



# ELECTRICAL INSTALLATION ENGINEER

## NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)

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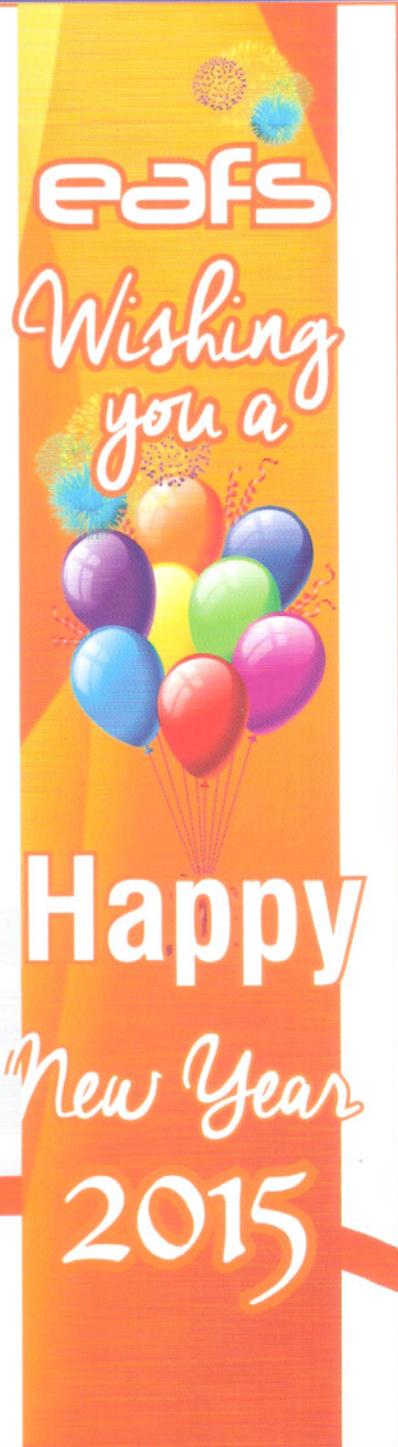
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## EDITORIAL

Dear Members, Fellow Professionals and Friends

*Greetings for Happy Christmas!!*

*Advance Greetings for A Happy and Prosperous 2015!!!*

Our Power of thoughts and thoughts of Power currently revolve around a few important happenings, pronouncements, studies and Scenario.

We just celebrated the Birth Anniversary of Dr. Kurien, the Milk Man or the AMUL Man of India, who was single handedly responsible for spear heading the “White Revolution” in India to make India one of the, if not the, largest Milk producers of the World. It is just a proof of what kind of “Leap Forward” is possible if we can combine our vast rural potential and the Modern Technology. The Powering of the whole Mission with Honesty, Sincerity and Single Mindedness certainly played the Key Role in the Success Story.

A similar model to harness the Rural Potential with Modern Technology could probably be developed in the area of Bio Energy. The concept evolves basically from “Waste to Energy”, with rural areas offering sizable potentials of Agricultural residues, Plantation wastes and Animal and Poultry wastes. The Co Operative Model will comprise of systematic collection of wastes from small and medium farms and areas and transportation to a processing centre for conversion to Energy Forms. Efficient Thermo Chemical Technologies are now available for conversion of all kinds of Biomass with varying sizes and different degrees of moisture content, into Energy Forms of Gas or Oil (Bio Oil or Bio Crude) or Carbon or Electricity. The Technologies involved are Combustion or Gasification or Pyrolysis or Torrefaction or Hydro Thermal Carbonization. Government is also working on similar concept to implement Bio Energy Mission with the participation of rural masses. Fast implementation to harness the huge potential of Bio Energy in our Country can go a long way in ensuring Energy Security. The month of December is marked by Celebration of Energy Conservation Day on the 14<sup>th</sup> and the Farmers Day on the 23<sup>rd</sup>. Both are of very vital importance for the stability and the growth of our Economy and they can enable activities towards Energy Security as well.

Energy Efficiency is another area of great concern and still provides tremendous scope though there have been substantial improvements in the past few decades. Though our country’s initiatives through BEE with Standards and Labeling Program, Auditing norms, Energy Efficient Building Codes etc have been contributing, focused efforts are still needed to address both Industries and Agriculture as well as Commercial and Domestic consumptions, as India’s consumption of Energy per unit of GDP is still considered very high compared to many countries of the world.

There was a recent Report by one of the International Consultants about a Plan for India to work for \$10 Trillion Economy by 2034 from the present level of approximately \$1.8 Trillion, with possibilities of faster Growth. Even now with 6.4% share to World GDP, India is the third largest economy after US and China. The Report suggests a ‘Winning Leap’ for India, with few possible scenarios, which can ensure fast developments in all sectors of economy. The Winning Leap includes investment in both human and physical capital and also focuses on investment in R&D and innovation and envisions a 9.0% CAGR of GDP for \$10 Trillion Indian Economy by 2034. This forecasts the most aggressive growth and is the way which can generate the 240 million new jobs India’s growing demography needs. This is supported by a massive transformation in the investment outlook and productivity metrics in India, supported through significant investments (domestic and foreign) and research and development.

Let us all wish to ourselves Best of Times with Best of Economy and the Best of Opportunities and resolve to work and contribute towards the same.

*We thank all those members who have helped us by participating in the advertisements appearing for the issue November 2014 – Vie Soleil Engineers Pvt. Ltd., Sri Bhoomidurga Marketing Pvt. Ltd., Emaar Electricals, Abirami Electricals, Power Links, Universal Earthing Systems Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., L&T Switchgear, Faith Power Solutions, EVR Electricals Pvt. Ltd., Pentagon Switchgear Pvt. Ltd., Galaxy Earthing Electrodes Pvt. Ltd., Heat Craft Engineers Pvt. Ltd., Cape Electric Pvt. Ltd., Max Electric Co., Electrotherm (India) Ltd., Ashlok Safe Earthing Electrode Ltd., Velohar Infra Pvt. Ltd.*

**EDITOR**

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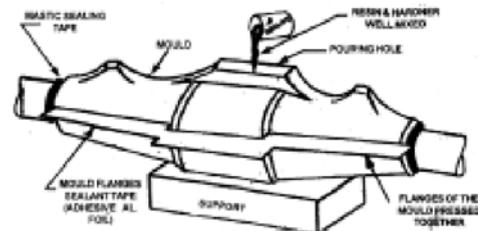
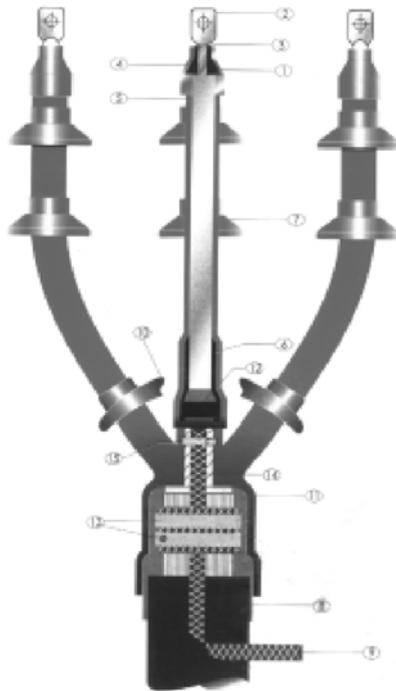
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## EVENTS

### DESIGN LIGHTING TOKYO 2015

3RD TOKYO DESIGN LIGHTING EXPO & CONFERENCE

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

**Date:** 14<sup>th</sup> – 16<sup>th</sup> January 2015

**Venue:** Tokyo Big Sight, Japan

**Website:** <http://www.design-lighting.jp/en/>

### INTELECT

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

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

**Date:** 22<sup>nd</sup> – 24<sup>th</sup> January 2015

**Venue:** Bombay Exhibition Centre,  
Mumbai, India

**Website:** <http://www.ii-intelect.org/>

### ieema METERING INDIA

2015

.... The Smart Indian Dimension

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

**Date:** 12<sup>th</sup> – 13<sup>th</sup> February 2015

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

**Website:** <http://www.meteringindia.in>



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

**Date:** 2<sup>nd</sup> – 4<sup>th</sup> March 2015

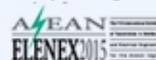
**Venue:** Dubai International Exhibition Centre

**Website:** <http://www.middleeastelectricity.com>

### ELECTRIC, POWER & RENEWABLE ENERGY MALAYSIA 2015

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

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Organiser:



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

**Date:** 25<sup>th</sup> – 27<sup>th</sup> March 2015

**Venue:** Kuala Lumpur Convention Center, Malaysia

**Website:** <http://www.epremalaysia.com>

# KNOW THY POWER NETWORK – 87

Let's tally hot (get started) with a clarion call / wake-up call.

"Be a Smart Literate"! or else, it may be difficult for you to eke out your living in the present smart, virtual world. Kindly permit me to add some more smart items to the list of items already discussed. Among them are smart mob (flash mob), smart payment and smart tags.

## I SMART MOB (FLASH MOB)

You may wonder how a 'mob' can be 'smart'. It is because the very term "Mob" indicates something "unruly or not disciplined". But in the present context, kindly note the term "Smart" placed before the term "Mob". This indicates the difference between a 'Smart Mob' and an "unruly mob moving in the street". Here the term 'Smart' shows the way in which the mob or group of persons are "summoned" for a particular purpose. It is organised via electronic means in a smart way (by means of an 'e' mail or text message through a 'smart phone' or thro' a SMS). This smart mob or group behaves intelligently and efficiently in a disciplined way. They spontaneously gather at a designated location at a specified time and perform an indicated action for the sake of public or commoners before dispersing. The first flash mob was created in Manhattan city in "USA in May 2003".

## II SMART PAYMENT

As a part of the activities in the present digital or smart world, now one can simply wave his/her mobile phone and press a thumb pad fixed on it in front of a payment terminal in a retail / departmental store and effect payments for his/ her purchase. There is no need to carry "paper cash" or plastic cards (credit / debit cards) for such visits to super market. This has been demonstrated by the manufacturers of "Apple-i phone recently. In the coming days to make "shopping", just a contact less "mobile wallet" (smart 'i' phone) will be sufficient. Wireless, finger print identification reader with a finger print scanning hardware enables this kind of "payment mode". So in the near future, we can see the gradual edging out or elimination of plastic cards from our wallets / view notwithstanding the continuity / sustainability of diversity in payment methods. The innovations carried out presently prompt us to recall the saying that "*One can do anything literally with a smart phone from sending a text message to listening to music and to effect payments*". These are in addition to its so many normal / routine functions such as a communication device controlling the electrical equipment in a house and measuring one's heart beats.

## III SMART TAGS

The latest addition of smart items relate to electronic toll collection system. The smart tags are nothing but "special radio frequency tags" which are inter operable across all toll plazas in a grand trunk road / route. These are provided to all the vehicles that move along that route and they need not stop / wait at all toll plazas. This reduces the total travelling time. The integration of the centralized data base of all vehicles (VA HAN) with the check posts and toll plazas along a particular road / route facilitates the easy identification and prompt payment of tolls. Such a step eases out the congestion experienced at check posts and toll plazas. Presently the "Smart Tags" method is proposed for trial in Delhi- Mumbai grant Trunk Road.

## IV SMART CITY

Let me add some more information on the topic "Smart City", which had a wide coverage in the last issue of this Newsletter. From my view point, a smart city is one that channelises to infuse intelligence into all the activities connected with an urban infrastructure and systems. This technique enables the authorities concerned to anticipate problems and deploy resources adequately to solve them quickly. A smart city is highly efficient and faster in identifying and solving basic essential city issues. It is meticulously and intelligently connected by a network of sensors, wireless devices, cameras, data centres and analytics. All the required data is collected, digitised and integrated for the quick analysis and decision taking by the urban management officials and city managers. Thus it provides a high quality of life, better economic opportunities, safety and good health to its residents. In addition, it enables savings in all kinds of energy forms, reduction in the cost of transport, buildings and efficient governance. In short, it helps to create a self, sustainable habitat with wiser use of natural resources, reduced pollution levels, low carbon footprints and a harmony with nature. Presently, there are many interpretive models of smart city. Among them are European, British, Japanese and American models. The templates are mostly anchored on land use – for homes business, government offices, public transport and recreational space.

Having learnt the salient features of a smart city, it is time for us to get a feel of the main players in smart city projects and its SWOT analysis. Main players / key elements of a Smart city

- Energy
- water
- waste
- infrastructure
- public-safety
- health care
- education
- green buildings / green homes
- transportation
- communication and finally
- citizen services

## Smart cities in India – SWOT analysis

- STRENGTH**
- Huge land parcels are available on the out skirts of most of the cities for development.
  - Necessity for creating new cities due to high out flow / large scale migration of people from rural areas to cities
  - New business destination can be easily created.
  - ROI on investment could be high
  - Increasing urbanization needs can be met easily
- WEAKNESS**
- Past poor track of execution by government agencies
  - Major hurdles may be expected in land acquisition
  - Present poor connectivity may create problems
- OPPORTUNITY**
- Possible economic turnarounds created by these projects
  - Better quality of life than in the existing cities
  - Present momentum towards the adoptability of modern technology
- THREATS**
- Slow approval and execution of projects
  - Activatism and Judicial interventions
  - Investments may get delayed due to various factors including legal issues

## V SMART GRID

Now it's time for me to touch base our regular topic 'Smart grid', which is presently called as "future grid or integrated grid". It is an intelligent and integrated grid of the future. Its ability to collect, glean and analyse the data about the grid operations and its assets in unmatched and continues to evolve. When we deal with smart grid in the first place, we should know what are the expectations of the consumers. Normally they expect reliability and sustained cyber and physical grid security of the grid and also the flow of quality power. Now let us turn our focus on the security challenges faced in a smart grid. It may be separated as challenges faced by the physical part of the grid and the cyber space of the grid.

### PHYSICAL CHALLENGES

Before viewing this problem, kindly have an idea about the size of the complex, widely spread yet physically interconnected power network in our state. It consists of nearly 400-500 generating units in 80-100 power plants (both large and small) and hundreds of thousands of transmission and distribution lines. Please imagine how such a huge infrastructure can be protected from all kinds of physical attacks. Then you will be agree that it is well high impossible to protect it from such attacks. But one point gives some relief. Experience shows that when ever such attacks take place, it is confined to a only small portion of the grid and it never extends nor engulfs the entire grid. Besides the challenges faced from terrorist attacks, this physical infrastructure suffers damages from periodical cyclones, heavy winds and lightning.

### CYBER CHALLENGES

Increased availability of highly sophisticated hacker tools and the decrease in the technical knowledge that is required to employ them lead to an increase in the number of threats against computer systems and internets (cyber space). Such cyber attacks and intrusions are rising rapidly in recent years and the human response to them is not fully adequate. Many refinements are being carried out in this regard. Unlike the physical infrastructure of the grid, here the adversaries have the potential and options to carry out attacks from any location they prefer. These unscrupulous people take advantage of the known vulnerabilities and mis- configured operating systems in the cyber grid, servers and network devices. Thus we see the cyber and communication networks require a focused attention to achieve our objective of the reliable operation of the grid. In a smart grid, the power systems rely more on the computerized communication and control system. So it makes the security of such a system to depend heavily on the integrity of the associated information system. Further the control systems, which were originally designed for use with proprietary stand alone communication systems are now connected to "internet" which has no built-in higher security levels. Moreover, the numerous types of communication systems and its protocols further compounded the problems. To cite an example, common telephone lines, wireless, micro wave, optical fiber and internet connections are employed in a substation control network at various levels. They have no common connectivity or inter operability. This kind of challenges add complexity when we try to establish secure communication to and from a substation. Let us learn these challenges in detail in the coming issues.

