flux distribution in every turn/disc of the windings to optimally design the cooling ducts to control hotspot temperatures. Since, the insulation arrangements for UHV class transformers are very complex with the use of several barriers, ducts, angle rings, angle caps etc., provision of adequate cooling paths becomes increasingly difficult. The cooling performance can be enhanced by resorting to fully directed oil flow cooling but the oil speed inducts must not lead to any electrostatic charging effects. These transformers have a powerful leakage field linking with metallic parts of tank. A very elaborate tank shielding is required to control hotspot generation.

D. Short circuit withstand capability

A high power UHV transformer would mean high fault currents during system short circuits with consequent higher magnitudes of electromagnetic forces calling for an adequate mechanical design. Both dynamic & static forces are considered resulting from flux distribution obtained from finite element studies. The transformer is carefully designed and ampere turn balance is achieved as precisely as may be practical. Manufacturing processes have to meet strict design tolerances. Coil stabilization and sizing attains a very high importance. Epoxy bonded conductors and high proof stress copper are used to obtain mechanical strength, rigidity and stability.

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is the automation applied to an inefficient operation will magnify the inefficiency." - BILL GATES

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EARTH LEAKAGE RELAYS

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SOLAR POWER TARIFF - A CONCERN?

The solar power tariffs have witnessed a steady decline in the past five years from a high of Rs17.91 kWh in 2011. In January 2016, FortumFinnsurya Energy Pvt. Ltd, a Finland-headquartered utility, quoted a record low of Rs4.34 per unit to get the mandate to develop a 70MW solar plant under NTPC Ltd's Bhadla Solar Park tender in Rajasthan.

Solar power tariffs in India, which have fallen below Rs.5 per unit since November, are expected to fall further as the industry doubles volumes every year and the cost of producing power continues to decline.At least three industry experts *Mint* spoke to said that tariffs will fall to as low as Rs.3.5 per unit in three years owing to better use of technology, higher volumes, increased competition and a favourable regulatory environment.

"There is no question about whether they (tariffs) will go down or not. Typically we are seeing a 3-4% increase in efficiency and about 3-4% reduction in costs. So we expect that solar tariffs will continue to go down by 5-8% year-on-year," said Vikram Kailas, managing director at renewable energy producer Mytrah Energy Ltd.

Solar module prices have already fallen sharply, **down by 10% in the first half of 2016** , leading to higher margins and reviving projects which were termed unviable earlier, *Mint* reported on Monday.

"The cost of production continues to come down. The challenge of course is by how much and whether it becomes unsustainable in specific points in time," said VinayRustagi, managing director, Bridge to India, a consulting firm.

Bridge to India sees tariffs falling by at least 5% annually and calls a sub-Rs.4 per unit tariff a realistic number.

"Other subsectors within power generation do not expect (a) decline in prices. So from grid-parity or competitive aspect, solar is the most attractive source of energy for long-term," added Rustagi.

A fall in tariffs would be a shot in the arm for the government, which has pushed renewable energy to the top of its energy security agenda and has been looking to provide green power at less than Rs.4.50 a unit. India has targeted 100 gigawatts (GW) of solar and 60GW of wind energy capacity by 2022. It currently has about 8GW of solar capacity and about 27GW of wind power capacity.

Bigger factories and lower cost of manufacturing will ultimately lead to a reduction in tariffs over the next few years, said Pashupathy Gopalan, president, Asia Pacific, SunEdison Inc., which has over 1GW of operational and under-construction solar projects in India.Indeed, solar tariffs hit a record-low in November last year when SunEdison bid Rs.4.63 per unit in a reverse online auction and fell to Rs.4.34 in Finland-based Fortum's bid at a January e-auction.To be sure, many have called the falling tariffs "unviable" and "suicidal", citing instances of companies unable to find financial closure for their projects.

Power producers argue that they have been able to bid aggressively at government-provided solar parks thanks to ready-to-use infrastructure such as land and transmission facilities. Global firms such as Fortum, SoftBank and SunEdison have also used aggressive bidding as a means to get a foot in the door of this nascent sector.Between 2010 and 2015, solar capacity addition had doubled annually. It is expected to grow even faster to touch 12GW by the end of this year. India will then become the fourth largest solar market, overtaking the UK, Germany and France.While lower tariffs will be a positive for consumers and the environment, there are concerns that investors won't get the returns they want. "This is, end of the day, a commodity industry," SunEdison's Gopalan said. Returns in the sector range from 12% to 16% depending on tariffs and other factors.

In India, which holds reverse auctions for tendering solar projects, the role of the buyer and seller is reversed and a business bid is won by quoting prices downwards. "In any other country, bidding is a double-edged sword, so they have a condition that one cannot bid below a certain price or IRR (internal rate of return). But India does not have any such condition. We believe that people will continue to be aggressive," Mytrah's Kailas said.Tariffs will go down only if there will be a decrease in the overall cost of setting up solar projects from Rs.5.5 crore per MW to Rs.3-4 crore and plant load factors increase from the current 15-20%, said Anubhav Gupta, an analyst at Maybank Kim Eng Securities India

