



ELECTRICAL

INSTALLATION ENGINEER

NEWS LETTER

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

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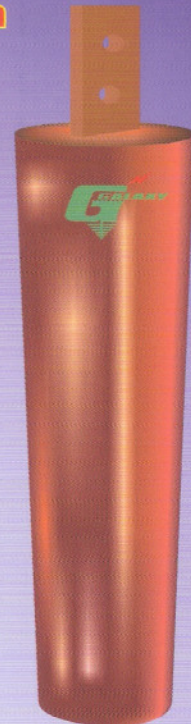
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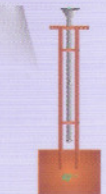


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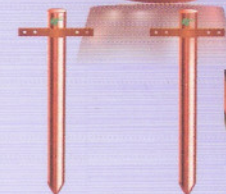
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EDITORIAL

Dear Members, Fellow Professionals and Friends

Seasons Greetings to one and all!

Greetings for A Happy Ayudha Pooja!!

Engineers day was celebrated in a grand manner at the Institution of Engineers India and the Key Note speaker stressed on the challenges in the forms of Technology, Productivity and competitiveness and apart from them advocated strongly that Indian Engineers must focus on becoming very good in three languages namely English, Hindi and the Mother Tongue. He also strongly suggested that we should learn one foreign language which could probably be Chinese or German to help meet the “Engineering Challenges for Knowledge Era”.

We can feel Happy and Proud about our heritage of celebrating Ayudha Pooja in tune with the dreams of our great patriots “UZHAVUKKUM THOZHILUKKUM VANDANAI SEYVOM” and the added dimension today is Services. All the three contribute to generation of wealth and all round growth of prosperity. This has been happening steadily in our country in spite of so many odds mainly due to the enterprise of people. It is very heartening to note the bold, fast and the powerful initiatives by both the State and the Centre in the areas of Energy, Industries, Investments, Infrastructure and many more such areas. India certainly has a great future if only the corruption comes down and the politicians and the professionals start realizing their great potential and the responsibilities.

It is very encouraging to note the increased stress on harnessing the Solar Energy in a very big way in our Country. But we have been writing in these columns’ about the great potential available in our country in the areas of both Bio Energy and Waste to Energy. Another area that needs immediate focus is harnessing of all the surplus and flood waters of all the rivers in our country. Interlinking of Rivers is a regular and popular slogan in our country with clarity in their mind that it will never happen. The real and feasible solution could probably be creation of a National Water Grid or Water Ways in our country utilizing only the spareable surplus waters from all the rivers of the country. There are always floods in our country in some of the rivers every year and the surplus waters are all hurriedly put into the sea to save the people and the cultivation. Studies have shown that even small rivers like Vaigai and Thambrabarani drain out 30 to 50 TMC of waters to the sea periodically, if not every year. Engineers from many parts of the country and particularly from Tamilnadu seem to have done lot of work in this area. One of the most important dimensions of this Water Grid Project is that it can help generate One Lakh Megawatts or more of Energy apart from help reduce fuel consumption in Transportation substantially. It is time therefore that the Governments take note and initiate urgent steps.

Our advance Greetings to our readers on the forthcoming occasion of Deepavali, the Festival of Lights, for bringing Brightness and Happiness!

We thank all those members who have helped us by participating in the advertisements appearing for the issue September 2015 – Supreme Power Equipment Pvt. Ltd., FLIR Systems India Pvt Ltd., Cape Electric Pvt. Ltd., Power Links, Electrotherm India Ltd., Galaxy Earthing Electrodes Pvt. Ltd., Energy Mission Machineries (India) Pvt Ltd., JL Seagull Power Products, OBO Bettermann India Pvt. Ltd., P2 Power Solutions Pvt. Ltd., Abirami Electricals, Ashlok Safe Earthing Electrode Ltd., DEHN India Pvt. Ltd., Wilson Power and Distribution Technologies Pvt Ltd., Faith Power Solutions, I.P.L. Products, Universal Earthing Systems Pvt. Ltd.

EDITOR

LETTER TO THE EDITOR

Dear Sir,

I find your “Electrical Installation Engineer” Magazine very informative and useful, particularly for Engineers interested in Installing good Quality and Safe Installations.

I also request you to advise me about the latest Policy of the Tamilnadu Govt. regarding Rooftop Grid Connected Solar Installations with Net Metering.

Thanks

S.S. HUBLI, Chairman
AVR Electronics P. Ltd.,
Bengaluru

OBITUARY



**Thiru
S. KALYANASUNDARAM
D.O.D.: 30.08.2015**

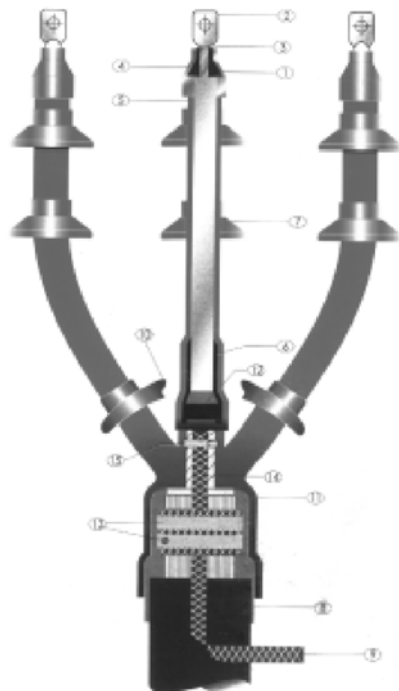
On behalf of The Tamilnadu Electrical Installation Engineers Association ‘A’ Grade extends **Heartfelt Condolences** for the demise of **Thiru S. KALYANASUNDARAM**, Retd. EI to Govt. of Tamilnadu.

We pray the almighty to rest his Soul in Peace.

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MEMBERS DETAILS

S.No.	Company Name	License No.	District	Contact No.
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120.	Sri Balaji Enterprises	EA 2515	Chennai	044-24845868, 9884709974



POWER LINKS

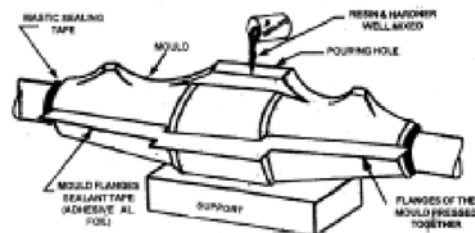
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EVENTS



Events Profile: CWP Conference includes the policy and market forums, the entrepreneur forums and the technology forums. The policy and market forums focus on global market development and regional market development in China and around the world. At the entrepreneur forums, Chinese and foreign enterprise representatives are invited to discuss challenges in the wind power market, international experiences and best practices, and solutions to the challenges.

Date: 14th – 16th October 2015

Venue: China International Exhibition Center (New Venue), Beijing, China

Website: http://chinawind.org.cn/cwp2015/index_en.asp



Events Profile: Power Nigeria provides a dedicated platform for utilities, contractors, consultants, distributors and other power specialists to source and discover the latest power technologies from around the world and learn from industry leaders in a 2 day free to attend conference.

Date: 3rd – 5th November 2015

Venue: EKO Hotel, Lagos - Nigeria

Website: <http://www.power-nigeria.com/>



Events Profile: The event's exhibition and conference both focus on the areas of photovoltaics, PV production technologies, energy storage systems and solar thermal technologies. Since being founded, Intersolar has become the most important industry platform for manufacturers, suppliers, distributors, service providers and partners of the solar industry.

Date: 18th – 20th November 2015

Venue: The Bombay Exhibition Centre (BEC), Mumbai

Website: <https://www.intersolar.in/en/home.html>



Events Profile: All sessions boast a practical 'how to' focus to provide you with the tools to form a joint venture, acquire finance, secure land, gain grid access. Leading local developers from Thailand, Philippines and Indonesia will share inside knowledge of upcoming policy changes

and regional regulations. 15 organisations, from international financial institutions, local banks, private equity firms and international development companies, are already confirmed and looking for business partners. Focus sessions address the respective country differences rather than approaching Southeast Asia as a homogenous market.

Date: 25th – 26th November 2015

Venue: IMPACT Exhibition and Convention Center, Bangkok, Thailand

Website: <http://seasia.solarenergyevents.com/>



South Asia Power Congress & Expo 2015

Events: South Asia, inclusive of India, Pakistan, Nepal, Bhutan and Sri Lanka, is now undergoing an especially promising period of its regional integration and economic cooperation. Proposed and led by India, power transmission grids at intrastate, interstate and cross-border levels are being deployed and commissioned all over the region, linking the countries within, as well as the energy sector.

Date: 1st – 3rd December 2015

Venue: The Kingsbury, Colombo, Sri Lanka

Website: <http://www.neoventurecorp.com/events/southasiahydro/>

TIME TO TAP SOLAR THERMAL ENERGY

A discussion on solar energy would naturally veer towards solar photovoltaics (SPV). Chances are few would have heard of solar thermal energy (STE), and rightly so, as PV panels dot the **Indian** landscape. Generating electricity from STE is similar to a conventional thermal power plant, the only difference being that instead of coal or gas, sunlight is concentrated by mirrors to generate steam, much like our childhood experience of **burning** paper with a magnifying glass.



The possibility of a 24×7 operation is the biggest USP of solar thermal plants. Moreover, unlike solar PV, which can only generate electricity, STE can be used to produce electricity, high temperature heat for process industries, refrigeration, and even fuels such as hydrogen. Clearly, STE is a dormant energy giant waiting to explode.

Despite its inherent advantages, STE is still in a state of infancy in **India**. Godavari Green Energy's 50 MW parabolic trough plant, **India**'s first commercial solar thermal plant, went on stream in 2013, while the world's first commercial solar thermal plant started operation in California in 1984.

At ₹14 crore / MW, a solar thermal plant is about 80% more expensive to build than a solar PV plant. STE currently is in the same state that solar PV was 15-20 years ago. Then too, solar PV was being castigated as being too expensive, a far cry from today when it is on the path to grid parity. What stands in good stead for STE is that **India** has the expertise in many generic technologies that are used in the production of solar thermal energy. Companies like Bhel have the expertise to design and manufacture components for the power block that converts steam into electricity. The solar block for converting sunlight into steam makes up 50-60% cost of a solar thermal plant, and is the biggest impediment in the path for cost-effective, indigenous development of STE. For example, expertise for making low-cost iron glass mirrors is not available in **India**. What should be our development strategy to make **India** a prominent technology provider in the global STE map? Let me outline a four-pronged strategy, which would go a long way in meeting the nation's energy needs, while increasing the indigenous engineering expertise and components manufacturing base.

* First, it is essential to set up a domestic manufacturing base for the solar block to drive down the costs. Making component would require significant infusion of technology and funding, which, alas, would depend on order volumes. So a viable solution is to hybridize a solar thermal plant with an existing coal/gas-fired plant. This should reduce the financial risk by 40% since the turbine will be shared. Another advantage is fuel compensation. When the sun is strong during the day, a larger proportion of the power can be generated through STE, thus saving on coal/gas. To incentivize hybridization, the National Solar Mission should extend the incentives of stand-alone solar plants to hybridized plants. This also fits in neatly with the renewal purchase obligations of thermal plants and also for carbon dioxide emitting manufacturing plants that have captive thermal power plants.

* Second, efforts should be made to develop expertise for designing and manufacturing critical components of the mature STEs, namely, parabolic trough and solar tower, as they are most likely to be installed for supplying **bulk** power to the grid. This would require expertise for developing new materials like alloys, low iron glass, specialised coatings, vacuum tubes, etc. Of greater importance is the engineering expertise for large-scale production of critical components—an **Indian** weakness— which last 15-20 years.

* Third, value added applications of STE should be looked at. Production of hydrogen gas and multi-utility chemicals such methanol using STE holds great promise. STE-based sea water desalination demonstration plants have been set-up; the main challenge is to drive down the costs. Cold storages are generally located in semi-urban and rural areas where power supply is irregular. Here one possible solution is to set-up a self- compensating, hybrid solar-conventional (electricity-based) air-conditioning system. When the sun is high, STE provides cooling, and as the day progresses, the proportion of conventional cooling increases. In the absence of sunlight, biomass boilers power solar cooling.

* Four, R&D should begin right now on disruptive innovation related to development of both STE and value-added applications, two examples of which are: (i) adaptation of current STE for generating electricity using supercritical carbon dioxide or simply from pressurised air, and (ii) use of STE for “green” production of metals from its ores, thereby cutting coal dependency. Work is also progressing on integrating STE and solar PV where the former extracts process heat and the latter generates electricity simultaneously. One major deficiency is the absence of small-scale STE units for deployment in distributed electricity generation and in commercial and housing complexes, one example of which is the MIT solar thermal system that can be used to create electricity without turbines.

How do we move forward? The main challenge is to synergise the expertise in generic STE technologies spread across several industries and move forward in a consortium mode. Materials and processes developed in laboratories have to be engineered and scaled-up by industry partners. Academic and R&D institutions have to work with industry to jointly design and develop manufacturing facilities for critical solar block components. One noted scientist remarked “STE is not rocket science, **but** getting **Indians** to work together is the real rocket science.” So, who will fire this rocket? In essence, we have to take a call whether the PM’s “Make in **India**” campaign for STE will be about Chinese companies manufacturing components in **India**, or **Indian** companies manufacturing indigenously designed components?

Source: Financial Express

NSE SETS UP WIND ENERGY PROJECT

India’s leading stock exchange National Stock Exchange of India Ltd installed a 6.25 MW wind power project at Satara in Maharashtra.”65% of the energy consumption of NSE office located at Exchange Plaza building, Bandra-Kurla Complex (BKC) Mumbai will be met by this wind project,” a statement said.

The project was implemented by Suzlon Group, one of the leading wind turbine manufacturers. The unit, comprising of 5 units of Suzlon’s robust S66, 1250 kW WTGs, will help in reducing ~12,730 tonnes CO₂ emissions annually, it said.

“The investment in wind power project is part of our long term focus on sustainable development. We are committed to conduct business in a way that protects the environment by using green technology. Harnessing wind energy for our operations is a step in that direction. This is in addition to the various power saving and energy efficient measures being undertaken at the premises,” said Mahesh Haldirpur, NSE spokesperson.

“The increased focus and investment in wind energy is a testament of efforts by corporates in India towards mitigating climate change and energy security,” said Ishwar Mangal, Chief Sales Officer, Suzlon Group. “NSE’s thrust on sustainable development and investments in wind energy will also encourage other corporates to harness wind energy for meeting their energy requirements and to hedge power cost for next 25 years thereby contribute towards a greener tomorrow. Suzlon’s ‘concept to commissioning’ approach offers convenience to customers for setting up wind project for captive use.”

Suzlon leveraged its end-to-end wind solutions expertise to oversee the project completion from start to end.



KNOW THY POWER NETWORK - 97

As stated in my last article, this time the focus will be on three selected topics only viz. Sparks and Arcs, Tan delta and Power Factor and other concepts relating to insulation.

I. Sparks and Arcs.

Almost all persons dealing with solid insulating materials or insulators will be familiar with surface tracking of insulation caused by surface arcs either under dry conditions or under wet conditions. There are many international standards like ASTM and IEC that prescribe test procedures for evaluating materials for **“Tracking Phenomenon”**. **Tracking** is one of the failure mechanisms of solid insulators (porcelain or composite dielectric) and resin based insulation materials. *It is nothing but the conversion of insulating resin surface or insulator surface to conducting carbon when it is locally exposed to very high temperature. Arcs which brought this development may be brought from the interruption of current flowing through water or any other conducting fluid on the insulation's surface or they may evolve from a high voltage spark flashover. Now a question arises – what is the difference between arcs and sparks?. To get answer for this question, let us first understand the distinction between sparks and arcs.*

Sparks – A type of discharge caused by relatively low current limited by the impedance of the series insulation barriers or circuit elements. The heat developed in this process is small. Though the quantum of heat energy produced is small, it still brings appreciable chemical decomposition in its vicinity. We can quote partial discharges as an example for this phenomenon.