*Till then, I am toodling along (signing off)*

*(To be continued...)*



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## GOVT IDENTIFIES 12 LOCATIONS FOR SETTING UP NEW SOLAR PARKS

A step ahead in the government's ambitious plan of setting up 25 solar parks, the Ministry of New and **Renewable Energy** (MNRE) has identified 12 locations in various states where such power projects can come up. The scheme envisages setting up of 25 solar parks over the next five years with a total capacity of around 20,000 mw, with each park housing a plant with a capacity ranging from 500-1,000 mw. The installed solar capacity has touched 3,000 mw in the country, according to the latest ministry data, and the government aims to increase it to 100,000 mw by 2022.

"We have identified 12 locations so far and are in the process of finalising the draft proposal for the same," MNRE Joint Secretary Tarun Kapoor told PTI. He said they will soon send the draft to the Cabinet for approval post which the bidding process could be started. The locations identified are in Andhra Pradesh, Telangana, Madhya Pradesh, Karnataka, Rajasthan, Odisha and Punjab. Kapoor said "adding that even Mizoram has expressed willingness to set up a park. Andhra Pradesh has proposed to have a 2,500 mw park, Telangana 1,000 mw, MP is keen to have two parks of 750 mw each, Karnataka a 750 mw park, Rajasthan has identified land to set up projects as big as 4,000-5,000 mw and Odisha and Punjab to have around 3,000 mw each," he said.

The ministry has cited parks in Gujarat and Rajasthan as models for the proposed solar parks. "We already have two solar parks, with one each in Gujarat and Rajasthan as models for the parks to be constructed as part of the scheme. The new parks would be based on the similar model," Kapoor said. The solar parks would be developed in collaboration with state governments while Solar Energy Corporation of **India** would be the implementation agency on behalf of the Centre. "A solar park is a concentrated zone wherein the government will provide land and basic infrastructure for setting up the plant as well as evacuation of power. Developers, on the **other** hand, will have to enter into power purchase agreements with distribution companies before setting up the plant," Kapoor added. The government has made an allocation of Rs 1,000 crore for the development of ultra large solar projects and parks, for this fiscal.

*Courtesy: Business Standard*

## PUNJAB TIES UP WITH US GLOBAL SECURITY AND AEROSPACE COMPANY FOR SOLAR POWER

To augment solar power generation in the state and overcome the power crisis, the Punjab government on Friday announced a tie up with US global security and aerospace company Lockheed Martin.

The state will add 1000 MW solar power in the next three years with Lockheed Martin providing plastic structures for solar panels on canals by using nano-technology.

"The company would also provide state-of-the-art technology to convert paddy straw into energy, solving the lingering problem of paddy straw burning in the state. The Punjab government and Lockheed Martin would ink a MoU in this regard," a spokesman said on Friday.

Punjab non-conventional Energy Minister Bikram Singh Majithia and a three-member team from Lockheed Martin comprising CEO Phil Shaw, Chief Innovation Officer Tushar Shah and Regional Director Jagmohan Singh, along with senior Punjab officials, decided this at a meeting here.

Majithia said that to meet 15 per cent demand for energy in the state from clean energy, the Punjab government has decided to explore around 5,00km of canal length for putting up solar panels.

"But due to the heavy cost of the structures, it becomes unviable. If Lockheed Martin could develop cheaper but durable plastic structures, then this area has a huge potential to be harnessed in future," Majithia said.

He expressed confidence that with the nano-technology solar panel developed by the US company, Punjab would be able to make solar power generation cost effective, attracting international investors to this area.

Majithia admitted that Punjab was facing a serious issue of burning of paddy stubble, causing major damage to the fertility of the land as well as polluting the environment. He said that this could be checked if farmers could get additional income in lieu of their agricultural residue.

CEO Phil Shaw said that the company has come out with waste-to-energy conversion solutions with successful conversion of waste products to electricity, heat and fuel by using gasification processes. He said that it was an environmentally friendly green recycling technology which requires little space and the plants are fully automated.

*Source: Times of India*

***The path towards sustainable energy sources will be long.....  
america cannot resist this transition, we must lead it. - BARACK OBAMA***

# ELECTRIC VEHICLES GOOD FOR THE ENVIRONMENT & SAVE YOU MONEY

The Union of Concerned Scientists has completed what is the most comprehensive study to date on the financial and environmental costs (or, more appropriately, savings) of electric vehicles.

“No matter where one lives in the United States, electric vehicles (EVs) are a good choice for reducing global warming emissions and saving money on fueling up, according to a new analysis by the Union of Concerned Scientists (UCS),” the UCS writes.

For years, EV critics have claimed that EVs don't reduce carbon dioxide or other global warming emissions because they burn electricity from coal and natural gas power plants. While drivers in regions with a lot of fossil fuel power will not cut emissions as much as drivers in regions with a lot of clean energy power plants, no matter where someone lives in the US, driving an EV is cleaner than driving a gasoline-powered car, according to the “State of Charge: Electric Vehicles' Global Warming Emissions and Fuel Cost Savings Across the United States.”

Notably, UCS also calculates how much EV drivers save in “fuel” costs — a lot.

Neither of these findings is at all a surprise to me, as one of our key EV writers has shown in the past that the cost of electric vehicles and their environmental costs are lower than

conventional automobiles, but this UCS study is more comprehensive than anything we've seen to date.

## **Saving Money by Driving an EV**

Everywhere in the country, an EV driver also saves money every time she or he “refuels” — compared to what they'd spend refueling a gasoline-powered vehicle.

“Based on electricity rates in 50 cities across the United States, the analysis found drivers can save \$750 to \$1,200 dollars a year compared to operating an average new compact gasoline vehicle (27 mpg) fueled with gasoline at \$3.50 per gallon. Higher gas prices would mean even greater EV fuel cost savings. For each 50 cent increase in gas prices, an EV driver can expect save an extra \$200 a year.”

Time of Use (TOU) electricity pricing, which many regions have or are implementing, allows a driver to maximize those savings, since they can access cheaper electricity at night when they are likely charging their vehicles.

## **Regional Differences for EV Emissions**

More good news is that most Americans live in the ‘best’ regions for driving an EV. UCS notes: “nearly half (45 percent) of Americans live in ‘best’ regions where an EV has lower global warming emissions than a 50 mile per gallon (mpg) gasoline-powered vehicle, topping even the best gasoline hybrids on the market. In places like California and most of New York, EV's environmental performance could be as high as an 80 mpg gasoline-powered vehicle.”

How about the worst region? Well, even in the dirtiest (when it comes to electricity) region of the US — some parts of the Rocky Mountains region — driving an EV is better than driving most other cars. “In parts of the



***In the end we will conserve only what we love. We will love only what we understand. We will understand only what we are taught.' - BABA DIOUM***

Rocky Mountains region, driving an EV produces global warming emissions equivalent to a gasoline vehicle with a fuel economy rating of 33 mpg, similar to the best non-hybrid compact gasoline vehicles available today — all while cutting our nation's oil consumption."

Also, notably, clean energy is increasing while dirty energy is getting shut down, all across the US.

"The good news is that as the nation's electric grids get cleaner, consumers who buy an EV today can expect to see their car's emissions go down over the lifetime of the vehicle," said Don Anair, the report's author and senior engineer for UCS's Clean Vehicles Program.

### **Bottom Line: Driving an EV is Better for the Environment than Driving a Gasoline-Powered Car**

That's the take home message, and if you ever run into a commenter saying otherwise, be sure to direct them to this post.

"This report shows drivers should feel confident that owning an electric vehicle is a good choice for reducing global warming pollution, cutting fuel costs, and slashing oil consumption," said Anair. "Those in the market for a new car may have been uncertain how the global warming emissions and fuel costs of EVs stack up to gasoline-powered vehicles. Now, drivers can for the first time see just how much driving an electric vehicle in their hometown will lower global warming emissions and save them money on fuel costs."

### **EVs Getting Popular**

10 new EV models are coming to market this year, and many more are on the drawing board. If you've been a CleanTechnica reader for a long time, you've probably noticed that we've increased our EV content a ton in the past year. I used to never write on EVs, and other writers hardly touched them, but with a few pioneering models hitting market, their clear environmental benefits, and a lot more EVs on the way, we have increased our coverage of these clean(er) vehicles considerably (and we're now a top site for car coverage, according to Technorati).

Of course, EV's are not as efficient or green as bicycling, walking, taking the train, or riding a motorcycle or scooter (especially an electric motorcycle or scooter) in most places, but for those who are going to stick with an automobile over one of the above options, EVs are the way to go.

Also, while EVs are greener than gasoline-power cars, we certainly need to keep maximizing their green factor by switching our grid over to a clean energy rather than primarily dirty energy grid. And for those of you interesting in doing so, there are a lot of options out there for going EV and going solar at the same time!

*Source: UCS*



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# SOLAR POWER KEY FOR SAUDI FUTURE, SAYS ENERGY CHIEF

A leading figurehead in Saudi Arabia's energy sector has called solar energy "a must" for the kingdom, stating that Saudi Arabia has little choice but to pursue the potential of solar power if it hopes to maintain the country's standard of living.



Speaking at the opening day of the fourth Solar Arabia summit in Riyadh, Hamed al-Saggaf, executive director of the Saudi Electricity Company, told attendees that the kingdom must learn to wean itself off its dependence on oil and gas for electricity production.

"If we continue to consume fuel at the same rate, then there will be a great lost opportunity," Saggaf said. "We have to start pursuing solar now."

With a peak electricity load of 57 GW and a growing, power-hungry middle class, Saudi Arabia has begun to give greater consideration to its energy future. The subject has rarely been discussed in recent decades as the oil-rich Kingdom cornered the global OPEC market.

However, Saggaf revealed at the conference plans to embellish Saudi Arabia's so-far stagnant solar industry. The Saudi Electricity Company plans to invest \$109 billion in solar energy between now and 2032 as it eyes a solar power capacity of 41 GW – a figure that would meet 30% of the Kingdom's projected 120 GW energy needs by that date.

"It is a dream right now," added Ali al-Maashi of petrochemicals company Saudi Basic Industries Corp. "But I think we have the capacity," he added, stressing that Saudi Arabia needs to develop clear policies and frameworks in order to create a conducive pro-solar environment.

Saggaf's plan is to develop solar power capacity in Saudi Arabia's remote north and northeast areas where diesel power generation is king. "The gateway for solar is these isolated areas," he said. "The cost of transporting the diesel is much higher than the subsidized cost of the diesel itself."

Saudi Arabia's 41 GW goal has already earned the support of the Chinese National Nuclear Corporation (CNNC) – a state-backed entity based in Beijing that is set to partner with the Saudi energy research center King Abdullah City for Atomic and Renewable Energy (K. A. CARE) to develop renewable and nuclear energy in the Kingdom.

Solar development in the Kingdom has threatened to take off for many years, but tangible progress so far is minimal. Nevertheless, IHS expects approximately 1.5 GW of solar PV capacity to be deployed in Saudi Arabia by 2017. The 2032 goal of 41 GW of solar energy will be driven predominately by concentrated solar power (CSP), but at least 16 GW of that capacity will be derived from PV sources, said K. A. CARE.

*For more : <http://www.pv-magazine.com>*

# LIVING PROOF: THINKING OUTSIDE THE BOX AT THE BULLITT CENTER

When the Bullitt Foundation determined to create the greenest commercial building in the world, we embarked on a quest that was mind-numbingly complex but enormously rewarding. I'd assumed that the toughest challenge would be to build a zero net energy six-story building in cloud-covered Seattle. That was difficult, but far from the hardest of the goals we set out to meet.

Our goal for the Bullitt Center was ridiculously ambitious. In a flight of rhetoric, I told the architects that I wanted them to do for buildings what the 707 did for commercial aircraft, what the first Macintosh did for personal computers, what the Prius did for automobiles. I wanted the Bullitt Center to redefine the whole category.

The instrument we chose toward that end was the Living Building Challenge. Like the X Prize (but, alas, without the monetary award), the LBC lays out a set of "stretch goals" that are so difficult that many people believed them to be impossible in a building of commercial scale located downtown in a major city. The requirements (which fill a small book) include:

**Energy:-** A Living Building must generate as much energy on-site each year as it uses. Other than low-grade heat, all its energy is electricity. Nothing can be burned in a Living Building.

**Water:-** A Living Building must use only the rain it can collect on its roof to meet all its water needs, including potable drinking water. Treated gray water must be returned to the hydrological cycle right on site.

**Healthfulness:-** A Living Building must be constructed without using 362 common building materials that are toxic, carcinogenic, mutagenic, endocrine disrupting, or otherwise harmful to humans and other forms of life. The building contains more than 1,000 components that had to be screened.

**Wood:-** All wood in a Living Building must either be recycled or come from forests certified to meet the very high standards of the Forest Stewardship Council.

**Human Waste:-** A Living Building must use only composting toilets. We could not find any other examples of composting toilets in six-story buildings.

**Biomimicry:-** Exterior blinds deploy automatically to control insolation heat.

The Bullitt Center does not look at all like an organism, but it functions like one. It has a brain and nervous system that determine whether the windows should be open or closed, whether the external shutters should be raised or lowered, whether lights should be on or off. Occupants can override these systems, but only for a half hour at a time. The Center is a strong-willed building that, like a life form, always seeks homeostasis.

## **Durability**

I set a design life of 250 years. The planned obsolescence built into large modern buildings is obscene, a triumph of net present value methodology over common sense.

## **Cars**

The Bullitt Center can be easily accessed by buses, trolley, and light rail; it has ample parking for bicycles (and two showers on every floor). However, the Center has no parking lot for automobiles.

## **Exercise**

The upper floors of the Center are serviced by an efficient, regenerative elevator. It is fully ADA compliant, with easy access to people with disabilities and those carrying heavy loads. However, it also has a glass-enclosed "irresistible stairway" with great views of the Olympic Mountains. The stairway lures most people to climb.



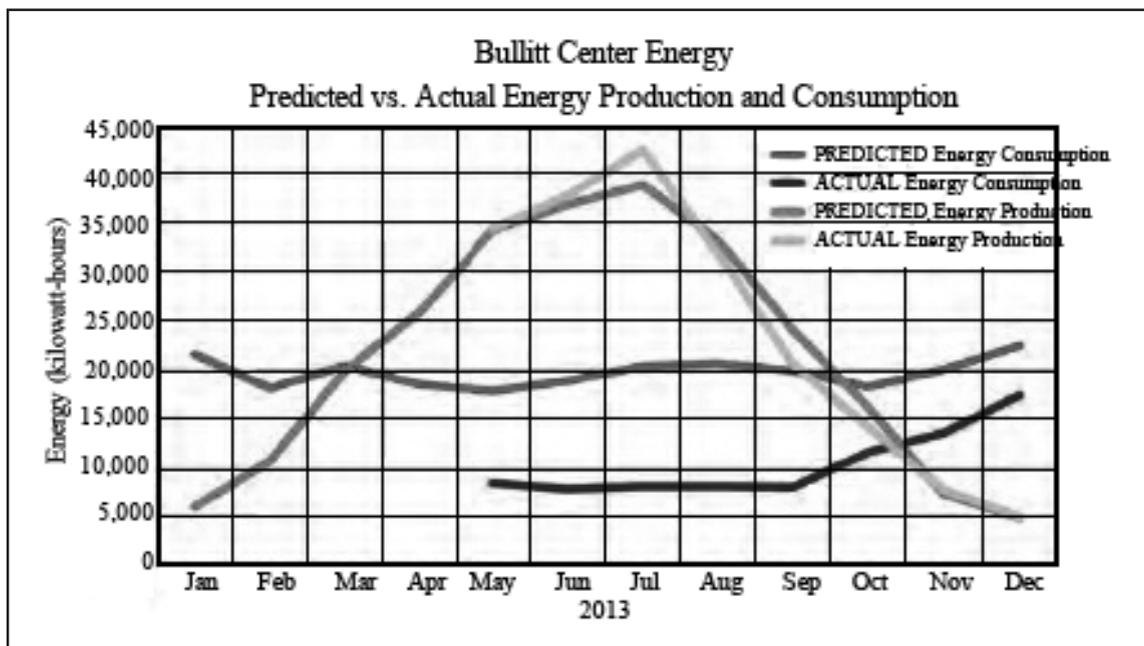
## Lighting

To the greatest extent possible, the Center is daylight. We *Homo sapiens* have spent 99 percent of our existence on this planet responding to circadian rhythms and to full spectrum sunshine. We are happiest, healthiest, and most productive in natural daylight. Most of the Center's artificial lighting is full spectrum LEDs. Still, I didn't need to turn on a lamp (except in the men's room) between April and the end of September.