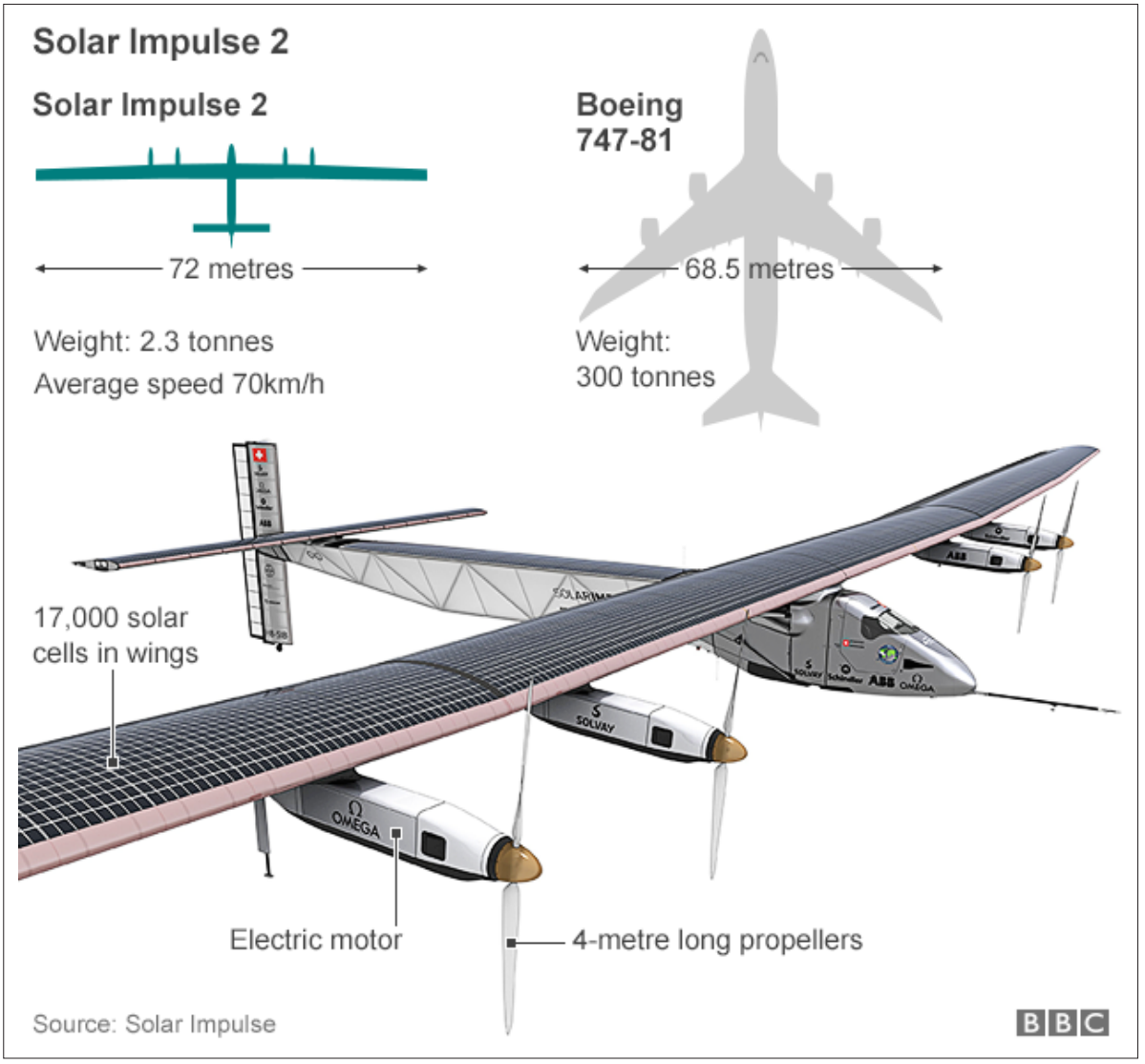
Courtesy:Livemint

"God is the only being who is good, and the standards are set by Him. Because God hates sin, He has to punish those guilty of sin. Maybe that's not an appealing standard. But to put it bluntly, when you get your own universe, you can make your own standards."

– FRANCIS CHAN, Crazy Love: Overwhelmed by a Relentless God

SOLAR PLANE MAKES HISTORY AFTER COMPLETING ROUND-THE-WORLD TRIP

In 2015 started the attempt of the **First Round-The-World Solar Flight, from Abu Dhabi to Hawaii**, already achieving the longest solo solar flight ever achieved in aviation history. In 2016, Bertrand Piccard and André Borschberg, our two Pilots and Founders, completed the first circumnavigation of the globe with no fuel. With their solar aircraft, a flying laboratory full of clean technologies, they flew 40,000 km to promote the use of renewable energies and energy efficiency on the ground, for a better quality of life. Across the Round-The-World flight, the team overcame technical, human and operational challenges that had never been faced before.



Where to start from, when, and where to go?

Because it is not possible to fly over oceans and continents in a single attempt, the solar airplane is doing its round-the-world flight in a total of about ten stages. These stops give the plane respite before setting off again. They also allow the pilots to take over from each other, as the plane is a singleseater: the only seat in the cockpit is the one for the person at the controls.

Departure time and location for the round-the-world flight have not been decided by chance. The plane needs good weather in order to fly. The month of March is early enough in the year to avoid flying over India during the monsoon; a season in which the winds blow very hard and the rains are abundant. The Arabian Gulf region has been chosen because it has constant sunshine, which is needed to charge the plane with solar energy.

To determine the flight path that Solar Impulse will take in the sky, many factors must be considered: weather, air traffic areas, also the height of the land to be flown over and the performance of the airplane. A team of engineers and meteorologists based in Monaco Mission Control Center (MCC) determines the best route for the plane and then prepares the flight plan. Once the route is chosen, overflight and landing clearances must be negotiated for each country.

- Distance to travel: 35,000 km (22,000 miles)
- Number of flight hours to be completed: 500
- Cruising speed: between 45 km/h (28 mph) and 90 km/h (56 mph) (depending on altitude)
- Number of stages planned: 10 Oceans overflown: 2, the Pacific and the Atlantic
- Regions: Arabian Sea, India, Myanmar, China, the Pacific Ocean, the United States, the Atlantic Ocean, Southern Europe and North Africa
- Mission duration: 5 months on two years
- Support team: 60 people
- Pilots: Bertrand Piccard and André Borschberg, a tandem that will take turns at the controls of the plane

Abu Dhabi, Arrival and Departure Host City

Abu Dhabi, capital city of the United Arab Emirates, will be the start and finish of the first solar powered flight around the world.

Masdar, Abu Dhabi's renewable energy company, is the host partner of Solar Impulse. The team was hosted by Masdar and Abu Dhabi at the start of January for testing and training before the start of the first solar powered flight around the world. Si2 was delivered in Abu Dhabi by cargo plane from the Payerne aerodrome in Switzerland on January 6th and has been showcased during the World Future Energy Summit as part of the Abu Dhabi Sustainability Week, which is hosted by Masdar between 17 and 22 January 2015.

Solar Impulse is not the first solar airplane, but it is the first to fly day and night, without any fuel, only using energy stored in its batteries. It is also the first to have crossed oceans: 5 days and nights from Nagoya, Japan, to Kalaeloa, Hawaii; 3 days and 2 nights from Kalaeloa to San Francisco; and 3 days and nights from New York to Seville, Spain. Behind Solar Impulse's achievements, there is always the same goal: show that if an airplane can fly several days and nights in a row with no fuel, then clean technologies can be used on the ground to reduce our energy consumption, and create profit and jobs.

The plane's unusual look undoubtedly helped the message of the project to be spread worldwide. The wingspan of a Boeing 747 Jumbo Jet, the weight of a family car, the power of a small motorcycle, Solar Impulse 2 is the largest aircraft ever built with such a low weight.

Discover the technologies

Capacity	:	1 pilot
Wingspan	:	72 m
Weight	:	2.3 tons
Number of solar cells	:	17,248
Number of propellers and batteries	:	4
Total energy produced from Abu Dhabi to Abu Dhabi	:	11655 kWh
Maximum flight time achieved	:	117 hours 52 minutes (André Borschberg)
Maximum altitude	:	28,000 feet
Average airspeed	:	75 km/h
Maximum recorded ground speed	:	216 km/h
Fuel consumption	:	0 L

Solar Impulse 2 was built to take up the challenge of achieving the first round-the-world solar flight. This revolutionary airplane had to do what no one had ever done before: fly through several consecutive days and nights to cross oceans without using any fuel. André Borschberg achieved such an oceanic crossing during his record-breaking flight from Nagoya to Hawaii.

Our challenge: to take an airplane to such a high level of energy efficiency that it could fly day and night relying only on the sun. This required the optimization of new kinds of technology and a drastic reduction in energy consumption. The components normally used in aircraft construction were far too heavy for Solar Impulse.

Solar Impulse's 80 engineers and technicians, under André Borschberg's leadership, thus had to find highly innovative solutions. What major civil and military aircraft makers thought impossible was achieved by the ingenuity of a small team.

The long flights of this adventure represented a challenge of endurance and vigilance for a single pilot in an unheated and unpressurized 3.8m3 cockpit.

Crossing the Pacific and Atlantic oceans introduced a new kind of difficulty for our pilots Bertrand Piccard and André Borschberg. The Round-The-World Solar Flight represented approximately a 40,000km journey. Although achieved in several legs, Bertrand Piccard and André Borschberg cumulated around 500 flight hours in the tiny cockpit.

The pilot had to have exceptional stamina to control this plane which is sensitive to turbulence due to its broad wings and light weight.

Challenge 1: Unpressurized and unheated cockpit

For the trip's "long haul flights" the pilot will be living in the 3.8 m3 cockpit for 5 or 6 days and nights in a row.

The cockpit volume provides enough space on board for oxygen supplies, food and survival equipment, whilst also meeting the optimal ergonomic requirements for flights lasting several days.

Multipurpose seat.

Reclining position, inflatable cushion... the pilot's seat has been developed for minimum weight, with all home comforts. It can in an instant be converted into a bed... even a toilet! When fully reclined, it allows the pilot to perform physical exercises. Concealed under the front part of the seat is an opening that serves as a toilet, protected by a sealed bag. Once used, the bag is sealed again and stored until the next landing.

Built into the back of the seat is a survival kit consisting of a parachute and life raft for use in case of an accident. If the pilot needs to jump from the plane in an emergency, the side door can be jettisoned in flight.