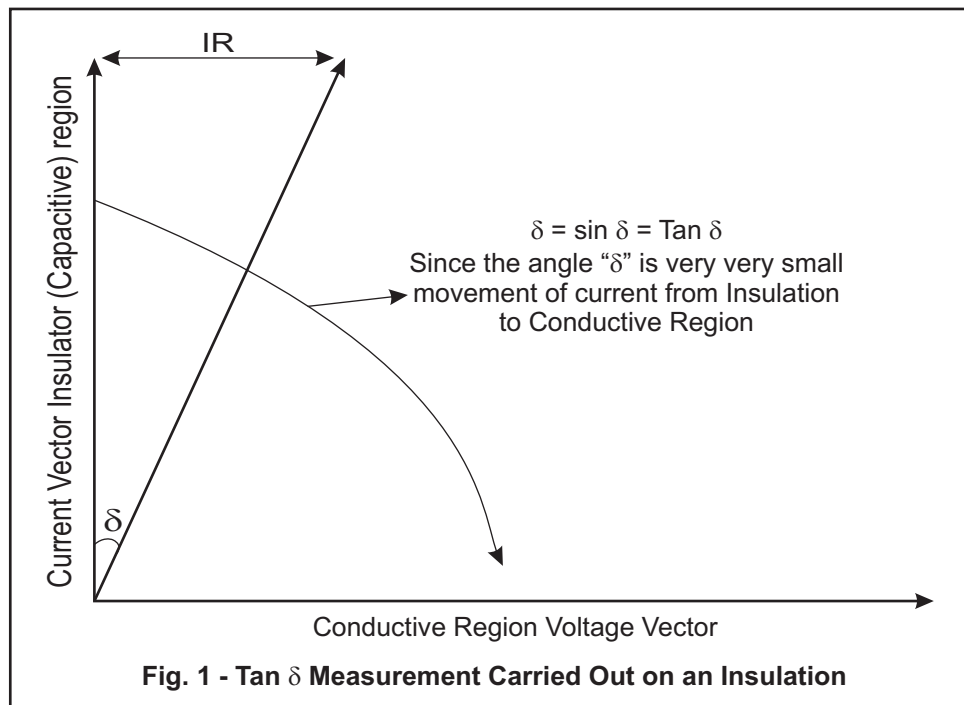
ARCS – By their very nature, they associate / involve comparatively much higher currents, developing much higher temperature. Surface water films, if any present will limit the currents in the circuit surface water film produces very much less impedance when compared with that of their insulating film. Now let us learn about the phenomenon of **“DRY ARC”**. When the water film (caused by mist and rain) exists, this phenomenon (DRY ARC) is widely noticed in contaminated / polluted line insulators. In the beginning, the current flows through the circuit and causes the heating of the film. As a consequence, the water gets partially evaporated and the film is broken. Now the current gets interrupted and it forces the arc to try some other ways to maintain its continuity. As a part of this forced process the arc bridges the gap produced in the water film earlier and maintain its continuity. Now the arc current is limited only by the resistance of water film. This kind of arc discharge (DRY ARC) produces very high temperature locally and causes the carbonization of the insulator surface or resin surface concerned. These spots of carbonization are more conducting than the water film and produces further arcs and extension of **“Carbon Track”** across the affected surface. So wide spread damages / destruction will occur in a very short time. In this context, it may be noted that this kind of **“Tracking”** can also develop from the presence of **“Water Condensation”** caused by the changes in the operating environment of the insulators. Use of track resistant resins / or clean hydro phobic surfaces deter the development of continuous water film when condensation of moisture occurs. Tracking and flash over due to surface water can also be reduced when the surface voltage stress is low (i.e. use of more insulators in a string).

II. Power Factor (Cos ϕ) and Tan δ (Dielectric Loss Factor or Insulation Power Factor)

What does power factor mean to you? Cos ϕ or Tan δ . It depends upon whether you are an **“Electric Power Engineer or Insulation Engineer”**. If you answer cos ϕ is power factor of the circuit, then we can easily guess that you are an electric power engineer dealing with the management of reactive power flow in a circuit or in a service connection. Then we take it for granted that you may spend most of your time trying to get as much out of a circuit as goes into it. i.e. you always endeavor to bring the P.F to unity or nearer to one. If the P.F is low or less than one, then there will be loss of power. On the other hand if you answer that power factor is related to **“Dielectric loss factor or Tan delta of an insulation** then we can simply treat you as an electrical insulation engineer. Here the P.F or dielectric loss factor indicates that the current flow in the insulation circuit leads the voltage by an angle, pretty close to 90°. Exact 90° lead can never be obtained. Depending upon the purity of the insulation, this P.F falls below 90° by a few notches or seconds.

In the two cases mentioned above, the current vector leads or lags behind the voltage vector. In one case it relates to the reactive power flow in the circuit and in the other case, it mirrors the essential characteristic of an insulation. By now, I hope that you are familiar with both “Cos ϕ or Tan δ ”.

More about “Tan delta” – Kindly see fig.1 given below. An insulator can be treated as a capacitor and hence its dielectric current always leads the voltage. Due to the presence of accumulated impurities brought by operating environment and service conditions, this current always has a tendency to move towards the conductive region or trailing behind 90°. This fall in angle or angular shift will be in the order of seconds (you all know that one degree has 60 minutes and one minute has 60 seconds). This kind of angular deviation or difference in an insulator circuit is mainly due to the erratic behaviour of the electrons in the circuit. Electrons, which move freely in a conductor, cannot flow easily in an insulator circuit. The insulating materials block or stop its free movement. However there are some exceptions to it. Some sneaky electrons stealthily move in the circuit and brings very negligible current flow in the circuit. As a result, I^2R loss occurs; now the insulator cannot behave exactly as a pure, loss-free capacitor. Its behaviour / performance is tilted / tipped towards the conductive region from its assigned insulating region. When the impurities faced by the insulator goes on increasing or adding up this angular gap also gets widened. Finally a stage will be reached, when it will be no longer safe to keep the insulation in service. It is now behaving more as a “conductor” rather than an “insulator”. The dielectric losses in the circuit and its attendant heat will cross or exceed the permissible / tolerance levels. That is, it enters the no return point or totally moves into the conductive region. The Tan δ measurements carried out with the aid of “**Schering Bridge**” will “**Function**” as a “**Trend Setter or Trend Watcher**” and it never gives an absolute value. It simply depicts the journey of the insulation from its ideal, insulation position to conductive region and also shows how deeply the impurities like moisture ingress, dust, dirt and heat affect the behaviour of the insulation. This tan delta test can be considered as “**Fine Imprints**” on the health chart of an equipment insulation. This test can be carried out once in a year or two years depending upon the criticality of the equipment and the adverse nature of the operating equipment. This test forms one of the essential test for HV bushings, transformer windings, generator, HT Motor windings and transformer oil. As a guideline to find out the end point or tolerance level, it is suggested that the measured tan delta and capacitance values should not exceed the reference tolerance values recommended by the equipment supplier or not to exceed the twice the tan delta and capacitance values measured at the time of commissioning of the equipment.



Let me sign off here. Kindly stay tuned.

(To be continued...)



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VOLTAIC ARRAY SOLAR LAPTOP CHARGER

The Array solar backpack both carries and charges your laptop along with cell phones, tablets, and digital cameras. The solar pocket can be removed and attached to other bags. It has 1,500 cubic inches of storage, a padded laptop sleeve, and plenty of other pockets.

Features

- Universal attachment system with four male/female clip sets.
- Fabric made from recycled PET (soda bottles) is waterproof, lightweight and UV resistant
- Convenient storage for cables, adapters, tablets and small laptops

Size and Weight

- 16.5" high x 10.5" wide x 8" deep (42cm high x 27cm wide x 20cm deep)
- 6.0 lbs (2.7kg) including battery and solar panels

Solar Panels

- 11.0 Watts at 6 or 18 Volts (selectable based on charging applications)
- Waterproof and UV resistant panels with urethane coating

V72 Laptop Battery

- Capacity: 20,000mAh, 72 Watt Hours
- Output: 5V/2A USB, and 12V/4A, 16V/3.5A, 19V/3A
- Input: 14-20V, 1.2A
- Battery Type: Li-Polymer
- Protection: Short Circuit, Over Charge, Over Discharge, Over Current, Over Temperature

Battery Functions:

1. DC Input to Charge Voltaic battery
2. DC Output to charge laptops
3. 12/16/19V Selector - controls High Voltage Output
4. USB Output (5 Volts) to charge smartphones and other USB devices
5. Power Button and Charge Indicator

About Voltaic

Voltaic Systems is a portable power company based in Brooklyn, New York. A drained phone in the middle of Spain led our founder to design the first solar backpack. Since then, the number and types of electronic devices we use has multiplied and our relationship with them have become more intense. No matter where



you or your devices are in the world, our goal is to keep them charged. Here are things that are important to us.

Charge Everything

When the latest and greatest phone is released, we head to the store like everyone else to get a look. We're not checking out the design though. We're looking for compatibility with our system and power requirements. While many devices charge from USB, there is a lot that goes on behind the scenes to make sure that charge happens consistently and efficiently. We're also looking at how to connect to MacBooks, digital cameras, GPS systems and every device that comes with a proprietary connection.

Conserve Resources

All of our products take energy to manufacture and ship to our customers. Across the product lifecycle, we do our best to conserve resources. This includes identifying and using environmentally preferable materials (e.g. Recycled PET over Nylon), making products modular for easy repair, choosing solar panels that have a long lifetime, eliminating unnecessary packaging, and reusing as much as possible.

We support individuals and organizations who are tackling energy and conservation problems. This can take many forms including gear that helps power pollution detection equipment in Nepal to keeping laptops of anti-poaching teams charged up.

NEW FLEXIBLE LED

Researchers from National Chiao Tung University in Taiwan have created highly flexible, efficient white LEDs with potential use in wearable displays and non-flat surfaces, such as curved and flexible television screens. While the design itself is new, the LED was completely fabricated from pre-existing technologies, allowing others to easily replicate and build on the platform. "Compared to organic light-emitting diodes, this design of flexible LEDs can be very attractive, due to the low cost, prolonged lifetime and high efficiency. In addition, all of the technologies associated with this design are currently available," said Chien-Chung Lin, associate professor, College of Photonics, National Chiao Tung University, Taiwan.



A paper by Lin, professor Hao-Chung Kuo, and their research team appears this week in the journal, *Optics Express*. This is their first flexible LED device, while their previous work had involved conventional gallium-nitride LEDs.

The researchers' off-the-shelf LED device gets its flexibility from its two primary materials, polyimide and polydimethylsiloxane. To construct it, Lin and his colleagues first covered a polyimide substrate with copper foil shielding tape. In a process known as flip-chip bonding, which reduces thermal resistance and results in higher heat dissipation than traditional wire bonding, they mounted 81 Blue LED chips, measuring 1.125 mm x 1.125 mm, to the foil in an upside down position. To provide a warm white-yellow light, the researchers then added another layer consisting of a yellow phosphor film that had been mixed and spin-coated in polydimethylsiloxane, or PDMS, a widely used silicone-based organic polymer. It was chosen for its high degree of transparency, stability, and flexibility. The final film measured 5 cm x 5 cm, but there is no reasonable limitation to the size of the film.

The researchers ran the device for a standard 1,000 hours to test its durability, finding that its emission decayed by only 5 per cent. Its potential for use in wearables was demonstrated when subjected to bending tests. It held its power output when bent to a curvature with a 1.5-cm radius. It also exhibited a light efficiency of 120 lumens per watt. "Because the components are all available by current technology, the combined reliability can be very good," Lin said. "Most of the novel processes or materials require a lengthy procedure to verify their reliability, but our design uses only available parts to avoid this issue."

SAVE ENERGY – Ignorance today brings, A dark tomorrow

WIND, SOLAR AND OTHER RENEWABLE SOURCES OF CLEAN ENERGY ARE NOW SECOND ONLY TO COAL IN GENERATING THE WORLD'S ELECTRICITY

It probably surprises nobody to learn that coal produces more of the world's electricity than any other fuel. But it may provide food for thought to realise that the second most widely-used fuels for power generation are now renewables. Electricity generation from renewable sources has overtaken natural gas to become the second largest source of electricity worldwide, the International Energy Agency (IEA) has announced.

In Europe, the main renewables used to generate electricity are wind and solar power. Since 1990, global solar photovoltaic power has been increasing at an average growth rate of 44.6% a

year, and wind at 27.1%. The IEA reports that electricity production last year in the 34 members of the Organisation for Economic Co-operation and Development (OECD) fell slightly to 10,712 TWh (terawatt hours) – a decrease of 0.8% (86 TWh) compared with 2013. To put that in context, 1 TWh is 1 billion kilowatt hours, and each KWh takes about 0.36 kilograms of coal to generate. This decline, the agency says, was driven by lower fossil fuel and hydro production, which were only partially offset by increases in non-hydro renewables. These grew by 8.5%, and nuclear energy by 0.9%.

In 2014, solar photovoltaic power overtook solid biofuels – used in power plants that burn biomass – to become the second-largest source of non-hydro renewable electricity in OECD countries of Europe, with a share of 17.3%. The IEA says overall growth in electricity generation continues to be driven by non-OECD countries. Its latest statistics, which show world electricity generation increasing by 2.9% between 2012 and 2013, reveal two distinct trends. Electricity generation is levelling off within the OECD, while it is rising strongly in the rest of the world. In 2011, non-OECD countries for the first time produced more electricity than members of the OECD. Other milestones were reached in 2013, when global non-hydro renewable electricity exceeded oil-fired generation for the first time, and renewable electricity overtook natural gas to become the world's second largest source of electricity, producing 22% of the total.

In the same year, electricity generated by coal reached its highest level yet at 9,613 TWh, representing 41.1% of global electricity production. The growth in coal generation was driven by non-OECD countries. Globally, more renewable energy is consumed in the residential, commercial and public services sectors than elsewhere, but there are two distinct patterns of use. In non-OECD countries, only 22.3% of renewables are used for electricity and heat production and 60.7% in homes, commercial and public sectors. In OECD countries, more than half of the renewable primary energy supply (58.5%) is used for electricity and heat. The IEA's data will encourage renewable energy's supporters, but they also show how much the world continues to rely on fossil fuels for its electricity.

In 1971, coal produced about 2 TWh of global electrical power, but that figure is now almost five times higher. Replacing that much generation with clean fuels will be a huge challenge, despite the very rapidly accelerating growth of renewables. Fatih Birol, the IEA's director, has said that, without clear direction from the UN climate summit to be held in Paris in December, "the world is set for warming well beyond the 2°C goal" – the internationally-agreed limit for global temperature rise that is intended to prevent climate change reaching dangerous levels. The IEA World Energy Outlook 2014 said that, by 2040, the world's energy supply mix is likely to divide into four almost-equal parts: oil, gas, coal and low-carbon sources. This scenario, it said, "puts the world on a path consistent with a long-term global average temperature increase of 3.6°C".