We chose the members of the senior team—Miller Hull, PAE, Point 32, Schuchart Construction, and Solar Design Associates—for their demonstrated talent and creativity, but also for their ability to play well with others. We employed an integrated design process, with diverse charrettes before beginning the design process. Professor Rob Pena from the University of Washington's Integrated Design Lab attended weekly meetings of the entire team for more than two years.

## Net Positive Energy

We determined the maximum surface area that could be covered with solar panels, the maximum efficiency then available in commercial panels, and the average insolation per year. We persuaded the city to create an ordinance providing for "solar canopies," allowing arrays to extend over public sidewalks. Solar Design Associates calculated that, in an average year, our 570 SunPower E19 245-watt modules yield a maximum capacity of 242kWp to generate about 257,000 kWh annually. We built in a buffer of 27,000 kWh and set 230,000 kWh as the energy budget for the building. In architectural terms, for a building with about 50,000 square feet, that translates to an energy use intensity (EUI, expressed as kBtu/ft<sup>2</sup>) of 16.



## Bullitt Center Energy Production and Consumption

Putting that in context, the average existing commercial building in Seattle has an EUI in the low 90s. A new building built to code would be in the low 50s. A LEED Platinum building with all its energy credits would be in the low 30s. So an EUI of 16 was a challenge. It was not as hard as I expected.

PAE of Portland, our principal engineering firm, decided to expand into Seattle, and wanted to locate in Bullitt Center. After carefully measuring the energy consumption per employee in Portland, they found they'd have to reduce electricity use by about 70 percent. They selected computers, monitors, printers, copier and task lights for the Seattle office to use as little energy as possible. The new standard computer setup, with a thin client server and two monitors/desk uses, only 17 percent as much energy as the system it replaces—with no loss of computing power or functionality.

The Center is still undergoing commissioning. The third floor is heated and lit, but it has not yet been leased and occupied. Some tenants are still building their staffs and moving toward full occupancy. And the first three tenants arrived only about Earth Day (April 22), 2013. Therefore our dataset is limited. Even so, it offers some insights.

The solar equipment, installed under the deeply experienced guidance of Steven Strong, performs as expected. When the sun shines, it generates power. For the eight months through December 31, it produced almost exactly as much power as predicted.

The surprises were on the demand side. During those eight months, the Center used only about half as much energy as expected, for an astonishing EUI of 8.4! During these eight months a six story building in cloudy Seattle produced more than twice as much power from sunshine as the building used.

But this must be taken with a grain of salt. It includes spring, summer, and autumn when Seattle's sunshine is most abundant, but not winter, and the Center was not fully occupied. After another year of operation, we will have a much clearer sense of how the completed and fully-tenanted building operates. But at this point, it appears likely to prove a stunning success.



#### **DENIS HAYES**

*Denis Hayes, president and CEO of the Bullitt Foundation, was national coordinator of the first Earth Day in 1970. He served as director of the National Renewable Energy Laboratory during the Carter Administration, and as chair of the Board of Trustees for ASES.*

## **ABB UNVEILS STRATEGY TO BECOME BATTERY LEADER**

In a presentation to international press and investors, ABB has set out its goal to focus on business growth priorities in which storage, micro and nano grids will play a central role. CEO Ulrich Spiesshofer enunciated this strategy in the context of the company becoming, "the leading partner in the big shift of the power sector."

A key part of this strategy is the firm's partnership with China's BYD, announced on Monday, that brings together the firms' power electronics capabilities.

"This is a wedding that we have already tested when we worked together in the e-mobility space," Spiesshofer said. The CEO was referring to ABB and BYD's fast charging infrastructure that the companies are currently rolling out in China.

With BYD's 180,000 staff and ABB's 145,000, the German CEO said that the combined team of 300,000 is set to see the companies' partnership forming the "leading entity in the energy storage world."

Setting out the changing utility and electricity sector in which ABB finds itself, Spiesshofer said that the utility business model has shifted and that the sector can no longer be described as being "dull and boring," adding that "these times are over." Increased renewable penetration means that grid complexity has increased, requiring intelligent control of electricity supply and distribution.

On the consumption side, "micro and nano grids will become the reality," Spiesshofer added, with the BYD partnership meaning the firm is at the forefront of this fundamental shift. Pointing out that "renewables are constantly ramping up," Spiesshofer said ABB was targeting India and Africa in particular.

ABB identified the utility sector in general as representing a market opportunity of \$600 billion at present that will grow to \$750 billion through 2020. The shift from simply transporting electrons to intelligent grid control and longer and higher capacity interconnectivity is a key part of this market.

Along with the BYD partnership in storage, a key part of ABB's business in PV is in solar inverters. While ABB previously had a central inverter business, for PV power plants, it added a string inverter portfolio when it acquired U.S. firm Power One last year. As Spiesshofer said in his Capital Markets presentation, this means the company is now the second largest inverter supplier globally.

#### **Power systems "step change"**

Reflecting on the company's shifting strategy, Spiesshofer spoke of ABB's exit from the solar EPC business, which is expected to be completed by the end of the year. ABB has ceased taking on new PV EPC projects and hopes to have completed legacy projects by the end of 2014.

Another component of the power system business is ABB's role in providing grid connection for offshore wind. This formerly troubled segment of ABB's business, including the solar EPC component, is set to be profitable in the fourth quarter of 2014 with a full-year 2014 goal of also returning the power systems business to black, according to Chief Financial Officer Eric Elzvik.

The "step change" in the power systems business involved a different approach to reducing planning and technical risk. Importantly, ABB intends to continue its power systems business in partnerships, where ABB brings its power conversion and distribution expertise while construction partner plan, develop and execute in terms of construction. Looking towards business growth opportunities, CFO Elzvik said the utility segment is forecast to deliver 2% to 4% year-on-year growth through to 2020. Transport infrastructure, including e-mobility, was also identified as an "organic growth" priority, with a target of 4 to 6% YOY through the end of the decade.

*Read more: [http://www.pv-magazine.com/news/details/beitrag/abb-unveils-strategy-to-become-battery-leader\\_100016366/#ixzz3KKE5TXVk](http://www.pv-magazine.com/news/details/beitrag/abb-unveils-strategy-to-become-battery-leader_100016366/#ixzz3KKE5TXVk)*

## LAS VEGAS HOTEL TO INSTALL COUNTRY'S 2<sup>ND</sup> LARGEST ROOFTOP SOLAR ARRAY

In a city with as many bright lights as Las Vegas, it's only fitting that they make full use of the brightest light this planet has ever known. With the enormous amounts of energy needed to illuminate the Vegas Strip each night, this desert oasis turned desert paradise is aiming to make use of some more of the sunlight that falls upon it each day.

A push in the right direction is now coming from Mandalay Bay, which recently announced plans to install the second largest rooftop solar array in the United States.



Take a look at an article below from [cleanenergyauthority.com](http://cleanenergyauthority.com) that details the extent of this plan they say will provide energy capable of powering as many as 1,000 homes.

*Mandalay Bay in Las Vegas will soon be home to one of the largest contiguous rooftop solar photovoltaic arrays in the world. NRG Solar will install the 6.2-megawatt system.*

*It will be MGM Resort's first commercial solar project in the United States and will generate enough electricity to power 1,000 homes, a press release said. MGM Resorts International operates other destination resort brands including the Bellagio, MGM Grand and the Mirage.*

*MGM Resorts chose Mandalay Bay for the new solar array due to its expansive sun-oriented rooftop, which spans about 20 acres. NRG Solar will custom design and develop the project. Mandalay Bay will buy the energy created by the array through a power purchase agreement.*

*At peak production the rooftop array will produce about 20 percent of Mandalay Bay's power needs.*

*MGM Resorts announced the project at a news conference featuring Sen. Harry Reid and Secretary of the Interior Sally Jewell in advance of the National Clean Energy Summit 6.0 which will be held Aug. 13 at Mandalay Bay.*

*"Integrating environmentally responsible practices throughout our operations has been a key pillar in MGM Resorts' strategic sustainability plan, said Jim Murren, Chairman and CEO of MGM Resorts International in a press release. "Partnering with NRG Solar to install the solar rooftop at Mandalay Bay highlights a major milestone in our efforts to promote renewable energy and reduce our consumption of the planet's limited resources."*

*Construction of the project will begin once several other projects at Mandalay Bay are finished, said Jeff Holland, director of communications with NRG in an email interview. The finish date will be determined once a start date is picked, he said.*

*MGM Resorts has made strides to reduce its natural resource consumption. In the past five years its reduced its energy intensity by more than 12 percent and saved more than 2.5 billion gallons of water, a press release said. NRG Solar has more than 2,000 MW of photovoltaic and solar thermal projects in operation under construction or in development in the southwestern United States.*

*In addition to MGM's desire to act as an environmental steward, the solar panels are a smart business decision, said Tom Doyle, president and CEO of NRG Solar in the press release. It will effectively enable the resort to lock in some energy costs at competitive rates. The company, Doyle said, expects other corporations will follow MGM Resorts' example.*

**"The best time to plant a tree was 20 years ago. The next best time is today." - Chinese Proverb**

# WORLD'S LARGEST SOLAR PLANT IN OPERATION

➤ Located on approximately 3,500 acres, the Topaz Solar Farm will produce enough electricity to power 160,000 average California homes. The location was selected after an extensive review of potential sites in California, taking into consideration the available solar resource, proximity to existing Moro Bay to Midway transmission lines, current land uses, and environmental sensitivities. Economic benefits from the project will include an estimated \$417 million, including property and sales tax revenues, for San Luis Obispo County, wages from direct and indirect employment, induced spending, and supply chain revenues.

➤ Developed by First Solar, the Topaz project incorporates the company's advanced thin-film cadmium telluride (CdTe) PV modules, which generate electricity with no emissions, waste or water use, and have the smallest carbon footprint of any PV technology. Electricity generated from the Topaz project will displace approximately 377,000 metric tons of CO<sub>2</sub> per year (the equivalent of taking approximately 73,000 cars off the road). The Topaz Solar Farm will occupy what is essentially non-prime agricultural land that has limited productivity. The project is over six miles away from sensitive habitats in the Carrizo Plain National Monument. Support posts for the mounting system are driven directly into the ground, negating any need for concrete work and the project recycles any construction wastes. Because of its location, the project will require minimal new transmission infrastructure.

➤ The project will help meet California's Renewables Portfolio Standard program 2020 goal for utilities to secure at least 33% of their electricity from renewable sources. As noted by the California Energy Commission, Governor Schwarzenegger's original Executive Order S-14-08 was further codified by Governor Brown in 2011. The new RPS preempts the California Air Resources Board's 33% Renewable Electricity Standard and applies to all electricity retailers in the state including publicly owned utilities, investor-owned utilities, electricity service providers, and community choice aggregators. All of these entities must adopt the new RPS goals of 20% of retail sales from renewables by the end of 2013, 25% by the end of 2016, and the 33% requirement being met by the end of 2020.

## Technology

➤ The CdTe (cadmium telluride) thin film photovoltaic cell that is at the heart of the First Solar process is the most widely used thin film solar panel technology. Other photovoltaic materials commonly used in thin film solar cells include amorphous silicon (a-Si) and copper indium gallium selenide (CIS or CIGS). Although not as efficient as crystalline silicon photovoltaic panels, thin film technology continues to be less costly (although dropping silicon costs have changed this dynamic dramatically in the past year) and more adaptable to building integrated photovoltaic (BIPV) installations.

➤ As of mid-2012, the ten most efficient monocrystalline silicon solar cells range from 19.1% to 22.5%. The top ten polycrystalline cell efficiencies range from 15.24% to 16.0%. By way of comparison, in early 2012, commercial panel conversion rate efficiencies for thin film industry leader First Solar had reached 12.4%.

## Project Development

➤ Project developer First Solar is one of the largest solar panel manufacturers and solar project developers in the world. The company was formed in 1999. Among First Solar's achievements:

➤ In the current extraordinarily competitive market they are still the cost leader at less than \$0.75 per watt.

➤ They were the first solar PV company to produce 1 GW in a single year and have over 5 GW installed to date.

➤ Set world records for CdTe PV cell (17.3%) and PV module (14.4%) efficiency certified by NREL.

➤ Developed the first comprehensive, pre-funded module collection and recycling program in the PV industry.

➤ Attained the smallest carbon footprint and fastest energy payback time of any PV technology.

➤ First Solar projects include over 5 GW installed and another 2.7 GW under construction or in development. Among the noteworthy completed projects are the 80 MW Sarnia Solar Project, the 58 MW Copper Mountain Solar 1 facility, the 53 MW Lieberose Solar Park, and the 30 MW Cimarron Solar Facility. Projects in development include the 550 MW Desert Sunlight Solar Farm. The 550 MW Topaz Solar Farm, the 290 MW Agua Caliente Solar Project, the 230 MW AV Solar Ranch One, and the 300 MW Stateline Solar Farm.

➤ Project owner, the MidAmerican Energy Holdings Company, is a global leader in the production, transportation and delivery of energy from a variety of fuel sources, including coal, natural gas, wind, hydro, nuclear, geothermal, solar and biomass. MidAmerican and its subsidiaries, MidAmerican Energy Company, MidAmerican Renewables, PacifiCorp, Northern Powergrid, CalEnergy Generation, Kern River Gas Transmission Company and Northern Natural Gas, are established leaders in the world energy marketplace. In production, distribution and delivery around the world. MidAmerican Renewables notable solar projects include the 550 MW Topaz Solar Farm and the 290 MW Agua Caliente Solar Project.

## Project Benefits

### ENVIRONMENTAL BENEFITS

- Enough power for 160,000 average homes
- Displaces 377,000 tons of CO<sub>2</sub> annually—equivalent to taking 73,000 cars off the road
- Lowest environmental impact of any PV technology
- No water used for electricity generation

### ECONOMIC BENEFITS

- Full economic benefits summary
- \$192 million in compensation for approximately 400 construction jobs over a 3-year period
- \$52 million in economic output for local suppliers
- \$14 million in sales taxes during construction and up to \$400,000 per year in new property tax revenues

### EDUCATIONAL

- Proposed 30kW solar array for Carrisa Plains Elementary School to support solar learning opportunities
- Cuesta College vocational solar training supported with 5kW array and meteorological station

### Community Commitment

First Solar is committed to being a good neighbor, working with the community to address issues through open communication. Topaz is sited on largely non-prime, actively tilled agricultural land that has limited productivity. At the northwestern edge of the Carrisa Plains, Topaz is more than six miles from the more sensitive habitats in the Carrizo Plain National Monument. We work to meet the community's needs by supporting local events and initiatives, offering educational benefits for local schools and universities, and providing information on the Topaz Solar Farm and the benefits of solar energy.

