



ELECTRICAL

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NEWS LETTER

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

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EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings to One and All!

Happy Engineers Day!!

September is a Month when we celebrate Engineers Day on the 15th of September all over the country and the theme for this year is, very appropriately,

“Digital Transformation: A New Industrial Revolution” A write up on this theme is published elsewhere in the issue for the information of readers.

India is marching ahead and is even trying to gallop ahead, with multiple objectives, starting from the basic of ‘**Clean India**’ to ‘**Make in India**’, ‘**Digital India**’ and so on with overall plans to achieve Growth of Agriculture, increased Farmers income, Growth of Manufacturing to form a higher percentage of GDP, Growth of Micro, Small and Medium Enterprises, Growth of Service Sector Internationally to achieve sizable share in the IT(Information Technology), IoT(Internet of Things) and AR(Artificial Intelligence) Markets and so on with highly improved Infrastructure, Safety and Security and Wellbeing for all Citizens of India. It is heartening for all of us that the overall growth is appreciable and it is predicted that in a few years time we will achieve great heights.

In these contexts, we Engineers have a very important role to play particularly in the area of Energy where we have to tirelessly work on Safety, Security and Reliability, clubbed with focus on Energy Sources with reduced ‘Carbon Emission’ and Energy Efficiency, for reducing the ‘Carbon Foot Prints’. Energy Efficiency in particular, is a very complex thing, as it is not just Efficient Equipment’s and Efficient Distribution, but much more like the concern for Efficiency in every one of the activities, from very simple to very complex. Simple activities like use of water for brushing the teeth, or discrete use of Energy at home and at work and in public places or Driving a vehicle and innumerable such activities matter a lot in achieving Energy Efficiency and the complex matters like processes and Controls and Productivity, these and more help achieve overall better efficiencies. It will be interesting to see that all the advanced countries work on faster and faster Transport Systems and better and better Roads for faster and uninterrupted movements to save time and make it available for more and more of productive and leisure time for people.

International Day for Preservation of the Ozone Layer is observed on the 16th of September and as we know, the main causes are use and misuse of Chemicals, particularly in Air Conditioners, which forms a substantial percentage of energy use. We are able to see just around us, the enormous increase in Air conditioning, in the past 1 or 2 decades, be it IT and Commercial sectors or entertainment centres or homes. Air conditioners have become commodities in retail trade with substantial increase in volumes. One important measure required is Legislation and Control with regard to use of Chemicals in Air Conditioners.

We thank all those members who have helped us by participating in the advertisement appearing for the issue August 2018 – Universal Earthing Systems Pvt. Ltd., Dehn India Pvt. Ltd., Power Cable Corporation., Supreme Power Equipment Pvt. Ltd., Alfa Switchgear (I) Pvt. Ltd., Excel Earthings, Consul Neowatt Power Solutions Pvt. Ltd., Galaxy Earthing Electrodes (P) Ltd., Wilson Power and Distribution Technologies Pvt. Ltd.

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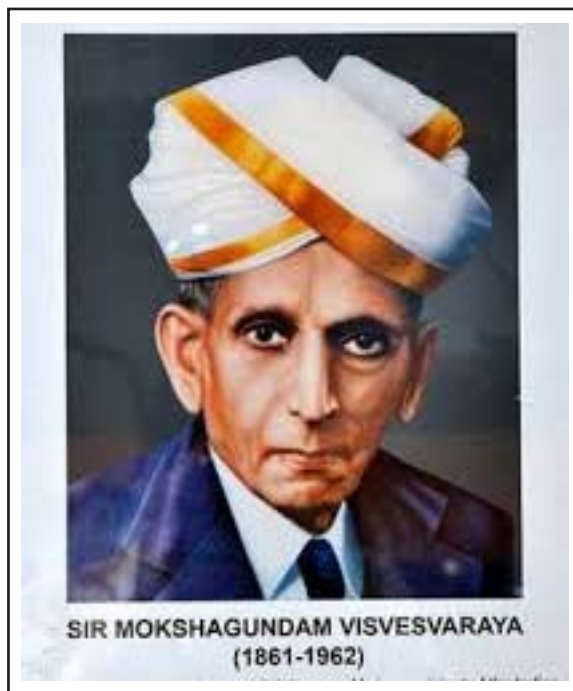
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MOKSHAGUNDAM VISVESVARAYA

It was well beyond midnight, **during the British era in India.**

A train was travelling to its **destination** with **howl** in the **silence** of the light. A man was **sleeping** with his head **on the side window** of the train. Suddenly **he woke up** from his sleep. He jumped from his seat and **pulled the chain** hanging just over his head. The **train stopped** immediately. The **employees** and other **passengers** in the train **rushed to the compartment** to know what had happened. They were **angry** on this man. All surrounded the man and **asked the reason** behind **chain pulling**. The man told them that there is a **crack in the railway tracks**, a few metres ahead. The people **did not believe him**. The man **asked them to go and check** for themselves. The railway workers got down to the track **to examine it**. And voila, **they found a crack** in the track. The man told them that **he heard the sound from the track** while sleeping and it **changed at some place**. The **vibrating sound changed** too heavily which the man recognized that it was **due to the crack** in the railway line. *Do you know who was that man who saved many lives from certain death?*



It was none other than **the best engineer** that India ever produced, *Bharat Ratna* **Sir Mokshagundam Visvesvaraya**. This man is **responsible** for the building of India's **irrigation structure**. It won't be wrong to say that he has **designed India**.

*15th September is celebrated as a **Engineers' Day** in the memory of **Sir. M. Visvesvaraya**.*

51ST ENGINEERS' DAY 15/09/2018 THEME DIGITAL TRANSFORMATION: A NEW INDUSTRIAL REVOLUTION

Industries around the world are now facing substantial challenges due to recent environmental, societal, economic and technological developments regarding disruptive concepts of Internet of Things, Cyber Physical Systems or Cloud based Manufacturing, which lead to the fourth stage of industrial revolution. Increased digitization which waves out traditional and conventional production concepts including mass production, batch production, continuous process flow and project is the need of the hour. The first industrial revolution utilised water and steam power for mechanizing production. During second industrial revolution, application of power was more with the objective to obtain mass production. During third industrial revolution, industrial automation was introduced, which involved vast application of Electronics and Information Technology. The fourth industrial revolution, termed as Industry 4.0 is empowered by wide range of digital technology not only in digital realm, which involves artificial intelligence, machine learning, advanced robotics and new formation of automation, but also in physical realm including new materials like graphene, genetic advances as well as biological realm which involves sensors, Internet of Things, Block Chain and Distributed Ledgers, 3D Printing, autonomous vehicles like drones, so on and so forth.

Thus Industry 4.0 is focused on creating intelligent products, processes and procedures that leads to ubiquitous connectivity of people, things and machines. The vision of Industry 4.0 is likely to be adopted worldwide and it might influence other initiatives and cooperative efforts. In general, there are nine key technological components that progressively make up the foundation of Industry 4.0: Autonomous robots, big data, augmented reality (AR), additive manufacturing, cloud computing, cyber security, IoT, system integration, and simulation.

On a digital platform, Industry 4.0 is applied with three mutually interconnected factors, namely

- Digitization and integration of any simple to complex technical – commercial relation,
- Digitization of products and service offers and
- New market models

All these human activities are interconnected through state of the art communication system, which include Internet of Things, Internet of Services and Internet of People.

There are three principal approaches in Industrial 4.0 concept, namely horizontal integration, vertical integration and integrated digital engineering. Horizontal integration refers to integration of different information systems, applied principally for production planning and process control. Vertical integration refers to integration of information at different hierarchical levels, which allows preventive actions to avoid any defect. Integrated digital engineering enables the collection and exchange of production data throughout the entire chain involved in product development and leads to reduction of large amount of production data accumulated throughout the life cycle.

According to India Brand Equity Foundation (IBEF), Government of India has set an ambitious target of increasing the contribution of manufacturing output to 25 percent of Gross Domestic Product (GDP) by 2025, from 16 percent currently. IoT, being one of the most important aspects of Industry 4.0 for India, is expected to capture close to 20 percent share in global IoT market in the next five years. According to IBEF forecast, the IoT market in India is projected to grow at a CAGR of more than 28 percent during 2015-2020. Government of India has taken initiatives such as Green Corridors and 'Make in India'.

The various bodies of Engineers and Engineering are committed for holistic development of the country and believe that Digital Transformation will usher a new Industrial Revolution.

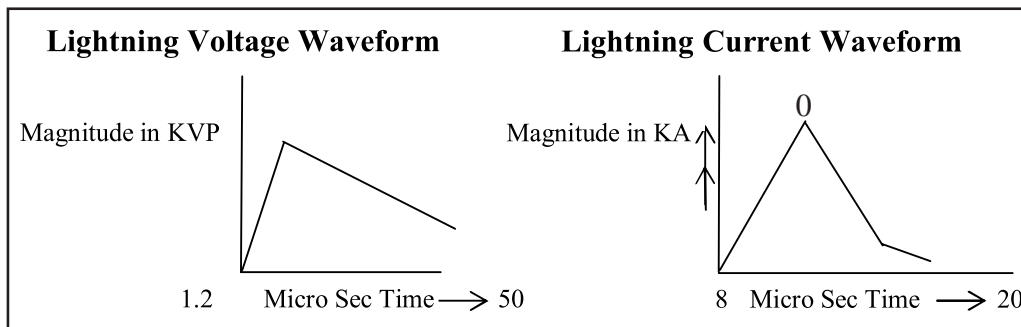
KNOW THY POWER NETWORK - 132

Let us move further. The characteristic features of the “**Lightning Surges; its impacts on the power apparatus and the system and its protective measures**” are as follows.

(i) **Origin:** It is a natural phenomenon occurring in micro seconds time. It occurs when a charged cloud discharges its static energy either to another cloud or to the ground. The separation and accumulation of charges occur due to the violent movement of air. Nobody knows how the charges are separated and get accumulated in the cloud. When the charges thus collected in a cloud exceed the clouds’ withstand level or storage capacity, the cloud starts leaking them. i.e. electrical discharges are triggered or initiated. i.e. the charges move away or escape from the charged cloud and travel at a very high velocity so as to reach its final destination Viz. ground or neighbouring cloud or any metallic object so as to discharge their stored energy successfully. All these events are completed in a period of a few micro seconds. The phenomenon of lightning can be compared to the one witnessed in a leaky condenser, normally experienced in a power system.

(ii) **Nature of Lightning Surge:**

(a) **Wave Form:** Voltage = 1.2 / 50 Micro second Current 4/10 or 8/20 Micro second



| | | |
|--|---|---|
| (b) Energy content | = | 1-2 MW (approx.) |
| Rate of rise of voltage | = | 1000-2000KV/Microsec |
| Voltage level | = | 1000 KVP (approx.) |
| Current | = | 100-200 KA peak |
| Peak value of lightning Voltage experienced so far | = | 4 – 6 P Unit |
| Where 1 PU | = | $\left\{ \frac{\sqrt{2} \times \text{L-L voltage}}{\sqrt{3}} \right\} \text{KVP}$ |

(iii) **Protective Measures**

(a) Direct lightning strokes

- (i) Masts or spikes
- (ii) Ground wires
- (iii) Spark gaps

A well maintained separate earth bit or other earthing system (without breaks or gaps) and with a low earth resistance is essentially required to withstand the encounters with lightning strokes.

High tower foot resistance or high earth resistance of any installation will make the system vulnerable, poses high risks and will lead to dangerous chopped waves (Back Flash Over) phenomenon.

(iv) Spark gaps – It forms a crude form of protection, not fully reliable.

(b) Indirect lightning strokes

- (i) Surge Arresters with adequate energy discharge / handling capacity
- (ii) Spark gaps
- (iii) Masts
- (iv) Ground wires

While arranging an effective protection against lightning the following points deserve due attention.