Courtesy: Climate News Network

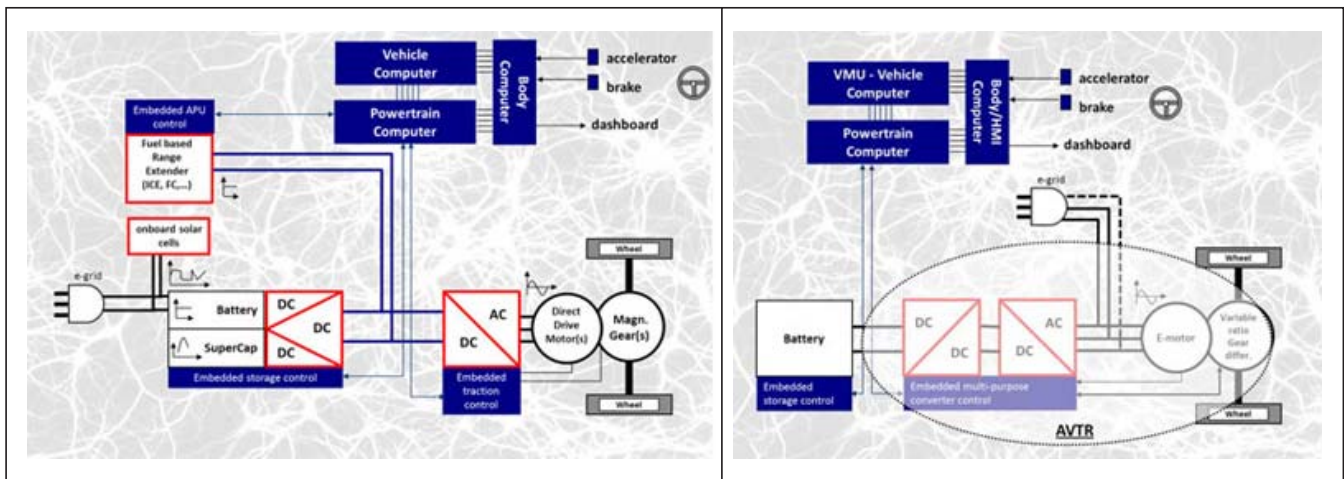


THE AVTR

AVTR (Adaptable Voltage and Transmission Ratio) project is part of the European Green Cars Initiative (EGCI) a Public-Private Partnership launched in the context of the economic crisis 2008, for research and development on zero emission, safe and efficient road vehicles and transportation aiming at economic recovery and the fight against climate change. A total of 1 billion Euro was announced to be made available jointly by the European Union and the industry for collaborative research projects mainly in the field of electrification but also for developing novel solutions in long distance freight and logistics. At the side of the European Commission, the PPP European Green Cars Initiative has been implemented by the involved units of the Directorates General for Research, Information Society and Media, Mobility, Environment as well as Enterprise and Industry. The industry has been included via three European Technology Platforms, namely the European Road Transport Research Advisory Council (ERTRAC), the European Technology Platform on Smart Systems Integration (EPoSS), and the SmartGrids Platform.

The AVTR project

The AVTR consortium consists of 8 partners from large Industry, Research and Small-Medium Enterprises aiming at the development and the industrialization of a complete powertrain systems for light electrical vehicles optimized as a whole of systems.



AVTR addresses the development of a complete Electrical powertrain optimized as a whole of systems, targeting the largest market context (vehicles weighing less than 1000kg) and featuring

- Energy saving in pure urban drive up to 20% with respect to state-of-the-art fixed transmission ratio and avoiding the use of Rare-Earth Permanent Magnet Motors
- Fun-to-drive experience by adaptable transmission ratio allowing highest acceleration in all conditions
- Overall cost reduction per a defined range through a reduced battery capacity
- Reduced cost of ownership and maintenance by a significant reduction of electro-mechanical stresses due to power/energy transients.

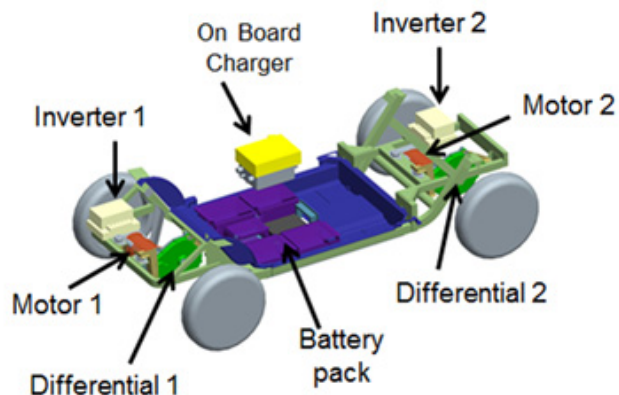
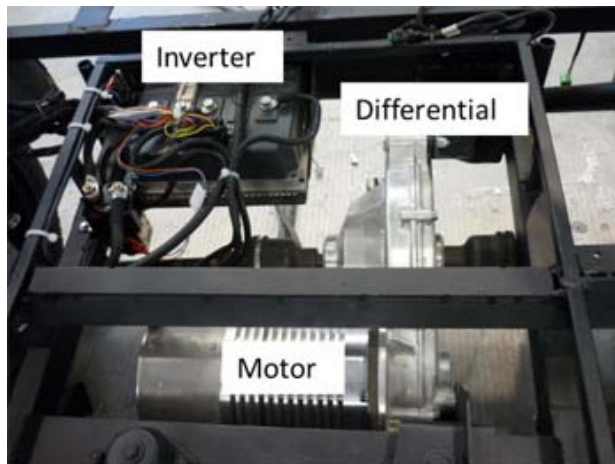
The ambitious objectives are obtained by integrating in a single, air cooled, compact module: power electronic and related control performing energy conversion, AC induction motor drive, variable rate mechanical transmission and differential.

Early demonstration of the technology will be made by preparing specific AVTRs to be installed on a FEV of new concepts for urban mobility and easily adaptable to the majority of the forthcoming (2015-2020) light electrical vehicles.

Expected impacts:

- Improved energy efficiency and extended driving range of the FEV
- Reduced costs of the electronic components and the overall FEV at increased performance
- Mitigated constraints for the user of the FEV versus the Internal Combustion Engine Vehicle
- Significant improvement of FEV's safety, comfort and new information and comfort services for FEV users.
- Strengthened global competitiveness of the European automobile, ICT for PWT.

➤ Market penetration of key components of FEVs.



A GARBAGE BIN THAT REWARDS USERS WITH FREE WiFi!

NEW DELHI: Realising the need of the internet in everyday life, two commerce graduates decided to give free WiFi to people in exchange of a cleaner surrounding with an unique initiative — a 'WiFi Trash Bin'.

"When somebody dumps trash into a dustbin the bin flashes a unique code, which can be used to gain access to free WiFi", says Prateek Agarwal, one of the two founders of the initiative.

Mumbai-based Agarwal and his partner Raj Desai, a self taught programmer, travelled extensively to countries like Denmark, Finland, Singapore etc and realised that keeping surroundings clean needed apart from a difference in structure, a change in the attitude of people.

"We took a lot of help from countries like Finland, Denmark, Singapore etc and decided to build a system similar to that", says Pratik.

The duo hit upon the idea while visiting the NH7 Weekender a music festival which is spread around a large area and as music festivals go is home to music food drinks and of course a lot of garbage.

"...It took us six hours to find our friends. Since there was no network, we could not reach them through a phone call. It was the trigger for the idea and we thought why not provide free WiFi to people using hotspots", says Pratik.

Keeping the place clean and helping to connect with their friends were the driving force behind their innovative project.

The self-funded experiment with support from operator MTS proved to be a success at the various Weekender Festivals held in Bangalore, Kolkata and Delhi but is not operative at the moment.

The founders say they have received queries from GAIL and talks are in due process.

"We wanted to change the attitude of the people and how things are structured, thus affecting an individual's behaviour," says Raj Desai.

The venture, though not operative now aims to satisfy the need of Internet at every step in the modern day world.

"... We want to work more for it," says Pratik.

The duo say they tend to setup a network of WiFi bins thus helping to bring about a behavioural redesign among people.

The venture was recently showcased at "Networked India", a unique initiative by Ericsson and CNN-IBN that aims to identify and facilitate clutter-breaking innovations in the field of connectivity and mobility.



LIXIL AND TOHOKU UNIVERSITY UNVEIL TOILET LIGHTING SYSTEM THAT WORKS EVEN IN BLACKOUTS

Since July 2014, LIXIL, a Japanese living and housing solutions company, and Tohoku University, have been conducting research to develop the “Zero Energy Toilet (ZET),” which allows people to use toilets comfortably even in times of disaster. As part of the study, on June 2, 2015, they announced the development of a zero-energy lighting system that utilizes electricity generated from the power of water flushing down the toilet bowl to light the room.



Normal time

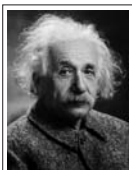


In an emergency

In times of disaster, if the external power supply is disrupted, but water and sewerage systems are not extensively damaged, the new system can provide light to the washroom and make it usable at night, by converting the hydropower energy of the flushing water into electricity for lighting. The system is supplemented by power storage, high-efficiency LED lights, and power supply control circuits. In addition, the researchers developed a new type of LED lighting that takes advantage of the “Purkinje effect,” a phenomenon that occurs at low light intensity, where blue objects reflect short-wavelength light and appear to be brighter than red objects that reflect long-wavelength light. The Purkinje effect gives the perception of higher brightness in dark places with minimal energy consumption.

In the ZET demonstration experiments site, set up in December 2014 on the campus of Tohoku University, the toilets equipped with the lighting system were monitored for the amount of power generation, storage of electricity, and power consumption for lighting in both men’s and women’s washrooms. The results showed that the electricity generation from flush water was enough to light up the rooms. Through further experiments, LIXIL and Tohoku University will work to establish control algorithms for comfortable and energy-efficient toilets, along with reliable operation.

Courtesy: Japan For Sustainability



***"Everything is energy and that's all there is to it.
Match the frequency of the reality you want
and you cannot help but get that reality.
It can be no other way. This is not philosophy.
This is physics." – ALBERT EINSTEIN***

GREENER CITIES ARE BEST AT TAMING URBAN HEAT



For the first time in human history, more than half the world now lives in cities. Later this century, the proportion could rise to two-thirds. Even without global warming because of a build-up of carbon dioxide in the atmosphere, itself the consequence of fossil fuel combustion, the cities are feeling the heat. That is because dark materials and hard surfaces – tarmac, brick, cement, tiles, slates, gutters, railway tracks, flyovers, motorways and so on – absorb the heat but not the rainwater that, as it evaporates, could damp down that heat. As a consequence, cities become “heat islands”: places conspicuously hotter than the surrounding countryside. According to a report in *Nature*, the annual average temperature in Los Angeles in California has risen by more than 2°C since 1878, and by mid-century the sprawling megalopolis is predicted to face 22 days a year of extreme heat: that is, with temperatures of more than 35°C.

Now British and US scientists are trying to work out the shape of the ideal city. Pack people together with lots of green spaces around, say the British. And keep the people cool with trees, parks, roof gardens to help them withstand the heat, add the Americans. Researchers at the University of Exeter in the UK and the University of Hokkaido in Japan report in the journal *Frontiers in Ecology and Environment* that they analysed nine case studies of cities worldwide to work out the arrangements with most benefits to humans.

Dense but spacious

The answer – separate from the climate question – is that dense settlements but with big parks and nature reserves deliver the greatest sense of well-being and the healthiest urban ecosystems.”As populations continue to grow, it’s vital that we expand our cities and build new ones in a way that is most sustainable for ecosystems, and which provides the greatest benefits to urban residents”, said the lead author, Iain Stott, from the University of Exeter’s Environment and Sustainability Institute on the Penryn campus in Cornwall. “Our research finds that compact developments that include large green spaces are essential for the delivery of ecosystem services. For humans to get the most benefit, however, combining this approach with greening of built land using street trees and some small parks and gardens is the best method.” Rather than focus on selected cities, a team led by scientists from the US space agency NASA report in *Environmental Research Letters* that they took an overall look at what asphalt and concrete do to the whole United States. The satellite data told a familiar story: those tracts of America covered by impervious surfaces such as roads, pavements, roofs and car parks were in summer up to 1.9°C warmer than the surrounding rural zones, and in winter 1.5°C.

“Urbanisation is a good thing...but we could probably do it a little bit better”

“This has nothing to do with greenhouse gas emissions. It’s in addition to the greenhouse gas effect. This is the land use component only”, said Lahouari Bounoua, of Nasa’s Goddard Space Flight Centre in Greenbelt, Maryland, and lead author. “Anywhere in the US small cities generate less heat than mega-cities.” Green things cool by evapo-transpiration. Broadleaf trees with big leaf areas can cool cities more than forests of pines with fine needles. The message is that green is good for cities and cities are good for the environment.

Cities in arid places – Phoenix in Arizona is a case in point – can paradoxically be cooler than the surrounding desert because residents bring lawns that must be watered, and trees for shade. This creates another problem. Water is a scarce resource and rising urban temperatures could make it even scarcer. Researchers from the University of Florida report in the journal *Technology and Innovation* that a survey of homeowners in Orange County, Florida, found that 64% of drinking water went to irrigate the lawns. In summer this proportion went up to 88%. Whatever the urban problems, global warming and climate change will make them worse, but cities offer ways to reduce energy use and save carbon dioxide emissions.”Urbanisation is a good thing”, Dr Bounoua said. “It brings a lot of people together in a small area. Share the road, share the work, share the building. But we could probably do it a little bit better.”

Climate News Network

FLOW BATTERIES

Flow batteries are an interesting alternative to conventional batteries because they can store charges in the form of a liquid electrolyte that can be kept in tanks. Only the size of the tanks limits the amount of energy that can be stored. Utility companies and energy engineering firms have been eyeing these devices because they might replace storage batteries, devices that: have a limited lifetime; are known to be fire hazards; require metals such as lithium, that are limited in supply; and can only store energy in the electrode material, which has a fixed volume. What stands in the way of the wide implementation of flow batteries, in spite of the fact that they are commercially available, is that the compounds they use are expensive, toxic, and corrosive. Additionally, the energy storage capacity per unit volume of the electrolyte is low, typically just squeaking past 20 watt-hours per liter.



Now a team of researchers at Harvard University have reported in the latest issue of *Science* that they’ve created a version that uses two alkaline electrolytes that contain quinone and ferrocyanide—both widely available and non-toxic compounds—in solution. The researchers reported that after 100 charge-discharge cycles, the battery’s stored energy capacity had degraded less than 1 percent.

Michael Aziz, who led the research group, realized that if the negative points of today’s flow batteries—cost and toxicity—could be overcome, the flow battery could become a commercially viable alternative for the storage now badly needed for intermittent energy sources such as solar and wind.

“This looks like a compelling value proposition if you can find inexpensive chemicals that work well,” says Aziz. “We noticed that there is a molecule in plants that takes the electrons from chlorophyll, and it forms an electron shuttle in photosynthesis that ports electrons over and over, without any sign of degradation. That is exactly the functionality you want for the battery,” says Aziz.

At this point, about 95 percent of stored energy in the United States is in the form of water pumped up into a reservoir, which can be released to generate power by driving turbines when flowing back down. But in flat or arid areas, this storage option is not available, and it is here that flow batteries could play an important role, argues Aziz. “We are looking at a technology that can be used where pumped hydro cannot—in the middle of a city, on rooftops, near windfarms and solar farms,” he says. However, reaching this goal will require further work. “We need to prove that these molecules can last many thousands of cycles of oxidation and reduction, without doing anything else.”

ELECTRIC BOAT MEETS LOUNGE CHAIR ON CHILLI ISLAND

Designed to deliver some of the on-water fun of a small boat without the work and hassle, the Chilli Island watercraft navigates the crisp, blue water like a motorized lounge chair. This small electric vessel has everything you need to enjoy a sunny day on the (not so) high seas with your favorite companion.

At first glance, the Chilli Island looks more like a pool chair or towable than a powered watercraft, but the included Torqeedo electric motor puts it in the latter category. Both 0.5- and 1-kW motor options are available, providing up to six hours of runtime with power from a 300 Ah pair of AGM deep cycle batteries.