Extreme temperatures

During a flight, temperatures vary between –40°C and +40°C (–40°F and +104°F). Inside the cockpit, thanks to the thermal insulation, this gap is cut to –20°C to +35°C (–4°F and +95°F)/Bertrand Piccard and André Borschberg are protected against the ambient cold or heat by high density thermal insulation in the cockpit structure.

High altitude risks to minimize the weight of the plane, there is no pressurization system in the cockpit. The pilot needs an oxygen supply as soon as he climbs above 3,600 meters (12,000 feet). Above this altitude, the quantity of oxygen in the air is not enough to meet the needs of the human body.

Challenge 2: Endurance and Vigilance

Exercise, Focus and Vigilance techniques

Lack of movement, tiredness, changes in temperature and lack of oxygen put the body under extreme stress.

The pilot uses elastic Jukari bands to do his exercises. Arms, legs, neck... all parts of the body must be exercised to prevent numbness.

It is difficult for the pilot to get any rest and he cannot sleep over populated areas. During these short flights (of 24 to 46 hours), there is no sleep for the pilot, only periods of relaxation. For longer flights (between 3 and 5 days) over oceans, sleep is permitted, but only in the form of short naps of 20 minutes at most. The pilots each have their own technique for keeping going: selfhypnosis for Bertrand Piccard, yoga and meditation for André Borschberg.

Bertrand Piccard uses hypnosis to go to sleep and wake up as quickly as possible during short naps. He achieves this either on his own using a breathing technique (selfhypnosis), or with guidance over a radio link from a hypnotherapist. As a psychiatrist, Bertrand Piccard uses hypnosis to treat his patients and has made use of it in his balloon expeditions.

André Borschberg has practiced yoga and meditation for years. Disciplining body and mind, yoga includes breathing exercises, physical movements, meditation and relaxation. Meditation is a practice, which consists of focusing your attention on an object. This object can be external or internal (such as a feeling or an imagined object). Meditation exists in many cultures in the world. It can calm thoughts and feelings, bring relaxation and clear the mind.

Diet & Medicine

The pilot is also entitled to his own special diet, carefully prepared by nutritionists from Nestlé Health Science to ensure that, during the flight, his meals cover all energy and hydration needs.

- 2.5kg (5.2lbs) of food
- 2.5l (84.5oz) of water
- 1l (33.8oz) of sports drink

Breakfast, lunch, dinner, all three meals are provided, with even gourmet snacks for slightly hungry moments.

On the menu are fresh products, sterilized and vacuum packed, or freezedried. This was a challenge for the scientific team who had to find packaging methods that can preserve food for a long time while withstanding changes in atmospheric pressure and temperature ranging from –20°C to +35°C (–4°F to +95°F).

The pilot is monitored closely by a team of doctors and specialists in high altitude flight. They try to anticipate health problems and carry out a complete checkup before each mission. Electroencephalogram (electrical function of the brain), electrocardiogram (recording of the electrical activity of the heart), blood test, ultrasonic scans... a whole array of tests to check that everything is normal and to determine a rest strategy for the pilot on the round-the-world flight.

Pilot's Equipment

Hightech suits, heated soles and gloves, antihair growth cream so that the oxygen mask adheres better to the skin, underwear that stimulates blood circulation... everything is provided to optimize pilot comfort. On top of the flying suit, the pilot wears a parachute in case he has to bail out suddenly at high altitude.

The flight suit is specially designed for the pilots. Made of nylon (derived from plastic), it maintains body heat when it is cold and prevents too much sweating when it is hot. During the day, the sun can be scorching hot up there, so hot that high altitude UV sun cream has been developed to protect the pilots in the cockpit.

Challenge 3: Piloting performance

Flight Training

An airplane with the weight of a car, but the width of 3 tennis courts, flying below 100km/h… flight skills had to be learnt from scratch. A flight simulator developed specifically for Solar Impulse gives the pilots the opportunity to train for long duration missions and practice the delicate handling of their aircraft.

A specific sea survival training has also been performed by the pilots, in case of midair emergency above the 5 days and nights flights above oceans.

Stabilization Augmentation System (SAS)

A monitoring system constantly checks the functioning of the autopilot and detects any anomaly or exceeding of safe limits. Because of its large wingspan and very low speed (75km/h 45mph on average), the solar airplane cannot exceed a certain bank angle: beyond 10° it could fall into an uncontrolled spin. This restriction requires continuous vigilance on the part of the pilot. To allow him to take his short naps, the Stability Augmentation System (SAS) has been invented. This is an electronic system that stabilizes the plane's flight path and alerts the pilot in his sleep if there is a problem. Cloth armbands placed over the pilot's arms are connected to an instrument that displays the bank angle of the plane. As soon as the bank angle goes beyond 5°, the armbands start to vibrate and an audible alarm wakes the pilot.

André Borschberg, Co-Founder, CEO and Pilot of Solar Impulse:

Solar Impulse has been flying day and night non-stop using renewable energy and energy efficient technologies. In the same way, their use could make our world more energy efficient enabling us to reduce carbon emissions. On a considerable scale. No need to wait for tomorrow as we demonstrated it.'

Kofi Annan, Former Secretary General of the United Nations, Nobel Prize Laureate:

The destructive toll that human activity inflicts on our precious ecosystems is no longer sustainable; prosperity built on destruction is not prosperity at all, but only a temporary reprieve from tragedy. We must instead look ahead and promote, clean, alternative, renewable sources such as solar and wind.

Bertrand Piccard, Initiator, Chairman and Pilot of Solar Impulse:

This airplane was not built to carry passengers but to carry a message. Flying around the world with no fuel demonstrates that we can reach incredible goals with clean and energy efficient technologies. Let's use them also.

5 WAYS THE INDIAN RAILWAYS IS ADOPTING RENEWABLE ENERGY TO REDUCE ITS CARBON FOOTPRINT

In an effort to feed at least 10% of its energy requirements, the Indian Railways has been vigorously changing its policies since 2010. With its power consumption growing by 5% every year, as it adds more trains and routes, it is the highest single consumer of electricity in the country. Recognising how deep an impact it can make on the environment (and also counting its rising costs on electricity and fuel), the Indian Railways commenced its journey towards a sustainable and economical change.

Railway Stations that Run on the Power of Wind and Sun

About 50 stations in the country are completely dependent on solar power, while 300 have solar or wind harnessing systems. Jaipur, the latest railway station to harness the power of solar energy, will save Rs 7.2 lakh annually on electricity bills. The water supply for the Perugamani station and its adjacent railways quarters is driven by solar powered water pumps since April 2015. In Thiruvananthapuram, railway gate signals are run on solar power. At Ratnagiri, Maharashtra, a solar plant was built to feed electricity for the station. In Birur,

Karnataka, a 15kW wind and solar harnessing plant was set up in 2015, which produces about 20,000 units of electricity. Similarly, a 26 MW windmill in Jaisalmer was inaugurated in December 2015.

Trains that Light up without Electricity

To power up trains, the Railways installed solar panels on the top of coaches. Estimates state that installing solar panels on its 63,511 coaches could save the Railways Rs 10.8 crores worth of diesel. In June 2015, the first solar powered coaches ran on the Rewarri-Sitapur, Pathankot-Jogindernagar and Kalka-Shimla lines. The panels powered the lighting requirements of the train.

Managing Human Waste, Naturally

The Indian Railways plans to phase out conventional toilets on all of its train coaches by 2020, and replace them with eco-friendly biodegradable toilet systems. These innovative systems ensure no human waste pollutes the railway tracks. With the help of a certain kind of bacteria, human waste is converted into non-corrosive water and gas, and is released through outlets. As of 2015, nearly 17,000 coaches were fitted with these toilets, and all newly built coaches will have this system integrated into its design. On the Mangalore Express and the Pune-Jammu Tawi Jhelum Express, the Central Railways has also introduced biodegradable waste bags for long distance journeys in its A/C coaches. In his Railway Budget speech this year, Suresh Prabhu said that Railways plan to set up 'waste to energy' conversion plants near major coaching terminals to dispose waste in an environment-friendly manner.