## BOSCH EYES INDIA'S EMERGING ENERGY-EFFICIENCY MARKET

German engineering major Bosch wants to position itself as an 'energy services company', or ESCO — an area it feels is beginning to take off in **India**. An ESCO typically executes energy-efficiency measures in **other** units for a fee, under a 'performance contract'. Mostly, the fee is paid out of the savings achieved, but there could be **other** payment models, too. Bosch is a Grade I ESCO, meaning 'very high' in a joint rating system of the agencies ICRA and CRISIL and the state-run Bureau of Energy Efficiency. The company is in advanced discussions with three entities — an IT company, a steel mill and a hotel group — to provide energy services, said CM Venugopalan, who heads Bosch Energy and Building Solutions.

ESCOs have been talked about in **India** for quite some time. A 2008 ADB study put the 'performance contract' market in **India** at 14,000 crore, and said the country could save up to 54 billion units of electricity. (Today, **India** consumes about 1 trillion units of electricity.) Venugopalan believes ESCOs are picking up now. Bosch has been receiving many business enquiries, he said, adding that one of the main reasons is that banks are now getting more comfortable with the idea.

Providing ESCO services is an extension of Bosch's existing businesses.

The company supplies water heating systems for industrial and commercial establishments, and recently came up with a product that combines a solar and heat pump. (Heat pumps, common in **Europe**, use both cooling and heating effects. The principle is like making good use of the heat produced by a refrigerator or the outdoor unit of an air-conditioner.) Since April, Bosch has sold 20 such units, to five hotel and hospital customers. Bosch officials said a typical installation would cost about 40 lakh, and would be paid back in two years.

### Huge potential

Energy services is a business where the returns are typically as high as 20-25 per cent, said S Raghupathy, Executive Director, CII-Godrej Green Business Centre, and an expert in the field. Raghupathy noted that while the potential for ESCOs has always been high, the model has not taken off well, despite the presence of companies such as Siemens, Schneider and Johnson Controls. The issues typically relate to baseline, or the benchmark over which improvements in energy efficiency is to be measured, changing conditions (such as a building meant to house, say, a 100 people ending up with twice the number), legal verification of achievements which could take exasperatingly long and clients not paying the ESCO on time by hiding behind some technicality or the **other**. Raghupathy calls ESCO a "big national need", but does not see a clear trend of the movement taking off. Nevertheless, if an ESCO does not shy away from investing in technology, it is bound to succeed, he said.

Source: BL

**Whether Half full or Half Empty... ..Resources are Limited. – Conserving Energy is in your Hands**

# CHINA HUNGER FOR CLEAN ENERGY TO LEAVE NO ROOFTOP BEHIND

China the world's biggest solar market for two years running, is pushing to install more panels at factories, schools and even greenhouses as it seeks to meet its goals under a historic climate agreement with the US.

China expects to install as much as 8 gigawatts of small solar systems this year, more than 10 times what was built last year. The country had almost 20 gigawatts of solar capacity at the end of 2013, a figure comparable to about 20 nuclear reactors. Most of that came from massive solar farms in remote locations and policy makers are now promoting smaller systems closer to where they're needed.



The push to promote wider use of rooftop solar comes amid growing health concerns tied to smog within its own population and from foreign companies. It also adds to the nation's push to be a leader within the global climate community.

## *A Global Push to Save the Planet*

The figures show the changes. Coal made up 64 per cent of China's electricity mix in 2013, down from 68 per cent in 2010, according to Bloomberg data. Solar's proportion of electricity generation capacity rose to 2 per cent, from 0.08 per cent four years ago, doubling nuclear power's share last year.

"Solar is actually the most attractive when you do rooftop because it eliminates transmission and distribution investment," said Ahmad Chatila, chief executive officer of St. Peters, Missouri-based SunEdison Inc.

SunEdison is in talks with a Chinese partner to build a factory in the country and agreed last month to jointly create a \$220 million fund to develop as much as 1 gigawatt of solar projects there. China's distributed solar market is going to be "enormous," Chatila said.

China's National Energy Administration introduced policies in September aimed at boosting the use of distributed solar power. Companies both in China and in other regions are responding. For instance, Solar Power Inc, a US developer backed by the Chinese manufacturer LDK Solar Co, said it would build 19 megawatts of rooftop systems in Shandong.

The country installed about 13 gigawatts of panels last year, almost matching the total amount of solar power in operation in the US, and 94 per cent of that capacity came from utility-scale projects.

## *Identifying sites*

The agency asked local authorities to identify potential sites for rooftop plants and smaller, ground-mounted projects. These would include industrial and commercial companies with large rooftops, and public buildings such as railway stations and airport terminals. China has set a goal of installing 8 gigawatts of small systems this year and 6 gigawatts for larger projects.

Distributed solar will look different in China, where land is state-owned and single-family houses are still relatively rare. While home owners are driving the rooftop solar market in the US and Europe, panels in China will be mostly found atop industrial and commercial buildings, as well as vacant lots, greenhouses, intertidal zones and the empty spaces around fishponds and lakes.

## *Solar bankruptcies*

China is expected to add as much as 8 gigawatts of distributed solar systems in 2015, out of 15 gigawatts of total photovoltaic power, according to Bloomberg New Energy Finance.

That forecast has China installing in one year about twice as many panels atop factories, office buildings and other distributed sites as there are currently in operation in Australia, one of the world's sunniest countries.

Chinese manufacturers sold about \$5 billion of shares from 2005 to 2010, and wrested control of the market from companies in the US., Germany and Japan. The added capacity drove down prices and pushed dozens of manufacturers into bankruptcy. Solar panels sell for 72 cents a watt now, compared with \$2.01 at the end of 2010. The price has slipped 12 percent this year.

"Beijing's solar policy of concentrating on distributed generation with ongoing tweaks to make it more effective is actually very solid in the mid- to long-term," said Charles Yonts, head of sustainable research at brokerage CLSA Asia-Pacific Markets in Hong Kong.

### **More projects**

JinkoSolar Holding Co, China's third-largest panel maker, arranged in July as much as 1 billion yuan (\$161 million) in financing from China Minsheng Banking Corp. for distributed solar. An 88.8 million-yuan loan for a 20-megawatt rooftop solar project in Zhejiang province will be the first under the agreement. JinkoSolar is planning three more projects of comparable size in Jiaxing, also in Zhejiang province.

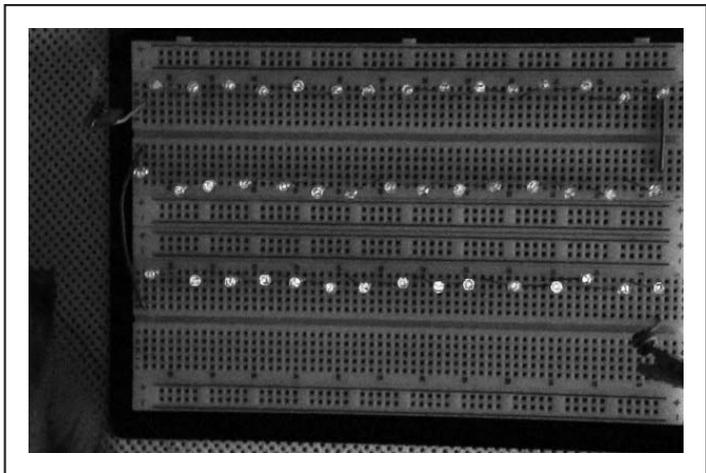
"Policies are relatively good, and companies are competing for rooftop space," said Sebastian Liu, Jinko's director of investor relations. Rooftop projects will account for a third of Jinko's developments in 2015, up from 10 percent this year.

"Investors have hesitated to start projects in the past because returns weren't clear," said MengXiangan, vice chairman of the China Renewable Energy Society, which acts as a liaison between the government and industry. Developers "should grasp the opportunities favorable for distributed projects to install more panels."

## **ENERGY HARVESTING NANOGENERATORS GIVE 130 VOLTS AT THE TOUCH OF A FINGER**

Engineers at KAIST are working on a better use for that harvested energy than zapping your friends and neighbours. They've come up with a nanotechnology-enhanced system to power small electronics.

Triboelectric generators (TENGs) consist essentially of two different materials that are rubbed together. Materials that like to give off electrons, such as glass or nylon, will donate them to materials that like to absorb them—materials with the highest electronegativity, such as silicon or teflon. However, rubbing these materials together causes wear. So Zhong Lin Wang, a physicist at Georgia Tech and colleagues developed materials that generate electricity by pressing them together. The contact surfaces of the materials are corrugated, and by pressing the materials together, the corrugated structures enmesh, causing the friction that leads to electricity generation.



"By applying pressure, those two materials are contacting, and they generate charge by contact electrification. This contact mode of triboelectricnanogenerator has less mechanical degradation with excellent efficiency," says Keon Jae Lee, from the department of materials science and engineering, at KAIST in Korea. Georgia Tech announced the invention of the first such device, called a triboelectricnanogenerator (TENG), in 2012. Lee says that the efficiency of TENGs has been increasing exponentially.

Lee, YeonSik Jung and other researchers from KAIST and now report that by reducing the size of the surface nanostructures, they can improve the efficiency of the TENGs even further. In a TENG consisting of a Teflon layer and a silicate layer, they produced nanodots, nanogrates, and nanomeshes on the silica layer using block copolymer self-assembly technology. (Block copolymers are chain-like molecules with a repeating pattern. On a surface, they can fold-up together in such a way that a nanometer-scale pattern emerges.)

The resulting TENGs can produce up to 130 volts. They report a TENG simply pressed with a finger powering 45 blue 3-V LEDs connected in series.

"This is the first report that demonstrates the self-assembly phenomenon of block copolymer in triboelectricnanogenerators for the modulation of nanostructure," says Lee. "They are very beneficial because they allow the increase of the contact area and the frictional electrification."

*Source: IEEE Spectrum*

## STATE-LEVEL PAINTING COMPETITION PHOTOS ON ENERGY CONSERVATION-2014 ORGANIZED BY POWERGRID

As a part of the National Campaign on Energy Conservation, the Ministry of Power, in co-operation with Bureau of Energy Efficiency [BEE] and other CPSUs, have organized a Painting Competition in two Categories i.e. **Category-A** for 4<sup>th</sup>, 5<sup>th</sup> & 6<sup>th</sup> Students and **Category-B** for 7<sup>th</sup>, 8<sup>th</sup> & 9<sup>th</sup> Students at School Level during August-September-October 2014. The State Level Painting Competitions were conducted at “**Vivekananda Auditorium**”, Anna University, Guindy Chennai in



**Second Prize Winner - B Category**  
**M Bhagavathy, AUPET Chinmaya Vidyala Mat Hr Sec School, Tirunelveli**  
Receiving prize from **Thiru. Natham R Viswanathan,**  
**Hon'ble Minister for Electricity, Prohibition & Excise**



**Prize Winners A&B with Chief Guest-1st 3 Winners**

the forenoon on **15.11.2014**. There was an exemplary response from the participants and their parents & guardians. The Hon'ble Minister for Electricity, Prohibition & Excise, Govt. of Tamil Nadu, **Thiru. Natham R Viswanathan** presided over the **Valedictory function** and gave away the cash prize to the winners of this State Level Painting Competition on Energy Conservation. **Er. S. Appavoo**, Chief Electrical Inspector to Govt also graced the occasion with his presence.

# PERFORMANCE ANALYSIS OF THREE PHASE THREE WIRE SERIES ACTIVE POWER FILTER

## Introduction

Explosive growth in consumer electronics and domestic appliances has generated a major concern in the electricity supply industry. Non-linear loads such as rectifier, converters, variable speed drives and arc furnace cause high disturbances in power supply system. To minimize these effects in electricity distribution system (non-sinusoidal voltages, harmonic current, unbalanced conditions, etc.) different types of compensations have been proposed to increase the electric system quality. One of that compensation is the active power filter (APF). A series APF that achieves low voltage total harmonic distortion (THD), reactive power compensation and power factor correction is presented. Hence, it is necessary to reduce the dominant harmonics below 5% as specified in IEEE-519-1992 harmonic standards. APF for damping out harmonic resonance in industrial and utility power distribution system have been researched.

Extensive surveys have been carried out to quantify the problems associated with electric power networks having non-linear load. Conventionally passive L-C filters were used to reduce harmonics and capacitors were employed to improve the power factor of the AC loads. However, passive filters have the demerits of fixed compensation, large size and resonance. The increased severity of harmonic pollution in power networks has attracted the attention of power electronics and power system engineers to develop dynamic and adjustable solutions to the power quality problems. Such equipment, generally known as active filters (AFs) are also called as active power line conditioners (APLCs), instantaneous reactive power compensators (IRPCs), APFs and active power quality conditioners (APQCs).

In this paper, the proposed control algorithm for series active power filter is applicable to harmonic voltage source loads as well as to harmonic current source loads. This control algorithm is applied under basic concept of the generalized p-q theory. However, this generalized p-q theory is valid for compensating for the harmonics and reactive power using the parallel active power filter in a three-phase power system. To overcome such limits, a revised p-q theory is proposed. This revised algorithm may be effective not only for the three-phase three wire series active power filter with harmonic current voltage loads, but also for the combined system of parallel passive filters and active filters.

This paper, basically deals with the design and modeling of three-phase three-wire series active power filter for compensation of harmonics.

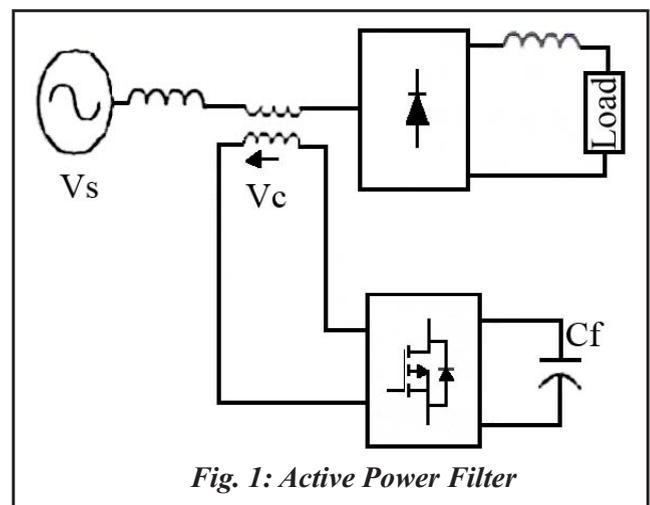
## Active Power Filter

The active filter topology is now more mature for providing compensation for harmonic, reactive power, or neutral current in AC networks. AFs are also used to eliminate voltage harmonics to regulate terminal voltage, to suppress voltage flicker, and to improve voltage balance in three-phase systems. This wide range of objectives is achieved either individually or in combination, depending upon the requirements and control strategy and configuration which have to be selected appropriately.

Following the widespread use of solid-state control of AC power, the power quality issues become significant. The AFs are basically categorized into three types, namely, two-wire (single-phase), three-wire and four-wire three-phase configurations to meet the requirements of the three types of non-linear loads on supply systems. Many control strategies such as instantaneous power theory, synchronous frame d-q theory, synchronous detection method and notch filter method are used in the development of three-phase AFs.

Fig.1 shows basic APF block diagram including non-linear load on the three-phase supply condition. APF overcomes the drawbacks of passive filters by using the switching mode power converters to perform the harmonic current elimination. A voltage source inverter (VSI) is used as the series APF.

This is controlled so as to draw or inject a compensating voltage from or to the supply, such that it cancels voltage harmonics on the load side i.e., this APF generates the distortions opposite to the supply harmonics.



*Fig. 1: Active Power Filter*

Series active power filters are operated mainly as a voltage regulator and as a harmonic isolator between the non-linear load and the utility system. This type of approach is especially recommended for compensation of voltage imbalances and voltage sags from the AC supply and for low power applications. The series active power filter injects a voltage component in series with the supply voltage and therefore can be regarded as a controlled voltage source, compensating voltage sags, and swells on the load side.

### Reference Voltage Generation

This Section introduces the control algorithm of the series APF, which compensates for harmonics and reactive power.