Vienna-based Chilli Island GmbH fancies its namesake watercraft an alternative to other lightweight watercraft, such as pedal boats. The company believes the craft has potential for beach resorts, hotels, lakes and other destinations that serve up water-based relaxation. It certainly looks more relaxing than a pedal boat or rowboat and seems like it could create an idyllic afternoon of sipping cold drinks under the sun while gently cruising over crystal clear waters.

In place of a traditional hull structure, the Chilli Island is structured more like an open, floatable lounge chair for two, measuring 8.2 x 7.4 ft (2.5 x 2.25 m) and weighing 440 lb (200 kg). It has a polyethylene body built over a fiberglass frame and wraps each passenger in an ergonomic full-body seat that can also serve as a slide, letting one slip into the water on a whim. Handholds help passengers get back on board. The palm tree-inspired, three-panel adjustable shading system provides an escape from the beating sun. Occupants control speed and direction via the central trackball, which sounds at least as simple and intuitive as the joysticks on boats like the Joyboat. There's no listed speed information, but given the craft's design and small motor, it'll surely be limited to puttering around slowly close to shore.

The Chilli Island doesn't have a whole lot of room on deck, but a few pieces of equipment enhance the ride. A bottle cooler keeps drinks cold, and cup holders on both sides ensure you don't have to hold onto your open drink the whole ride. The two-speaker Bluetooth sound system plays music from your mobile device, providing up to 80 watts of audio power. Audio is controlled through the small onboard computer, which also provides information like battery level, speed and motor position.

The Chilli Island Classic base model with 0.5-kW motor and 40-watt sound system is priced at €9,985 (US\$11,225), as listed in Chilli Island's online brochure. Higher spec models include upgrades like the 1-kW motor, 80-watt sound system, and sound and lighting effects. Company branding is also available.

That pricing seems a little steep for a motorized floatable lounge chair, particularly when compared to similarly simple watercraft like the aforementioned Sky Yacht Joyboat or the BeachRay, both of which were priced several thousand euros/dollars less when we covered them last year. Then again, you could spend more than €15,000 (US\$16,900) on an electric surfboard that drains its battery in 30 minutes, so it's all relative. We'd certainly be quick to inquire about day pricing if we ever saw the Chilli Island for rent at a beach or lake resort and relaxation was the priority over fast-paced recreation.



Technical Details

Length:	2,50 Meters
Width:	2,25 Meters
Draught with Engine:	0,40 Meters
Draught without Engine:	0,15 Meters
Weight:	200 Kg
Passengers:	2

Material:	Polyethylene (corbus), GfK (chassis)
CE-certification:	D (protected water)
Motorisation:	Electric Motor 0.5 kW or 1.0 kW
Batteries:	AMG
Loader:	Internal through a plug External with charging station

Source: Chilli Island

PRODUCT OF THE MONTH

FLIR VP52 NON-CONTACT VOLTAGE (NCV) DETECTOR + FLASHLIGHT

The FLIR VP52 CAT IV-rated NCV detector is designed to reliably detect voltages on the latest tamperproof outlets and electrical systems installed.

- Safe CAT IV-1000V rating and toolbox tough with rubber reinforced case and buttons, and a low-profile detection tip
- Vibration and red LED alarms alert users to the presence of voltage in noisy areas
- Versatile high/low sensitivity modes detect voltage on industrial equipment and low-voltage installations
- Powerful LED worklight always at the ready to illuminate poorly lit locations
- Inspection light at the probe tip facilitates testing in dark areas
- Long run time capable with power saving low battery indication and auto power off
- Rugged double molded design
- Includes 2 AAA batteries, user manual and limited lifetime warranty



Technical Summary	
Voltage ranges	90 to 1000V 24 to 1000V
Category rating	CAT IV-1000V
Frequency range	45 - 65Hz
Built-in flashlight	Yes
Vibrating indication	Yes
On/Off switch	Yes
Warranty	Limited lifetime

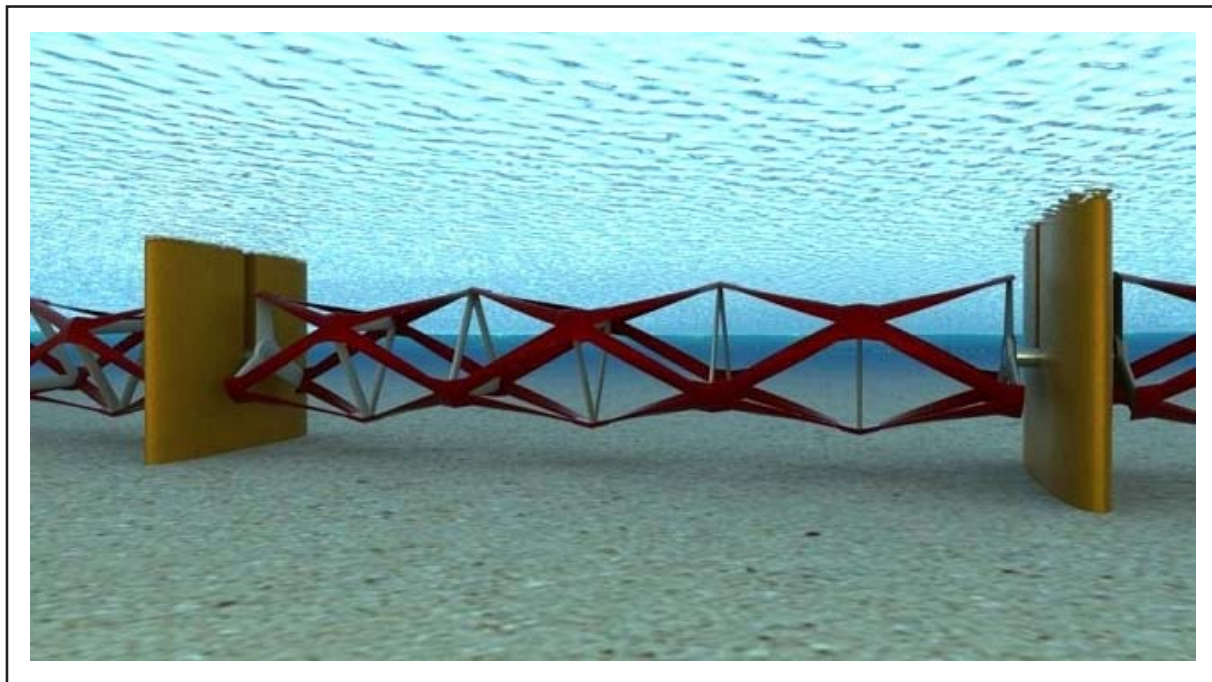
For more details contact - M/s. FLIR Systems India Pvt Ltd., 1111, D-Mall, Netaji Subhash Place, Pitampura, New Delhi – 110034. INDIA. Tel : +91-11-4560 3555 Fax :+91-11-4721 2006.
E-mail : flirindia@flir.com.hk Website: www.flir.com

INNOVATIVE TURBINES DESIGNED IN THE UK AIM TO HARNESS TIDAL ENERGY TO PRODUCE CHEAPER ELECTRICITY – WITHOUT ENDANGERING MARINE LIFE

A British company has announced plans for an array of unique marine turbines that can operate in shallower and slower-moving water than current designs. Kepler Energy, whose technology is being developed by Oxford University's department of engineering science, says the turbines will in time produce electricity more cheaply than off-shore wind farms. It hopes to install its new design in what is called a tidal energy fence, one kilometre long, in the Bristol Channel "an estuary dividing South Wales from the west of England" at a cost of £143m (US\$222m). The fence is a string of linked turbines, each of which will start generating electricity as it is completed, until the whole array is producing power. The fence's total output is 30 megawatts (MW), and 1MW can supply around 1,000 homes in the UK.

Power outputs

Peter Dixon, Kepler's chairman, told Reuters news agency: "If we can build up to, say, 10 kilometres' worth, which is a very extended fence, you're looking at power outputs of five or six hundred megawatts. And just to visualise that, it's like one small nuclear reactor's worth of electricity being generated from the tides in the Bristol Channel." The new Transverse Horizontal Axis Water Turbine (THAWT) "whose design is compared to that of a water mill" will use the latest carbon composite technology, and should be suitable for the waters around Britain, as well as overseas.



How the rotor blades look installed in a tidal fence configuration. Image: Kepler Energy

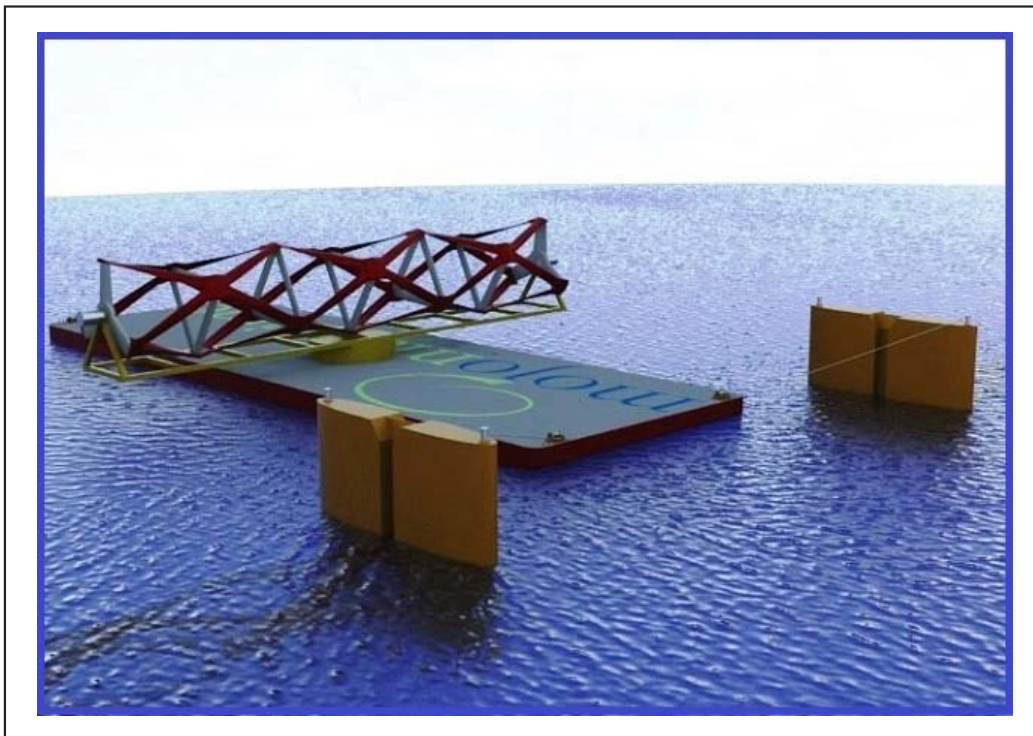
Because the turbines sit horizontally beneath the surface of the sea, they can be sited in water shallower than the 30-metre depth typically required by current designs. And because the water is slow-moving, the company says, fish can safely avoid the turbines' blades. Although the technology is regarded as environmentally benign, Kepler says it will still undergo a rigorous environmental impact assessment during the planning process to ensure that it poses no significant risk to marine life and to other users of the sea. There is more good news for proponents of renewable energy after the UK government "which is no longer encouraging onshore wind and solar energy" gave the go-ahead for a large offshore wind farm that could provide power for up to two million homes.

The new wind farm is to be built near the Dogger Bank in the North Sea and will have 400 turbines. Its developers say it could create almost 5,000 jobs during construction. And, earlier this year, they obtained planning consent for another installation nearby which, with the new development, will form one of the largest offshore wind farms in the world.

North Seas assets

But the fossil fuel industry is far from abandoning its own interest in British waters as the energy giant BP has announced that it is to invest about £670m (US\$1,040m) to extend the life of its North Sea assets. It said it would be drilling new wells, replacing undersea infrastructure, and introducing new technologies to help it to produce as

much as possible from the area, whose future would be secured “until 2030 and beyond”. In November, delegates to the UN Climate Change Convention annual negotiations will gather in Paris to try to conclude an ambitious and effective agreement on preventing the global average temperature rise caused by greenhouse gas emissions exceeding 2°C above its pre-industrial level. Last year, the Convention’s executive secretary, Christiana Figueres, said the world’s long-term goal was to reduce greenhouse gases to zero by 2100 “a target she said would require leaving three-quarters of fossil fuels in the ground. “We just can’t afford to burn them”, she said.



Climate News Network

MUSHROOM BATTERY

Engineers at the University of California have shown that mushrooms can create long-lasting, environmentally friendly anodes for lithium-ion batteries.

The idea was cooked up by the husband-and-wife team of Cengiz and Mihri Ozkan, both engineering professors at UC Riverside. They’d been looking for natural materials that might replace the graphite used in today’s batteries. The process of making anodes of graphite involves treating the material with large amounts of hydrofluoric and sulfuric acids and creates as much as two tons of contaminated waste-water for every ton of graphite produced.

As an alternative, the two took strips of skin from the cap of portabella mushrooms and heated them to 900 °C, turning the skin into carbon nanoribbons. The process caused a reaction in various organic and potassium compounds in the mushroom’s skin, much the same way other organic materials are carbonized by heating them in the presence of potassium hydroxide. The end result was a nanoribbon studded with pores ranging in size from less than a nanometer to tens of nanometers.

The varied pore sizes help maintain the structural integrity of the ribbon during the expansion and shrinking that happens when lithium ions pass into and out of the anode. They not only last longer, but also provide a large surface area for current flow.

The team built a small, coin-style battery and tested it for 700 cycles, roughly the equivalent of seven years’ use in an electric vehicle. The battery had a specific discharge capacity—the amount of charge available—of 260 milliamp-hours per gram. That’s not quite as good as graphite, which is usually capable of storing 300 to 350 mAh/g, but it turns out to be only a starting point.

As the battery stretches and shrinks, cavities that were closed off in the material actually open up, increasing the surface area, and therefore the capacity, of the material. The Coulombic efficiency of the battery had increased by about 25 percent.



SARDAR PATEL RENEWABLE ENERGY RESEARCH INSTITUTE

Sardar Patel Renewable Energy Research Institute (SPRERI) was established in January 1979 as a result of the initiative taken by a group of foresighted persons led by Late Dr. H.M. Patel and Late Shri Nanubhai Amin.

STATUS – SPRERI is a non-profit autonomous organization registered as a Society under the Societies Registration Act 21 of 1860 and also as a Public Trust under the Bombay Public Trust Act 1950. It has been approved as a Research Association for the purpose of clause (ii) of subsection (1) of Section 35 of the Income Tax Act 1961 and is recognized as a Scientific and Industrial Research Organization (SIRO) by the Department of Science & Technology, Govt. of India. It is recognized by S.P. University, Vallabh Vidyanagar, Junagadh Agricultural University, Junagadh, Nirma University, Ahmadabad as a Centre for M.Tech and Ph.D. Research.

VISION – SPRERI, a leading organization for research and development of renewable energy (RE) technologies, focuses on sustainable biomass conversion and solar energy based solutions, which are technically efficient, economically viable, environment friendly and which meet the needs of society.

MISSION

- ❖ To set-up a world class “CENTRE FOR ADVANCED RESEARCH IN BIOMASS CONVERSION TECHNOLOGIES”
- ❖ To develop environment friendly technologies for conversion of biomass into bio-fuels, energy (including electricity) and useful chemicals
- ❖ To develop technologies for utilization of bioconversion waste
- ❖ To develop technologies for application of solar energy
- ❖ To develop business models for promoting use of RE technologies
- ❖ To provide knowledge based insights to influence policies and programmes of the Governments for utilization of biomass and solar energy technologies for meeting energy requirements
- ❖ To provide specialized training in RE technologies to engineers and scientists guidance and facilities to research students
- ❖ To provide extension support and consultancy to RE programmes
- ❖ To test and evaluate RE technologies

R & D ACTIVITIES – Research and Development activities are organized under following Divisions:

- ◆ **Solar Energy Division** is carrying out design, development, evaluation and refinement of solar thermal and SPV systems
Regional Test Centre, approved by Bureau of Indian Standards and MNRE, carries out testing of various solar thermal devices such as solar cookers, solar water heaters etc.
- ◆ **Bio-Conversion Division** pursues basic studies and development of technologies and systems for conversion of biomass to energy carriers through various biological routes and their utilization for thermal applications and power generation.
- ◆ **Thermo-Chemical Conversion Division** is engaged in basic studies and development of technologies and systems for efficient conversion of biomass to energy through thermo-chemical / mechanical pathways and their use for thermal applications and power generation.
- ◆ **Technology Transfer Division** facilitates promotion of new RE technologies through field evaluation, demonstrations, trainings and entrepreneurship development, awareness programmes and integrated development of selected tribal villages.