- Capture lightning strokes
- Route their energy to ground
- Dissipate their energy in the grounding network effectively.
- Bond all ground points together so as to make this process more effective
- Arrange adequate surge protection for the power lines and cables before they enter into the power station or substation. This may be carried out upto a distance of 2 km from the stations concerned and adopt effective ground wire system or line surge arresters.
- In the case of LV networks and communications circuits, adopt proper earthing for the devices and employ reliable surge protective devices.
- Arrange separate earth joints for the lightning strokes and electronic devices; also provide adequate protection for the building and all the electronic and other vulnerable equipment / devices housed in that building.

(v) Impacts – If we fail to arrange effective protective / guarding measures against lightning, we should be prepared to experience the impacts of lightning surges as described below.

Normally lightning strokes occur in single or multiple and follow the same plasma path.

There are three effects of lightning discharges. They are

- | | |
|------------------|--|
| (i) Electrical | } These effects are determined by the current that is discharged to the building structure on earth. These currents are unidirectional, vary in amplitude from a few hundred Amps to 200 KA in a few microsec and decay quickly. |
| (ii) Thermal | |
| (iii) Mechanical | |

1. Electrical Effects

Of all these effects, electrical effects occupy the prime position. These effects are two fold

- (a) The lightning current, which is discharged to earth through the resistance of the lightning conductor and earth electrode (lightning protective system) produces a resistive voltage drop and momentarily raises the potential of the above said lightning protective system to a very high value. The lightning current also produces, around the earth electrode, a high voltage gradient which is dangerous to persons and animals.
- (b) Moreover, it is supplemented by the inductive voltage drop produced by the lightning current in the above system and it adds up to the resistive voltage drop and brings a high voltage in the system. Now the object hit by the lightning stroke is subjected to a very high potential across it and it may lead to its failures. At times it may trigger partial discharges in the equipment like Transformers and Current Transformers and Potential Transformers.

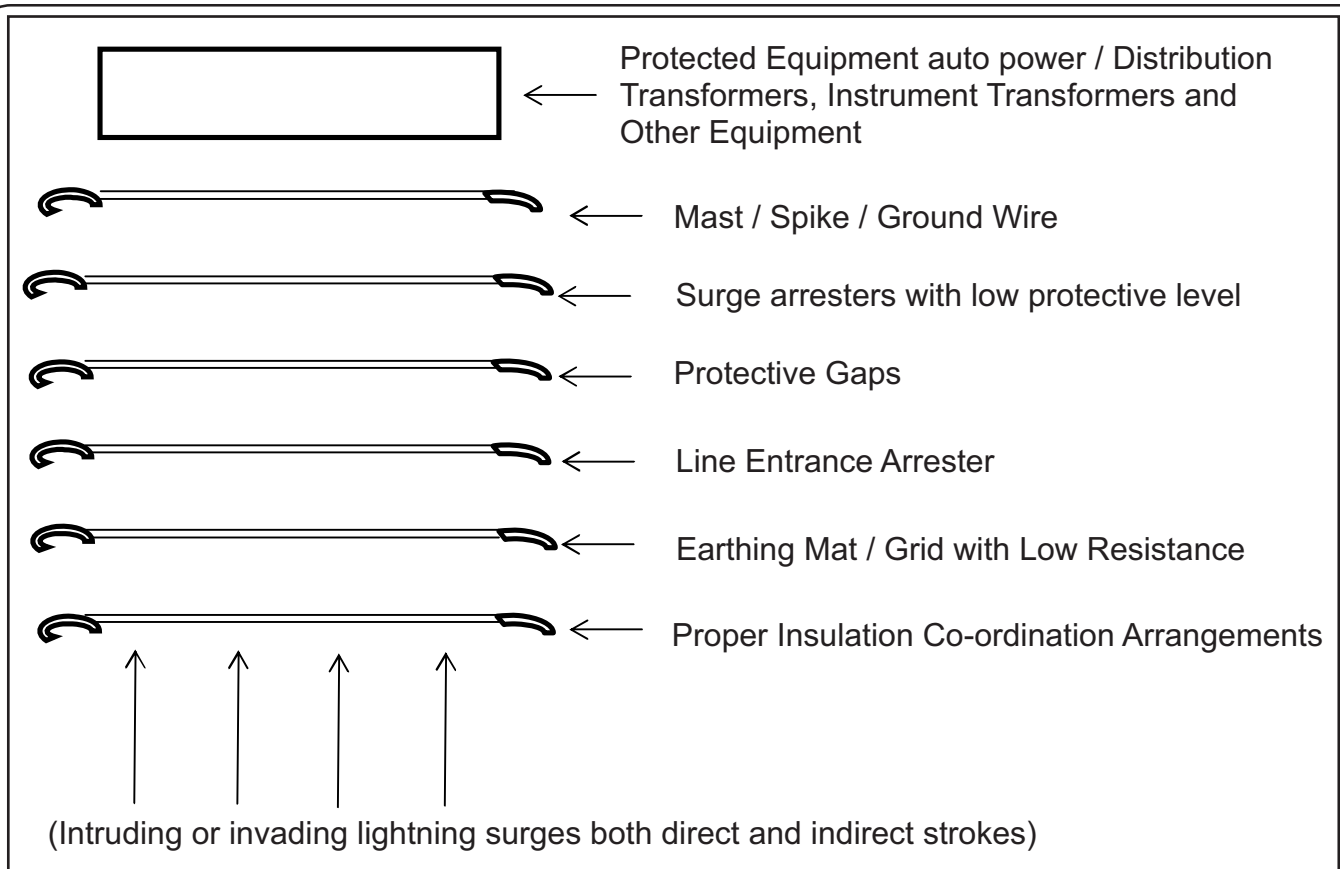
2. Thermal Effects

When the lightning discharge through the lightning conductor on the building structure occurs, it simply raises the temperature of the related object to a very high level. But as it happens only for a short duration Viz. the flow of lightning current for a few micro seconds, its effect is usually negligible and hence it is not given much importance. However it gains much significance when it hits trees or thick forests. Then the fire brought by it demand immediate action.

3. Mechanical Effects

When the lightning discharge occurs through parallel conductors which are in close proximity to each other, they are subjected to large mechanical forces. Hence it is essential to provide mechanical fixings / support to these conductors. Another effect that may be experienced is due to the air channel or plasma space along which the lightning discharge travels is suddenly raised to very high temperature. (Air channel is nothing but the ionized space (plasma space) that exists between the lightning stroke and the lightning conductor or any other object that is exposed to the lightning). This results in a strong air pressure wave which is responsible for the damages to the buildings, trees and other structures. It is well-nigh possible to provide protection against such effects.

The six layers of protection normally given to the power station and substation equipment, especially transformers and instrument transformers are depicted in Fig 1.



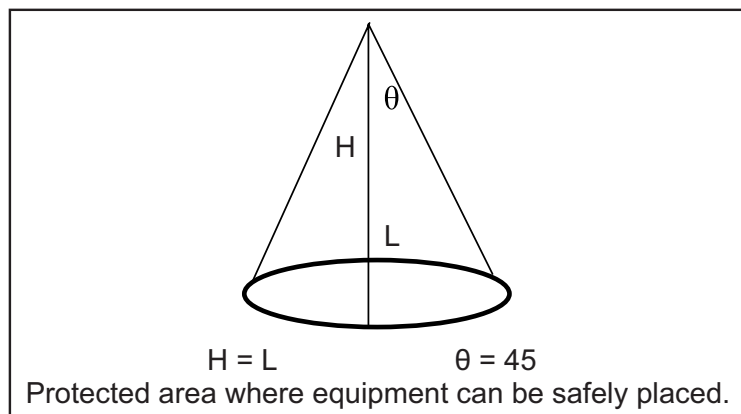
Now let us see the salient features of these protective devices.

(1) Mast / Spike / Ground wire / Earth screen

These are provided to guard against direct lightning strokes. The protected area covered by these measures depends upon their height. In the case of mast / spike the protected area is in the form of a cone as shown right.

This protective cone is in the form of an equilateral triangle. Angle ' θ ' is called shielding angle. Normally due to various controlling factors its effective shielding area is in the range of 26° .

The ground wire / earth screen provide similar protection but they give better protection when compared to that of Masts / Spikes.



Spark gaps offer only a crude form of protection. Its operation is controlled by factors like the rate of rise of incoming wave, gap setting, atmospheric pressure and humidity.

Let me sign off here.

In the forth coming article we shall continue the topic of over voltage surges with a special focus on surge arresters which are generally provided to guard against indirect lightning strokes and switching surges.

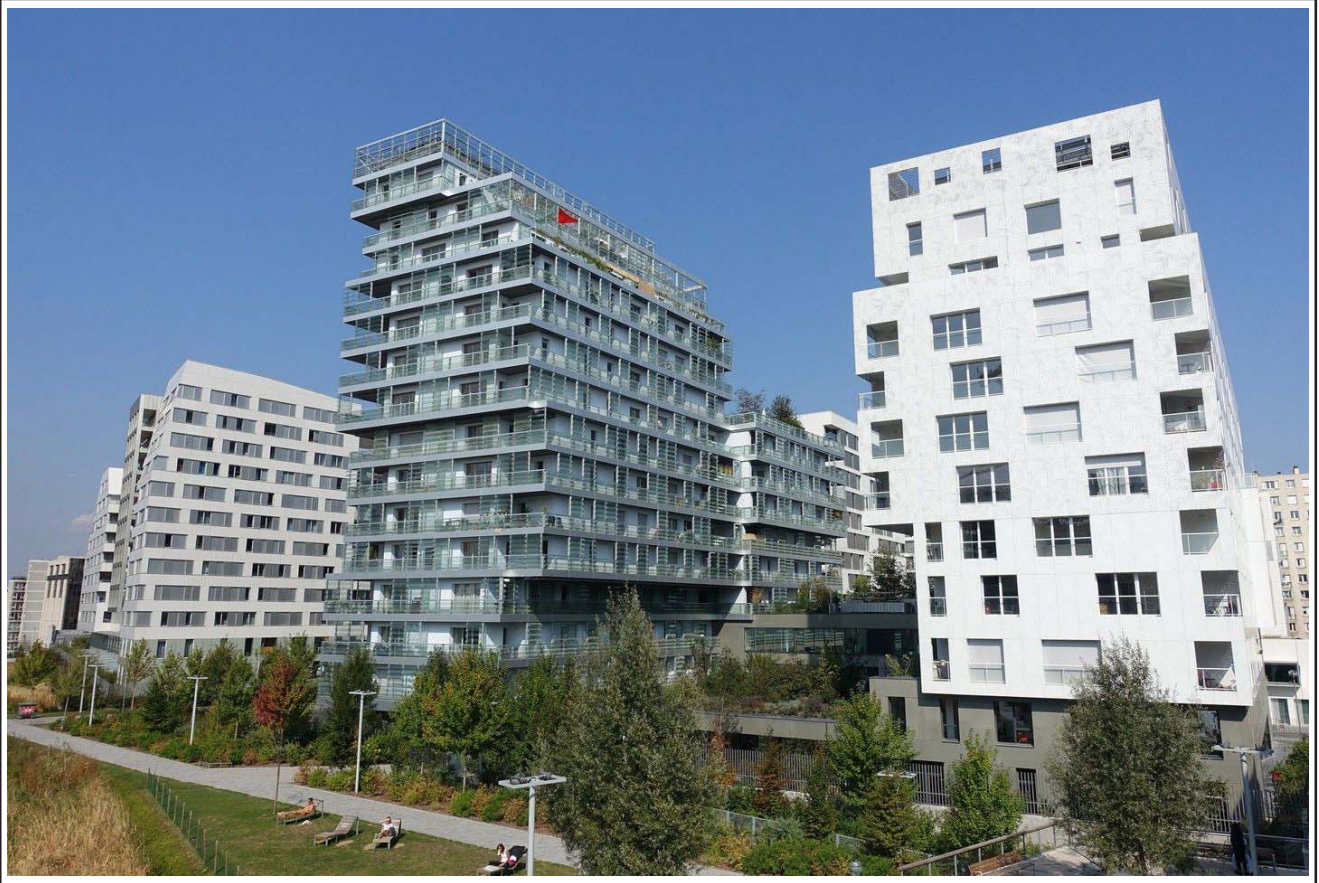
(To be continued...)