The three-phase voltages  $V_a$ ,  $V_b$  and  $V_c$  and currents  $i_a$ ,  $i_b$  and  $i_c$  for the three-phase three-wire power distribution system is shown in Fig. 3.

The three-phase load voltages  $V_{L(a,b,c)}$  and the three-phase source currents  $i_{s(a,b,c)}$  are represented as:

$$VL(a, b, c) = \begin{bmatrix} VL_a \\ VL_b \\ VL_c \end{bmatrix} \quad i_{s(a, b, c)} = \begin{bmatrix} i_{sa} \\ i_{sb} \\ i_{sc} \end{bmatrix} \dots\dots(3.1)$$

The load voltage vector  $^{VL(abc)}$  and the source current vector  $^{is(a,b,c)}$  of (3.1) are transformed into  $\alpha\beta 0$  coordinates by the substituting (3.3) into (3.2) as

$$VL(\alpha, \beta, 0) = [T] \begin{bmatrix} VL_a \\ VL_b \\ VL_c \end{bmatrix} = \begin{bmatrix} qL\alpha \\ qL\beta \\ qL0 \end{bmatrix}$$

$$i_{s(\alpha, \beta, 0)} = [T] \begin{bmatrix} i_{sa} \\ i_{sb} \\ i_{sc} \end{bmatrix} = \begin{bmatrix} i_{s\alpha} \\ i_{s\beta} \\ i_{s0} \end{bmatrix} \dots\dots(3.2)$$

$$[T] = \frac{\sqrt{2}}{\sqrt{3}} \begin{bmatrix} 1 & -1/2 & -1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \\ 1/\sqrt{2} & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix} \dots\dots(3.3)$$

The active power  $p$  can be expressed as (3.4) by the inner product of the load voltage vector  $^{VL(\alpha, \beta, 0)}$  and the source current vector  $^{is(\alpha, \beta, 0)}$  of (3.2), where the active power  $p$  is the instantaneous active power at the load side of the CT in Fig. 3.2.

$$p = VL(\alpha, \beta, 0) \cdot i_{s(\alpha, \beta, 0)} = VL\alpha i_{s\alpha} + VL\beta i_{s\beta} + VL0 i_{s0} \dots\dots(3.4)$$

Also, the reactive power  $qL(\alpha, \beta, 0)$  is represented as (3.5) by the cross product of  $VL(\alpha, \beta, 0)$  and  $i_{s(\alpha, \beta, 0)}$

$$qL(\alpha, \beta, 0) = VL(\alpha, \beta, 0) \times i_{s(\alpha, \beta, 0)} = \begin{bmatrix} qL\alpha \\ qL\beta \\ qL0 \end{bmatrix}$$

$$q = \|qL(\alpha, \beta, 0)\| = \|VL(\alpha, \beta, 0) \times i_{s(\alpha, \beta, 0)}\| \dots\dots(3.5)$$

Where,  $q$  is the instantaneous reactive power at the load side of the CT in Fig.3.

For a three-phase system without zero sequence voltage and current, i.e.  $v_a+v_b+v_c=0$ ,  $i_a+i_b+i_c=0$ ,

$$VL0 = \frac{1}{3}(V_a + V_b + V_c) = 0$$

and

$$i_{s0} = \frac{1}{3}(i_a + i_b + i_c) = 0$$

(3.4) and (3.5) can be expressed as follows:

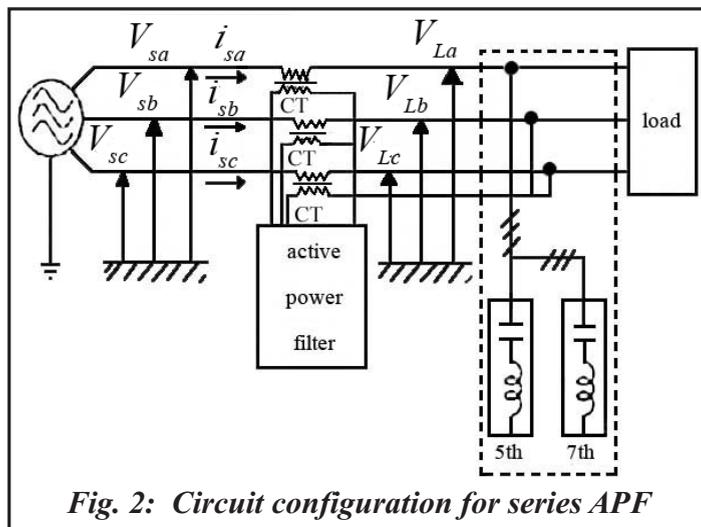


Fig. 2: Circuit configuration for series APF

$$p = VL(\alpha, \beta, \theta) \text{ is } (\alpha, \beta, \theta) = VL\alpha\text{is}\alpha + VL\beta\text{is}\beta \dots\dots(3.6)$$

$$qL(\alpha, \beta, \theta) = VL(\alpha, \beta, \theta) \times \text{is}(\alpha, \beta, \theta) = \begin{bmatrix} qL\alpha \\ qL\beta \\ qL0 \end{bmatrix} = \begin{bmatrix} | 0 | \\ | 0 | \\ \hline VL\alpha \quad VL\beta \\ i_{s\alpha} \quad i_{s\beta} \end{bmatrix} \dots\dots(3.7)$$

From (3.1)-(3.5), the active voltage vector  $V_{p(\alpha, \beta, 0)}$  and the reactive voltage vector  $V_{q(\alpha, \beta, 0)}$  are defined as follows:

$$V_{p(\alpha, \beta, 0)} = \frac{P}{i_{(\alpha, \beta, 0)} \cdot i_{(\alpha, \beta, 0)}} i_{(\alpha, \beta, 0)} \dots\dots(3.8)$$

$$V_{q(\alpha, \beta, 0)} = \frac{q_{(\alpha, \beta, 0)} \times i_{(\alpha, \beta, 0)}}{i_{(\alpha, \beta, 0)} i_{(\alpha, \beta, 0)}} \dots\dots(3.9)$$

The active voltage vector and the reactive voltage vector can be obtained by the vector norm of the three-phase load voltage vector, which is known from (3.9), (3.10). In other words,  $V_{p(\alpha, \beta, 0)}$  represents the parallel component of the load voltage vector  $VL(\hat{\alpha}, \hat{\beta}, 0)$  to the current vector  $i_{s(\alpha, \beta, 0)}$ ;  $V_{q(\alpha, \beta, 0)}$  represents the perpendicular component of the load voltage vector  $VL(\alpha, \beta, 0)$  to the current vector  $i_{s(\alpha, \beta, 0)}$ . As a result, the load voltage vector is represented by the sum of the active voltage vector  $V_{p(\alpha, \beta, 0)}$  and the reactive voltage vector  $V_{q(\alpha, \beta, 0)}$  as follows:

$$VL(\alpha, \beta, \theta) = V_{p(\alpha, \beta, 0)} + V_{q(\alpha, \beta, 0)} \dots\dots(3.10)$$

The active voltage vector  $V_{p(\alpha, \beta, 0)}$  is induced as follows, using the projection of the load voltage vector  $VL(\alpha, \beta, 0)$  onto the current vector  $i_{s(\alpha, \beta, 0)}$

$$\begin{aligned} V_{p(\alpha, \beta, 0)} &= \text{proj}_i VL(\alpha, \beta, 0) = \frac{VL(\alpha, \beta, 0) i_{s(\alpha, \beta, 0)}}{\|i_{s(\alpha, \beta, 0)}\|^2} i_{s(\alpha, \beta, 0)} \\ &= \frac{VL\alpha\text{is}\alpha + VL\beta\text{is}\beta + VL0\text{is}0}{i_{s\alpha}^2 + i_{s\beta}^2 + i_{s0}^2} i_{s(\alpha, \beta, 0)} \dots\dots(3.11) \\ &= \frac{P}{i_{s\alpha}^2 + i_{s\beta}^2 + i_{s0}^2} i_{s(\alpha, \beta, 0)} \end{aligned}$$

The reactive voltage vector, which is perpendicular to the active voltage vector, is also induced through (3.13)-(3.16):

$$\begin{aligned} q_{L(\alpha, \beta, 0)} &= VL(\alpha, \beta, \theta) \times \text{is}(\alpha, \beta, \theta) \\ \text{is}(\alpha, \beta, \theta) \times qL(\alpha, \beta, \theta) &= \text{is}(\alpha, \beta, \theta) \times (VL(\alpha, \beta, \theta) \times \text{is}(\alpha, \beta, \theta)) \dots\dots(3.12) \end{aligned}$$

$$\begin{aligned} &= (\text{is}(\alpha, \beta, \theta) \times \text{is}(\alpha, \beta, \theta)) VL(\alpha, \beta, \theta) - (\text{is}(\alpha, \beta, \theta) VL(\alpha, \beta, \theta)) \text{is}(\alpha, \beta, \theta) \\ &= \|i_{s(\alpha, \beta, 0)}\|^2 VL(\alpha, \beta, \theta) - \text{pis}(\alpha, \beta, \theta) \dots\dots(3.13) \end{aligned}$$

$$VL(\alpha, \beta, \theta) = \frac{i_{s(\alpha, \beta, 0)} \times qL_{s(\alpha, \beta, 0)}}{\|i_{s(\alpha, \beta, 0)}\|^2} + \frac{P}{\|i_{s(\alpha, \beta, 0)}\|^2} i_{s(\alpha, \beta, 0)} \dots\dots(3.14)$$

After taking a cross product on both sides of (3.12), (3.13) is obtained when the right side of (3.12) is unfolded by means of the relations of inner and cross product. After transposing the current vector component of the right-hand side to the left side in (3.13), (3.14) can be obtained. The second term of the right-hand side of (3.14) is the active voltage vector and the first term of the right-hand side of (3.15) becomes the reactive voltage vector  $V_{q(\alpha, \beta, 0)}$

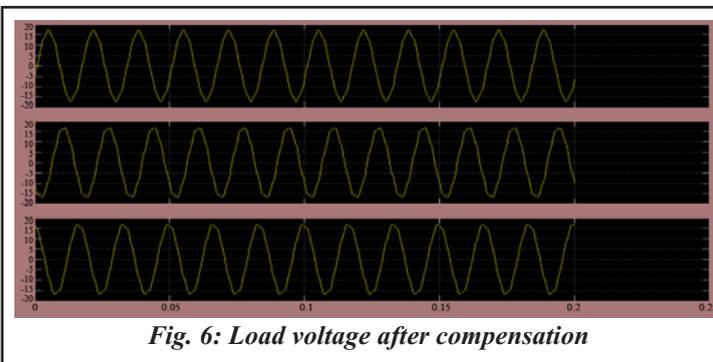
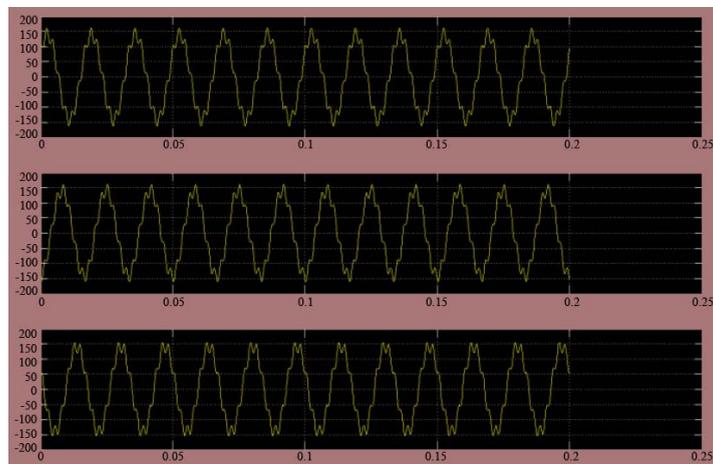
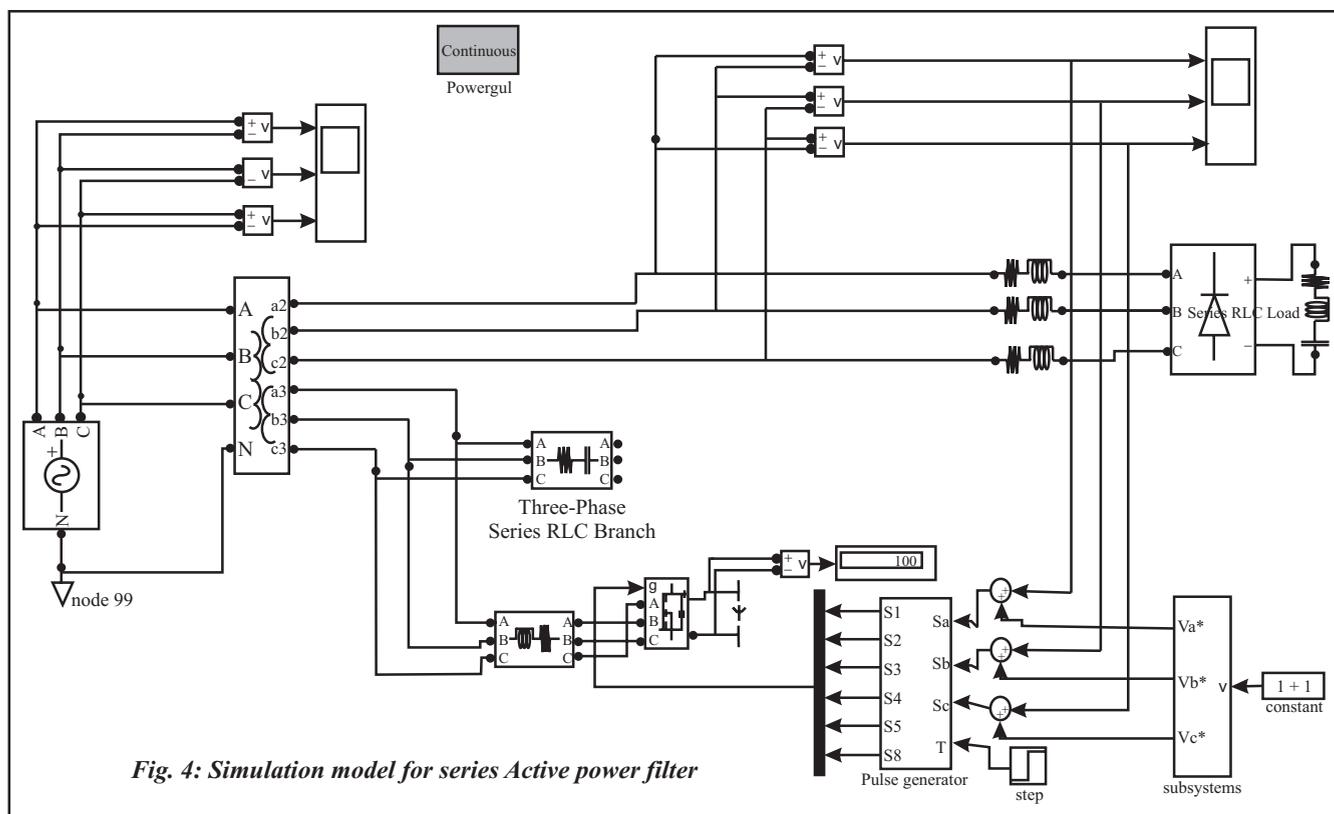
$$V_{q(\alpha, \beta, 0)} = \frac{i_{s(\alpha, \beta, 0)} \times qL_{s(\alpha, \beta, 0)}}{\|i_{s(\alpha, \beta, 0)}\|^2} = \frac{i_{s(\alpha, \beta, 0)} \times qL_{s(\alpha, \beta, 0)}}{i_{s(\alpha, \beta, 0)} i_{s(\alpha, \beta, 0)}} \dots\dots(3.15)$$

Where  $q_{L(\alpha, \beta, 0)}$  is equal to the reactive power, which is defined in the instantaneous reactive power theory. The voltage compensation reference of the series active power filter can be represented as (3.16), using  $V_{p(\alpha, \beta, 0)}$  and  $V_{q(\alpha, \beta, 0)}$  in (3.8) and (3.9):

$$V^*c(\alpha, \beta, \theta) = \frac{P}{i_{s(\alpha, \beta, 0)} i_{s(\alpha, \beta, 0)}} i_{s(\alpha, \beta, 0)} + \frac{i_{s(\alpha, \beta, 0)} \times qL_{s(\alpha, \beta, 0)}}{i_{s(\alpha, \beta, 0)} i_{s(\alpha, \beta, 0)}} \dots\dots(3.16)$$



Fig.6 shows the improved load voltage for the non-linear RLC load when the compensation is done with series APF. It is observed that all the harmonics are considerably removed after compensation.