Important SPRERI technologies available for Use / Commercialization

- 1) Solar refrigerator
- 2) Low tunnel solar drying technology
- 3) Forced circulation solar drying technology
- 4) Roof integrated unglazed solar drying system/class
- 5) Conversion of fruit and vegetable residues to biogas and manure
- 6) Anaerobic filter based effluent treatment system for dairies
- 7) Conversion of kitchen residues to biogas and manure
- 8) Open core down draft gasifier systems
- 9) Biomass combustor-cum-hot air generator
- 10) Inverted down draft gasifier type biomass cook stoves
- 11) Movable platform type wood cutter for preparing feedstock for gasifier

LOCATION – SPRERI is situated in Vallabh Vidyanagar, a township about 5 km from Anand, the milk capital of India. It has been named after Sardar Patel whose ancestral home and village is in nearby Karamsad. Well connected by road and rail, Vallabh Vidyanagar is 75 km from Ahmedabad and 40 km from Vadodara. Ahmedabad and Vadodara are the two linking airports.

THE AUSTRALIAN SOLAR TOWER CONCEPT

EnviroMission's inspirational program to adapt innovative Solar Tower technology to US conditions and construct the world's first large-scale solar thermal power station is set to deliver a renewable energy solution that will also be a destination and extreme engineering icon.

The scale of the first 200MW power station will capture worldwide attention and attract significant added value through tourism and agribusiness. A single 200MW Solar Tower power station will provide enough electricity to power around 100,000 households, similar to the number of homes in a city the size of Burbank (California, USA) or Palm Bay (Florida, USA). The energy output will represent an annual saving of more than 900,000 tonnes of greenhouse CO₂ gases from entering the environment, with an outstanding Life Cycle Analysis of 2.5 years.



The Technology

A Solar Tower power plant- sometimes referred to as a “Solar Chimney” or “Solar Updraft Tower” is a Solar Thermal Power Plant that combines the use of a solar air collector (canopy) and a central updraft tower to generate a solar induced convective flow which drives 32 x 6.25MW pressure staged turbines to generate electricity.

HOW IT WORKS:

The Technology is made up of three components.

The Tower

The Tower is the thermal engine of the Solar Tower technology. In it, heat is transformed into mechanical energy. The updraft inside the tower, produced by the rising lighter, hot air, is essential for this. The greater the velocity of the Tower, the higher the column of air is and the stronger the updraft. Therefore, a high-capacity power plant should have the highest Tower possible.

The Canopy

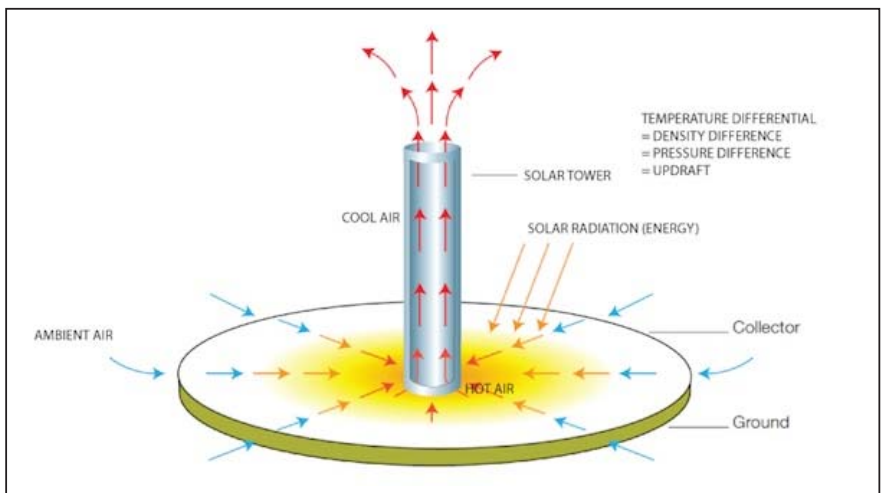
The canopy converts a large percentage of the insulation into heat, which in turn, heats the air trapped under the canopy roof or is stored in the ground soil thermal storage system. One of the main objectives of the canopy is to lose as little heat as possible into the ambient.

The Turbines

The Turbines transform the energy from the heat and pressure of the air into mechanical energy and the generator converts it into electricity. They work like the well known Kaplan Turbines used in hydro-electric power plants.

Small Scale Pilot Plant

Solar Tower technology has been tested and proven with a successful small-scale pilot plant constructed in Manzanares Spain. The pilot project was the result of collaboration between the Spanish Government and the



German designers, SchlaichBergermann and Partner. The plant operated for seven years between 1982 and 1989, and consistently generated 50kW output of green energy. The pilot plant conclusively proved the concept works and provided data for design modifications to achieve greater commercial and economic benefits associated with an increased scale of economy.

Project Background

EnviroMission started work on development back in 2001 with a search for the best possible site for the world's first Solar Tower power station. A site was selected at Buronga in the southwest corner of New South Wales, on a former wheat and cattle station known in the district as Tapio Station, 23km north of Mildura. Tapio Station is mostly flat to undulating, semi-arid and has the necessary solar radiation levels in close proximity to transmission grids.

Whilst EnviroMission now expects the first Solar Tower will be developed in the USA, it is felt international development will provide important leverage to increase development prospects in Australia. EnviroMission is seeking the strongest business case for development, and conditions in the USA support development ahead of Australia at this time.

SOLAR TABLE

The table in the garden of a family home in Niederglatt, not far from Zurich, looks like many a garden table — simple design, chromium steel, matt finish. But there's a difference: one leg reveals a cable that runs along the ground and ends up in a power point. The table leaf is black and turns out to be made of glass, covering a set of solar panels. "My solar table — an



energy-producing piece of furniture," says Markus Weingartner, an engineer, father of two, hobby innovator and furniture creator. The "solar table" generates 280 kilowatt-hours of electricity a year, enough to cover 30% of a person's energy consumption or to power an e-bike for 70km every day. The Swiss authorities did not warm to Weingartner's concept for a long time because unlike rooftop panels, the electricity generated by the table is fed directly into the private grid through a power point. It does not have to be sold into the public grid and then repurchased, and it can be used instantaneously. "Most people don't even know that this is now possible," Weingartner says.

Weingartner, who also builds solar panels for flower pots and side or coffee tables, sees a niche market for his solar furniture.

He founded his own business for solar installations and employs five people. He calls it his "routine business". He broke out of the routine in 2013, when he designed his solar table because he anticipated a change: "Ten years from now we won't be seeing a lot of solar panels on small roofs anymore." Although solar technology becomes ever cheaper, he says, installation costs will remain high while feed-in tariffs (ie compensation rates) will fall. For an individual, installing rooftop panels will become less and less viable. "The trend goes towards large-scale installations and cost-efficient solar parks."

AUDI BACKS AN ARTIFICIAL FUEL PRODUCED BY SUNFIRE'S POWER-TO-LIQUIDS PROCESS

Sunfire, the German specialist in reversible electrolysis and fuel cell technology, says it has created a synthetic diesel-like liquid distilled from atmospheric CO₂. The company claims the “Blue Crude” can be made from a process powered by renewable energy, making it cleaner than petroleum diesel. The project is being backed by the German auto giant Audi and has the endorsement — and cash backing — of the German federal government.

The new “wonder fuel” is currently being produced at a pilot plant in Dresden, and was publicly tested in an Audi A6 in Berlin last week at a conference in front of a prestigious audience that included German Minister of Education and Research **Johanna Wanka**. According to the company, the power-to-liquids technology that synthesizes Blue Crude



reaches system efficiencies of about 70 percent. The centerpiece of a three-stage production process is reversible electrolysis based on a Solid Oxide Power Core (rSOC). The rSOC generates hydrogen with an efficiency of approximately 90 percent, which reacts with atmospheric carbon to produce a mixture of hydrocarbon chains, of the type found in conventional crude. Taking Sunfire and Audi's figures at face value would indicate that around 50 kilowatt-hours of electricity are needed to produce one gallon of diesel.

The process can also go into reverse if electricity prices peak and make the production of Blue Crude uneconomical. After a short turnaround interval, says Sunfire, the system can be switched to fuel-cell mode and used to convert hydrogen reserves or any another fuel back into power and heat. This means that, in addition to providing fuel for mobility, the technology has a potential.

Blue Crude is a heterogeneous mix of artificially produced short- and long-chain hydrocarbons that mimics the stuff you dig out of the ground, with, its backers point out, a crucial lack of the sulfur found in the naturally occurring product. The fuel also extracts carbon from atmospheric CO₂. The CO₂ is released back into the atmosphere after combustion, rather than totally sequestering the pollutant — making the fuel ‘green’ only if the electricity used to synthesize it comes from renewable resources.

So how serious is Audi about backing Sunfire? It's still an early relationship. Audi partnered with Sunfire around 18 months ago, with an interest in power-to-gas technology that has subsequently evolved into backing power-to-liquid.

The automaker hasn't fully jumped into plug-in EVs, instead opting for hybrids, such as the Q8 e-tron. Audi is concerned about range anxiety and believes German motorists will continue to want the advantages of a hydrocarbon-fueled car. He also cites the current high price of batteries as a barrier to EV adoption and believes hybrids with smaller (and thus cheaper) battery packs are, therefore, more appealing. This makes sense in the current climate. But if the price of lithium-ion batteries continues to fall thanks to economies of scale and sustained improvements in efficiency, the strategy may fall short.

Sunfire has a process that works at a pilot level and could be plugged into the existing fuel infrastructure, although questions remain about the reliability and potential hidden costs of the process once scaled up. It relies on changes in legislation that will allow access to cheap, plentiful electricity — and, for it to be a truly green alternative, much of that electricity will need to be from renewable sources.

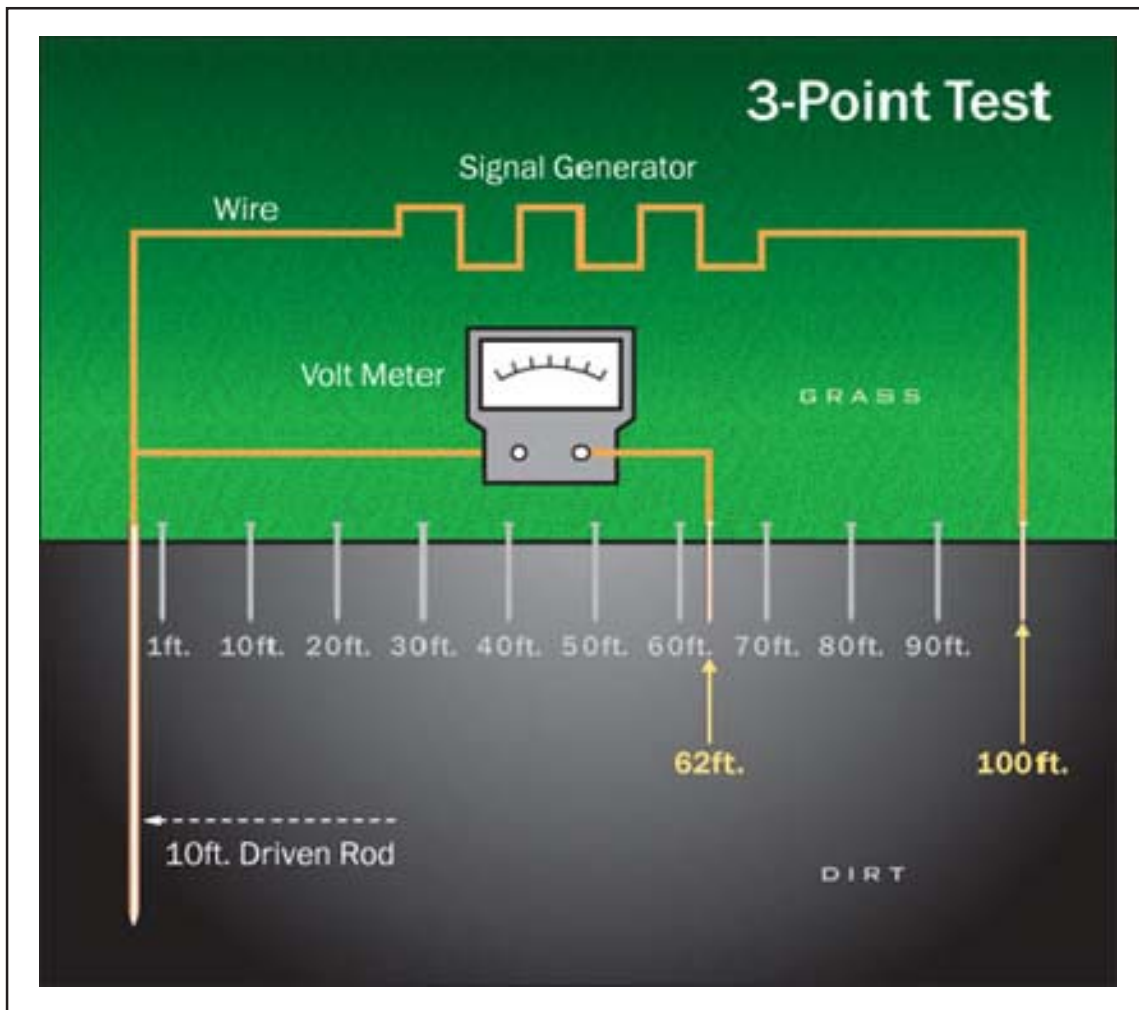
Berninghausen also says that this process is unlikely to compete with fossil fuels without state subsidies. “Long-term, there will be a split in the energy market between fossil fuels and renewables,” he predicts — implying that if Blue Crude can't beat oil, it can become a part of a subsidized and “socially important” renewables market. Berninghausen and Dieninger are hoping that a new round of funding for projects by the German government — worth several billion dollars in total — will allow the process to be scaled up. The pilot plant currently produces a modest 42.2 gallons of Blue Crude per day. In two to three years, it could potentially reach 475 gallons per hour, they predict.

Courtesy: Greentech media

HOW TO DO ELECTRICAL GROUNDING SYSTEM TESTING

The measurement of ground resistance for an earth electrode system is very important. It should be done when the electrode is first installed, and then at periodic intervals thereafter. This ensures that the resistance-to-ground does not increase over time. There are two (2) methods for testing an electrical grounding system. The first is the 3-point or Fall-of-Potential method and the second is the Induced Frequency test or clamp-on method. The 3-point test requires complete isolation from the power utility. Not just power isolation, but also removal of any neutral or other such ground connections extending outside the grounding system. This test is the most suitable test for large grounding systems and is also suitable for small electrodes. The induced frequency test can be performed while power is on and actually requires the utility to be connected to the grounding system under test. This test is accurate only for small electrodes, as it uses frequencies in the kiloHertz range, which see long conductors as inductive chokes and therefore do not reflect the 60 Hz resistance of the entire grounding system.