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PARIS IS BUILDING THE ECO-COMMUNITY OF THE FUTURE RIGHT NOW. HERE'S HOW.

Every so often an environmentally friendly building gives us a glimpse of the low-carbon future so many climate plans envision. With the development of Clichy-Batignolles, the city of Paris has created a groundbreaking eco-village filled with such buildings. Begun in 2002, the massive redevelopment project is about 30 percent complete and is slated to be finished in 2020.



In 2007, Paris became one of the first municipalities in the world to adopt a climate action plan, setting goals for greenhouse gas emission reductions above and beyond those outlined by the European Union. Employing virtually all the tools in the green builders' toolkit, Clichy-Batignolles aims to be tangible evidence of the city's commitment to reducing its carbon footprint as well as an experimental laboratory for testing what's possible in climate-sensitive redevelopment.

What used to be a train yard is being turned into an urban park surrounded by energy-efficient buildings that will house 7,500 residents and provide places of employment for more than 12,000 people.

Clichy-Batignolles' naturally landscaped park and eclectic modern architecture contrasts sharply with historic Paris. But what makes Clichy-Batignolles most significant cannot be seen with the naked eye. The complex planning process it pioneered involving disparate stakeholders working in concert to maximize building efficiency and minimize resource use offers other cities a roadmap to achieve a low-carbon future.

The development's contribution to sustainable urban design was recognized in 2016, when it won the Sustainable City Grand Prize in the international Green City Solutions Awards competition.

Maximizing Space, Minimizing Emissions

According to a brochure for the project, the City of Paris sought to make Clichy-Batignolles "a model for sustainable urban development." Architects, urban design experts, government officials and environmental engineers worked together for years to plan the project, and the project's design team was charged with incorporating as many best practices in contemporary green design as possible.

Nicolas Rougé, a consultant in sustainable urban planning who has been with the project in a number of roles since 2008, says this mandate drove those involved to experiment with technologies in ways they hadn't before in order to meet ambitious goals.

To keep building footprints as small as possible while maximizing usable space, Clichy-Batignolles developers sought and won permission to exceed Paris's longstanding height limit of 37 meters (120 feet). When the project is complete, 10 buildings will stand at 50 meters (160 feet), while the new Palace of Justice by renowned architect Renzo Piano soars to 160 meters (520 feet).

Overseen by a public company owned by the City of Paris, developers at Clichy-Batignolles must follow extremely strict guidelines for building energy consumption.

For heating, energy use cannot exceed 15 kWh per square meter (11 square feet), the aggressive limit set by Passivhaus building standards. Buildings maximize use of insulation and high-performance window glazing, and they are oriented toward the sun to capitalize on natural heat and light. Many use high-density materials that capture and release solar heat to aid in heating and cooling.

Mireille Fenwick, a resident of the eco-district, says her apartment is so well insulated that in the three years she's been there, she's turned on her heat only a few times. Considering that heat accounts for a substantial proportion of residential energy use, that savings is significant.

Some energy-efficient measures offer other benefits, too. A number of buildings have green roofs that offer not only insulation, but also garden space for residents and habitat for wildlife. One building housing an elementary school has walls covered with plants that both insulate the building and add biodiversity.

Much of the district's heat and electricity comes from renewable sources, rare in Paris today. The development innovated the use of a neighborhood-scale geothermal heating system that taps into a warm water table beneath the park, drastically reducing energy needed for heating. Some buildings use heat from outgoing graywater (water drained from sinks, tubs and washing machines) to heat incoming tapwater, saving 58 percent of the energy typically required for water heating.

Wherever possible, developers have installed solar panels on roofs and facades. More than 35,000 square meters (380,000 square feet) of panels will generate 3,500 MWh per year, roughly 40 percent of the electricity used in the development.

To cut carbon emissions further, the layout of the development encourages walking and use of mass transit while limiting space for cars. Roadways are restricted to 12 percent of the total surface area, and low speed limits prevail, which helps privilege pedestrians over cars. To further improve air quality in the district, deliveries are restricted to a fleet of electric vehicles that cover the last kilometre (0.6 mile) from a central drop-off site.

In addition to retail and office space, the district encompasses a wide range of housing and services, including four schools, medical services, daycare facilities, gyms and an activity centre for teens with performing arts spaces and a practice kitchen. The historic Odéon theatre has a venue there, and a multiscreen cinema and community gathering place will open soon.

The development's residential units include housing for buyers with a range of incomes, as well as capped-rent units. Different sizes of apartments meet the needs of families, couples and those who live alone. Some buildings are designated for students, while another houses a nursing home.

Other innovative measures minimize Clichy-Batignolles's climate impact. A system of pneumatic tubes beneath the development collects trash and recycling, reducing traffic and cutting the greenhouse gases associated with waste disposal by an estimated 42 percent. Recyclables are sorted, then shipped using an adjacent railway. Nonrecyclable waste goes to the Saint-Ouen incineration facility, which burns trash to produce heat and electricity.

Green Space With Multiple Functions

The buildings encircle the 10-hectare (25-acre) Martin Luther King Park, which provides a recreation area in a part of Paris especially lacking in green space. In addition to being a pleasant space to play, the park is a key element of the development's climate adaptation strategy. Its trees, plants and water features help lower the air temperature on hot summer days.

Permeable surfaces allow water to soak into the ground, and an underground tank collects rainwater for irrigation to minimize water use. A pond provides habitat for waterfowl and other wildlife, and also cools the surrounding area as water evaporates.

To support Paris's Biodiversity Plan, nearly 500 plant species have been planted in the park. An additional 6,500 square meters (70,000 square feet) of private green space and 16,000 square meters (170,000 square feet) of green roofs offer further opportunities for outdoor recreation, wildlife habitat, cooling and rainwater infiltration, while two community gardens give residents places to grow their own food and compost food waste.

Emmanuel Demange, who moved into Clichy-Batignolles two years ago, chose the location in large part because he wanted "to overlook a large green space like Martin Luther King Park." One of the highlights of living there, he says, is his proximity to the park's "biodiversity, its fauna, its flora," a refreshing antidote to urban life.

Demonstrated Capabilities

Rougé calls Clichy-Batignolles "very ambitious," and "a flagship project for sustainability." At the same time, he notes that while on paper the project comes very close to net-zero carbon emissions, data from the occupied buildings suggests significant "discrepancy between the theoretical and the actual."

Rougé is part of a team working to address this gap with a coordinated project called CoResponsibility in District Energy Efficiency & Sustainability (CoRDEES), which was recently awarded €4.3 million by the European Union's Urban Innovative Actions Initiative to develop smart-grid technology aimed at bringing real-time energy use in line with Paris's ambitious targets. The community-based model aims to enlist end users to help monitor and manage energy at Clichy-Batignolles to ensure that buildings achieve the carbon dioxide reductions they were designed to.

With Clichy-Batignolles, Paris has demonstrated the capabilities of many existing tools to build carbon-neutral cities.

By putting so many green building technologies to work in one place, the city has provided a working model of a low-carbon community for other cities around the world.

This article is written by Susannah Shmurak, from Ensia.com.

PRIVATE POWER COS ALLOWED TO SELL OVER 1MW DIRECTLY TO FIRMS

After nearly a decade, the Tamil Nadu government has allowed private power companies based in the state to sell more than 1MW of power directly to industrial consumers.

Energy department secretary VikramKapur issued an order a few days ago allowing the companies to sell power after paying the wheeling and cross subsidy surcharge to Tangedco.

The decision was taken owing to the availability of surplus power, with supply likely to rise in a few days when the wind season begins. A decision not to allow private companies to sell more than 1MW power directly to consumers was taken in 2009 as there was a power shortage.

The energy department issued the policy order even as Tangedco's appeal in this regard is pending with the Tamil Nadu Energy Regulatory Commission (TNERC). **"The government after careful examination has decided to accept the proposal of Tangedco's chairman and issue a policy directive under the Electricity Act to amend the TNERC regulation on allowing open access to the consumer with a load of 1 MW and above,"** said the order.

The latest government decision to allow open access sale of power is likely to be a boon for private power companies as Tangedco is not evacuating power from these companies to the maximum capacity.

"It is a good decision as many private companies are not generating power to their full capacity. Tangedco is evacuating power from various sources based on the merit order (lower tariff to higher). As the tariff of private companies is a little high, only a few MW of power are being evacuated by Tangedco," said a senior official of a private power company.

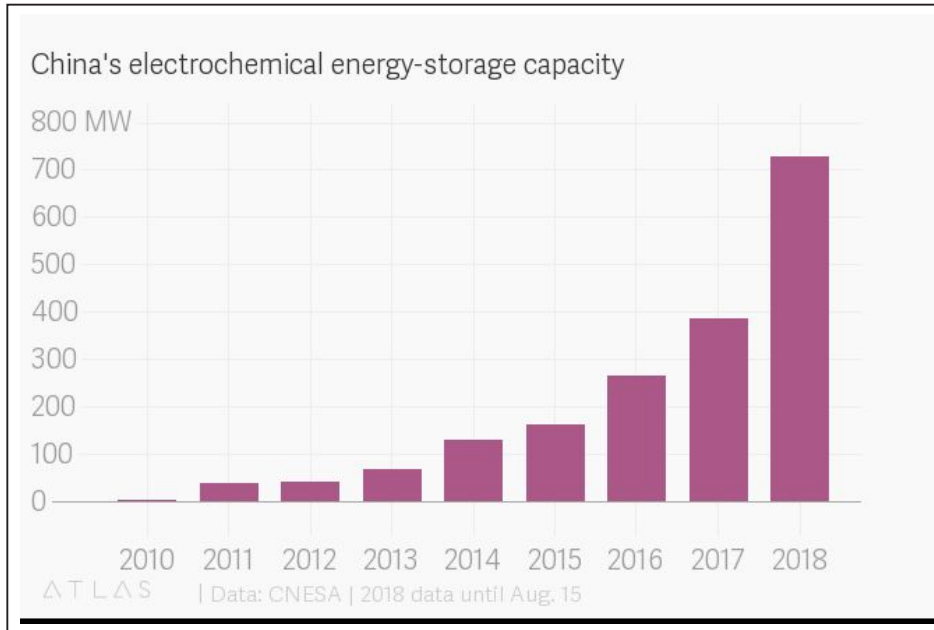
But private companies want the government to lower the cross subsidy surcharge.

"It is only in Tamil Nadu that the cross subsidy surcharge is as high as Rs 3 per unit. Though as per the Electricity Act, the surcharge must come down to nil, in Tamil Nadu it is being collected from private generators. The open access order will benefit us only if the surcharge is lowered," said the official.

Tangedco says the decision to lower the cross subsidy surcharge depends on the TNERC. "Even last year, we lowered the surcharge and a decision on any further reduction will have to be taken by TNERC," said a Tangedco official.

CHINA ADDED AS MUCH BATTERY-STORAGE CAPACITY IN 2018 AS ALL PREVIOUS YEARS COMBINED

“China isn’t building gigafactories,” says Patrick Hurley, chief technology officer of A123, a lithium-ion battery company. “It is building gigacities.”



Gigafactories are named for their capacity to build batteries in tens of gigawatt-hours (GWh) every year, which is about a million times the amount of energy consumed by a typical US household in a day. What Hurley meant by gigacities are complexes that include not just the gigafactory but everything else needed to support it: housing, infrastructure, research and development centers, and universities to train staff.

China’s battery ambition can be seen in the speed at which the country is adding battery-storage capacity. At the start of 2018, China had an operational battery-storage capacity of 389 megawatts (MW). By August, China had added another 340 MW of additional capacity. That’s why the China Energy Storage Alliance (CNESA) declared 2018 to be “one of the most significant years yet for the industry.”