No more Chug-Chugging on Diesel

In 2013, the Railways announced that it had started developing designs for trains that run on LNG, a move that was said to bring about 50% reduction in operating costs.

Currently, there are about 5000 diesel and 4500 electric engines, annually costing about Rs 16,000 crores and Rs 9000 crores respectively. Besides this, the first locomotive to run on dual CNG and diesel was launched in 2015 between Rewari and Rohtak. Later this year, Railways will roll out LNG-based locomotives, and is currently collaborating with foreign firms for its research and design. Bio-diesel, known to be cleaner for the environment, has also been in use since 2014, attributing to 5% of the diesel requirement.

Water, Water, Everywhere

Taking water conservation seriously, the Railways installed rainwater harvesting systems at nearly 50 stations, as a start. These systems are low maintenance, at a nominal cost. In the 2016 Railway Budget speech, Suresh Prabhu said, "We have launched a mission for water conservation. Water recycling plants will be set up at major water consumption centres after conducting water audit. Expansion of water harvesting systems will also continue." In Mumbai's LokmaniyaTilak Terminus, rainwater harvesting yields up to 40% of its water requirement.

Besides these major structural changes, the Railways has also worked on growing plants along railway routes and introducing e-ticketing to save paper. **That's a lot being done to reduce its Rs 13,000 crore power bill!**

Courtesy: The Better India

"Organizational effectiveness does not lie in that narrow minded concept called rationality. It lies in the blend of clear headed logic and powerful intuition." - HENRY MINTZ BERG

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ENERGY CONSERVATION THROUGH ENERGY EFFICIENCY – 20

Extract of an Article / News Item from Business Standard

Manufacturing sector in India could increase electricity efficiency by 18% India, which needs more energy efficient equipment, ranks ahead of China and follows Russia in electricity efficiency potential, says a report of Siemens Financial Services

Energy Efficiency images

General: Energy is one of the crucial elements in the economic growth of a nation. India being a developing country, the energy demand is ever increasing and making provision for adequate energy supply is a great challenge owing to the huge investment required for this purpose. India has the fourth largest energy demand after the United States of America, China and Russia. As far as commercial energy use is concerned, India is the 6th largest energy consumer in the world with 3.5% of the overall. This demand is expected to become 2.5 times by the year 2020 i.e. a yearly increase of 16%. India suffers from significant energy poverty and pervasive electricity deficits. In recent years, India's energy consumption has been increasing at a relatively fast rate due to population growth and economic development. Though energy is essential for economic growth, the relationship between economic growth and increased energy demand is not always a linear one.

The research findings say that India has approximately 17.9 percent of untapped **electricity efficiency** potential and optimising industrial motor-driven systems could deliver overall savings up to 60 percent on industrial electricity consumption, thus providing a huge opportunity for cost-savings, according to a research report of **Siemens** Financial Services, a subsidiary of **Siemens** AG.

"In particular, electricity consumption and prices have risen substantially over the past decade. Electricity usage in the manufacturing sector has undergone huge growth over the last 40 years, rising three times faster than overall energy use, and now represents over a quarter of industrial energy consumption," said the report.

Independent research was conducted amongst the global top 20 industrial equipment manufacturers between late 2014 and early 2015. The research provided an estimate on the unused potential for **energy efficiency** (usage and cost-savings, expressed as a proportion of total electricity consumption) in the manufacturing sector, putting India in the second position following Russia and ahead of China in **electricity efficiency** potential.

In order to remain competitive in the future, the report suggests, the **manufacturing sector** should continuously innovate and reinvent itself. In particular, electricity consumption and prices have risen substantially over the last decade. Electricity usage in the **manufacturing sector** has undergone huge growth over the last 40 years,

rising three times faster than overall energy use, and now represents over a quarter of industrial energy consumption.

Sunil Kapoor, chief executive officer, **Siemens Financial Services Pvt Ltd**, said, "Investing in electricity-efficiency technologies not only helps cut energy bills, manufacturing costs and carbon emissions, new equipment often brings productivity and capacity improvements as an added bonus, improving business performance and competitiveness. The global **manufacturing sector** is inevitably electrifying, resulting in electricity becoming a pathway to a sustainable energy system and allowing greater levels of automation and digitalisation in the manufacturing process."

Access to finance to fund investments in energy efficient equipment remains relatively restricted in many countries, especially in India where there are large base of smaller and medium-sized manufacturing operations. "Such tailored financing arrangements will prove fundamental to the Indian **manufacturing sector** in terms of energy-efficiency and thus, will boost the government's **'Make in India'** initiative placing India as a manufacturing hub," added Kapoor.

The **manufacturing sector** globally is now estimated to account for 42 percent of total annual electricity consumption. The sector has, therefore, become keenly focused on installing more electricity efficient equipment to reduce the consumption and cost of electricity. As a result, an increasing range of electricity-efficient solutions are now available to manufacturers that help reduce electricity consumption, reduce transmission losses, improve business performance, reduce lifecycle costs and meet environmental regulations.

Study conducted by Siemens Financial Services also says that optimising the industrial motor-driven systems could deliver overall savings up to 60%.

(To be continued)

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

LAPP INDIA LAUNCHES WATER PROOF SOLAR CABLES ELECTRON BEAM CROSS-LINKED SOLAR CABLE WITH OPTIMIZED PERFORMANCE IN WATER

Lapp India, a 100% subsidiary of the Lapp Group Germany and a leading supplier of integrated solutions and branded products in the field of cable and connection technology in India, has introduced its first permanently waterproof solar cable under the flagship ÖLFLEX® SOLAR series.

OLFLEX® SOLAR waterproof series is an electron beam cross-linked solar cable which is durable and weather-resistant for use in photovoltaic systems. Its optimised cable design and the constantly high insulation resistance ensure that it will still function reliably even after being in water for long time. The cable is now also available with relevant TUV and the latest EN certification.

When photovoltaic cables are exposed to dampness over a long period of time, it can lead to decreased performance and insulation resistance – the consequence of which may be short circuits, which in turn can lead to failure and damage to the respective equipment. The ÖLFLEX® SOLAR waterproof series is a safe alternative – particularly in areas which are prone to flooding or where cables are installed underground in protective conduits where water, heat and moisture can accumulate.

Features of ÖLFLEX® SOLAR waterproof series include:

- Weather/UV-resistant acc. to HD 605/A1
- Ozone-resistant according to EN 50396
- Halogen-free and flame-retardant
- Good notch and abrasion resistance
- XLR/XL WP = X-Linked Radiated Water-Proof
- Proven electron beam cross-linked quality

"Lapp is synonymous with 'Innovation' and we continuously strive towards developing our products and solutions keeping in mind the application requirements and high standards of quality. Solar industry faces challenges like large scale PV plant shutdown due to PV cable failures owing to flood like situation. This has led us to the development of the first permanently waterproof PV cable. As a pioneer in the photovoltaic cable and connection technology, we strive towards not only meeting the current demands of the solar industry, but also exploring innovative ways to tap into the potential of this fast growing industry", says Marc Jarrault, Managing Director – Lapp India.

Lapp has been making a name for itself as a driving force for innovation in the photovoltaic industry. For over ten years, the company has been successfully developing connection systems for photovoltaic modules and has regularly pushed the market forward with its intelligent innovations. Since 2010, Lapp India has catered to over 2.5 GW of grid connected projects with an array of highly efficient and reliable products like cables, connector, splitters and other accessories.

OLFLEX SOLAR waterproof series of cables will be showcased at Intersolar 2016 from 19th to 21st Oct. Visit us at Stall No. – 1650, Hall No. – 1, Bombay Exhibition Centre, Mumbai to experience our array of offerings for the solar industry.