Fall-of-Potential Method or 3-Point Test



The 3-point or fall-of-potential method is used to measure the resistance-to-ground of existing grounding systems. The two primary requirements to successfully complete this test are the ability to isolate the grounding system from the utility neutral and knowledge of the diagonal length of the grounding system (i.e. a 10' x 10' grounding ring would have a 14' diagonal length). In this test, a short probe, referred to as probe Z, is driven into the earth at a distance of ten times (10X) the diagonal length of the grounding system (rod X). A second probe (Y) is placed in-line at a distance from rod X equal to the diagonal length of the grounding system. At this point, a known current is applied across X & Z, while the resulting voltage is measured across X & Y. Ohm's Law can then be applied ($R=V/I$) to calculate the measured resistance. Probe Y is then moved out to a distance of 2X the diagonal length of the grounding system, in-line with X & Z, to repeat the resistance measurement at the

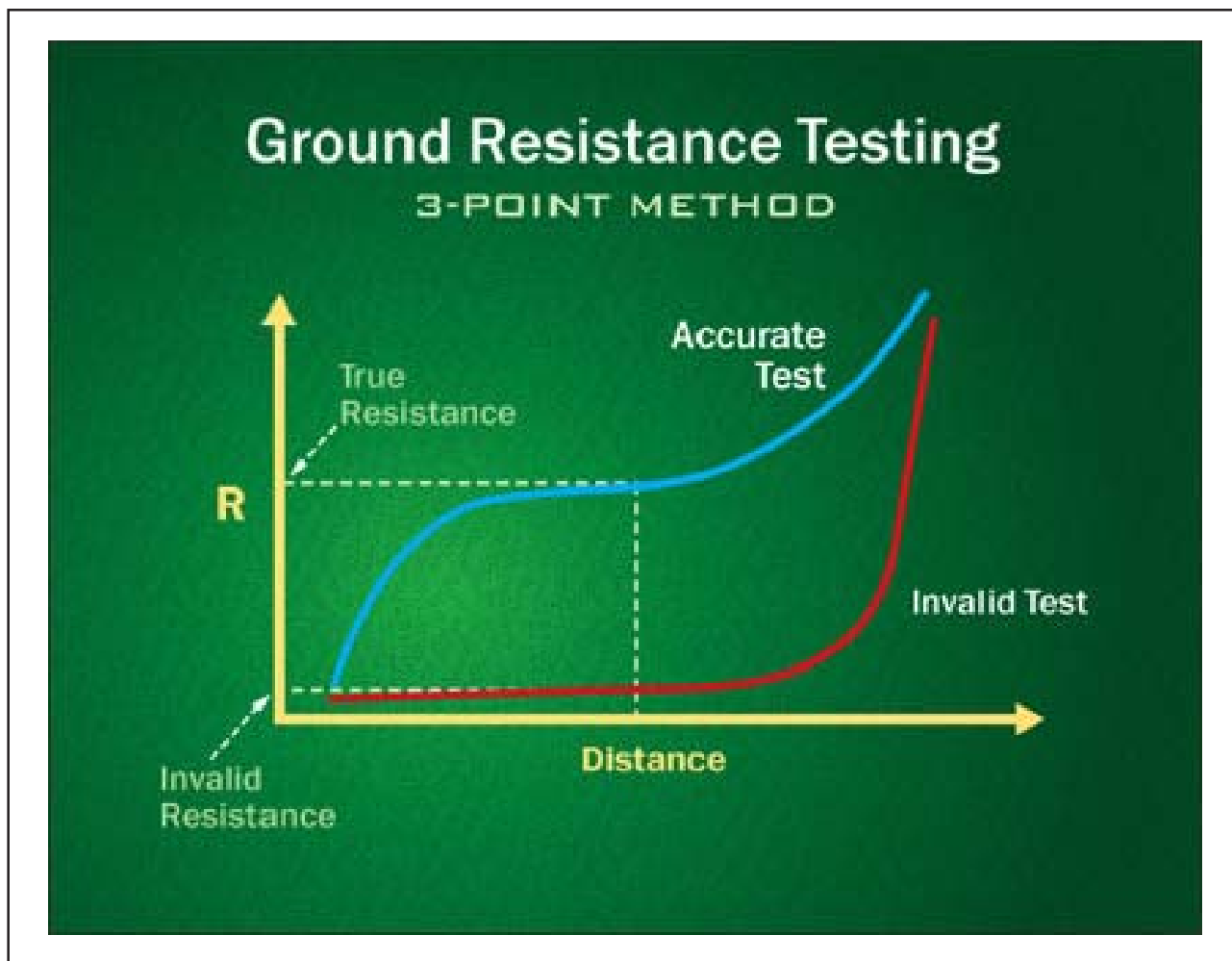
new interval. This will continue, moving probe Y out to 3X, 4X, ... 9X the diagonal length to complete the 3-point test with a total of nine (9) resistance measurements.

Graphing & Evaluation

The 3-point test is evaluated by plotting the results as data points with the distance from rod X along the X-axis and the resistance measurements along the Y-axis to develop a curve. Roughly midway between the center of the electrode under test and the probe Z, a plateau or “flat spot” should be found, as shown in the graph. The resistance of this plateau (actually, the resistance measured at the location 62% from the center of the electrode under test, if the soil is perfectly homogeneous) is the resistance-to-ground of the tested grounding system.

Invalid Tests

If no semblance of a plateau is found and the graph is observed to rise steadily the test is considered invalid. This can be due to the fact that probe Z was not placed far enough away from rod X, and can usually indicate that the diagonal length of the grounding system was not determined correctly. If the graph is observed to have a low plateau that extends the entire length and only rises at the last test point, then this also may be also considered invalid. This is because the utility or telecom neutral connection remains on the grounding system.



Induced Frequency Testing or Clamp-On Testing

The Induced Frequency testing or commonly called the “Clamp-On” test is one of the newest test methods for measuring the resistance-to-ground of a grounding system or electrode. This test uses a special transformer to induce an oscillating voltage (often 1.7 kHz) into the grounding system. Unlike the 3-point Test which requires the grounding system to be completely disconnected and isolated before testing, this method requires that the grounding system under test be connected to the electric utilities (or other large grounding system such as from the telephone company) grounding system (typically via the neutral return wire) to provide the return path for the signal. This test is the only test that can be used on live or ‘hot’ systems. However, there are some limitations, primarily being:

The amount of amperage running through the tested system must be below the equipment manufacturer's limits.

The test signal must be injected at the proper location, so that the signal is forced through the grounding system and into the earth.

This instrument actually measures the sum of the resistance of the grounding system under test and the impedance of the utility neutral grounding, including the neutral wiring. Due to the high frequency used, the impedance of the neutral wiring is non-negligible and can be greater than the ground resistance of a very low resistance grounding system, which can therefore not be measured accurately.

The ground resistance of a large grounding system at 60 Hz can be significantly lower than at 1.7 kHz.

Many erroneous tests have been conducted where the technician only measured metallic loops and not the true resistance-to-ground of the grounding system. The veracity of the Induced Frequency Test has been questioned due to testing errors, however when properly applied to a small to medium sized, self-standing grounding system, this test is rapid and reasonably accurate.

Test Application

The proper use of this test method requires the utility neutral to be connected to a wye-type transformer. The oscillating voltage is induced into the grounding system at a point where it will be forced into the soil and return through the utility neutral. Extreme caution must be taken at this point as erroneous readings and mistakes are often made. The most common of these occur when clamping on or inducing the oscillating voltage into the grounding system at a point where a continuous metallic path exists back to the point of the test. This can result in a continuity test being performed rather than a ground resistance test.

Understanding the proper field application of this test is vital to obtaining accurate results. The induced frequency test can test grounding systems that are in use and does not require the interruption of service to take measurements.

Ground Resistance Monitoring

Ground resistance monitoring is the process of automated timed and/or continuous resistance-to ground measurement. These dedicated systems use the induced frequency test method to continuously monitor the performance of critical grounding systems. Some models may also provide automated data reporting. These new meters can measure resistance-to-ground and the current that flows on the grounding systems that are in use. Another benefit is that it does not require interruption of the electrical service to take these measurements.

TOWARDS RECORD THIN-FILM SILICON-BASED SOLAR CELLS

Thin-film silicon solar cells are one of the promising photovoltaic (PV) technologies owing to the earth-abundance of raw materials for producing them. It is a cheap and, when using flexible solar modules, also a light-weight PV technology. Recently, Hairen Tan was awarded his PhD with distinction (cum laude) on new materials and light management schemes for producing high-efficiency thin-film silicon solar cells at the Faculty of Electrical Engineering at TU Delft. The challenge for thin-film solar cells is that the absorber material is so thin that much light can be lost by passing through the material without being absorbed. By using photon management light trapping the optical thickness and light absorption of the solar cell is increased. Light trapping means that light is travelling as long as possible in the absorber layer of the cell. Tan has developed and applied various innovative high performing light trapping techniques, such as plasmonics and modulated surface textures, that have resulted in record solar-to-electricity conversion efficiencies of the thin film silicon-based solar cells.

Plasmonics

Light trapping by plasmonic nanoparticles has the potential to outperform the conventional light trapping methods. Hairen Tan developed an easily up-scalable process which can be used to create nanoparticles with the ideal size, shape and surface. He integrated the silver nanoparticles at the back of the solar cell, guiding light back into the solar cell to generate more power. Hairen Tan demonstrated that the performance of thin-film solar cells with nanoparticles can be as good as – and potentially much better than – solar cells with conventional ways of light trapping.



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IndiGo Airlines: Within Five Years Of Its Launch Has Displaced National Carrier Air India And Jet Airways To Become Number One In The Indian Aviation Sector.



RAHUL BHATIA
Chairman, IndiGo

This is another “**Believe It or Not**” entrepreneurial story of India. A decade ago, father and son duo, Kapil and Rahul Bhatia, were just a travel agency in Connaught Place. After five years, they started off as a humble budget airline and are now Gurgaon based IndiGo Airlines. Rahul likes to keep a low profile, but his business makes him visible all over India - and, increasingly; the world. IndiGo, with its two-tone blue livery and enviable on-time performance, has become a familiar, favoured brand.

Winner of ALMA’s Entrepreneur of the Year Award, Rahul feels the low-cost airline model would prevail overtime. Rahul is an Electrical Engineer from Ontario, Canada. Over the years got experience and exposure from his family travel business. After a two year stint with IBM, he roped in an experienced aviation management guru, Rakesh Gangwal, formerly of US Airways with a 50% share. IndiGo has become the largest low-cost carrier with no frills and walking its talk about what customers want i.e. **on-time departure, clean aircraft and good and clean flying experience. Its on-time performance record is 80.6%.**

The airline started operations in August 2006 and currently is the largest airline in India by market share. The airline is also one of the fastest growing airlines in South Asia. IndiGo operates to 33 destinations in India and abroad with 399 daily flights. Unlike most low cost carriers, IndiGo uses a hub and spoke model used by full service airlines where the airline flights to different destinations are routed through its hub. IndiGo has won many awards and recognitions including best LCC by the Airline Passengers Association of India (2007), best LCC at the Galileo Express Travel Awards (2008), CNBC Awaaz’s Travel Award for best low cost airline (2009), Skytrax Awards - Best low cost carrier (2010, 11, 12). IndiGo Airlines is now India’s biggest domestic operator with 27 per cent market share, despite a Government he has accused of being partial to a “select few”.

In India Today High and Mighty Power list 2013, Rahul has been ranked No 16.

20 MOST PEACEFUL COUNTRIES IN THE WORLD - 11

IRELAND



With its rich historical sites, amazing green pastures and friendly people, it’s not surprising that **Ireland** is one of the most peaceful countries on Earth! Ireland is an overall fabulous country with a plethora of reasons for tourism! Its rich literary history, castle-topped hills, spectacular coastline and legendary hospitality make Ireland a wonderful place to visit any time of the year.

(To be continued)
Courtesy: Amerikanki

வெள்ளை உணவின் கறுப்புப் பக்கம்

இன்றைக்கு உணவகங்களுக்குச் சென்று இரவு உணவு சாப்பிடும் பெரும்பாலோரின் விருப்ப உணவாக இருப்பது **பரோட்டா** அல்லது **புரோட்டா**.



இந்தப் பரோட்டா தயாரிக்கப் பயன்படுவது ‘வெள்ளை கோதுமை’ என்றழைக்கப்படும் மைதா. கோதுமை மிகப் பழமையான தாவரப் புரதம். கோதுமையில் புரதம், மாவு வடிவில் இருப்பதால், 99 சதவீதம் எளிதில் ஜீரணமாகிவிடும். ஆனால் மைதா அப்படிப்பட்டதல்ல என்கிறது ஏற்காடு இளங்கோ எழுதிய ‘பரோட்டா’ என்ற புத்தகம்.

மைதா என்பது கோதுமையின் எண்டோஸ்பெர்மில் இருந்தே தயாரிக்கப்படுகிறது. எண்டோஸ்பெர்ம் எனப்படும் கோதுமையின் உள்பகுதியை அரைத்தால், மஞ்சள் நிறத்தில் இருக்கும்.

இதனுடன் அசோடிகார் போனபைட், குளோரின் வாயு, பென்சாயில் பெராக்சைடு போன்ற வேதிப்பொருட்கள், மிருதுவாக மாற்ற அலக்ஸான் எனும் வேதிப்பொருள் போன்றவை சேர்த்துத் தயாரிக்கப்படுகிறது மைதா. **மாவை பிளீச் செய்யப் பயன்படும் பென்சாயில் பெராக்சைடு வேதிப்பொருட்களுக்குச் சீனா, ஜரோப்பிய ஒன்றியம், பிரிட்டன் உள்ளிட்ட பல நாடுகளில் தடை விதிக்கப்பட்டுள்ளது.** மரவள் எிக் கிழங் கிலிருந்தும் மைதா தயாரிக்கப்படுகிறது.

இந்த மைதாவில் சர்க்கரைச் சத்தைக் கொண்ட 100 சதவீத ஸ்டார்ச் எனப்படும் கார்போஹைட்ரேட் மட்டுமே உள்ளது. நார்ச்சத்து, வைட்டமின், புரதம் போன்ற எதுவுமே இருக்காது. இதனால் எளிதில் ஜீரணமாகாது. **பரோட்டா சாப்பிடுவதால் உயர் ரத்த அழுத்தம், மாரடைப்பு, இதய நோய்கள், உடல் பருமன், புற்று நோய், நீரிழிவு நோய், சிறுநீரகக் கல், மன அழுத்தம் போன்ற நோய்கள் ஏற்படலாம்.** பரோட்டா மட்டுமல்லாமல் மைதா மூலம் தயாரிக்கப்படும் எல்லாப் பேக்கரி உணவுகளாலும் இந்த நோய்கள் வரக்கூடும் என்று எச்சரிக்கிறது இந்தப் புத்தகம்.

பரோட்டா – ஏற்காடு இளங்கோ
வெளியீடு: யுனிகியூ மீடியா
இண்டிகிரேட்டர்ஸ், எண்: 8, 6-வது குறுக்கு,
8-வது மெயின் ரோடு, வைஷ்ணவி நகர்,
திருமல்லைவாயல், சென்னை – 600 109.

Courtesy: **தி இந்து, 12.09.2015**

TESLA IMPRESS PM WITH BATTERY TECH

Prime Minister Narendra Modi visited the Tesla Motors campus here on Sunday and showed keen interest in some of its path-breaking inventions, particularly in the renewable energy sector which can have multiple applications in remote rural areas.

After touring the iconic American automotive company's campus, Mr. Modi tweeted how he was impressed by the Powerwall technology of Tesla Motors which helps store electricity in a battery for long term.

“Enjoyed discussion on how battery technology can help farmers,” Modi said after his hour-long visit to Tesla campus wherein he was given a tour by its CEO Elon Musk. Mr. Musk said that he had a “great discussion” with Mr. Modi about solar and batteries empowering rural communities.

“For India, the main takeaway was the technology behind long-term storage battery, which can have multiple applications,” said Vikas Swarup, External Affairs Ministry spokesman.