The battery-storage capacity is for storing excess electricity on the grid. Its main use is to smooth out the intermittent production of electricity from sources such as solar and wind—China also leads the world in renewables—or to replace fossil-fuel peaker plants, which are run only during high-demand periods, such as when lots of people turn on air-conditioners when they get home from work on summer evenings.

The battery figures, though impressive, are still tiny when compared to China’s other energy-storage technology: pumped hydro. The country currently has a whopping 30 GW of pumped hydro storage capacity, about 40 times that of battery storage. Pumped hydro works by storing excess electricity in the form of gravitational potential energy. When there is more electricity in the grid than necessary, the excess is used to pump water up a dam. When there’s more demand for energy than currently available otherwise, the water is allowed to fall and run turbines that generate electricity.

Further, neither of these figures include another energy-storage technology: electric-vehicle batteries. In 2017, CNESA estimates that China built 40 GWh worth of batteries for electric cars and buses. That accounts for the batteries in more than 50% of all electric vehicles sold globally in the same year.

(A side note: Watts are used to measure power, or how much electricity can flow per second. Watt-hours are used to measure energy, or the total amount of electricity stored/consumed in one hour. The energy-storage industry tends to use watts when talking about grid-scale storage, because power capacity is as important as energy capacity. On the other hand, electric-vehicle batteries have to be built for high-power applications. So they care to only share figures on storage, which defines how far the car can go on a single charge).

ANNEXURE-A

GUIDELINES FOR AUTHORIZING THE “CHARTERED ELECTRICAL SAFETY ENGINEER (CESE)”

In accordance the Regulation 5A of CEA (Measures relating to Safety and Electric Supply) Amendment Regulations, 2018, the Central Government has introduced Self certification of the electrical installation by the owner or Chartered Electrical Safety Engineer (CESE) upto the notified voltage. The guidelines for authorizing of the Chartered Electrical Safety Engineers (CESE), as under: -

1. Short title and Commencement- (I) These guidelines may be called the “Guidelines for authorizing of the Chartered ‘Electrical Safety Engineers (CESE)’” under regulation 5A of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2018.
2. They shall come into force on the date of their official issuance by CEI Division, CEA.
2. Definitions: (I) In these guidelines, unless the context otherwise requires,
 - a) “Chartered Electrical Safety Engineer” means a person authorised by the Appropriate Government as referred to in CEA safety regulation 5A;
 - b) “Notified Voltage” means a voltage notified by the appropriate Government under intimation to the Authority for the purpose of specifying the voltage level upto which self-certification is to be carried out under CEA safety regulation 30 and regulation 43;
 - c) Words and expressions used and not defined in these guideline but defined in the Electricity Act, 2003 and CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended) shall have the meanings respectively assigned to them in the Electricity Act, 2003 and CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended).
3. Qualification of Chartered Electrical Safety Engineer:
 - a) The Chartered Electrical Safety Engineers shall be an Electrical Engineering degree holder or equivalent degree with at least five years experience in operation and maintenance of electrical installations and also should have the knowledge of the works related to observance of electrical safety regulations or an Electrical Engineering Diploma holder with at least 10 years of experience in operation and maintenance of electrical installations and also should have the knowledge of the works related to observance of electrical safety regulations.
 - b) He/ She shall qualify the prescribe test/ interview conducted by Electrical Inspectorate Department of the concerned Government, after paying the requisite fees. The procedure for the test/ interview shall be decided by the respective Government.
 - c) He/She shall have the knowledge of Central Electricity Authority (Measures relating to Safety and Electric Supply), Regulations, 2010 (as amended) and other relevant Act and Regulation related to electricity supply in the respective State Government.
 - d) Retired Chief Electrical Inspector/ Electrical Inspector who were already notified by Appropriate Government would be eligible for CESE. However, State Government would have the responsibility to take the decision on exemption for test/ interview for retired chief Electrical Inspector/ Electrical Inspector.
 - e) The Chartered Electrical Safety Engineers shall not hold any post in Govt /Semi Govt./ PSUs or associated with any organisations which directly or indirectly influence the working of CESE.

- f) He/ She shall for all the time in his possession have the basic testing equipments (some basic testing equipment given in Annexure-I) as may be prescribed by the office of the Chief Electrical Inspector/Electrical Inspector for testing of the electrical installations.
 4. Scope of work: The Chartered Electrical Safety Engineers shall assist the owner or supplier or consumer of electrical installations for the purpose of self-certification upto the level of notified voltage under regulation 30 and regulation 43 of Central Electricity Authority (Measures relating to Safety and Electric Supply), Regulations, 2010 (as amended), provided those installations are not be covered under section 54 of Electricity Act, 2003.
 5. Duties & Responsibilities of Chartered Electrical Safety Engineer:
 1. He / She shall carry out recommended tests as per the relevant Regulation and Standards.
 2. He / She shall test electrical installations & keep a record thereof in Form-I/ Form-III Form-III of Central Electricity Authority (Measures relating to Safety and Electric Supply), Regulations, 2010 (as amended), as the case may be and submit the same along with photographs/ video of the apparatus tested to the respective office of the Chief Electrical Inspector (CEI)/ Electrical Inspector (EI) within seven working days from the date of testing and will produce the same at the time of renewal.
 3. The Owner shall carry out the recommendations given by the CESE in his report, within the time prescribed in the report. In case the owner fails to rectify the shortcomings as identified by the CESE even after the prescribed period, the CESE shall inform the same to the office of the Chief Electrical Inspector/ Electrical Inspector within a period of 15 days from the expiry of the time prescribed in the report of rectification. Such records shall be made available to the office of the Chief Electrical Inspector by the owner/ CESE, as and when required.
 4. If, on inspection of installation of the owner or supplier or consumer, as the case may be, the CESE is satisfied that the installation is likely to be dangerous for the use of electricity, he/ she shall bring the same to the notice to the owner and the office of Chief Electrical Inspector (CEO/ Electrical Inspector within the period of 48 hours from the date of testing. The CEI/ EI on receipt of such notice should take immediate action as per CEA safety regulation 31.
 6. Fees and levycharges of CESE:-
 - a) Testing of electrical installation in a single premise up to notified voltage under CEA Safety Regulation 43 is Rs. 5000/-.
 - b) Periodic Testing of electrical installation in a single premise up to notified voltage under CEA Safety Regulation 30 is Rs. 3000/-.
- Fees to be levied by the CESE from the Utilities shall be received in the modes other than cash.
7. Accessibility of CESE to the Consumers: The Appropriate Government shall upload the name of the authorised Chartered Electrical Safety Engineer, within 15 days, on the web portal of the Government or Department dealing with matters of inspection of electrical installations for the information of the owner, supplier and consumer.
 8. Others term and condition:
 - a) It shall be the responsibility of owner of the Installation to maintain & operate the installation in a condition free from danger and as recommended by the manufacturer/CD/EI/CESE or by the relevant codes of practice of the "Bureau of Indian Standards."
 - b) The authorization of a Chartered Electrical Safety Engineer shall be liable to be suspended or cancelled by the Chief Electrical Inspector/Electrical Inspector, if he/she is found to be

indulging in willful negligence, mal-practices, misuse or any other activities affecting directly and in-directly the safety of electrical installations. However, no such authorization shall be suspended/cancelled unless an opportunity of being heard is given to the concerned CESE.

- c) The authorization of a Chartered Electrical Safety Engineer shall be initially for the period of three years at the time of registration and the authorization shall be extended for a period of additional two years at a time by the office of the CEI/EI based on the performances of CESE. However, the authorization will cease automatically on his/her attaining the age of 65 years. There shall be only one time fees of Rs. 10000/- for the registration as CESE.
- d) In case of any dispute arising between CESE and owner or supplier or consumer on the inspection, the decision of the Electrical Inspector of the respective Government on the same, shall prevail.
- e) Any electrical installation which have been checked/tested by the CESE could be inspected/revisited by the CEI/EI in case he/she is not satisfied with the check/testing carried out by CESE.
- f) The testing equipment used by the CESE shall be calibrated at any NABL accredited laboratory at least once in every two years.

Annexure-I

Basic testing equipment

- 1. **Voltmeter:** use to measure the potential difference occurs any equipment/ electrical apparatus.
- 2. **Ammeter:** an instrument for measuring electric current in amperes.
- 3. **Multimeter:** A multimeter can measure voltage, current, and resistance.
- 4. **Megger! Earth Insulation Tester:** an instrument for measuring the resistance of electrical insulation.
- 5. **Line Tester**
- 6. **Tong-tester:** An electrical meter with integral AC current clamp is known as a clamp meter, clamp-on ammeter or tong tester.
- 7. **Safety Helmet:** It should be available as per Indian standard (IS: 2925)
- 8. **Safety Belt:** It should be available as per Indian standard (IS: 2521)
- 9. **Safety Shoes:** It should be available as per Indian standard
- 10. **Hands Gloves:** It should be available as per Indian standard
- 11. **Others necessary testing kits:** as suggested by the office of the CEI/EI.



Complied by:

S. Subramaniyan, B.E. (Electrical) From Coimbatore Institute of Technology, Joined Tamilnadu Electrical Inspectorate Service, Served from 16.11.1968 to 31.08.2004 in categories of Junior / Assistant Electrical Inspector, Electrical Inspector, Senior Electrical Inspector, Chief Electrical Inspector to Government of Tamilnadu. Served as chairman of ETDC 20 committee, Served in Lift and Escalators committee of BIS. Served as Member of Central Electricity Board rule making body under Electricity Act 2003. As Energy Auditor has conducted Energy Audits in TNEB Gas Power Generating Stations and Andhra Pradesh Coal Power Station etc.

HUMANITY MAY BE NEARING THE POINT OF NO RETURN FOR CLIMATE ACTION, ACCORDING TO NEW STUDY

An international team of scientists has proposed a series of deadlines by which humanity must take serious action to combat climate change if it is to meet the ambitious goals of the 2015 Paris Agreement, and stave off potential disaster. The team behind the study hopes that these points of no return will help inform debate, and spur leaders to take action to mitigate the threat of climate change while there is still time.



In December 2015, 195 countries signed up to a legally-binding global climate deal known as the Paris Agreement. Signatories would work together to limit the increase in global average temperature to a total below 2 °C relative to pre-industrial levels, up to the year 2100. The agreement also set out an even more aspirational target of capping the rise in temperature to 1.5 °C by the end of the century.

The Paris goals were set in an attempt to mitigate the potential dangers posed by climate change. These include rising sea levels due to melting polar ice shields, and an increase in extreme weather events, such as droughts and flooding.