## Conclusion

In this paper, a series active power filter control scheme has been proposed to improve the performance of APF under non-ideal mains voltage scenarios. The substantial increase in the use of solid-state power control results in harmonic pollution above the tolerable limits. Utilities are finding it difficult to maintain the power quality at the consumer end. The computer simulation has verified the effectiveness of the proposed control scheme. The source voltage and load voltage is observed for the RLC load. From the simulation results, the proposed approach was very successful and easily implemented. The harmonics in the source voltage have been removed. Hence, improving the power quality of the supply voltage. The input voltage harmonics are compensated very effectively by using the series active power filter.

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SHIATS, Allahabad*

*Courtesy: Ieema Journal, January 2014*

## HYBRID CARS: PARALLEL Vs. SERIES

New variations on a very old idea

The hybrid car, powered by both an internal combustion engine (ICE) and a battery-driven electric motor, is not a new concept. The first hybrid was built in 1901 by Ferdinand Porsche, then a young engineer at the Lohner Carriage Works in Vienna, Austria. Porsche's idea was to replace two tons of lead acid batteries in the company's electric cars with a relatively lightweight gasoline engine. The gasoline engine drove a generator to recharge a smaller battery feeding electric motors in the wheel hubs. By 1905, the Belgian engineer Henri Pieper combined the motor and generator into a single unit and invented a single-lever control system that took care of all the drive and recharging functions, including regenerative braking. He got a U.S. patent on his system in 1909. In 1914, Hermann Lemp at General Electric figured out how to scale up the DC power controller to run a diesel-electric locomotive, and since then, hybrid drive has been common for railroad, ship and submarine propulsion.

These are all series hybrids, so called because the ICE drives the generator, which drives the electric motor, which drives the wheels. This arrangement works well in low-speed, high-torque applications because the electric motor produces maximum torque at zero revolutions per minute (rpm). Maximum cranking power is available to get the locomotive or the submarine moving, without the use of a complex, heavy clutch and transmission.

The series drive is less useful in high-speed cruise, because there's an efficiency loss between the generator and motor—and a double efficiency loss if a battery sits in the electric flow between the generator and motor. In automobiles, that's always the case. The driver may need more power, for quick acceleration or hill climbing, than the engine-generator combination can provide instantaneously — so you want some power in reserve, stored in the battery.

A car, however, is light and agile compared to a loco-motive. A sophisticated lightweight transmission can be designed to bypass the electric motor at cruising speed and connect the ICE directly to the wheels. The result is a parallel hybrid system, where the ICE and the electric motor work one at a time or in tandem, depending on what's most efficient for the driving situation. Excess power from the ICE is routed through the generator to keep the battery charged and ready to pitch in for bursts of acceleration. This is the system that runs most of today's hybrid and plug-in hybrid cars, including all the hybrids from Toyota, Honda, Ford, Hyundai and BYD.

The exception is the Chevy Volt. In principle it's a simple series hybrid like Pieper's 1905 car — the battery runs the electric motor to drive the wheels through a slick continuously-variable transmission. The ICE never drives the wheels but rides along until needed to recharge the battery. The Volt, to be sure, uses 21st century integrated-circuit controls to make smooth, quiet power throughout the speed range.

Any proper hybrid does better in stop-and-go driving than a pure ICE, because it doesn't idle when stopped and because it recovers energy through regenerative braking. So do you want a series or a parallel hybrid? In theory, the series hybrid should be less complex and more easily adaptable to a wide variety of auxiliary power plants, from diesels to Stirling heat engines. The Volt drive train will thus be the base for dozens of car and truck applications. But parallel hybrids are here right now and here to stay. So we'll see.

*Courtesy: Solar Today*

## JAPAN'S FIRST MEGA-SOLAR POWER PLANT

**JAPAN'S FIRST MEGA-SOLAR POWER PLANT ON A FORMER AIRPORT SITE STARTS OPERATIONS POWER PLANT WITH MAXIMUM OUTPUT OF 8.2 MW ON THE FORMER MAKURAZAKI AIRPORT SITE**

ORIX Corporation a leading integrated financial services group, and Kyudenko Corporation recently announced the commencement of operations at a large-scale solar power generation (mega-solar) plant, Makurazaki Former Airport Site No.1 and No.2 Power Plants, with maximum output of 8.2 MW (8,218 kW) on the former site of Makurazaki Airport (Makurazaki City, Kagoshima Prefecture). The project is the first example in Japan of a mega-solar power plant business utilizing a former airport site.

Makurazaki Airport opened in January 1991 as Japan's first commuter airport. In light of mounting annual budget deficits for the management and operation of the airport, as well as future fiscal policy and the financial burden faced by residents, Makurazaki City shuttered the airport at the end of fiscal 2012. ORIX and Kyudenko have used the former airport site to develop a mega-solar power plant. Furthermore, through donations made to Makurazaki City and the tertiary sector as community contributions, an area for touring and learning about this power plant that has made use of an airport terminal will also be established on the site, along with an astronomical observatory.

*Source : ORIX Corporation*



# TAMILNADU ELECTRICAL INSTALLATION ENGINEERS ASSOCIATION 'A' GRADE

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# IMPORTANT DATES INDIAN HISTORY

## *Leading up to the Independence*

| Periods   | Events/Significance  | Periods | Events/Significance  |
|-----------|--|---------|--|
| <b>BC</b> |  | 1240    | Death of Razia Sultan  |
| 300-5000  | Indus Valley Civilization  | 1296    | Accession of Ala-ud-Din Khilji   |
| 563       | Birth of Gautama Buddha<br>(or 576 BC in some sources)                         | 1325    | Accession of Muhammad-bin Tughlaq  |
| 527-540   | Birth of Mahavir; Nirvana  | 1327    | Shifting of Capital from Delhi to Daulatabad in Deccan by the Tughlaqs                           |
| 327-326   | Alexander's invasion of India. It opened a land route between India and Europe | 1336    | Foundation of Vijayanagar empire in South  |
| 313       | Accession of Chandragupta Maurya, according to Jain traditions.                | 1351    | Accession of Feroze Shah   |
| 305       | Defeat of Seleucus at the hands of Chandragupta Maurya                         | 1398    | Invasion of India by Timur   |
| 273-232   | Ashoka's reign   | 1469    | Birth of Guru Nanak  |
| 261       | Conquest of Kalinga  | 1494    | Accession of Babur in Farghana   |
| 145-101   | Reign of Elara, the Chola king of Sri Lanka                                    | 1497-98 | First Voyage of Vasco de Gama to India (discovery of sea route to India via Cape of Good Hope) I |
| <b>AD</b> |  | 1526    | First Battle of Panipat; Babur defeated Ibrahim Lodhi; foundation of Mughal dynasty by Babur     |
| 78        | Beginning of Saka Era  | 1527    | Battle of Kanwaha-Babur defeated Rana Sanga  |
| 120       | Accession of Kanishka  | 1530    | Death of Babur and Accession of Humayun  |
| 320       | Commencement of Gupta Era, the golden age of Hindu India                       | 1539    | Sher Shah Suri defeated Humayun and became India's emperor                                       |
| 380       | Accession of Vikramaditya  | 1555    | Humayun recaptured the throne of Delhi   |
| 405-411   | Visit of Chinese traveller Fahien  | 1556    | Second battle of Panipat   |
| 415       | Accession of Kumara Gupta I  | 1576    | Battle of Haldighati - Rana Pratap defeated by Akbar   |
| 455       | Accession of Skanda Gupta  | 1582    | Din-e-Ilahi founded by Akbar   |
| 606-647   | Harshavardhan's reign  | 1600    | East India Company established   |
| 712       | First invasion in Sindh by Arabs   | 1605    | Death of Akbar and accession of Jehangir   |
| 836       | Accession of King Bhoja of Kannauj   | 1606    | Execution of Guru Arjun Development  |
| 985       | Accession of Rajaraja the Chola ruler  | 1611    | Jehangir marries Nur Jahan   |
| 998       | Accession of Sultan Mahmud   | 1616    | Sir Thomas Roe visits Jehangir   |
| 1001      | First invasion of India by Mahmud Ghazni who defeated Jaipal, ruler of Punjab. | 1627    | Birth of Shivaji and death of Jehangir   |
| 1025      | Destruction of Somnath Temple by Mahmud Ghazni                                 | 1628    | Shah Jahan becomes emperor of India  |
| 1206      | Accession of Qutub-ud-Din Aibak to the throne of Delhi                         | 1631    | Death of Mumtaz Mahal  |
| 1210      | Death of Qutub-ud-Din Aibak  | 1634    | The English permitted to trade in India (in Bengal)  |
| 1236      | Accession of Razia Sultan to the throne of Delhi                               | 1659    | Accession of Aurangzeb, Shahjahan imprisoned   |
| 1240      | Death of Razia Sultan  |         |  |

|         |  |         |  |
|---------|--|---------|--|
| 1665    | Shivaji imprisoned, by Aurangzeb   | 1905    | First Battle of Bengal under Lord Curzon   |
| 1666    | Death of Shah Jahan  | 1906    | Foundation of Muslim League  |
| 1675    | Execution of Guru Teg Bahadur, the ninth Guru of Sikh  | 1911    | Delhi Darbar; King and Queen visit India; Delhi becomes the Capital of India                         |
| 1680    | Death of Shivaji   | 1914    | World War I begins   |
| 1707    | Death of Aurangzeb   | 1916    | Lucknow Pact Signed by Muslim League and Congress  |
| 1708    | Death of Guru Gobind Singh   | 1918    | World War I ends   |
| 1739    | Nadir Shah Invades India   | 1919    | Montague-Chemsford Reforms introduced; Jallianwala Bagh Massacre at Amritsar                         |
| 1757    | Battle of Plassey, establishment of British political rule in India at the hands of Lord Clive | 1920    | Khilafat Movement launched   |
| 1761    | Third Battle of Panipat; Shah Alam II becomes India's emperor                                  | 1927    | Boycott of Simon Commission; broad casting started in India  |
| 1764    | Battle of Buxer  | 1928    | Death of Lala Lajpat Rai   |
| 1765    | Clive appointed Company's Governor of India  | 1929    | Lord Irwin's Pact; resolution of complete independence passed at Lahore Congress                     |
| 1767-69 | First Mysore War   | 1930    | Civil disobedience movement launched; Dandi March by Mahatma Gandhi (6 April, 1930)                  |
| 1780    | Birth of Maharaja Ranjit Singh   | 1931    | Gandhi Irwin Pact  |
| 1780-84 | Second Mysore War  | 1935    | Government of India Act enacted  |
| 1784    | Pitt's India Act   | 1937    | Provincial Autonomy; Congress forms ministries   |
| 1790-92 | Third Mysore War   | 1939    | World War II begins (September 1)  |
| 1793    | The Permanent Settlement of Bengal   | 1941    | Escape of Subhash Chandra Bose from India and death of Rabindranath Tagore                           |
| 1799    | Fourth Mysore War - Death of Tipu Sultan   | 1942    | Arrival of Cripps Mission in India; Quit India Movement launched (August 8)                          |
| 1802    | Treaty of Bassein  | 1943-44 | Netaji Subhash Chandra Bose forms provisional Azad Hind Fauj and Indian National Army; Bengal Famine |
| 1809    | Treaty of Amritsar   | 1945    | Trial of Indian National Army at Red Fort; Shimla Conference; World War II ends                      |
| 1829    | Practice of Sati Prohibited  | 1946    | British Cabinet Mission visits India; Interim government formed at centre                            |
| 1830    | Raja Ram Mohan Roy visits England  | 1947    | Division of India; Indian and Pakistan separate independent dimensions                               |
| 1839-42 | First Afghan War   | 1948    | Mahatma Gandhi assassinated (January 30); integration of princely states                             |
| 1845-46 | First Anglo-Sikh War   |         |  |
| 1853    | First Railway line opened between Bombay and Thane and a Telegraph line in Calcutta            |         |  |
| 1857    | The Sepoy Mutiny of First War of Independence  |         |  |
| 1861    | Birth of Rabindranath Tagore   |         |  |
| 1869    | Birth of Mahatma Gandhi  |         |  |
| 1885    | Foundation of Indian National Congress   |         |  |
| 1889    | Birth of Jawaharlal Nehru  |         |  |
| 1897    | Birth of Subhash Chandra Bose  |         |  |
| 1904    | Tibet Expedition   |         |  |

*Courtesy: Heritage-Cartman, Feb 2012*

***Peace is the result of retraining your mind to process life as it is, rather than as you think it should be. - WYANE W. DYER***

## WHERE THEY RIDE WITHOUT ANY FEAR



This year, 435 riders without helmets have died on city roads.

There has been a shocking escalation in road fatalities related to helmetless riding in the city, with Chennai Traffic Police (CTP) statistics till September end indicating they account for 99 percent of all deaths of motorcyclists.

The traffic police have now planned to intensify the drive against helmetless riding.

A total of 437 fatalities involving motorcyclists have been recorded in the city this year, of which 435 involved riders without helmets who suffered severe head injuries. "After the helmet rule came into effect, our personnel intensified the drive and penalised many motorists riding without helmets in the city. We keep advising motorcyclists not to ride without protective headgear, but most people throw caution to the winds without realising the consequences of a simple fall and resulting head injury," said a senior CTP officer.

He said over speeding was a major reason for road fatalities, and youngsters with fast motorcycles and scooters flouting traffic rules were a major cause for concern.

Shockingly, substandard helmets and a failure to fasten the strap of a helmet while riding have also resulted in the deaths of a few young people in the last few years. In Chennai, it isn't mandatory by law for pillion riders to wear a helmet, unlike in Delhi or Kerala. But authorities here have always advised those seated pillion to wear helmets too. This year, so far, the city roads has witnessed 51 fatalities of pillion riders.

"Enforcement is secondary; self-discipline is primary. Police action or penalties can curb road accidents and resulting fatalities only to a certain extent. Motorcyclists should realise the consequences of helmetless riding as a fatal accident or a head injury resulting in a coma is traumatic for family too," the officer added.

### இயற்கை மருந்துகள்

இடுமருந்து வயிற்றில் புண் குடல் புண் ஆற மருத்துவம் நுணா இலை மற்றும் இதன் காய் (மஞ்சநெத்தி இலை) இரண்டையும் கொதிக்கவைத்து வெல்லம் சேர்த்து வடிகட்டி ஆறவைத்து குடித்துவர குடல்புண் ஆறும். மேலும் முருங்கை இலைச்சாற்றை 10 சொட்டுக்கள் குடிக்கவும்.