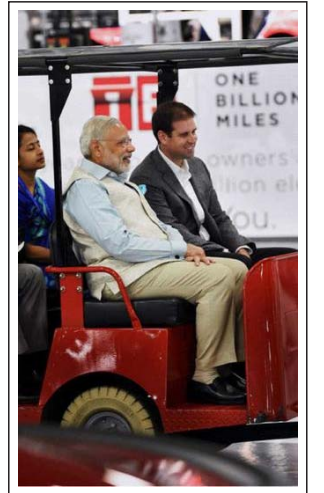
“The Prime Minister was very keen to see how we could utilise the battery — the Powerwall concept — to leapfrog development in India,” he added.

“The solar-operated battery can allow clean energy to reach out to the unserved parts of India where you have nothing right now and by using solar powered and long term battery could provide immediate access to energy,” Mr. Swarup said.

During the meeting, Mr. Musk gave a presentation to Mr. Modi on the revolutionary technologies being developed by Tesla “We were delighted to host Prime Minister Modi at the Tesla Factory,” Mr. Musk said.

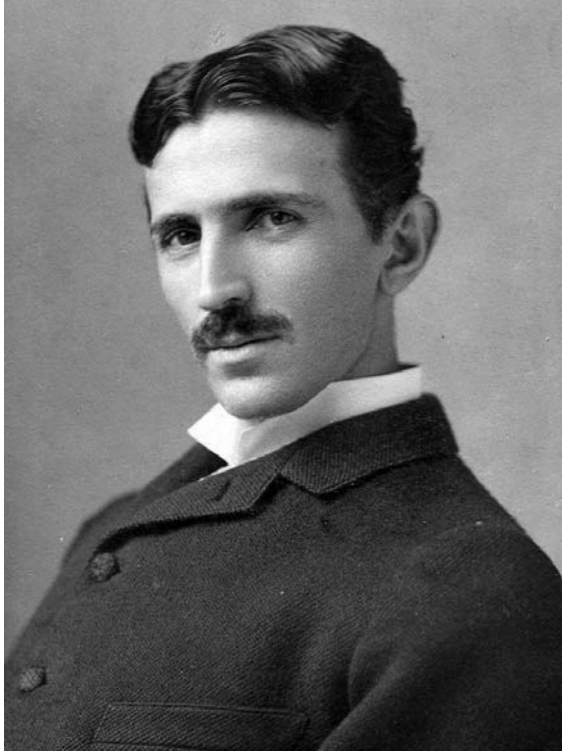
Mr. Modi also interacted with Indians working at Tesla and posed for a group picture with them. — PTI

Courtesy: **The Hindu, 28.09.2015**



NIKOLA TESLA (1856 - 1943)

Early years



A handwritten signature of Nikola Tesla in cursive script.

Nikola Tesla was born on 10 July 1856 to Serbian parents in the village of Smiljan, Austrian Empire (modern-day Croatia). His father, Milutin Tesla, was a Serbian Orthodox priest. Tesla was able to perform integral calculus in his head, which prompted his teachers to believe that he was cheating. He finished a four-year term in three years, graduating in 1873. In 1881, Tesla moved to Budapest to work under Ferenc Puskas at a telegraph company, the Budapest Telephone Exchange. Upon arrival, Tesla realized that the company, then under construction, was not functional, so he worked as a draftsman in the Central Telegraph Office, instead. Within a few months, the Budapest Telephone Exchange became functional and Tesla was allocated the chief electrician position. During his employment, Tesla made many improvements to the Central Station equipment and claimed to have perfected a telephone repeater or amplifier, which was never patented nor publicly described. In 1882, Tesla began working for the Continental Edison Company in France, designing and making improvements to electrical equipment. In 1885, Tesla claimed that he could redesign Edison's inefficient motor and generators, making an improvement in both service and economy.

Middle years (1886–1899)

In 1886, Tesla formed his own company, Tesla Electric Light & Manufacturing. The company installed electrical arc light based illumination systems designed by Tesla and also had designs for dynamo electric machine commutators. In April 1887, Tesla started a company, the Tesla Electric Company, with the backing of New York attorney Charles F. Peck and Alfred S. Brown, the director of Western Union. They set up a laboratory for Tesla at 89 Liberty Street in Manhattan so he could work on his alternating current motor and other devices for power distribution, with an agreement that they share fifty-fifty with Tesla any profits generated from patents. It was here, in 1887, that Tesla constructed a brushless alternating current induction motor, based on a rotating magnetic field principle he claimed to have conceived of in 1882. He received a US patent for the motor in May 1888. Company's Pittsburgh labs. During that year, Tesla worked in Pittsburgh, helping to create an alternating current system to power the city's streetcars. He found the time there frustrating because of conflicts between him and the other Westinghouse engineers over how to best implement AC power. Between them, they settled on a 60-cycle AC current system Tesla proposed (to match the working frequency of Tesla's motor), although they soon found that, since Tesla's induction motor could only run at a constant speed, it would not work for street cars. They ended up using a DC traction motor instead.

American citizenship

On 30 July 1891, at the age of 35, Tesla became a naturalized citizen of the United States. He told many of his companions that he valued the citizenship more than any scientific honors that he had acquired. In the same year, Tesla established his South Fifth Avenue laboratory in New York. Later, he established his Houston Street laboratory in New York at 46 E. Houston Street. He lit electric lamps wirelessly at both of the New York locations, providing evidence for the potential of wireless power transmission.

Tesla also explained the principles of a rotating magnetic field and induction motor by demonstrating how to make a copper egg stand on end. The device he constructed is known as the "*Egg of Columbus*".

X-ray experimentation

Starting in 1894, Tesla began investigating what he referred to as radiant energy of "invisible" kinds that he had noticed damaged film in his lab in previous experiments (later identified as "*Roentgen rays*" or "*X-Rays*"). His early experiments were with Crookes tubes, a cold cathode electrical discharge tube.



X-ray of a hand, taken by Tesla

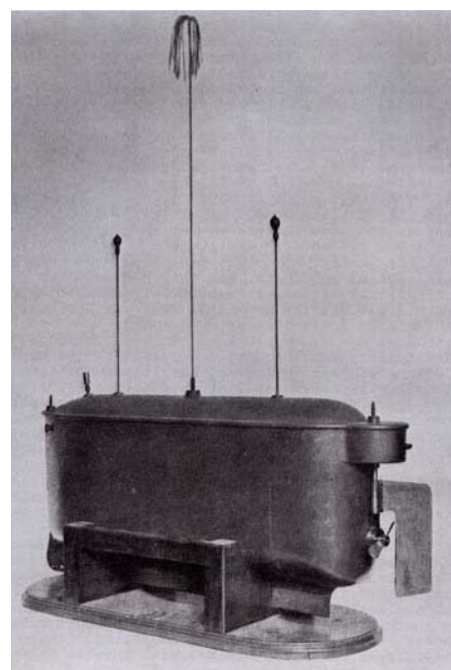
Tesla may have been the first person in North America to accidentally capture an X-ray image, when he tried to photograph Mark Twain illuminated by an earlier type of gas discharge tube Geissler tube in 1895. The only thing captured in the image was the metal locking screw on the camera lens. Tesla proceeded to do his experiments in X-ray imaging, developing a high energy single terminal vacuum tube of his own design that had no target electrode and that worked from the output of the Tesla Coil (the modern term for the phenomenon produced by this device is *bremsstrahlung* or *braking radiation*). In his research, Tesla devised several experimental setups to produce X-rays. Tesla held that, with his circuits, the “instrument will [... enable one to] generate Roentgen rays of much greater power than obtainable with ordinary apparatus.”

Tesla noted the hazards of working with his circuit and single-node X-ray-producing devices. In his many notes on the early investigation of this phenomenon, he attributed the skin damage to various causes. He believed early on that damage to the skin was not caused by the Roentgen rays, but by the ozone generated in contact with the skin, and to a lesser extent, by nitrous acid. Tesla incorrectly believed that X-rays were longitudinal waves, such as those produced in waves in plasma. These plasma waves can occur in force-free magnetic fields.

Radio

Tesla's theories on the possibility of the transmission by radio waves go back as far as lectures and demonstrations in 1893 in St. Louis, Missouri, the Franklin Institute in Philadelphia, Pennsylvania, and the National Electric Light Association. Tesla's demonstrations and principles were written about widely through various media outlets. Many devices such as the Tesla Coil were used in the further development of radio.

Tesla's radio wave experiments in 1896 were conducted in Gerlach Hotel (later renamed The Radio Wave building), where he resided.



Tesla boat

In 1898, Tesla demonstrated a radio-controlled boat—which he dubbed “teleautomaton”—to the public during an electrical exhibition at Madison Square Garden. Remote radio control remained a novelty until World War I and afterward, when a number of countries used it in military programs. Tesla took the opportunity to further demonstrate “Teleautomatics” in an address to a meeting of the Commercial Club in Chicago, whilst he was travelling to Colorado Springs, on 13 May 1899. In 1900, Tesla was granted patents for a “system of transmitting electrical energy” and “an electrical transmitter”.

On 15 June 1899, Tesla performed his first experiments at his Colorado Springs lab; he recorded his initial spark length at five inches long, but very thick and noisy. Tesla investigated atmospheric electricity, observing lightning signals via his receivers. Reproductions of Tesla's receivers and coherer circuits show an unpredicted level of complexity: distributed high-*Q* helical resonators, radio frequency feedback, crude heterodyne effects, and regeneration techniques. Tesla stated that he observed stationary waves during this time. At his lab, Tesla proved that the earth was a conductor. He produced artificial lightning (with discharges consisting of millions of volts and up to 135 feet long). Thunder from the released energy was heard 15 miles away in Cripple Creek, Colorado. People walking along the street observed sparks jumping between their feet and the ground. Electricity sprang from taps when turned on. Light bulbs within 100 feet of the lab glowed even when turned off. Horses in a livery stable bolted from their stalls after receiving shocks through their metal shoes. Butterflies were electrified, swirling in circles with blue halos of St. Elmo's fire around their wings.

Later years (1918–1943)

In 1928, Tesla received his last patent, U.S. Patent 1,655,114, for a biplane capable of taking off vertically (VTOL aircraft) and then be “*gradually tilted through manipulation of the elevator devices*” in flight until it was flying like a conventional plane. Tesla stated it would weigh 800 pounds and would sell at \$1,000 for both military and consumer uses. Although the aircraft was probably impractical, it may be the earliest known design for what became the tiltrotor/tilt-wing concept as well as the earliest proposal for the use of turbine engines in rotor aircraft. In 1935, in an annual birthday celebration interview, Tesla announced a method of transmitting mechanical energy with minimal loss over any terrestrial distance, a related new means of communication, and a method of accurately determining the location of underground mineral deposits. Later in life, Tesla made claims concerning a “**teleforce**” weapon after studying the Van de Graaff generator. The press called it a “**peace ray**” or **death ray**. Tesla described the weapon as being able to be used against ground-based infantry or for antiaircraft purposes.

Tesla gives the following description concerning the particle gun's operation:

[The nozzle would] send concentrated beams of particles through the free air, of such tremendous energy that they will bring down a fleet of 10,000 enemy airplanes at a distance of 200 miles from a defending nation's border and will cause armies to drop dead in their tracks.

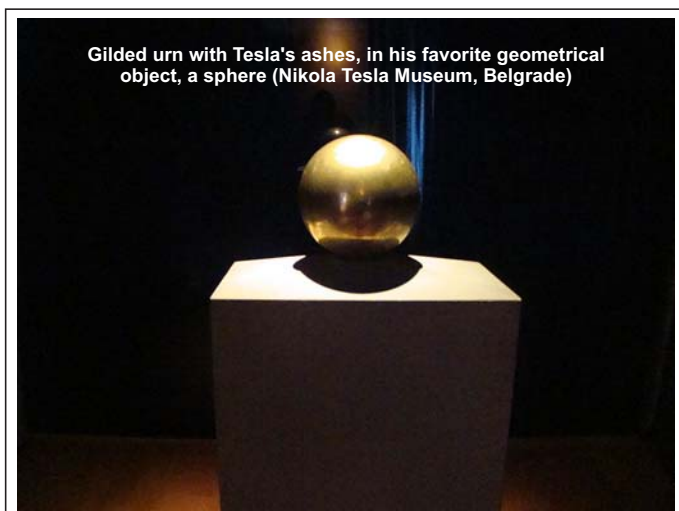
In total, the components and methods included:

An apparatus for producing manifestations of energy in free air instead of in a high vacuum as in the past. A mechanism for generating tremendous electrical force. A means of intensifying and amplifying the force developed by the second mechanism. A new method for producing a tremendous electrical repelling force. This would be the projector, or gun, of the invention. Tesla claimed to have worked on plans for a directed-energy weapon from the early 1900s until his death. His records indicate that the device is based on a narrow stream of small tungsten pellets that are accelerated via high voltage (by means akin to his magnifying transformer).

During the same year, Tesla wrote a treatise, "*The Art of Projecting Concentrated Non-dispersive Energy through the Natural Media*," concerning charged particle beam weapons. Tesla published the document in an attempt to expound on the technical description of a "superweapon that would put an end to all war". This treatise is currently in the Nikola Tesla Museum archive in Belgrade. It describes an open-ended vacuum tube with a gas jet seal that allows particles to exit, a method of charging particles to millions of volts, and a method of creating and directing non-dispersive particle streams (through electrostatic repulsion).

Death

On 7 January 1943, Tesla, 86, died alone in Room 3327 of the New Yorker Hotel.



Gilded urn with Tesla's ashes, in his favorite geometrical object, a sphere (Nikola Tesla Museum, Belgrade)

Patents

Tesla obtained around 300 patents worldwide for his inventions. Some of Tesla's patents are not accounted for, and various sources have discovered some that have laid hidden in patent archives. There are a minimum of 278 patents issued to Tesla in 26 countries that have been accounted for. Many of Tesla's

patents were in the United States, Britain, and Canada, but many other patents were approved in countries around the globe. Many inventions developed by Tesla were not put into patent protection.

Literary works

Tesla wrote a number of books and articles for magazines and journals. Among his books are *My Inventions: The Autobiography of Nikola Tesla*, compiled and edited by Ben Johnston; *The Fantastic Inventions of Nikola Tesla*, compiled and edited by David Hatcher Childress; and *The Tesla Papers*. Many of Tesla's writings are freely available on the web, including the article "**The Problem of Increasing Human Energy**," published in *The Century Magazine* in 1900, and the article "**Experiments With Alternate Currents Of High Potential And High Frequency**," published in his book *Inventions, Researches and Writings of Nikola Tesla*.

Legacy and honors

Tesla's legacy has endured in books, films, radio, TV, music, live theater, comics and video games. The lack of recognition received during his own lifetime has cast him as a tragic and inspirational character, well suited to dramatic fiction. The impact of the technologies invented by Tesla is a recurring theme in several types of science fiction.

On Tesla's 75th birthday in 1931, *Time* magazine put him on its cover. The cover caption "**All the world's his power house**" noted his contribution to electrical power generation. He received congratulatory letters from more than 70 pioneers in science and engineering, including Albert Einstein. The Tesla Society, founded in 1956. Tesla, a 26 kilometer-wide crater on the far side of the moon. 2244 Tesla, a minor planet. TPP Nikola Tesla, the largest power plant in Serbia. Tesla (company), electrotechnical conglomerate in the former Czechoslovakia. Tesla Motors, an electric car company.

The Belgrade Nikola Tesla Airport.

The Nikola Tesla Award

The Nikola Tesla Museum Archive in Belgrade
On 7 July 2006, on the corner of Masarykova and Preradoviceva streets in the Lower Town area in Zagreb, the monument of Tesla was unveiled. This monument was designed by Ivan Meštrovic in 1952 and was transferred from the Zagreb-based Ruđer Boškovic Institute where it had spent previous decades. A monument to Tesla was established at Niagara Falls, New York.