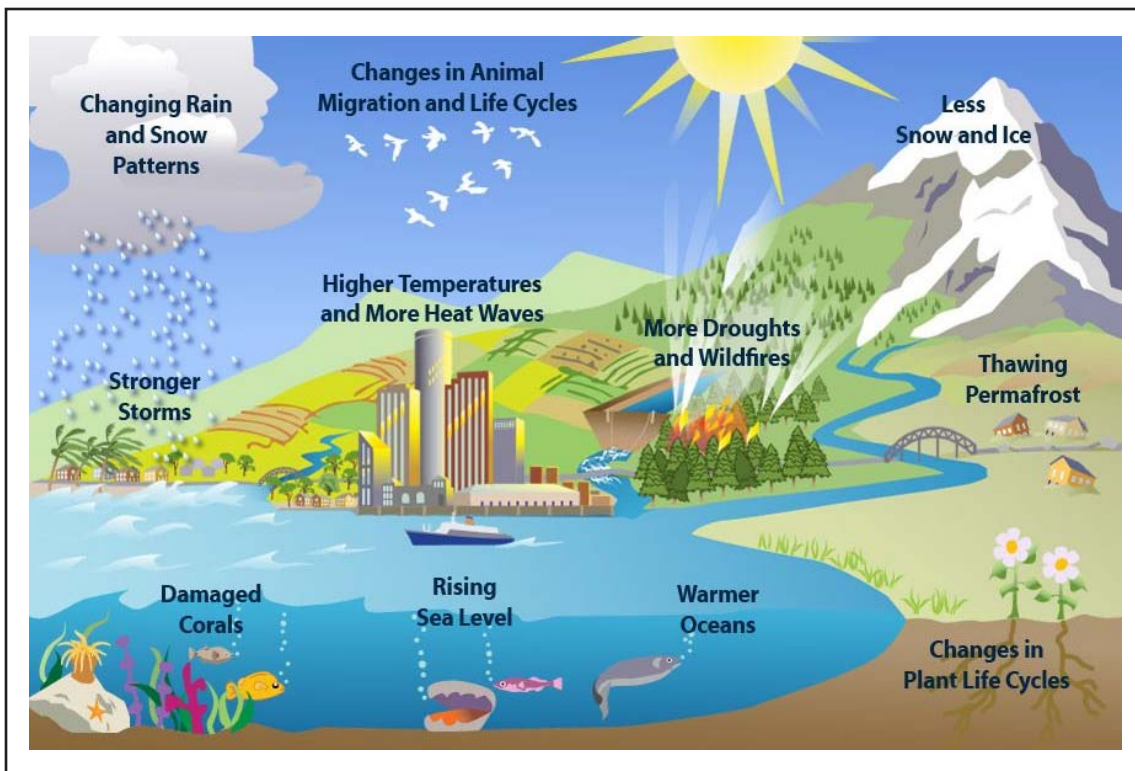
“In our study we show that there are strict deadlines for taking climate action,” says HenkDijkstra, a professor at Utrecht University in the Netherlands, and one of the study authors. “We conclude that very little time is left before the Paris targets [to limit global warming to 1.5°C or 2°C] become infeasible even given drastic emission reduction strategies.”

The study is a joint effort between scientists from the Netherlands and the UK. The points of no return (PNR) set out in the new paper represent the thresholds after which it would be too late to take strong action on climate change with the hope of avoiding the worst of its effects. The team estimate that the thresholds have a 67 percent probability of being correct at this point.

The researchers used data from numerous climate models to define PNRs for the goals of the Paris Agreement, dependent in part on how quickly humanity can reduce emissions using renewable energy.

One set of PNRs deal with a moderate scenarios in which the share of renewable energy is increasing by 2 percent year on year from the point that serious action is taken. Another set of PNRs were calculated contingent on humanity increasing the share of renewable energy by 5 percent each year.

According to the results of the study, the PNR for using a moderate approach in the hope of keeping warming under 1.5 °C by the end of the century has already passed us by. However, if emissions could be cut by 5 percent each year, the governments of the world would have until 2027 to take extreme action.

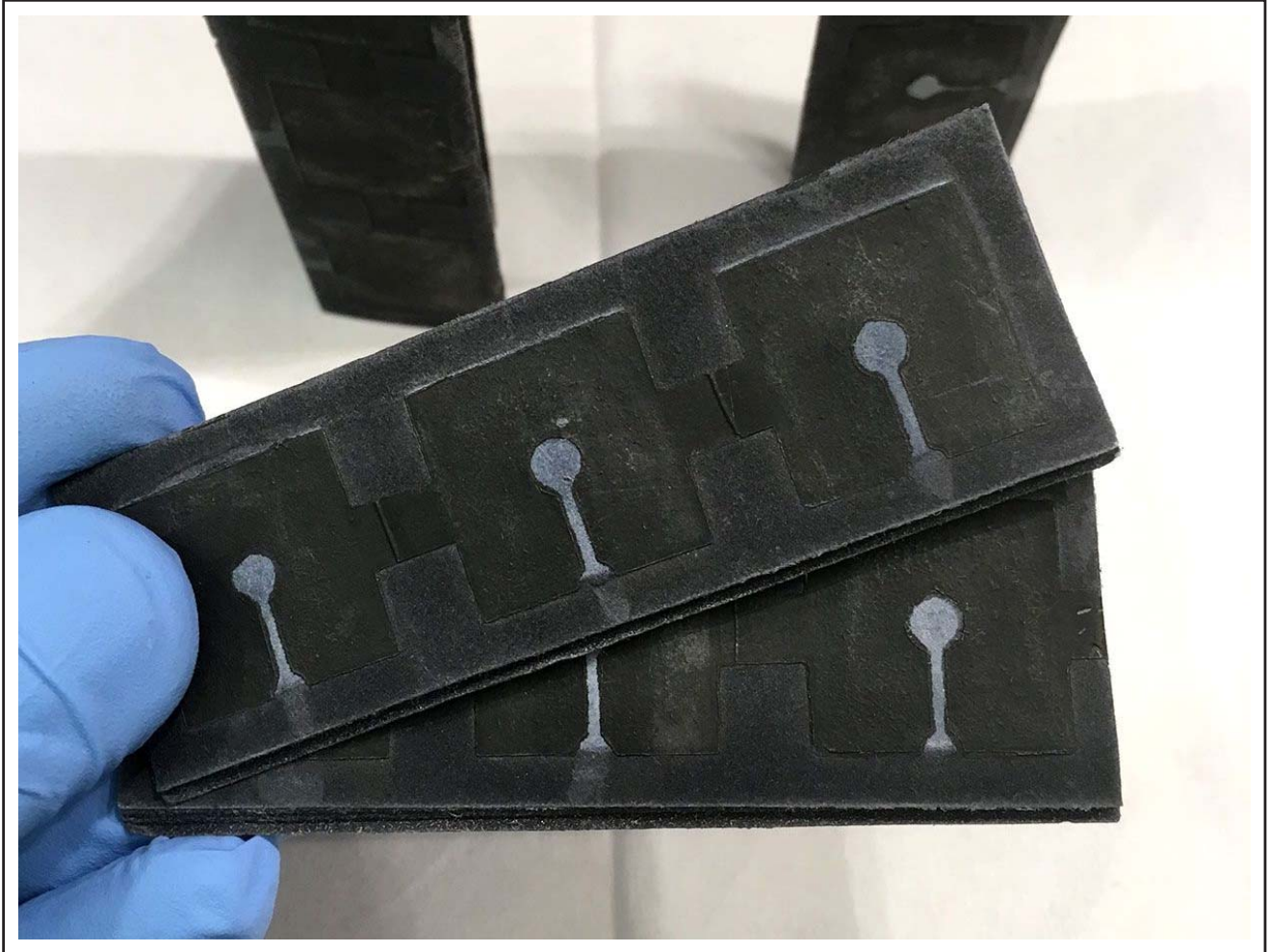


For the more realistic target of capping warming to 2°C by 2100, the moderate 2 percent scenario calls for action to be taken by 2035. If the share of renewable energy were to increase at a pace of 5 percent year on year, the PNR would be pushed back to 2045.

The authors also note that the PNRs could potentially be delayed by 6 to 10 years with the use of negative emissions technology, which remove greenhouse gases already present in the atmosphere.

HOW PAPER BATTERIES CHARGED BY BACTERIA COULD POWER THE INTERNET OF THINGS

The explosive growth of miniaturized electronics and batteries to power everything from ingestible health care devices to sensors for intelligent transportation is driving innovation in how those devices are designed and raising concerns over their environmental impact.



By some estimates, more than 50 billion electronic devices may be deployed during the next five years. Many will have a short working life, their fast obsolescence resulting in a disposal issue.

Enter papertronics, which offer electronics engineers the benefits of flexibility, sustainability, eco-friendliness, and low cost, as well as useful mechanical, dielectrical, and fluidic properties.

Seokheun Choi, associate professor in the department of electrical and computer engineering at the State University of New York at Binghamton, and his colleagues have created a paper-based, single-use battery that relies on bacteria both to generate an electric current and also to devour the battery at the end of its useful life.

In a paper published in the journal *Advanced Sustainable Systems*, the authors write that lithium-ion batteries and supercapacitors offer a high energy density, are lightweight and are capable of being integrated into flexible substrates. But they point out that Li-ion batteries also are made with nonbiodegradable and often toxic materials that often require energy-intensive and potentially environmentally damaging manufacturing processes.

Alternative energy harvesting techniques such as solar cells, nanogenerators, and thermoelectric generators contain large amounts of nonrenewable and nonbiodegradable heavy metals and polymers.

Good-old-fashioned office paper may offer a more sustainable option, Choi argues, once some sophisticated engineering is applied.

Innovative engineering techniques can be used to manipulate the diameter of paper's cellulose fibers, smoothing out roughness and controlling transparency to enable a number of applications. Combining paper with organic, inorganic, and biological entities widens the range of engineering possibilities and makes paper a viable platform for next-generation electronics.

Choi's work, funded in part with a US \$300,000 grant from the National Science Foundation, focuses on integrating bacteria into paper both to generate electricity and to dispose of the battery. His initial work, first reported in 2015, created a paper-based battery. His most recent report, which was presented 19 August at the 256th National Meeting & Exposition of the American Chemical Society, describes how the biobattery can be activated and how its shelf life can be improved. His report also explains how on-demand energy can be delivered even in places with no electricity to power a light-emitting diode and an electric calculator.

In the lab, the bacteria-based battery uses respiration to convert the biochemical energy stored in organic matter into biological energy. The process involves a cascade of reactions through a system of electron-carrier biomolecules which transfers electrons to a terminal electron acceptor, an anode.

To create the battery, the research team placed freeze-dried **"exoelectrogens"** on paper. They explain that exoelectrogens are a type of bacteria that can transfer electrons outside of their cells. The electrons pass through the cell membrane and make contact with external electrodes to power the battery.

To activate the battery, the researchers added water or saliva, both of which revived the bacteria. In the lab, the microbial battery produced a maximum power of 4 $\mu\text{W}/\text{cm}^2$ and a current density of 26 $\mu\text{A}/\text{cm}^2$, which Choi says are **"significantly higher"** than previous paper-based microbial batteries. Even so, the power performance is **"very low,"** limiting their application, at least for now. To be viable for commercial use, the power/current density must be improved by a factor of around 1,000, Choi says.

"The beauty of using paper as a device substrate is that you can simply stack or fold them for serial or parallel connection," Choi says. Origami techniques may be particularly useful.

As part of his earlier work in 2015, Choi created an origami-inspired battery which folds into a square the size of a matchbook. It used an air-breathing cathode created with nickel sprayed onto one side of a piece of office paper. The total cost of the device was five cents.

The paper battery currently has a shelf life of about four months. Choi says that his latest hybrid paper-polymer biobattery readily decomposes in water.

Choi and his colleagues are not alone in working on paper-based batteries. In 2017, a metal-free and biodegradable redox flow battery for portable single-use applications was described by researchers from Spain, Canada, and the U.S. After their cellulose-based battery operated for 100 minutes, it was disposed of in soil by microorganisms, similar to the way a backyard compost pile works. Choi says that a potential drawback to that approach is that the battery's biodegradability depends on favourable landfill conditions.

Choi is working on conditions to improve the survival and performance of the freeze-dried bacteria, enabling a longer shelf life. He also has applied for a patent for the battery and is seeking industry partners for commercialization.

"Sustainable development is one big innovation agenda. Not only can we adopt more widespread economic beneficial solutions that have less impact on the quality of our living environments, but also all of them improve our quality of life."

GERMANY REACHES 100K HOME BATTERY STORAGE INSTALLATIONS

A household just outside Berlin has become the recipient of the 100,000th grid-connected residential battery energy storage system in Germany.



Parliamentary State Secretary at the Federal Ministry for Economic Affairs and Energy, Thomas Bareiß attended an official event to mark the system's commissioning in Eichwalde. Bareiß hailed the event as an "important milestone" that Germany has reached in its energy transition – referred to domestically as the *Energiewende*.