தலைவலிக்கான (நீர்க்கோர்வை) மருத்துவம் நாக்கடுகு இலை, சொடக்குத்தக்காளி, கேழ்வரகு மாவு, சின்னவெங்காயம் 2 சேர்த்து அரைத்து நெற்றியில் தடவினால் நெற்றியில் உள்ள நீரை வெளியேற்றும். அரை மணி நேரம் கழித்து கழுவுவும். *Courtesy: Zee Tamil Natural Medicines*

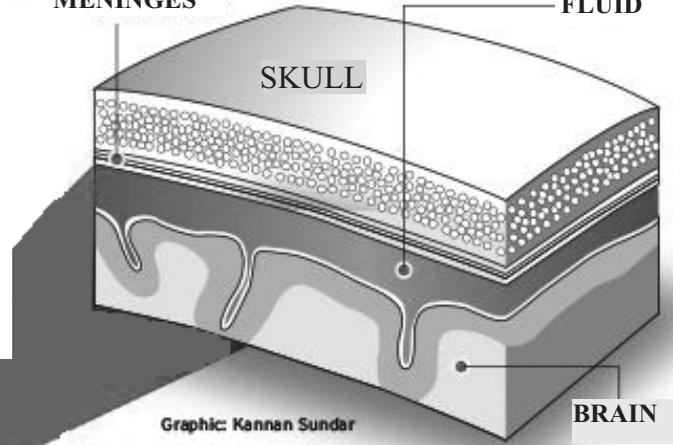
**WITHOUT ANY DEFENSE**

**Riding without a helmet is punishable under the Tamil Nadu Motor Vehicles Act**

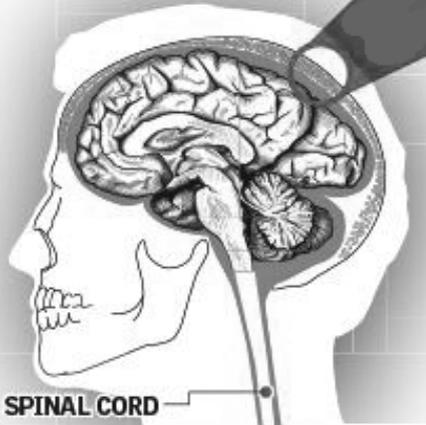
| FATALITIES   | 2013 | 2014* |
|--|------|-------|
| In two-Wheeler accidents                               | 655  | 437   |
| From head injuries sustained by riders without helmets | 643  | 435   |
| Involving pillion riders                               | 93   | 51    |

(\*till Sept)

MENINGES



Graphic: Kannan Sunder



**THE ANATOMY OF A BRAIN INJURY**

- \* The brain is a **sensitive organ** that floats in a liquid – cerebrospinal fluid – inside the skull cavity.
- \* When a rider is thrown off his vehicle and hits the road, the body stops on impact, but the **brain continues to move** because of the momentum
- \* It **slams against the skull** and goes back and forth, or rotates and collides with the skull
- \* This causes a brain injury. Blood vessels snap and **blood leaks into the skull cavity**
- \* In **mild and moderate brain injuries**, the skull is fractured and a portion of the brain damaged. Often, these injuries are **completely treatable**
- \* However, if the brain stem – the portion of the brain which connects it to the spinal cord – is damaged beyond repair, the patient **goes into a coma** and this Leads to **brain death**

**The Perils of ignoring helmet rule**

What happens moments after a motorcyclist without a helmet falls from his vehicle after an accident?

“When someone is riding very fast and collides with another vehicle, the rider is generally thrown off and hits a hard surface,” explains **Ranganathan Jothi**, head of the neurosurgery department at Rajiv Gandhi government General Hospital.

“This causes an impact injury – for instance a skull bone fracture. The momentum causes the brain, suspended in a liquid inside the skull cavity, to continue to move. It smashes against the skull bone and this leads to brain injuries”.

Every day, the neurosurgery department examines at least 40 cases of head injuries, about 70 Per cent of

them caused by road traffic accidents. Of these, about six are operated upon daily. A majority of the victims are men aged between 15 and 35.

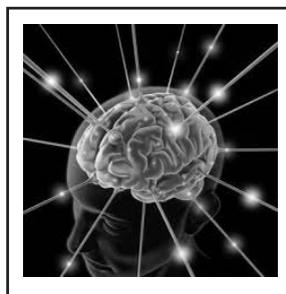
Riding a two-wheeler without a helmet, riding rashly and at high speeds are the major factors that lead to sustaining of head injuries, says, Dr. Jothi. “Helmets are crucial in preventing mild and moderate brain injuries. Safe driving will help prevent severe ones,” says Dr. Jothi.

With head injuries, it is crucial to bring in patients within the golden hour, says **Sai Surendar**, emergency consultant and chief at SRM Institute of Medical Sciences. “The brain is very sensitive. If there is no oxygen to it for over five minutes, the patient lapses into a coma”. *Courtesy: The Hindu, dt:11.10.2014*

**POWER YOUR MIND - WISE VS IGNORANT**

He is a wise man

Who not only sees but observes  
 Not only observes but learns  
 Not only learns but is ever eager  
 To translate that  
 Learning into practice  
 By all means, if it  
 Is good to himself  
 And for others



He is ignorant who says  
 ‘I know everything’  
 But he is wise who says  
 ‘I know but One Thing,  
 The source of everything.’

*Courtesy: Swami Srikantananda*

# UKKIRAPANDI MUTHURAMALINGA THEVAR

Ukkirapandi Muthuramalinga Thevar (October 30, 1908 – October 30, 1963), also known as Pasumpon Muthuramalingam Thevar, was an Indian politician. He hailed from the Maravar community and became the leader of the All India Forward Bloc in Tamil Nadu, and was national deputy chairman of the party from 1952 onwards. He was elected thrice to parliament.



## Childhood and family life

Thevar was born in the village of Pasumpon, Ramnad district. He hailed from a wealthy landlord family. Thevar was the only son of Ukkirapandi Thevar and Indiraniammal.

His mother died before his first birthday and his stepmother the next year. From 1910 onwards he was in the custody of his maternal grandmother Parvathiammal in the neighbouring village of Kallupatti. Parvathiammal was furious on Thevar's father for having taken two new wives shortly after the death of his second wife. During his youth, Thevar was aided by Kuzhanthaisami Pillai. Pillai was a close family friend of Thevar's father. Pillai took responsibility for arranging Thevar's schooling. First he was given private tuition and in June 1917 he began attending classes at an elementary school run by American missionaries in Kamuthi. Later he joined the Pasumalai High School (near Thirupparankundaram) and then he shifted to the Union Christian High School in Madurai.

Thevar would however, not complete his studies. In 1924 he missed his final examinations due to an outbreak of a plague epidemic. The following year he also missed his chance to attend the final examinations, as he returned to Pasumpon to fight a legal battle over issues of inheritance of family property. The case would linger and was not settled until 1927, when the court ruling in Muthuramalingam Thevar's favour. Thevar's father, Ukkirapandi Thevar, died on June 6, 1939.

## Anti-CTA struggle

One particular issue would have a special impact on Thevar's political career. Since 1920 the Criminal Tribes Act had been enacted by the government of the Madras Presidency and began to be implemented in the Madurai, Ramnad and Tirunelveli districts. After his entry into politics, Thevar began to mobilize resistance to the CTA. He toured villages in the affected areas and led protest rallies for the rights of the individuals registered under the CTA. In 1929 the Maravars of 19 villages in Appanad were forced to registered under the CTA. Thevar led a massive campaign in the villages, urging the people to defy the CTA. The authorities partially withdrew, and reduced the number of CTA registrations in the concerned areas from around 2000 to 341.

In 1934 Thevar organised a convention at Abhiram, which urged the authorities to repeal the CTA. A committee consisting of Thevar, Dr. P. Varadarajulu Naidu, Perumal Thevar, Sasivarna Thevar and Navaneethakrishna Thevar was appointed by the convention to carry on the efforts to persuade the government to revoke the Act. The CTA was, however, not revoked. On the contrary, its implementation was widened. Thevar again led agitations and awareness-raising campaigns against the Act. At the time the Justice Party was governing the Madras presidency, and their refusal to revoke the law created a strong animosity on Thevar's behalf towards the Justicites.

## 1936 District Board election

Infuriated over the attitude of the Justice Party government towards the CTA, Thevar came to the conclusion that the communities affected by the Act had to be mobilized by the Congress. After returning from a trip to Burma in 1936, he began to work to strengthen the Congress in the southern areas of the Presidency. He contested the election to the Ramnad District Board from the Muthukulathur constituency, defeating his Justice Party opponent. This was Thevar's first experience of being a candidate in an election.

After the election Thevar made a bid to be elected the president of the District Board. So did P.S. Kumarasamy, the Raja of Rajapalyam. Conflict erupted within the local Congress organisation over the issue. S. Satyamurthi, on behalf of the Tamil Nadu Congress Committee, intervened to preserve the unity of the Congress. Thevar was convinced to withdraw his candidature for president, and presented a motion nominating Kumarasamy as president. When the Congress Socialist Party began to mobilize in the Madras Presidency in 1936, Thevar joined their ranks.

## 1937 provincial election

Ahead of the 1937 elections to the assembly of the Madras Presidency, Thevar enlisted youths from the Mukkulathor communities to work for the Congress.

His activities created worries for the Justice Party government, which forbade him to travel outside of the Ramnad district and to make speeches in public. In February 1937 Thevar contested the assembly election himself, as a candidate in the Ramanathapuram constituency. He had a powerful opponent, the Raja of Ramnad. However, Thevar won a landslide victory with 11 942 votes against 6 057 for the Raja. Following the election the Congress formed a government in the Presidency. Thevar had high hopes that the new Congress ministry would revoke the Criminal Tribes Act. But the new Chief minister, C. Rajagopalachari, did not fulfill those hopes.

#### **As a trade unionist**

During the late 1930s, Thevar got increasingly involved in labour activities. He formed and led the Pasumalai Mahalaskshmi Mill Workers' Union, the Meenakshi Mill Workers' Union and the Madura Knitting Company Labour Union. During a prolonged strike of the Pasumalai Mahalaskshmi Mill Workers' Union, demanding the reinstatement of a section of fired trade unionists, Thevar was jailed for seven months from October 15, 1938. In the end, the management of the Mahalaskshmi Mills accepted the demands of the union. In the same period a strike was led by Thevar at the Madura Knitting Company. In 1945, he would become the founding president of the TVS Thozhilali Sangam.

#### **Tripuri session of the Congress and formation of the Forward Bloc**

Thevar attended the 52nd annual session of the Indian National Congress, held in Tripuri in March 1939. At this meeting the presidency of Subhas Chandra Bose was challenged by Pattabhi Sitaramayya. Sitaramayya had the active support of Gandhi. Bose was re-elected as the Congress President. Thevar strongly supported Bose in the intra-Congress dispute. Thevar mobilised all south India votes for Bose. However, due to the manoeuvrings of the Gandhi-led clique in the Congress Working Committee, Bose found himself forced to resign from the Congress Presidency. He then launched the Forward Bloc on June 22, calling for the unification of all leftwing elements into a united organisation within the Congress. Thevar, who was disillusioned by the official Congress leadership which had not revoked the CTA, joined the Forward Bloc. When Bose visited Madurai on September 6, Thevar organised a massive rally as his reception.

#### **In jail**

The growing popularity in Thevar as a leader of elements opposing the official Congress leadership in Tamil Nadu troubled the Congress-led government. Thevar was also increasingly associated with labour militancy. A criminal case, the so-called Madura Security Case, was proceeded against him. He was banned from leaving Madurai. When travelling to his birthplace, Pasumpon, in September 1940 he was apprehended and

jailed for 18 months at the Central Jail in Tiruchirapalli. His capture sparked wide condemnation in Tamil Nadu. Soon after his release he was arrested again under the Defense of India Rules. He was released from prison on September 5, 1945.

#### **After release from jail**

In 1945 C. Rajagopalachari tried to make a comeback within the Congress organisation in Tamil Nadu. He had the support of Gandhi and Sardar Patel, but the majority of in the Tamil Nadu Congress Committee opposed him. A conference was held in Tirupparankundram, in which the leadership should be elected. Chaos broke about during the conference, as warring factions confronted each other. Thevar interrupted the disputes and passed a motion reelecting Kamaraj as the TNCC President. Elections to the assembly of the Madras Presidency were again held in March 1946. Thevar contested from the Mudukulathur constituency, and was elected unopposed. Soon thereafter, the CTA was repealed.

In February 1948 the Congress expelled all dissenting fractions, including the Forward Bloc. The Forward Bloc became an independent opposition party, and Thevar became its president of its Tamil Nadu state unit (a position he would hold for the rest of his life).

On January 23, 1949, in connection with birthday anniversary celebrations of Subhas Chandra Bose, Thevar publicly announced that Bose was alive and that he had met him. Soon thereafter Thevar disappeared without any explanation. He returned to public life in October 1950. Rumours claimed that he had travelled to Korea and China during this period.

On the national level the Forward Bloc had been suffering from internal ideological divisions. In 1948 two separate Forward Blocs had emerged, a 'Forward Bloc (Marxist)' (out of which the Forward Bloc of today emerged) and a 'Forward Bloc (Ruiker)' (led by R.S. Ruiker). On June 23, 1951, the two parties reunified at a meeting in Calcutta. A central committee was announced for the united party, which included Thevar as one of its members.

#### **1952 general election**

In January 1952 the first general elections in independent India were held. The Forward Bloc contested with the aim of forming non-Congress governments at the Centre as well as in the states. Election were held simultaneously to the Lok Sabha as well as to the legislative assemblies of the states. Thevar contested the Aruppukottai constituency in the Lok Sabha election and the Mudukulathur constituency in the assembly election. He won in both cases. After the election, he decided to vacate his Lok Sabha seat and concentrate his efforts to the Madras legislative assembly. After the election, Congress lacked a majority of its own in the Madras legislative assembly. Thevar cooperated with the communists in trying to form a non-Congress

governing coalition. However, the governor intervened and made C. Rajagopalachari of the Congress the Chief Minister.

### **Split in the Forward Bloc**

In 1955, internal divisions reappeared with the Forward Bloc. The Indian National Congress had adopted Socialism as its guiding principle at a session in Madras. Some leaders within the Forward Bloc, like the chairman Mohan Singh and Sheel Bhadra Yajee, now argued that the time had come for the Forward Bloc to merge with the Congress. This proposal did however not win much support in other sections of the party leadership. Singh-Yagee unilaterally declared the party merged into the Congress. An extraordinary central committee meeting was convened in Nagpur May 11–15, 1955. Singh, Yagee and their followers were expelled from the party. Hemanth Kumar Bose was elected chairman of the party, Haldulkar the general secretary and Thevar the deputy chairman of the party. Thevar would hold that post until his death.

### **1957 general election**

In December 1955 Thevar travelled to Burma for the second time, during which he took part in political and religious activities organised by the All Burma Tamil Nadu Association. He returned on February 18, 1956 and began to prepare for the coming general election.

A new dynamic in the efforts to build a non-Congress front had emerged in the Madras State (which had been reorganised in 1956). The Congress had been divided and C. Rajagopalachari had formed a new party, the Congress Reform Committee (CRC). Thevar now made peace with his former enemy C. Rajagopalachari, and the Forward Bloc and the CRC worked together to defeat Kamaraj and the Congress rule in the state.

In the election Thevar again contested both the Aruppukottai constituency in the Lok Sabha election and the Mudukulathur constituency in the assembly election. He won both seats, but this time he decided to vacate the assembly seat.

### **Ramnad riots**

A by-election was held in the Mudukulathur assembly constituency on July 1, 1957, as Thevar had resigned from his assembly seat. The election was won by D.V. Sasivarna Thevar of the Forward Bloc. The situation in the area was tense on the day that the results were released, and there was a sizeable presence of police forces in place. Clashes between Maravars, who largely supported the Forward Bloc, and pro-Congress Devendrars began in a few villages soon after the election result was acknowledged. Gradually the violence spread to more and more villages, and by August the riots had spread throughout the entire district. Several persons were killed and thousands of houses were torched. Thevar himself travelled to Delhi on July 17 to attend the session of the Lok Sabha. He returned on September 9. On September 10 he took part in a 'Peace

Conference' together with T. V. Sasivarna Thevar and Velu (a Dalit legislative assembly member of the Forward Bloc). From the Congress side six Devendrars took part. There was also a delegate from the Nadar caste. The conference concluded that the three castes should live in harmony.