KEEP YOUR FAMILY HEALTHY WITH LAUGHTER

I know you've heard that laughter is the best medicine. It's not a joke. It really is.

What health benefits can we expect from laughing regularly?



According to Sondra Kornblatt, from her book, *A Better Brain at Any Age: The Holistic Way to Improve Your Memory, Reduce Stress, and Sharpen Your Wits*, laughter can:

- Lower blood pressure.
- Increase vascular blood flow and oxygenation of the blood.
- Give a workout to the diaphragm, abdominal, respiratory, facial, leg and back muscles.
- Reduce stress hormones such as cortisol and adrenaline.
- Increase the response in tumor and disease-killing cells such as Gamma-interferon and T-cells.
- Give you greater defense against respiratory infections — even reducing the frequency of colds — by immunoglobulin in saliva.
- Increase memory and learning: in a study at Johns Hopkins University Medical School, humour during instruction led to increased test scores.
- Improve alertness, creativity and memory.

It can also:

- Lessen depression and anxiety.
- Help you in connecting with others.
- Give you greater ease in coping with difficult situations.
- Enhance intake of oxygen-rich air stimulates the heart, lungs and muscles and increases the endorphins that are released by the brain.

I can't think of any pill, treatment, or therapy that has all of these benefits with no harmful side effects. And, humour works quickly. Less than a half-second after exposure to something funny, an electrical wave moves through the higher brain functions of the cerebral cortex. The left hemisphere analyzes the words and structures of the joke; the right hemisphere "gets" the joke; the visual sensory area of the occipital lobe creates images; the limbic (emotional) system makes you happier; and the motor sections make you smile or laugh.

Here are some suggestions for how your family can laugh more

- Decide you want to laugh and it will happen more naturally.
- Post a joke of the day on the refrigerator.
- Pack a joke in a brown bag lunch.
- Record and send a joke as a cell phone message.
- Plan a family open mic comedy night.
- Watch a funny movie together.
- Encourage pranks.
- Learn to laugh at your mistakes. (As an extra benefit, others will laugh with you, not at you.)
- Talk about serious things with a humorous edge. (Here's one of my own examples: My first husband just didn't understand why he shouldn't date other women while we were married. My second husband didn't get why he shouldn't date other men while we were married. Go ahead, then. Ask me why I'm single.)
- Call a funny friend.
- Play with children — they have a much more natural ability to laugh at everything.
- Read a funny book.
- Keep a silly journal to look at when you need a laugh. Fill it with humorous quotes, funny events and jokes.
- Go to a place with lots of people and imagine funny stories about their lives (I love to sit in airports with a friend and dream up crazy lives for the people I see.)
- Try laughter yoga or join a laughter yoga group.
- Turn off the news radio on your commute and listen to a morning comedy team.
- Start a pillow fight.
- Watch silly YouTube videos (particularly laughing babies).
- Close your eyes and remember a time when you laughed really, really hard.
- Read the comics in the newspaper.
- Go to a comedy club. (Beware that some are rather raw humour, so check them out first.)
- Listen to and practice the wisdom of Stephen King: "You can't deny laughter; when it comes, it plops down in your favourite chair and stays as long as it wants."

Do your best to incorporate humour into your life and your family. It may be work at first, but worth the effort. You will all be healthier for it. It will teach your children how to laugh at themselves and their troubles and help them to have healthier families.

HOME FESTIVALS – 11

கார்த்திகை – Karthikai (November/December)



Krittika Dipa (right) is a joyous festival held on the Krittika nakshatra (when the moon is in Pleiades constellation). Also called Sivalaya Dipa, it is celebrated most

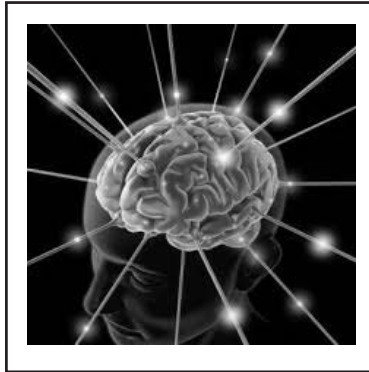
famously at Tiruvannamalai (upper left in the painting), on top of Arunachala Hill, home of saint Ramana Maharishi. A bonfire is lit on top that can be seen for miles around. Karthigai Purnima, the full-moon day, honours Lord Murugan. In one traditional story, six sparks from Siva's third eye became six babies (lower left), later gathered into one six-headed Arumugam (center) by Parvati. Celebrations include lighting hundreds of oil lamps especially the standing lamp (right) of the home. On this day in Orissa, devotees make banana leaf boats and float them in the river with oil lamps (lower left).

(To be continued)

POWER YOUR MIND

DO YOU REALLY LOVE?

Those who say 'I love'
Know not what love is
Those who love out of fear
Can never love their near and dear
Those who love for selfish gain
Must get only sorrow and pain
Love that will never expect
In return gets love and respect.
Love that embraces one and all
Alone can hear the divine call
When it transcends the limited self
It gets lost in the Supreme Self.



Courtesy: Swami Srikantananda

LOVE YOU MUST

Don't be hard-hearted
But learn to love
Does not matter, whom do you do love
Only remember this:
When you love your near and dear
That is ignorance.
When you love objects of
Enjoyment that is infatuation.
When you love the poor,
And the needy, that is compassion.
When you love God
And the prophets that is devotion.
When you love the whole world as
Your family that is wisdom.

Do not twist scriptures to suit your views. Understand it properly and act accordingly, with faith and devotion. Do the duties prescribed by shastras, not just to the extent possible but "wholly". The practice of the shastraic injunctions will remove our sins and cleanse our hearts. In the heart so kept clean, God will manifest himself and guide us to the higher realms of realization, when all differences will automatically drop off.

– **H.H. SHRI PARAMACHARYA**

PHILIPS LED FIXTURES REVEAL ARCHITECTURE OF TURKEY'S TUNCA BRIDGE

Philips Lighting has announced another LED lighting project at an iconic historical site — the Tunca Bridge constructed during the Ottoman Empire that links Edirne, Turkey with western neighborhoods of the city and ultimately Greece. Solid-state lighting (SSL) products, including color-tunable LED fixtures from Philips Color Kinetics, combine with a network control system to present a dynamic nighttime experience that fully reveals the historic architectural details of the bridge.

Philips has been involved with a number of bridge projects including the Big Four Bridge in Louisville, KY. But the Tunca project required great care to ensure that no damage was done to the bridge structure. Indeed, the company said that it had to devise ways to mount the LED fixtures without drilling into the bridge structure. Instead, the team working on the bridge used steel cables and plates to add luminaire mounting locations at select points on the structure.

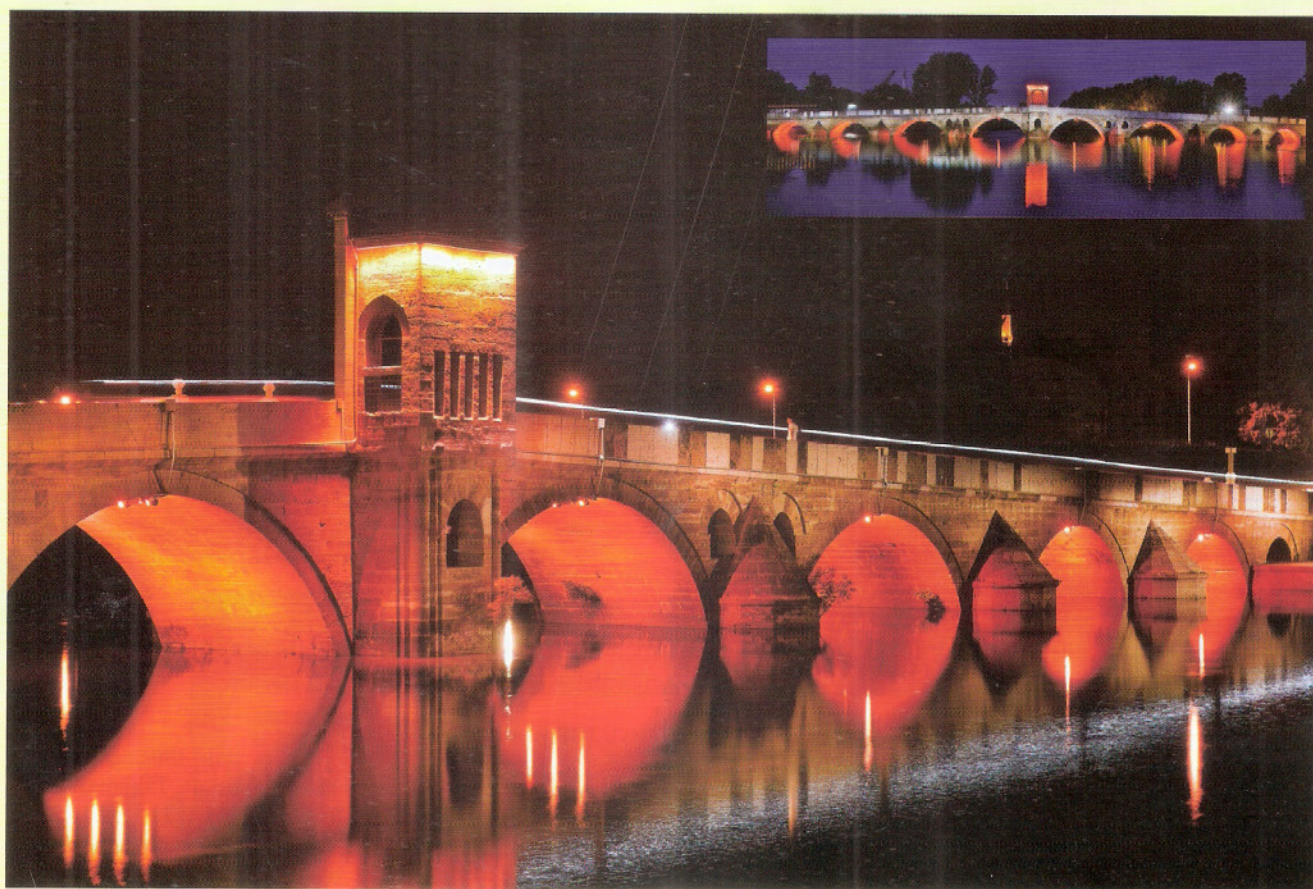
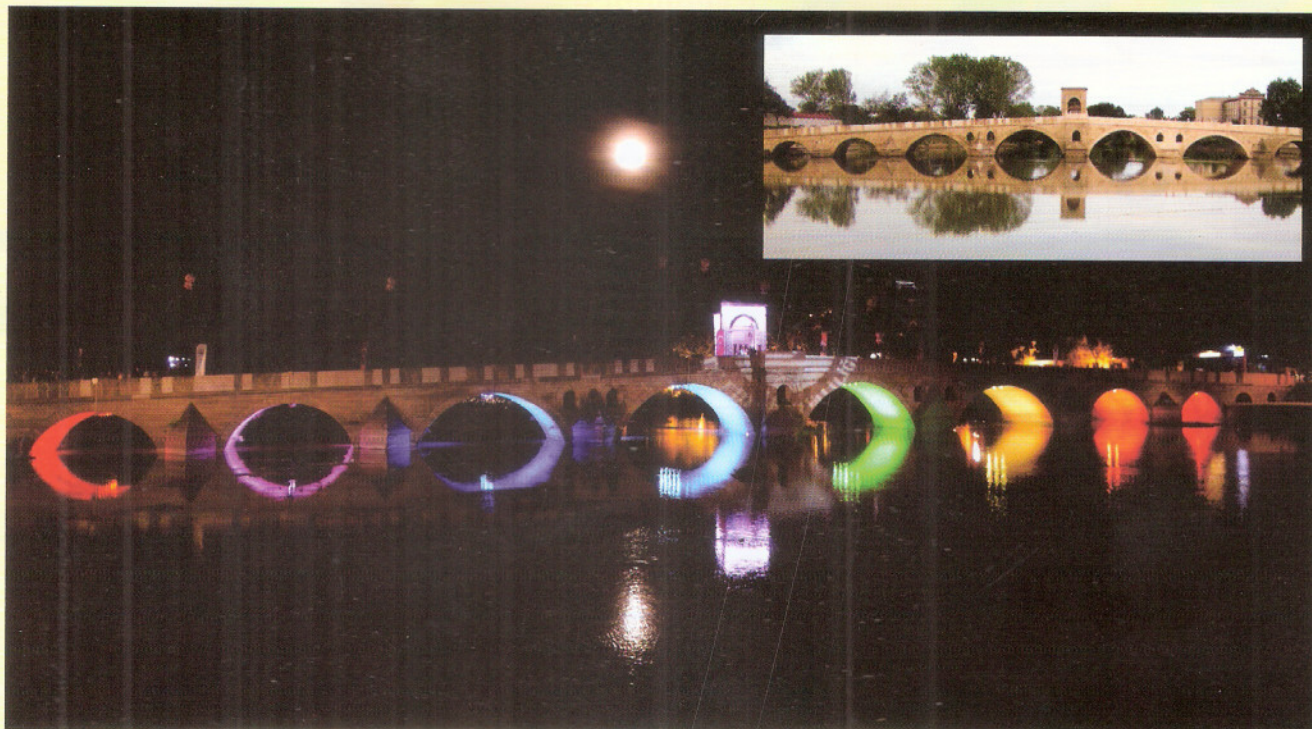
The completed project uses Color Kinetics iColor Graze MX Powercore linear grazing luminaires, Color Blast Powercore wall washers, and water-resistant C-Splash LED fixtures to deliver the dynamic or subtle lighting of the arches. The project also used Philips ProFlood 150W projectors and ilti Luce Lux20 spotlights from a Philips business unit in Italy.

Previously, simple projectors only lit the silhouette of the bridge. The new system fully reveals the arches and facades of the structure. Moreover, the design also includes inner and outer lighting of the dome of the Kitabe Pavilion in the center of the bridge. Color or shades of white can be applied to both the arches and the central tower. Despite the far superior lighting experience afforded by the new SSL installation, the project will deliver significant energy savings of 53% relative to the simpler projector-only systems used previously. Moreover, a combined wired and wireless control system allows for both the dynamic presentation and dimming of the lighting for additional savings.

History

The **Saraçhane Bridge** aka the **Sultan's Bridge**, **Sahabettin Pashaa – Sultan Mustafa Bridge** or **Horozlu Köprüsü** (Rooster Bridge) is an Ottoman bridge across the Tunca river in Edirne, Turkey. The bridge was built in 1451 on the direction of Sahabettin Pasha, the Beylerbey of Rumelia in the court of Sultan Murad II (r. 1421–44, and then 1446–51). It is 120 m (390 ft) long and 5 m (16 ft) wide, with 11 piers and 12 arches. The bridge was repaired during the reign of Sultan Mustafa II in 1706.

PHILIPS LED FIXTURES REVEAL ARCHITECTURE OF TURKEY'S TUNCA BRIDGE



Abirami Electricals

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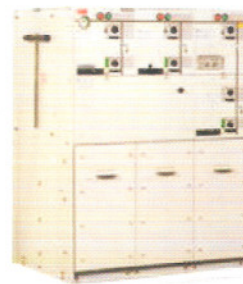
VCB



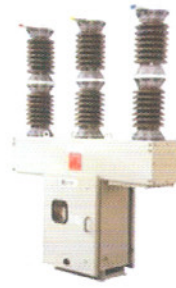
LBS



USS



RMU



PCVCB

LT Panel Boards



MV Panel



AMF



APFC

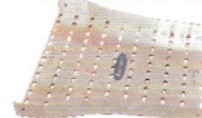
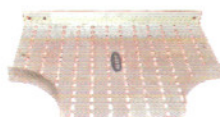


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