The politician said that since 2013 battery costs have fallen by over 50%, making the *Energiewende* more affordable and expanding "flexibility options" open to grid operators for intelligent load management, while bolstering energy security.

National solar trade group BSW Solar's chief CarstenKörnig thanked the willingness of German people to invest in this technology for the future as well as the incentive programme put in place by the government five years ago, which offers rebates for equipment purchases. Körnig put forward his view that solar storage should become "the standard" if politicians are serious about the energy transition.

The next milestone to aim for, the BSW Solar managing director, is to reach 200,000 systems in the next two years. The country appears to be on a more rapid trajectory to achieving that goal than many others. By way of illustration, there were around 50,000 systems installed by mid-2017. Energy-Storage.news reported in July this year that as many as 37,000 units were sold and connected to the grid during last year, according to the European Market Monitor on Energy Storage (EMMES) from Delta-ee and trade association EASE.

This had outstripped a Delta-EE forecast of around 31,000 units for 2017. In an interview with EMMES author ValtsGrintals, the Delta-EE analyst discussed some of the drivers behind this rise, including sales and marketing that is tailored to householders' needs.

The 100,000th system, which was a Solarwatt My Reserve residential device, joins 1 million homes in Germany now with their own PV system, as announced by BSW Solar in June.

MATERIALS “SANDWICH” BREAKS BARRIER FOR SOLAR CELL EFFICIENCY

GEM Alum and NYU Tandon Professor André D. Taylor’s Team Combines Materials and Borrows Lessons from Nature to Build a Better Organic Solar Cell.

The National GEM Consortium has produced myriad amazing academics and STEM (science, technology, engineering, and math) professionals since its inception in 1976, and Professor André D. Taylor of New York University’s Chemical and Biomolecular Engineering Department is among the top on that list.

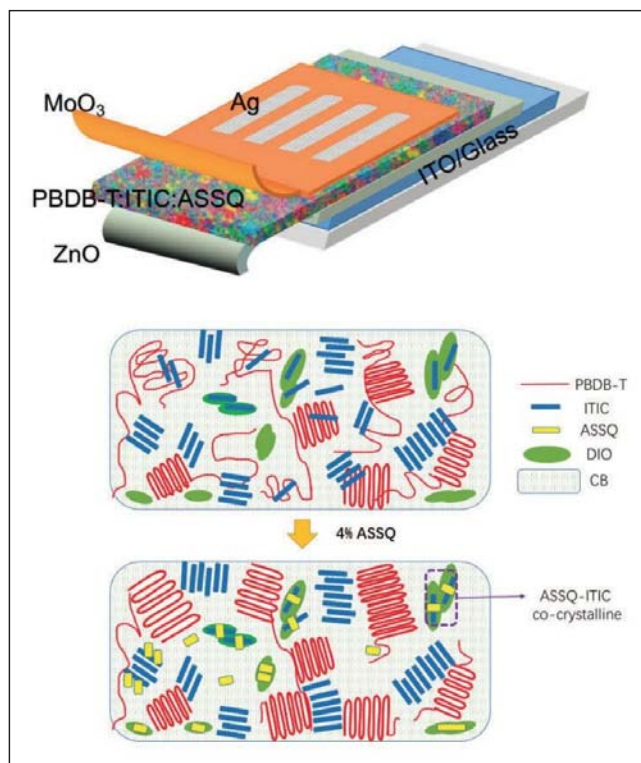
Dr. Taylor was awarded with prestigious GEM Fellowships for his Master’s degree from Georgia Tech and his PhD degree from the University of Michigan. Both awards were helpful in enabling Dr. Taylor to pursue his advanced work in energy and materials design. Specifically, his research group, the Transformative Materials and Devices Laboratory, develops innovative architectures for energy applications. Dr. Taylor realized that solar cells have great potential as a source of clean electrical energy, but they are not cheap, light, and flexible enough for widespread use. Dr. Taylor’s and his research team at NYU have now found an innovative and promising way to improve solar cells and make their use in many applications more likely.

Most organic solar cells use fullerenes, spherical molecules of carbon. The problem, explains Taylor, is that fullerenes are expensive and don’t absorb enough light. Over the last 10 years he has made significant progress in improving organic solar cells, and he has recently focused on using non-fullerenes, which until now have been inefficient.

Think of a solar cell as a sandwich, Taylor says. The “meat” or active layer — made of electron donors and acceptors — is in the middle, absorbing sunlight and transforming it into electricity (electrons and holes), while the “bread,” or outside layers, consist of electrodes that transport that electricity. His team’s goal was to have the cell absorb light across as large a spectrum as possible using a variety of materials, yet at the same time allow these materials to work together well. “My group works on key parts of the ‘sandwich,’ such as the electron and hole transporting layers of the ‘bread,’ while other groups may work only on the ‘meat’ or interlayer materials. The question is: How do you get them to play together? The right blend of these disparate materials is extremely difficult to achieve.”

Using a squaraine molecule in a new way — as a crystallizing agent — did the trick. “We added a small molecule that functions as an electron donor by itself and enhances the absorption of the active layer,” Taylor explains. “By adding this small molecule, it facilitates the orientation of the donor-acceptor polymer (called PBDB-T) with the non-fullerene acceptor, ITIC, in a favorable arrangement.” This solar architecture also uses another design mechanism that the Taylor group pioneered known as a FRET-based solar cell. FRET, or Förster resonance energy transfer, is an energy transfer mechanism first observed in photosynthesis, by which plants use sunlight. Using a new polymer and non-fullerene blend with squaraine, the team converted more than 10 percent of solar energy into power. Just a few years ago this was considered too lofty a goal for single-junction polymer solar cells. “There are now newer polymer non-fullerene systems that can perform above 13 percent, so we view our contribution as a viable strategy for improving these systems,” Taylor says.

The organic solar cells developed by his team are flexible and could one day be used in applications supporting electric vehicles, wearable electronics or backpacks to charge cell phones. Eventually, they could contribute significantly to the supply of electric power.



RESEARCHERS TO CREATE HYDROGEN ENERGY SOURCE USING NANO TECHNOLOGY

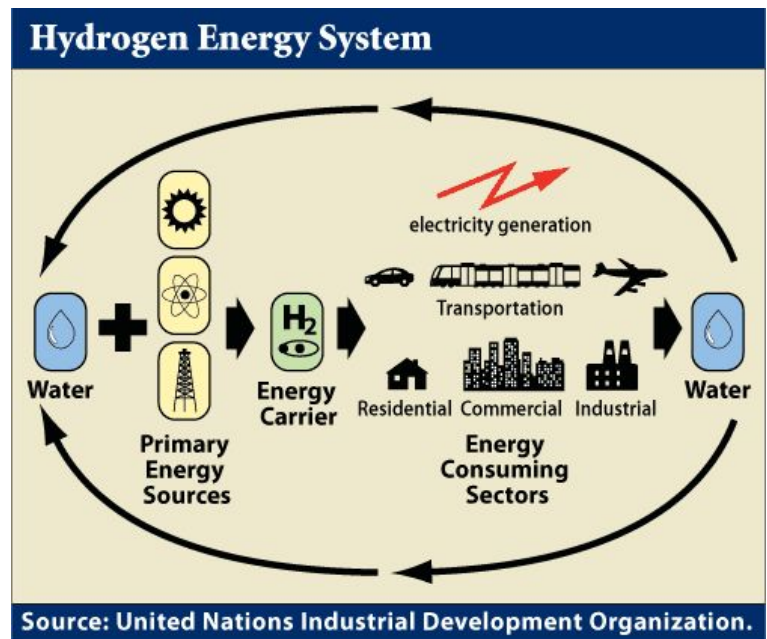
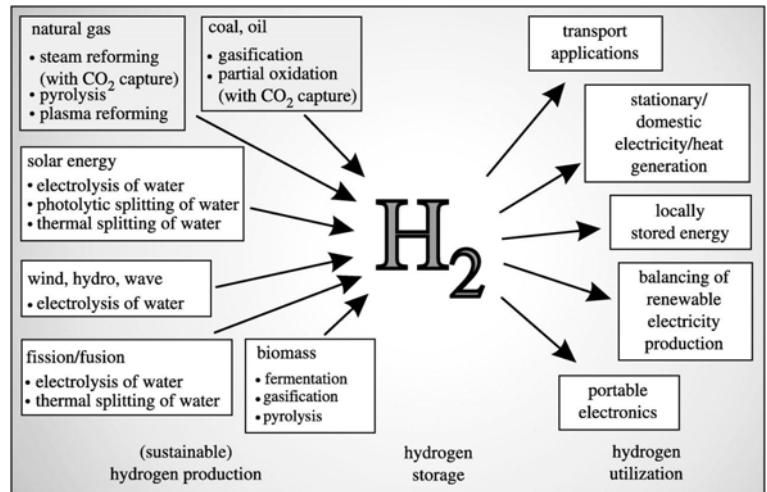
Researchers at Manchester Metropolitan University in the UK have announced plans to use screen-printed nanotechnology to try and create a new green power source from hydrogen.

It is hoped that the new energy form will provide remote communities with an affordable alternative to expensive diesel and petrol imports. Led by professor in electrochemical and nanotechnology Craig Banks, the team will screen print electrodes using graphene-like nanotechnology embedded in a fluid carbon-based printer ink. The electrodes can be printed in a variety of shapes, as well as on a mass production scale. These electrodes will then be used in electrolyzers, which separate water into its two components oxygen and hydrogen. The hydrogen will then be taken for storage or transportation, and ultimately fed into fuel cells to create electricity whenever needed. The fuel cells and electrolyzers will then be 'harsh water tested' on Scotland's Orkney Islands, in collaboration with the European Marine Energy Centre.

According to the university, the hydrogen energy source is more efficient than other renewable forms of energy. Research associate Dr Samuel Rowley-Neale said: "The electricity generated by wind, wave, tidal and solar power is often ill correlated to consumer demand and typically has to be fed into the National Grid where it is used instantly or must be expensively captured somehow, such as in a battery – which has issues with degradation – or else the turbines have to be shut off to ensure the generated electricity does not overload the electricity grid. "In contrast, an electrolyser creates hydrogen that can be easily stored and physically transported as a gas with no deterioration, and then later fed into a fuel cell for conversion to power when needed."

The team behind the technology hope that, if successful, the hydrogen energy source will prove beneficial to remote communities that currently rely on imported fossil fuel-based power sources, which are not only carbon-heavy but also expensive. *Dr Rowley-Neale added:* **"This is the perfect opportunity to explore whether we can produce a less polluting alternative to current fossil fuel-based energy generation techniques". "This will put Manchester Metropolitan at the forefront of renewable energy research as it helps to tackle climate change by enabling off-grid clean and cost effective hydrogen production."**

The university had already conducted proof-of-concept studies into finding a cheaper alternative to the expensive materials, such as platinum and iridium, which are used in traditional methods of manufacturing electrodes. It was awarded a £100,000 grant from Engineering and Physical Sciences Research Council to pursue the research. Electrode development will take place at Manchester Metropolitan University over the next six months, followed by installation of the electrolyser stack in Scotland and connection to a renewable energy system. The technology will then be tested over a six-month period.



ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 12

Sustainable Growth, Sustainable Electrical Energy and Renewable Energy

Thermo Chemical Technologies – Gasification Technologies

Biomass and GAS: Continued.....

Uses of Bio Gas and Economics:

Heat: This is one of the popular and best use of Bio Gas. The Gas is burnt directly through suitable burners and the Heat produced can be used at homes for cooking or in Industries for Heating and Drying etc, depending on the scale of usage. One example of Industrial use is, use of this Gas in Paper Industries for Drying of Paper.

In terms of economics, this gas, in terms of Heating Value, will be equivalent to about half of say LPG Gas. i.e we will have to burn 2 Kgs of Bio Gas in place of 1 Kg of LPG Gas. The present price of commercial LPG Gas being around Rs 60 a Kg, the value we derive is Rs30/- per Kg of Bio Gas, whereas the actual production cost will almost be negligible. There are examples of Paper Industries where they produce Bio Gas of over 60,000 Cu.M (or 50,000 Kgs) per day from out of waste and wash water etc.