Emmanuel sekaran Devendrar, the leader of the Congress Dalits at the Peace Conference was killed the following day. On September 28, a few days after the clashes had ceased, Thevar was arrested by the police under the Preventive Detention Act. Thevar's was apprehended directly after holding a speech at the conference of the Indian National Democratic Congress (the new name taken by the Congress Reform Committee). Thevar was taken to the Jail. Pudukkottai court was hearing that case. He was later accused of having masterminded the murder of Emmanuel sekaran Devendrar. The Forward Bloc and its allies condemned Thevar's arrest as a political vendetta, engineered by the Congress. A 'Thevar Committee' was set up by the INDC. Thevar was acquitted of all charges and released in January 1959.

### **Final years**

After being released from prison Thevar began mobilising for the Madurai municipal elections, held in March 1959. An alliance of the Forward Bloc, Communist Party of India, Indian National Democratic Congress and Dravida Munnetra Kazhagam was formed. The alliance won the elections, and for the first time Congress lost its hold over the city administration. Following the election, Thevar's health deteriorated and he largely withdrew from public life. He was nominated for the 1962 Lok Sabha election. However he only attended a single campaign meeting, which also was attended by C. Rajagopalachari (who now had merged with his INDC with the Swatantra Party). Thevar was reelected, but due to health reasons he was unable to travel to the parliament in Delhi. U. Muthulingam Thevar, died on October 30, 1963, on his 55th birthday. A by-election for the Aruppukottai Lok Sabha constituency seat vacated by his death was held in 1964, in which the Forward Bloc was defeated for the first time.

### **Legacy**

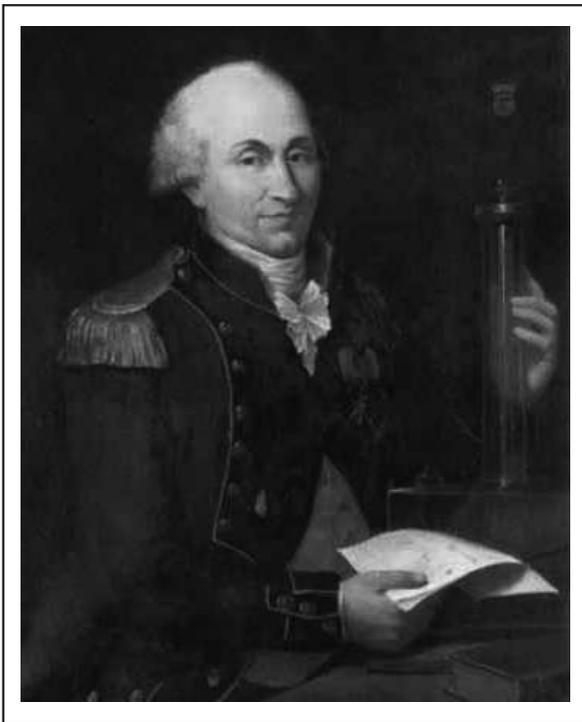
Statue of Thevar garlanded during *Thevar Jayanthi* in Madurai, 2007.

The pillars of Thevar's political thought were spiritualism, nationalism, anti-communism, anti-imperialism and non-Congressism (wanting to create a non-Congress political alternative). Although committed to the construction of a federal socialist India, Thevar rejected Marxism-Leninism as a foreign concept and he opposed the trade policy of the Soviet Union as discriminatory towards countries like India. But first and foremost, his animosity towards the communists was due to the rejection of the Indian communists of Subhas Chandra Bose (who they had called a



# CHARLES AUGUSTIN DE COULOMB (1736-1806)

Charles Augustin de Coulomb was born in Angoulême the Capital of Angoumois in France. His parents were Henry Coulomb and Catherine Bajet. He went to school in the Collège Mazarin in Paris where his father lived. His studies included philosophy, language and literature. He also received a good education in mathematics, astronomy, chemistry and botany. He was described by his professor as a smart and active young man. Coulomb graduated in November 1761 from École royale du génie de Mézières. Over the next twenty years he was posted to a variety of locations where he was involved in engineering, in structural, fortifications, soil mechanics, as well as other fields of engineering. His first posting was to Brest but in February 1764 he was sent to Martinique, in the West Indies, where he was put in charge of building the new Fort Bourbon and this task occupied him until June 1772.

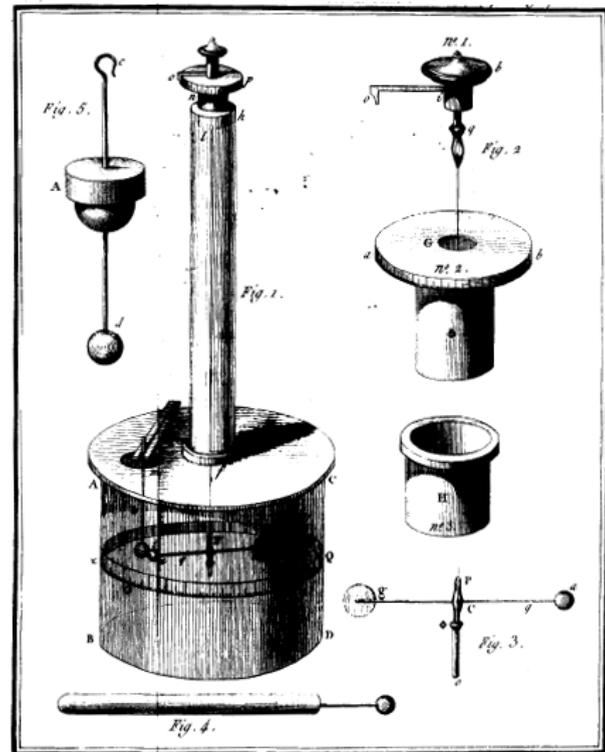


On his return to France, Coulomb was sent to Bouchain. However, he now began to write important works on applied mechanics and he presented his first work to the Académie des Sciences in Paris in 1773. In 1779 Coulomb was sent to Rochefort to collaborate with the Marquis de Montalembert in constructing a fort made entirely from wood near Ile d'Aix. During his period at Rochefort, Coulomb carried on his research into mechanics, in particular using the shipyards in Rochefort as laboratories for his experiments. Upon his return to France, with the rank of Captain, he was employed at La Rochelle, the Isle of Aix and Cherbourg. He discovered an inverse relationship of the force between electric charges and the square of its distance, later named after him as Coulomb's law.

In 1781, he was stationed at Paris. On the outbreak of the Revolution in 1789, he resigned his appointment as *intendant des eaux et fontaines* and retired to a small estate which he possessed at Blois. He was recalled to Paris for a time in order to take part in the new determination of weights and measures, which had been decreed by the Revolutionary government. He became one of the first members of the French National Institute and was appointed inspector of public instruction in 1802. His health was already very feeble and four years later he died in Paris. Coulomb leaves a legacy as a pioneer in the field of geotechnical engineering for his contribution to retaining wall design. His name is one of the 72 names inscribed on the Eiffel Tower.

## Research

In 1784, his memoir *Recherches théoriques et expérimentales sur la force de torsion et sur l'élasticité des fils de metal* (Theoretical research and experimentation on torsion and the elasticity of metal wire) appeared. This memoir contained the results of Coulomb's experiments on the torsional force for metal wires. His general result is,



"... the moment of the torque is, for wires of the same metal, proportional to the torsional angle, the fourth power of the diameter and the inverse of the length of the wire..."

In 1785, Coulomb presented his first three reports on Electricity and Magnetism:

- *Premier Mémoire sur l'Électricité et le Magnétisme*. In this publication, Coulomb

describes “How to construct and use an electric balance (torsion balance) based on the property of the metal wires of having a reaction torsion force proportional to the torsion angle.” Coulomb also experimentally determined the law that explains how “two bodies electrified of the same kind of Electricity exert on each other.” On page 574 he states:

*Il résulte donc de ces trois essais, que l'action répulsive que les deux balles électrisées de la même nature d'électricité exercent l'une sur l'autre, suit la raison inverse du carré des distances.*

Translation: *It follows therefore from these three tests, that the repulsive force that the two balls — [which were] electrified with the same kind of electricity — exert on each other, follows the inverse proportion of the square of the distance.*

- *Second Mémoire sur l'Électricité et le Magnétisme.* In this publication, Coulomb carries out the “determination according to which laws both the Magnetic and the Electric fluids act, either by repulsion or by attraction.” On page 579, he states that the attractive force between two oppositely charged spheres is proportional to the product of the quantities of charge on the spheres and is inversely proportional to the square of the distance between the spheres.
- *Troisième Mémoire sur l'Électricité et le Magnétisme.* “On the quantity of Electricity that an isolated body loses in a certain time period, either by contact with less humid air or in the supports more or less idio-electric.”

Four subsequent reports were published in the following years:

- *Quatrième Mémoire* “Where two principal properties of the electric fluid are demonstrated: first, that this fluid does not expand into any object according to a chemical affinity or by an elective attraction, but that it divides itself between different objects brought into contact; second, that in conducting objects, the fluid, having achieved a state of stability, expands on the surface of the body and does not penetrate into the interior.” (1786)
- *Cinquième Mémoire* “On the manner in which the electric fluid divides itself between conducting objects brought into contact and the distribution of this fluid on the different parts of the surface of this object.” (1787)
- *Sixième Mémoire* “Continuation of research into the distribution of the electric fluid between several conductors. Determination of electric density at different points on the surface of these bodies.” (1788)
- *Septième Mémoire* “On magnetism” (1789)

Coulomb explained the laws of attraction and repulsion between electric charges and magnetic poles, although he did not find any relationship between the two phenomena. He thought that the attraction and repulsion were due to different kinds of fluids. Charles de Coulomb was the one who discovered Coulombs Law; he did this by measuring the twist in a wire, or Torsion Balance.

## 20 MOST PEACEFUL COUNTRIES IN THE WORLD – 1

Do you know which are the most peaceful countries in the world? Since 2007 each year, the Global Peace Index has been issued by the IEP (Institute for Economics and Peace) and is a measurement of nations’ and regions’ peacefulness based on external and internal measures. Although it seems like the world is becoming more cruel, according to the Global Peace Index there are 20 most peaceful countries in the world.

### DENMARK

**Denmark** tops the list of the most peaceful countries on Earth since it’s really a safe place to live. Even while Copenhagen, the capital of Denmark, was under occupation by the Nazis during the World War II, it still did not fight. The point is that people living in Denmark prefer to focus on economic matters, instead of involving themselves in various armed conflicts. Danish people are very friendly, open and helpful. Personally I have been to Copenhagen twice and I wish I lived in this country. I’m pretty sure that those who have been to Denmark at least once could say the same.

*(To be continued)*

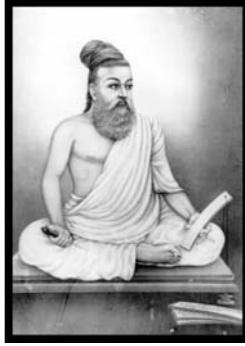
*Courtesy: Amerikanki*



## TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' 20

Marketing is the core activity around which the Business revolves and the key elements of Marketing are Knowledge of Customers, their needs and behavior and the Knowledge of Competition.

Marketing Warfare is a popular concept of present times as strategies are formulated to face competition and win over our share of Business. One of the important quotes of Business or Marketing is that 'You cannot formulate your Strategy unless you know your competitors strategy'. Business intelligence and constant touch with all the activities, happenings and changes in needs and behavior in the Market Place are the only ways, which can help assess competition and formulate appropriate strategies. 'Interactivity' and 'Connectivity' are again the two concepts to constantly assess the feedback from Customers and the constant changes that keep taking place in the territories.



Valluvar brings out these concepts and directions in the following Kurals, where he addresses the King and the Kingdom which can equally apply to the Business Head and the Market place. He also, appropriately mentions about use of Books on the subject and past experience while formulating the strategies.

**"Otrum Uraisandra Noolum Ivaiirandum  
Thetrenga Mannavan Kann" Kural 581**

ஒற்றும் உரைசான்ற நூலும் இவைஇரண்டும்  
தெற்றென்க மன்னவன் கண். குறள் 581

**"Let the King understand that Intelligence Forces  
and the appropriate Books and Knowledge are the  
two eyes wherewith he seeth"**

**"Ellarkum Ellam Nigazhbavai Engnandrum  
Vallaridhal Vendan Thozhil" Kural 582**

எல்லார்க்கும் எல்லாம் நிகழ்பவை எஞ்ஞான்றும்  
வல்லறிதல் வேந்தன் தொழில். குறள் 582

**"It is the duty of the King to constantly keep track  
all the time of everything that befalleth every man  
and every day"**

## HOME FESTIVALS - 1

**தை – Thai (mid-January/Mid-February)**



At left the Sun god, Surya, is being worshiped with the outdoor cooking of a large pot of rice from the recent harvest. The overflowing of the dish is called "pongalo-pongali", and thus this festival is known as **Thai Pongal**. Other crops, like sugarcane, bananas and turmeric, are also offered. *Kolams* (hand-made rice flour patterns) are drawn in the form of the chariot, with the Sun and Moon in the centre. On this day cows and other animals are decorated and fed special foods, and their owners prostrate to them. Crows and other birds are offered food on leaves of turmeric. Sisters pray for the welfare of brothers, and elders bless the children. Thai Pongal is celebrated by the poorest farmers and the wealthiest householders.

(To be continued...)

***One easy method of providing fodder for the cows without any cost is for housewives, hotel keepers, and hostel authorities, to carefully preserve every day in a neat and sanitary place, their kitchen garbage, such as wastage from plantain leaves, skins of all fruits and vegetables, the water after washing rice and the kanji. If an organization like the Pinjrapole or a group of cow owners can arrange to come round daily and collect them, the amount of fodder that will be thus available to our cows will be considerable.***

- H.H. Shri Paramacharya

## SHERATON HUZHOU HOT SPRING RESORT



Officially called Sheraton Huzhou Hot Spring Resort, the ring-shaped, 27-storey structure lies on Taihu Lake between Nanjing and Shanghai and is currently in its soft-opening phase. Its unique design was conceived by the architect Ma Yansong and constructed by Shanghai Feizhou Group. Best known in his native China, Yansong has worked with Zaha Hadid Architects in London and is responsible for the rippling Absolute Towers in Mississauga, Canada.

With two levels that underground to create a complete oval, and 27 floors above water, the Sheraton Huzhou contains 282 rooms and a host of design features intended to lure China's rapidly growing population of luxury travellers. Jade, a symbol of elegance and pureness in Chinese culture, is found throughout the hotel. The lobby's floor is paved with Afghanistan White Jade and features Tiger's Eye Stone from Brazil, while the porticos and the entire ceiling are laid with Citrine, a jade that symbolizes wealth. Additionally, the lobby ceiling is decorated with 20,000 Swarovski and European natural crystal lamps which are suspended in a way intended to resemble a rolling wave.

Additional features include an extensive spa as well as a separate 'spa village' which features eight villas, 40 hot springs and a yacht dock. A club lounge, huge ballroom and various restaurants and bars will also be available to guests who find themselves in Huzhou. Known as the 'City of Silk' because of its ancient silk-production industry, the city is said to be the home of China's tea culture as well as the capital for writing, calligraphy and painting. Nearby attractions include the Anji Bamboo Museum Garden, the 8th-century Feiyang Pagoda and Huzhou Hot Spring Golf Club.



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