About Lapp India

Lapp India is a 100% subsidiary of the LAPP GROUP Germany, is a leading supplier of integrated solutions and branded products in the field of cable and connection technology. Having started its operations in 1996 with a manufacturing unit in Jigani, Bangalore Lapp India provided in 2015 about 140,000 km per year of control, instrumentation, power and data cables along with connectors, accessories and End to End Systems to over 3000 customers pan India spread across different industry segments such as automation, textile, automotive, machine tools, oil and gas, renewable energy, process industries, as well as in the infrastructure and building sectors.

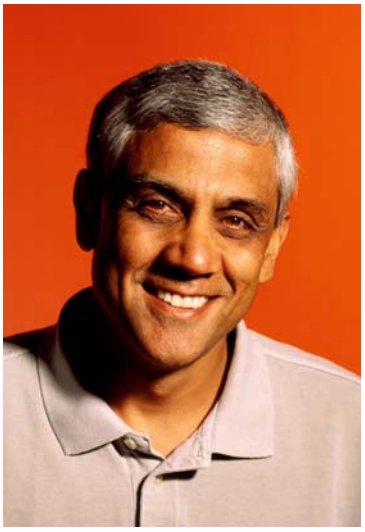
- 23 Sales offices close to customers all over India
- 300 employees committed to best serve customers
- Strong Network of 146 dealers
- 2 top of the notch manufacturing units - Bangalore and Bhopal
- State of the Art Laboratory
- Fully fledged Technology and innovation center

In 2012, Lapp India completed phase one of its second manufacturing plant in Pilukedi, Bhopal which produces more than 216,000 kms of single core cables per annum, catering mainly to the Building Cable Segment. The production area at Jigani was also doubled in 2014 and a new multi core line was commissioned in Bhopal with a total investment of over 5 Million Euros.

Lapp brands – ÖLFLEX®, UNITRONIC®, ETHERLINE®, HITRONIC®, EPIC®, SKINTOP®, SILVYN®, FLEXIMARK® – are some of the best-known in the cable technology field and have earned an outstanding reputation as premium products. All over the world, they stand for the values which Lapp and their customers consider paramount: quality, precision and reliability.

"A particular shot or way of moving the ball can be a player's personal signature, but efficiency of performance is what wins the game for the team." - PAT RILEY

VINOD KHOSLA | *Sun Microsystem* | ENTREPRENEUR



VINOD KHOSLA
Sun Microsystem

Vinod Khosla, Sun Microsystems, pledges half his $1.4-Bn fortune to charity.

Vinod Khosla was born in New Delhi in a family of army officers. He earned a B.Tech degree from the Indian Institute of Technology (IIT), Delhi. Vinod Kholsa then went to the United States and earned his M.S. Degree in Biomedical Sciences at Carnegic Mellon and later did MBA from Stanford University in 1979.

Khosla was one of the co-founders of **Sun Microsystems**, and served as its first CEO and Chairman in the early 1980s. In 1986, he became a general partner of the venture capital firm **Kleiner Perkins Caufield & Byers**, where he remained through the early 2000s. In 2004 Khosla formed his own firm, **Khosla Ventures**, which focused on venture investments in various technology sectors, most notably clean technology. Khosla's childhood in India instilled within him a set of priorities and morals that enabled his innate entrepreneurial spirit to reach its full potential in America. He dreamed of starting a Silicon Valley company at the age of fifteen.

Sun's $150 billion market capitalization in 2000 made it the largest Indian-founded corporation at that time.

Khosla and his wife Neeru are among the latest billionaires to have pledged half of their vast fortunes to charity either during their lifetime or after death. Ten more families, including the Khoslas, signed the pledge on April 26, 2011, bringing the total number of Signatories to 69. 57-year-old Khosla is Silicon Valley's most prominent "green" venture capitalist and a dominant personality in the "clean tech" community. Clean energy is a passion for Khosla, who received the support of former British Prime Minister Tony Blair in pushing technologies focused on the environment. Khosla also provided the endowment that has helped IIT Delhi create a novel IT research institution. Khosla is a Member of the Board of Trustees of the Blum Center for Developing Economies at the University of California, Berkeley. The Center is focused on finding solutions to address the crisis of extreme poverty and diseases in the developing world. Five Indian-Americans, including Khosla, have been named among the richest people in the US by Forbes, a list of 400 billionaires topped by Microsoft founder Bill Gates.

பிளாஸ்டிக்கை சாப்பிடாதீர்கள்!

மூன்று வேளை உணவைத் தவிர்க்காமல் சாப்பிடுவது எந்த அளவுக்கு முக்கியமோ அதைவிட முக்கியம், எந்தக் கலனில் வைத்துச் சாப்பிடுகிறோம் என்பதும்தான் என்று எச்சரிக்கிறார் தாரிணி கிருஷ்ணன்:

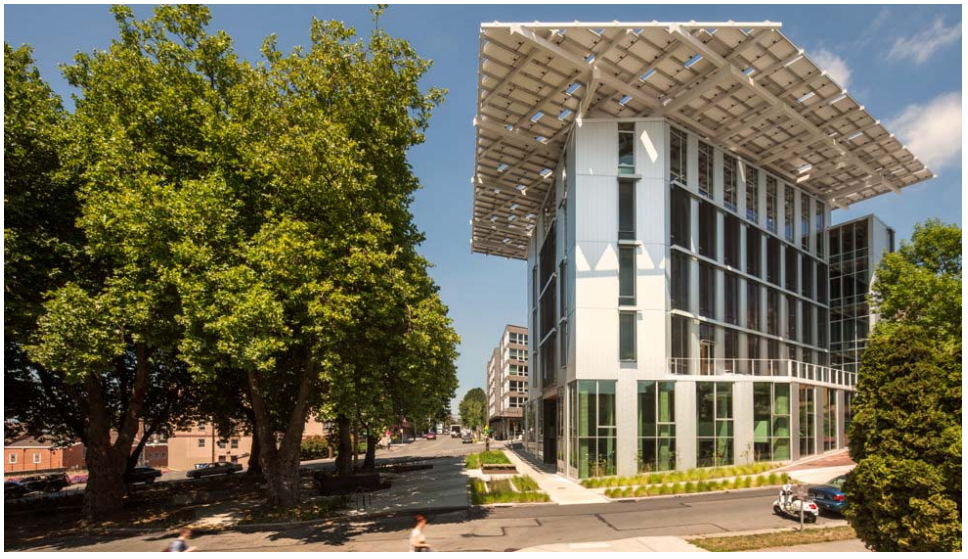
∴புட் கிரேட் பிளாஸ்டிக் என்று விற்கப்படும் டப்பாக்கள் கூடப் புளிப்பு சார்ந்த உணவை அடைத்து வைப்பதற்கு உகந்தவை அல்ல. முந்தைய தலைமுறையில் கண்ணாடி பாட்டில், மண் ஜாடியில்தான் ஊறுகாய் போட்டு வைப்பார்கள். ஆனால், இப்போதோ ஊறுகாயைப் பிளாஸ்டிக் டப்பாக்களில் அடைத்தே விற்கிறார்கள்.

அதேபோல இட்லிக்கான மாவை வீட்டிலேயே தயார் செய்துகொள்ளுங்கள். அதுதான் நூறு சதவீதம் சுகாதாரமானது. குழந்தைகள், பெரியவர்கள் அனைவருமே உணவை எவர்சில்வர் டிபன் பாக்ஸில் எடுத்துச் செல்லுங்கள். அதுதான் ஆரோக்கியமானது. இட்லி மாவு என்றில்லை, புளிக்கக்கூடிய எந்தப் பொருளையும் பிளாஸ்டிக் உறையில் அடைக்கக் கூடாது. குளிர்ச்சியான பழரசங்கள் தொடங்கிக் சுடச்சுடக் காபி, டீ, சாம்பார் என அனைத்தையுமே பிளாஸ்டிக் பாக்கெட்டில் ஊற்றித்தான் ஹோட்டல்களில் கொடுக்கிறார்கள் நாமும் கண்ணுக்குத் தெரியாமல் கொஞ்சம் கொஞ்சமாகப் பிளாஸ்டிக்கைச் சாப்பிட்டுக்கொண்டிருக்கிறோம். உடல் ஆரோக்கியத்துக்கு எதிரான இந்தப் பழக்கத்தை அடியோடு நிறுத்தியாக வேண்டும்.