Electricity Generation

Biogas is the gas resulting from an anaerobic digestion process. A biogas plant can convert animal manure, green plants, waste from agro industry and slaughter houses into combustible gas.

Biogas can be used in similar ways as natural gas in gas stoves, lamps or as fuel for engines. It consists of 50-75% methane, 25-45% carbon dioxide, 2-8% water vapour and traces of O₂ N₂, NH₃ H₂ H₂S. Compare this with natural gas, which contains 80 to 90% methane. The energy content of the gas depends mainly on its methane content. High methane content is therefore desirable. A certain carbon dioxide and water vapour content is unavoidable, but sulphur content must be minimised - particularly for use in engines.

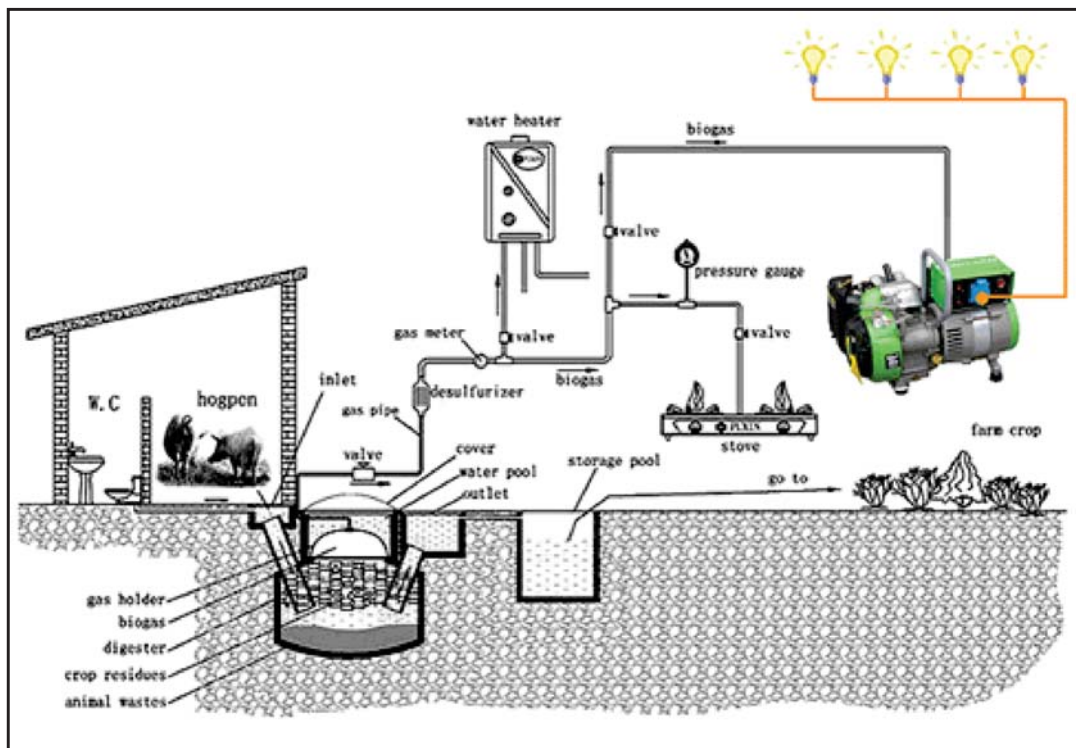
The average calorific value of biogas is about 4500 K Cal./Kg, so that 1 m³ of biogas corresponds to 0.5-0.6 l diesel fuel.

The biogas yield of a plant depends not only on the type of feedstock, but also on the plant design, fermentation temperature and retention time. For example – Fruits and Vegetable wastes or poultry litter yield more biogas per ton than cow manure. About 2 live-stock units (corresponding to about 2 cows or 12 rearing pigs) are expected to yield a constant output of about 1 Cub.M of Biogas per day. Electricity Generation would be around 1.5 to 2 Units per Cub.M of Biogas.

Conversion to Electricity

Theoretically, biogas can be converted directly into electricity by using a fuel cell. However, this process requires very clean gas and expensive fuel cells. Therefore, this option is still a matter for research (Bloom Energy of USA, headed by an Indian have demonstrated solutions with Fuel Cells) and is not currently a popular option. The conversion of biogas to electric power by a generator set is much more practical. In contrast to natural gas, biogas is characterized by a high knock resistance and hence can be used in combustion motors with high compression rates.

Schematic of a biogas plant used for power generation



Picture of a Genset of Capacity of 3 KW



Picture of a Large Engine to go with Generator of 1 MW Capacity

In most cases, biogas is used as fuel for combustion engines, which convert it to mechanical energy, powering an electric generator to produce electricity. The design of an electric generator is similar to the design of an electric motor. Most generators produce alternating AC electricity; they are therefore also called alternators or dynamos. Appropriate electric generators are available in virtually all countries and in all sizes. The technology is well known and maintenance is simple. In most cases, even universally available 3-phase electric motors can be converted into generators. Technologically far more challenging is the first stage of the generator set: the combustion engine using the biogas as fuel. In theory, biogas can be used as fuel in nearly all types of combustion engines, such as gas engines (Otto motor), diesel engines, gas turbines and Stirling motors etc.



(To be continued)
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RETAIL GIANT AMAZON'S UK PLANS INCLUDE 3.77MW TESLA BATTERY WITH SOLAR PV

Amazon has submitted plans for a 4MW rooftop solar array to be deployed on its Tilbury fulfilment centre alongside a 3.77MW Tesla battery facility to help power the site, our UK sister site *Solar Power Portal* has exclusively revealed Planning permission is being sought from Thurrock Council by Push Energy, which is developing the site on behalf of the online retail giant.

A 4.074MWp system has been proposed using over 15,000 270W solar PV modules from Jinko Solar. The system would add to an existing solar array installed at the site of an unknown size, suggesting it is currently less than 1MW as formal planning consent is not required for systems below this threshold under permitted development rules.

The building's estimated annual electrical demand from the grid currently stands at almost 20GWh per annum, with the new solar PV system predicted to generate just over 3.5GWh each year. Amazon expects all of this electricity to be used on site, contributing approximately 17.7% towards the total site demand.



The new solar installation will add significant generating capacity to a smaller existing array. Image taken from project planning documents submitted by Push Energy on behalf of Amazon.

In addition, 28 Tesla Power Pack units will be installed to the rear of the main building to provide ‘a complimentary capacity’ of 3.77MW. According to the documents the battery installation will draw from the grid to supplement the solar generation, decreasing grid connection stress during periods of peak demand.

The project is the latest uncovered by *Solar Power Portal* to be proposed by Amazon for its UK sites after documents were found pertaining to the company’s fulfilment centres in Rugeley and Daventry, as well as Doncaster. However, this is the largest so far and the only project to include battery storage in addition to new solar installations.

Planning also shows that 82 Huawei inverters are also intended for use on the project should it be approved, with a determination date set for 15 October.

THE GREEN PROMISE OF VERTICAL FARMS

Indoor farms run by AI and lit by LEDs can be more efficient than field agriculture, but can they significantly reduce greenhouse gas emissions?

Stepping inside the glass-walled lobby on the second floor, I see racks upon racks of leafy green lettuce and kale growing in hydroponic solutions of water and a precisely calibrated mix of nutrients. Energy-efficient LEDs emit a pinkish light within a spectral range of 400 to 700 nanometers, the sweet spot for photosynthesis. I'm here to find out how plant factories, called vertical or indoor farms in Western countries, can help reduce the greenhouse gas emissions associated with conventional field agriculture. According to the World Bank, 48.6 million square kilometers of land were farmed worldwide in 2015. Collectively, agriculture, forestry, and other land uses contributed 21 percent of global greenhouse gas emissions, per a 2017 report from the Food and Agriculture Organization of the United Nations, mostly through releases of carbon dioxide, methane, and nitrous oxide.

Vertical farms avoid much of these emissions, despite the fact that they rely on artificial light and have to be carefully climate-controlled. Indeed, according to vertical farms evangelist Dickson

Despommier, who's widely credited with taking the fledgling industry mainstream, these kinds of farms could significantly reduce the amount of land devoted to farming and thereby make a serious dent in our climate change problem.

For US \$1 million, you can buy a medium size VegetaFarm like this one from Espec Mic, including the racks, control systems, HVAC, and lighting. Besides the lettuce and kale, the Tokyo farm grows bokchoy, mint, mizuna, and shiso, and is experimenting with basil and radishes. Lettuce grown in the field takes about 60 days from seed to harvest. In the VegetaFarm, it takes 40 days. Other plant factories claim faster rates, in the 30-day range. So instead of one to three harvests per year on a conventional farm in the middle latitudes, a plant factory can produce one harvest every month or so. And unlike field-grown lettuce, which is harvested all at once, the indoor harvest is continual and the yields extremely high, with no loss from pests or inclement weather.





One of the major benefits of plant factories is that you can tune the plant's chemical composition to engineer its nutrient content and flavor profile. The company grows its Mineraleaf lettuces in seawater pumped up from 800 meters, which makes for a tender, delicious leaf—maybe the tastiest lettuce I've ever had—that's also dense in calcium, potassium, and magnesium. According to Toyoki Kozai, professor emeritus at Chiba University and president of the Japan Plant Factory Association, plant factories use water 30 to 50 times as efficiently as a traditional greenhouse does. Many plant factories don't even wash their produce. Instead, as at VegetaFarm, harvested plants go straight into packaging, and they're clean enough to eat.

Japan's vertical farming industry is still tiny, despite being around for several decades. Eri Hayashi, director of international relations and consulting at the Japan Plant Factory Association, says there are 182 plant factories in Japan. One of the largest is Spread Co.'s Kameoka plant near Kyoto. Its two 900-m² towers have a total cultivation area of 25,200 m² and produce 21,000 heads of lettuce per day. Later this year, Spread will open the Techno Farm in Kyoto, which the company says will exploit advanced automation to more than double productivity, to 648 heads per square meter.





CHETNA GALA SINHA
Founder MDMS Bank



“The woman of Mann Deshi has aligned Lakshmi and saraswathi (The goddesses of knowledge and wealth) to create dignified spaces for themselves in the banking business and the stock market”.

An economist, farmer, and activist, Chetna Sinha works for social change in some of the poorest and most drought-stricken areas of rural India. **She is the founder and the current president of the Mann Deshi Mahila Bank, a**

micro-enterprise development bank. Mann Deshi's clients are from low-income group. The bank currently has seven branches, over 185,000 clients and conducts 10,000 transactions on a daily basis. The bank has grown from an initial shareholder capitalization of 6,00,000 rupees to 400,00,000 rupees and created 42,000 women entrepreneurs. Chetna has promoted a holistic approach to help her clients – one that combines economic activity with the educational tools and health care necessary to lead a productive life. Since 2006, Chetna has partnered with global organisations such as HSBC, British Asia Trust, Accenture, Clinton Global Initiative, GIZ, Deutsche Bank, Bonita trust, Common wealth of learning and Global giving to develop corporate community partnership programs, which allow the corporate sector in the U.S. and Europe to get a unique view of the impact that micro-finance initiatives have on the local population. Since 1996; Chetna has been organizing women in rural areas of Maharashtra in the fight for the land and housing property rights.

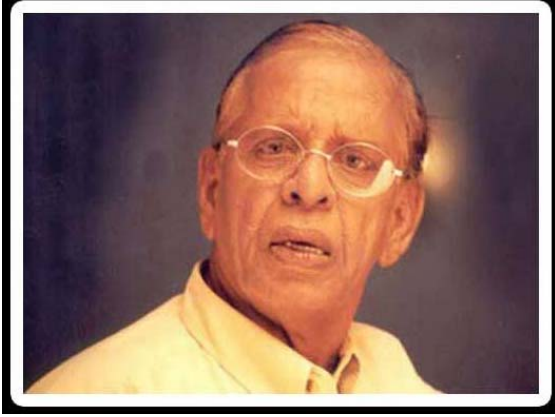
Mann Deshi has also launched a community radio station, which provides a platform for information sharing and creative self-expression among the community members of Mhaswad. **She has established a first kind of “Mann Deshi Chamber of Commerce” and “Finance Company” for rural women.** With this formation Chetna aims to support ONE MILLION women entrepreneurs by 2020.