Courtesy: Dr. தாரிணி கிருஷ்ணன், தி இந்து, 18.06.2016

BIG, BEAUTIFUL AND SUSTAINABLE – 10 OF THE WORLD'S MOST ENERGY EFFICIENT OFFICES - 4

THE BULLITT CENTRE, SEATTLE (USA)



Opened in 2013, The Bullitt centre is considered to be the greenest commercial building in the world being powered by 100% renewable energy. The design of the building takes cues from nature and it has been compared to a living organism. Its design means it is naturally day-lit and ventilated to create a comfortable working environment; it is expected to survive for the next 250 years.

It's claimed the building is 83% more efficient than a typical commercial site in Seattle. It achieves this by using technologies such as extensive use of heat exchangers for the conditioned air, sophisticated building management systems and even composting toilets. The building has also been designed to encourage inhabitants to walk amongst the building floors rather than using energy consuming lifts. The building houses an irresistible stair – a transparent glass stairwell on the building's outside wall that offers stunning views of Seattle's skyline for occupants to enjoy. The lift system also has key card restrictions to discourage use over the stairs.

(To be continued...)

THE WORLDS TOP 10 MOST INNOVATIVE COMPANIES IN ENERGY - 4

PHILIPS

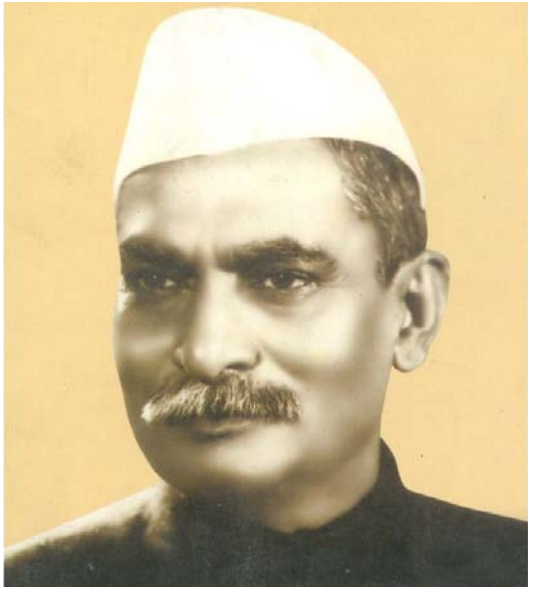
For upending lighting with its smart LED bulbs. Philips's LEDs, similar in many respects to silicon chips, use about one-sixth the electricity of a conventional bulb, saving not only on electricity but vastly reducing carbon emissions in the process. Its Hue system for controlling its LED lights through iPhones and remote applications debuted with great fanfare. But the LED bulbs themselves—which will help bring in nearly $2 billion in sales for the company by next year—remain the benchmark for efficiency, quality, and design.

(To be continued...)

Many of life's failures are people who did not realize how close they were to success when they gave up. - THOMAS A. EDISON

RAJENDRA PRASAD

Rajendra Prasad 3 December 1884 – 28 February 1963) was the first President of the Republic of India. An Indian political leader, lawyer by training, Prasad joined the Indian National Congress during the Indian independence movement and became a major leader from the region of Bihar. A supporter of Mahatma Gandhi, Prasad was imprisoned by British authorities during the Salt Satyagraha of 1931 and the Quit India movement of 1942. Prasad served one term as President of the Indian National Congress from 1934 to 1935. After the 1946 elections, Prasad served as minister of food and agriculture in the central government. Upon independence in 1947, Prasad was elected president of the Constituent Assembly of India, which prepared the Constitution of India and served as its provisional parliament.



When India became a Republic in 1950, Prasad was elected its first President by the Constituent Assembly. Following the general election of 1951, he was elected President by the electoral college of the first Parliament of India and its state legislatures. As President, Prasad established a tradition of non-partisanship and independence for the office-bearer, and retired from Congress party politics. Although a ceremonial head of state, Prasad encouraged the development of education in India and advised the Nehru government on several occasions. In 1957, Prasad was re-elected to the presidency, becoming the only president to have been in the office twice.

Parentage - Rajendra Prasad was a Kayastha Hindu and born in Zeradai, in the Siwan district of Bihar . His father Mahadev Sahai, was a scholar of both the Sanskrit and Persian languages, while his mother, Kamleshwari Devi, was a religious woman who would tell stories from the Ramayana to her son.

Student life - When Prasad was five years old, his parents placed him under the tutelage of a Moulavi, an accomplished Muslim scholar, to learn the Persian language, Hindi and arithmetic. After the completion of traditional elementary education, he was sent to the Chapra District School. Meanwhile, in June 1896, at an early age of 12, he was married to Rajavanshi Devi. He, along with his elder brother Mahendra Prasad, then went to study at T.K. Ghosh's Academy in Patna for a period of two years. He secured first in the entrance examination to the University of Calcutta and was awarded Rs. 30 per month as a scholarship.

Prasad joined the Presidency College, Calcutta in 1902, initially as a science student. He passed Intermediate level classes then called as F. A. under the University of Calcutta in March 1904 and further graduated with First Division from there itself in March 1905. Impressed by his intellect, an examiner once had commented on his answer sheet "*examinee is better than examiner*". Later he decided to focus on the study of arts and did his M.A. in Economics with first division from the University of Calcutta in December 1907. There he lived with his brother in the Eden Hindu Hostel. A devoted student as well as a public activist, he was an active member of The Dawn Society. It was due to his sense of duty towards his family and education that he refused to join Servants of India Society. Prasad was instrumental in the formation of the Bihari Students Conference in 1906 in the hall of the Patna College. It was the first organization of its kind in India and produced some leaders from Bihar like Anugrah Narayan Sinha, Shri Krishna Singh and Deep Narayan Singh.

Career - Rajendra Prasad served in various educational institutions as a teacher. After completing his M.A in economics, he became a professor of English at the Langat Singh College of Muzaffarpur in (Bihar) and went on to become the principal. However, later on he left the college for his legal studies. In 1909, while pursuing his law studies in Kolkata he also worked as Professor of Economics at Calcutta City College. In 1915, Prasad appeared in the examination of Masters in Law, passed the examination and won a gold medal. He completed his Doctorate in Law from Allahabad University in 1937.

As a lawyer - In the year 1916, he joined the High Court of Bihar and Odisha. Later in the year 1917, he was appointed as one of the first members of the Senate and Syndicate of

the Patna University. He also used to practice law at Bhagalpur, the famous silk-town of Bihar.

Role in the Independence Movement - Jawaharlal Nehru, Bhulabhai Desai, and Rajendra Prasad (Center) at the AICC Session, April 1939 Prasad's most initial association with Indian National Congress was during 1906 annual session organised in Calcutta, where he participated in as a volunteer, while studying in Calcutta. Formally, he joined the Indian National Congress in the year 1911, when the annual session was again held in Calcutta. During the Lucknow Session of Indian National Congress held in 1916, he met Mahatma Gandhi. During one of the fact-finding missions at Champaran, Mahatma Gandhi asked him to come with his volunteers. He was so greatly moved by the dedication, courage, and conviction of Mahatma Gandhi that as soon as the motion of Non-Cooperation was passed by Indian National Congress in 1920, he retired his lucrative career of lawyer as well as his duties in the university to aid the movement.

He also responded to the call by Gandhi to boycott Western educational establishments by asking his son, Mrityunjaya Prasad, to drop out of his studies and enroll himself in Bihar Vidyapeeth, an institution he along with his colleagues founded on the traditional Indian model.

During the course of the independent movement, he interacted with Rahul Sankrityayan, a writer, and polymath. Rahul Sankrityayan was greatly influenced by Prasad's intellectual prowess, finding him to be a guide and guru. In many of his articles he mentioned about his meeting with Sankrityayan and narrated about their meetings. He wrote articles for the revolutionary publications ***Searchlight*** and the ***Desh*** and collected funds for these papers. He toured widely, explaining, lecturing, and exhorting the principles of the independence movement.

He took an active role in helping the affected people during the 1914 floods that struck Bihar and Bengal. When an earthquake affected Bihar on 15 January 1934, Prasad was in jail. During that period, he passed on the relief work to his close colleague Anugrah Narayan Sinha. He was released two days later and set up Bihar Central Relief Committee on 17 January 1934, and took the task of raising funds to help the people himself. During 31 May 1935 Quetta earthquake, when he was forbidden to leave the country due to government's order he set up Quetta Central Relief Committee in Sindh and Punjab under his own presidency.

He was elected as the President of the Indian National Congress during the Bombay session in October 1934. He again became the president when Netaji Subhash Chandra Bose resigned in 1939. On 8 August 1942, Congress passed the Quit India Resolution in Bombay which led to the arrest of many Indian leaders. He was arrested from Sadaqat Ashram, Patna and sent to Bankipur Central Jail. After remaining incarcerated for nearly three years, he was released on 15 June 1945.

After the formation of Interim Government of 12 nominated ministers under the leadership of Jawaharlal Nehru on 2 September 1946, he got the Food and Agriculture department. Later, he was elected the President of Constituent Assembly on 11 December 1946. Again on 17 November 1947 he became Congress President for a third time after Jivatram Kripalani submitted resignation. Two and a half years after independence, on 26 January 1950, the Constitution of independent India was ratified and Dr. Rajendra Prasad was elected the nation's first President.

Between 1958 and 1960, President Prasad led 5 state visits to Japan, Ceylon, USSR, Indo-China, Malaya and Indonesia.

Prasad acted independently of politics, following the expected role of the president as per the constitution. Following the tussle over the enactment of the Hindu Code Bill, he took a more active role in state affairs. In 1962, after serving twelve years as the president, he announced his decision to retire. After relinquishing the office of the President of India on May 1962, he returned to Patna on 14 May 1962 and preferred to stay in the campus of Bihar Vidyapeeth. He was subsequently awarded the **Bharat Ratna**, the nation's highest civilian award.

He died on 28 February 1963. Rajendra Smriti Sangrahalaya in Patna is dedicated to him.

Literary contributions

Rajendra Prasad painting as Indian National Congress President by Swamy in 1948 issue of Chandamama magazine.

- President of Constituent Assembly
- Satyagraha at Champaran (1922)
- India Divided (1946, online)
- Atmakatha (1946), his autobiography written during his 3-year prison term in Bankipur Jail
- Mahatma Gandhi and Bihar, Some Reminiscences" (1949)
- Bapu ke Kadmon Mein (1954)
- Since Independence (published in 1960)
- Bharitya Shiksha

At the feet of Mahathma Gandhi

பல்

மனிதனோட முக்கியமான அடையாளமே பேசும் திறன்தானே. அதற்கு மிகவும் பக்கபலமா இருக்கும் உறுப்பு பற்கள்தான். தற்காலத்துல பற்களுக்கான சிகிச்சைகள்னு பார்த்தா அது கொஞ்சம் காஸ்ட்லிதான். கொஞ்சம் கவனத்தோடு நாம இருந்தா, பற்களை மிக நல்ல முறையில் பார்த்துக்க முடியும்.

தினமும் 2 லிட்டர் தண்ணீர் குடிப்பது, அதிக குளிரூட்டப்பட்ட உணவு வகைகளைச் சாப்பிடாமல் தவிர்ப்பது, சூடான உணவைச் சாப்பிட்டு முடித்த உடனேயே ஜில்லான உணவைச் சாப்பிடாமல் இருப்பது, உணவை அவசர அவசரமாகச் சாப்பிடாமல் நிதானமாகமென்று சாப்பிடுவது, நமது நாக்கின் உதவியோடு பற்களையும், வாயையும் அவ்வப்போது சுத்தப்படுத்திக் கொள்வது. பல் துலக்கத் தொடங்குவதற்கு முன் கைகளைச் சுத்தப்படுத்திக் கொள்வது இதெல்லாம் அடிப்படையாக நாம் அனைவருமே அன்றாட வாழ்க்கையில் கடைப்பிடிக்க வேண்டிய விஷயங்கள். gingivitis போன்ற பல் உபாதைகள் வராமல் இருக்கணும் என்றால் நமது பற்களை நாம் ஆரோக்கியமாகக் கட்டாயம் வைத்துக் கொள்ள வேண்டும்.

பல் ஆரோக்கியமின்மை இதயத்தையும் பாதிக்கும். நமது வாய்தான் எல்லாவற்றுக்குமே நுழைவாயில். இந்த வாயிலில் நுழைந்துதான் அனைத்துக் கிருமிகளும் நோய்களும் நம் உள்ளே போகும் என்பதால் பற்களை பன்மடங்கு அக்கறையோடு நாம் பராமரிக்க வேண்டும். சரி, இப்போ பற்கள் பற்றி பல் மருத்துவர் மற்றும் சீரமைப்பு நிபுணரான **டாக்டர் உதய ராஜா** என்ன சொல்கிறார் தெரிந்து கொள்வோமா?

இனி ஓவர் டூ டாக்டர் உதய ராஜா

பற்களில் வருகிற முக்கால் பங்கு நோய்களை அது வராமலே முன்கூட்டியே தவிர்க்க முடியும். தானா வரும் நோய்கள் பற்களைப் பொறுத்தமட்டில் கம்மிதான். தினம் இரண்டு முறை பல் துலக்கணும்னு பழக்கப்படுத்திக்க நம்ம எல்லாராலும் முடியும்தானே. ஒவ்வொருமுறை சாப்பிட்ட பிறகும் வாயை நன்றாகக் கொப்புளிப்பதும், சரியான முறையில் ப்ரஷ் செய்வதும் ரொம்ப ரொம்ப அவசியம்.

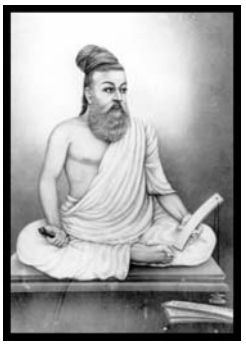
பற்களை அரை மணி நேரம், தேய் தேய் எனத் தேய்த்தால் பற்களில் உள்ள எனாமல் தேய்ந்துவிடும். பற்களுக்கு எனாமல்தான் மிக முக்கியம். பற்களில் மேலும், கிழுமாக, வட்டமாக ப்ரஷ் கொண்டு துலக்கிவிட்டு flossing you tube செய்ய வேண்டும். You tube வழியாகப் பார்த்தோ அல்லது பல் மருத்துவரிடம் கேட்டோ இதைத் தெரிந்து கொண்டு செய்ய வேண்டும். பற்களுக்கு இடையே மாட்டி இருக்கும் உணவுப் பொருட்களை நீக்க இந்த flossing பெரிதும் உதவும். சாப்பிடும் உணவு அப்படியே பற்களில் தங்கி விடுவதால் வாயில் உள்ள பாக்டீரியாக்கள் அவற்றை அமிலங்களாக மாற்றி பல் சொத்தைக்கு வழி ஏற்படுத்தி விடுகின்றன. பல் சொத்தை வந்தாச்சுன்னா அதற்கு உடனடித் தீர்வு பல் பிடுங்குவது கிடையாது. Filling, crown or cap போடுவது, root canal சிகிச்சைகள் செய்துக்கலாம்.

சிறு வயதிலிருந்தே நமது பற்களின் மீது தனி கவனம் செலுத்திவந்தால் எவ்வளவு வயதானாலும் நம் பற்களைப் பழுதடையாமல் வெச்சுக்கலாம். சின்னஞ்சிறு குழந்தைகளுக்கு இரவில் பால், சர்க்கரை சேர்த்த பால், சாக்லேட், பிஸ்கெட் போன்றவற்றைக் கொடுப்பதைத் தவிர்க்க வேண்டும். அதையும் மீறி சாப்பிட்டால், வாயைக் கழுவாமல் பல் துலக்காமல் படுக்கக் கூடாது. ஆறு மாதங்களுக்கு ஒருமுறை பல் மருத்துவரிடம் சென்று, பற்களைச் சுத்தப்படுத்திக் கொள்ள வேண்டும். sealant என்ற ஒரு கோட்டிங் போட்டுக் கொண்டால் 90 சதவிகித பல் சொத்தையைக் குறைத்துவிடலாம்.

பற்களோ, தாடையோ சீராகச் சரியான வடிவத்தில் வளர்ச்சி பெறாமல் இருந்தால் அதைச் சிறுவயதிலேயே கவனித்து, கட்டுப்படுத்தி முக அழகை மேம்படுத்திக் கொள்ள முடியும். 12, 13 வயது கழித்து தான் டாக்டரிடம் காண்பிக்க வேண்டும் என்பது கிடையாது. பொதுவாகவே அதிக அளவு சாக்லேட், ஜீஸ்க்ரீம், கார்போனேடட் பானங்கள், சிட்ரிக் ஜுஸ்கள், ஆகியவற்றை எடுத்து கொள்ளாமல் இருப்பது நல்லது. வெள்ளை வெளேரென்று இருந்தால்தான் அவை அழகான, ஆரோக்கியமான பற்கள் என்பதில்லை. லேசான பழுப்பு நிறத்தோடு தான் பற்கள் இருக்கும். பல்லில் உள்ள கரையை நீக்க ப்ளீச்சிங் மற்றும் லேசர் சிகிச்சை செய்து கொள்ளலாம். பல் தூக்கலாக இருந்தால் ப்ரேசஸ் போட்டுக் கொள்ளலாம். பற்கள் இல்லை என்றால் அதையும் நிரந்தரமாகப் போடலாம்.

பற்களைப் பொறுத்தவரைக்கும் எல்லா விதமான சிகிச்சைகளும் இருக்கு என்றாலும், சில சின்னச் சின்ன வழிமுறைகளை மேற்கொண்டு பல்களை ஆரோக்கியமாக அழகாக நம்மால் பராமரித்து கொள்ள முடியும்! ***Courtesy: PESOT Newsletter, June 2014***

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 43



Black money and hoarding them in huge measure in the Banks in 'Tax Havens' is a serious economic problem faced by many countries of the world and by India in particular. These are accumulated illegally, partly through Tax Evasions and mostly through corruption. The unconfirmed reports indicate the amount of illegal Indian money abroad as 1.5 Billion Dollars or about Rs. 75 Lakh Crores. Many countries of the world, including advanced countries like Germany, France and the US have taken measures to get them back and there is lot of talk about it in India also. We are aware of a recent step taken by Government to unearth the unaccounted money within the country which brought out about Rs.65,000 Crores, but the huge problem of corruption and the money abroad is yet to be tackled. In the context of Ethics in Personal life, Management and Business, the most unethical practice is illegal wealth, which can damage the economy of the country and can always destroy the name and fame of the persons and the businesses.

Tiruvalluvar deals with this improper hoarding of wealth and condemns the persons associated with it in a strong manner as can be seen from the following Kurals.

Eettam Ivari Isaivenda Aadavar
Thotram Nilakkup Porai ***Kural 1003***

ஈட்டம் இவறி இசைவேண்டா ஆடவர்
தோற்றம் நிலக்குப் பொறை. குறள் 1003

"Behold the men that are always hoarding but care not for fame; their existence is a burden unto the earth"

Anporith Tarchetru Aranokkathu Eettiya
Oneporul Kolvaar Pirar ***Kural 1009***

அன்பொரீஇத் தற்செற்று அறநோக்காது ஈட்டிய
ஒண்பொருள் கொள்வார் பிறர். குறள் 1009

"Behold the man who thinketh not of Righteousness and who pileth up wealth, by starving himself and his heart; his wealth is hoarded only for the behoof of strangers"

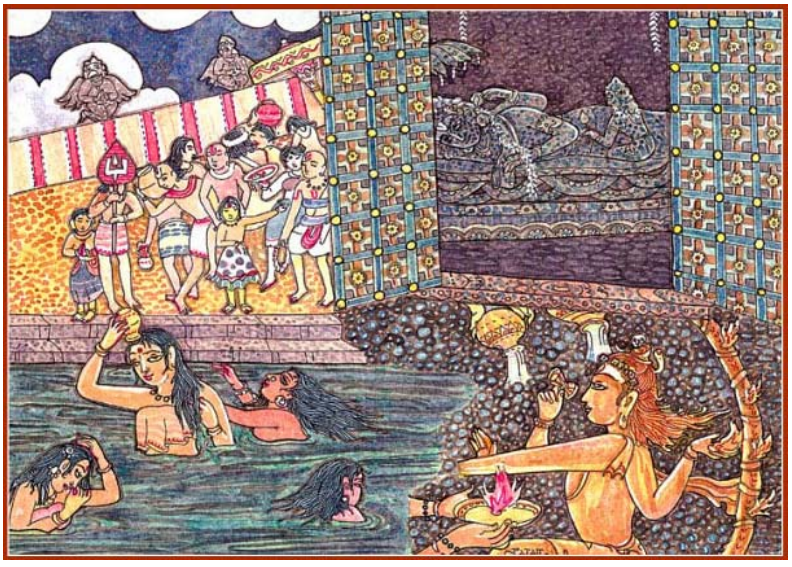
Nachchap Padaathavan Selvam Naduvoorul
Nachchu Marampazhuth Thatru ***Kural 1008***

நச்சப் படாதவன் செல்வம் நடுவூருள்
நச்சு மரம்பழுத் தற்று குறள் 1008

"The property of the man that is not loved of men is like the fruiting of the poison tree in the midst of the village"

HOME FESTIVALS 12

மார்கழி - 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."

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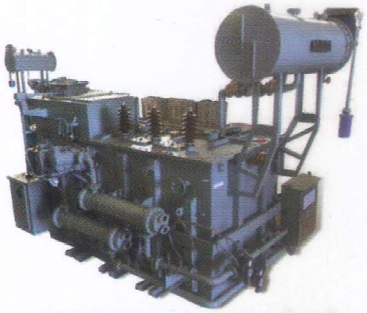
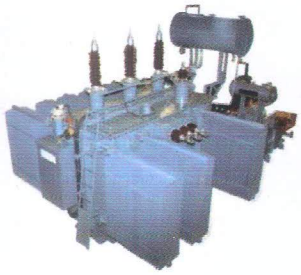
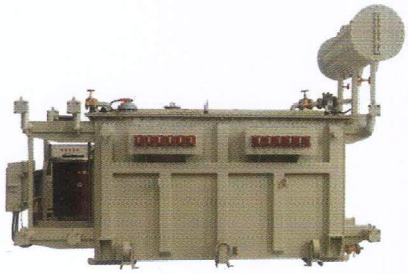


1. ARC/Submerged Arc Furnace Transformer



3. Power Transformers



5. 5MVA 5 Winding, Solar Inverter Duty Transformers

2. Converter Duty Transformer

4. LRF Transformer

6. Compact Substation

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