She won the first prize in social sector of the international 2005. Ashoka Change makers Innovation award, honoured nationally with the 2005 Jankidevi Bajaj Puraskar award for rural entrepreneurship by Yale and Harvard Universities. She was selected for the first class of Yale University's World Fellows program in 2002-3 and in 2003 Harvard University recognised her as a “Bridge Builder”. She was invited for “Business Event” meeting with Mr. Obama Barrack on 6th Nov, 2011.

“I'm a concerned optimist. Optimist because we are headed in the right direction but concerned because we are not moving fast enough. The future can be bright. We have to start working together on saving the climate and in the end we will find that it is the climate that will save the world.”

நகைச்சுவை நடிகர் நாகேஷ்

“நகைச்சுவை நடிகர் நாகேஷ்” அவர்களின், தன்னம்பிக்கை மிக்க அருமையான வார்த்தைகள்... வானொலிப் பேட்டியொன்றில் நாகேஷ்..



நியாயமாக உங்களுக்கு வரவேண்டிய நல்ல பெயர் மற்றவர்களுக்குச் செல்லும் போது உங்களுக்கு எப்படி இருக்கும்?

நாகேஷ்: நான் கவலையே படமாட்டேன் சார். ஒரு கட்டடம் கட்டும் போது, சவுக்கு மரத்தை முக்கியமாவச்சு சாரம் கட்டி, குறுக்குப் பலகைகள் போட்டு, அதன் மேல பல சித்தாள்கள் நின்று, கைக்குக் கை கல் மாறி கட்டடம் உயர்ந்து

கொண்டே போய் அது முடிந்த பிறகு, அந்தக் கட்டிடத்துக்கு வர்ண ஜால வித்தைகள் எல்லாம் அடிச்சு, கீழ இறங்கும் போது ஒவ்வொரு சவுக்கு மரமாக அவிழ்த்துக் கொண்டே வருவார்கள். கட்டடம் முடிந்து,” கிரஹப்பிரவேசத்தன்று” கட்டடம் கட்டுவதற்கு எது முக்கிய காரணமாக இருந்ததோ, அந்தச் சவுக்கு மரத்தையார் கண்ணிலும் படாமல் பின்னால், எங்கயோ மறைத்து வைத்துவிட்டு, வேறெங்கேயோ வளர்ந்த வாழை மரத்தை முன்னால் நட்டு கிரஹப்பிரவேசம் நடத்தி அனைவரையும் வரவேற்பார்கள்.

அத்தனை பெருமையும் வாழை மரத்துக்குப் போய் விடும். இதில் உள்ள உண்மை என்ன தெரியுமா? அந்த வாழைமரம் மூன்று நாள் வாழ்க்கை தான் வாழும். ஆடு மாடுகள் மேயும். குழந்தைகள் பிய்த்தெடுப்பார்கள்.

பிறகு குப்பை வண்டியிலே போய்ச் சேரும். எங்கோ மூலையில் மறைந்து கிடக்கிறதே அந்தச் சவுக்கு மரம் கண்ணீர் விடுவதில்லை. அடுத்த கட்டடம் கட்டுவதற்கு ஏணியாக தயார் நிலையில் என்றைக்கும் சிரித்துக் கொண்டேயிருக்கும்.!!!

நான் வாழை அல்ல...! சவுக்கு மரம்...
Always think positive...

HUMOUR

Already Named

A woman was rushed into the hospital in an ambulance as she was just about to give birth to twins.

At the hospital the lady was in such pain she had to be sedated.

A couple of hours after the babies had been delivered, she woke up and asked to see her children.

“Doctor, could you bring my babies to me so I can name them?”

The doctor replied, “You don’t need to worry about names, your brother has already named them.”

“Why did you let him name them, he has no sense! What did he call the little girl then?”

“Denise.” replied the doctor.

“Oh that’s not too bad, I thought u were going to tell me he’d named her something awful! So what did he call the little boy?”

“De-nephew, of course!”

Driving and Signals

Two elderly women were out driving in a large car, both could barely see over the dashboard. As they were cruising along, they came to an intersection. The stoplight was red, but they just went on through.

The woman in the passenger seat thought to herself “I must be losing it, I could have sworn we just went through a red light.”

After a few more minutes, they came to another intersection and the light was red again. Again, they went right through. The woman in the passenger seat was almost sure that the light had been red but was really concerned that she was losing it. She was getting nervous.

At the next intersection, sure enough, the light was red and they went on through.

So, she turned to the other woman and said, “Mildred, did you know that we just ran through three red lights in a row? You could have killed us both!”

Mildred turned to her and said, “Crap, am I driving?”

“About half of a city’s energy bill is lighting. For them, seeing the opportunities with LEDs where they can reduce their energy bill by half – or even up to 70% – quite often means they can spend the money elsewhere or they can reduce public budget deficits.”



உத்திரகாண்ட் மாநிலத்தில் டேராடூன் மாவட்டத்தில் மிகப் பசுமையானமலைநகரம் முசோரி. (மன்கூரி என்றும் சொல்கிறார்கள்). இதை மலைகளின் ராணி என்று அழைக்கிறார்கள்.

கேப்டன் யங் என்ற ஐரிஷ் அதிகாரி இங்கு வந்த போது இதன் அழகிலும் இதமான தட்ப வெப்பத்திலும் வசீகரிக்கப்பட்டு முசோரியில் தங்கி, அதை விரிவாக்கினார். அங்கு ‘மன்கூர்’ எனும் புதர்ச்செடி அதிகமாகக் காணப்படுவதால் ஆங்கிலேயர்கள் அந்தப் பெயரையே இந்த இடத்துக்குச் சூட்டினார்கள். இங்கு உயரமான ஓக், பைன், மேபிள் போன்ற மரங்களும் காணப்படுகின்றன.

முசோரியில் உள்ள லேண்டர் என்ற சிறிய ஊர் எந்தவகையிலும் மாசு அடையாமல் அமைதியாகவும் அழகாகவும் இருக்கிறது. இங்கே உள்ள சாலைகளின் வளைவுகளில், ‘இங்கு சுற்றுபவர்கள் யாரும் தொலைவதில்லை’, ‘பயணங்களில் நிறைய பாடங்களைக் கற்கலாம்’ போன்ற பொன் மொழிகளை அழகாக எழுதி வைத்திருக்கிறார்கள்.

இந்தியாவின் புகழ்பெற்ற எழுத்தாளர் ரஸ்கின் பாண்ட், இங்கே வசிக்கிறார். இந்தியாவின் முதல் நிலக் கணக்காளர் ஜார்ஜ் எவரெஸ்ட்டின் இருப்பிடமும் இங்கு உள்ளது. 1825-ல் கேப்டன்

யங் கட்டிய ‘முல்லிங்கர்’ வீடு, அரண்மனைகள் போன்ற வரலாற்றுப் புகழ்மிக்க இடங்கள் ஏராளமாக இருக்கின்றன.

முசோரியின் உயரமான இடமான ‘லால்டிப்பா’, லேண்டரில் உள்ளது. இமயமலையின் கார்வால் மலைத்தொடரின் அழகையும் இங்கே ரசிக்கலாம். சூரிய உதயம் அஸ்தமனம் ஆகியவை கண்கொள்ளாக் காட்சியாக இருக்கும். அதனால் சுற்றுலாப் பயணிகள் இந்த நேரங்களில் அதிகமாகக் குவிகின்றனர்.

“Energy efficiency is not just about saving energy, it’s about tackling economic, environmental and social issues at the same time.”

லாண்டிப்பாவுக்குப் போகும் வழியில் 1839-ம் ஆண்டு கட்டப்பட்ட மிகப் பழமையான செயிண்ட் பால் மாதா தேவாலயம் இருக்கிறது. இதனருகில் இருக்கும் 'சார்துகான்' என்ற நான்கு கடைகள் புகழ் பெற்றவை. 1920களில் ஆரம்பிக்கப்பட்ட இந்தக் கடைகள் இன்றும் பரபரப்பாக இயங்கி வருகின்றன. மிகச் சிறந்த சிற்றுண்டிகளும் பலவித சுவைகளில் தேநீரும் கிடைக்கின்றன.

'கம்பெனி தோட்டம்' மிகப் பெரியதாக இருக்கிறது. ஆங்கிலேயர்கள் இதைமிகவும் அழகுணர்ச்சியுடன் அமைத்திருக்கின்றனர். பலவிதமான பூக்கள் அழகான வடிவங்களில் வெட்டப்பட்டுள்ள சீரான செடிகள், நூற்றுக்கணக்கான பூக்களைத் தாங்கிக் கொண்டு நிற்கும் ரோஜா செடிகள் போன்றவற்றை ரசித்துப் பார்க்கலாம். அருகில் ஏரியும் செயற்கை நீருற்றும் உள்ளன. இங்கிருந்து 6 கி.மீ தூரத்தில் உள்ள கெம்ப்டி அருவியின் அழகை வார்த்தைகளால் சொல்லிவிட முடியாது!

மகிழ்ச்சியும் சாகசமும் தரும் அற்புதமான இடங்களில் முசோரியும் முக்கியமானது.



தொடர்புக்கு: ஆம்பூர்மங்கையர்கரசி, mangai.teach@gmail.com

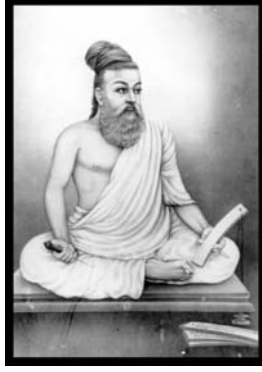
Courtesy: தி இந்து, தேதி:13.12.2017

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 65

Tirukkural deals extensively and comprehensively, with the various attributes and characteristics for every person for leading a proper, good and useful life in this world. Some important of these must be looked into when we have to identify persons.

In the Democratic set up we are in, there are innumerable occasions when we have to identify persons for electing them to represent us and work for us, be it a Co-operative Institution or any kind of Associations or a Local Body or a Legislature in the State or the Centre. When it comes to identifying persons, Tiruvalluvar provides some very simple and easy yardsticks which are so fundamental but are so very important.

**"Ilamendru Vekhudal Seyyar Pulamvendra
Punmaiyl Katchi Yavar"** Kural 174



இலம்என்று வெ.குதல் செய்யார் புலம்வென்ற
புன்மையில் காட்சி யவர். குறள் 174

**"Behold the men that have mastered their senses
and enlarged their vision; they covet not
saying – lo we are in want"**

**"Padupayan Vekhki Pazhipaduva Seyyar
Naduvanmai Naanu Bavar"** Kural 172

படுபயன் வெ.கிப் பழிப்படுவ செய்யார்
நடுவன்மை நாணு பவர். குறள் 172

**"Behold the men that turn away from evil; they
covet not, neither do they yield to ignoble deeds"**

**Sitrinbam Vekhki Aranalla Seyyare
Matruinbam Vendu Bavar** Kural 173

சிற்றின்பம் வெ.கிப் அறன்அல்ல செய்யாரே
மற்றுஇன்பம் வேண்டு பவர். குறள் 173

**"Behold the men that care for other's joys; they
are not greedy after little delights, nor do they
yield unto inequity"**

HOME FESTIVALS - 10

ஐப்பசி–Aippasi (October/November)



Skandashasti is the first festival of this month(right), commemorating the victory of Lord Murugan over the demon Sura, of the higher, spiritual self over the lower nature. **Dipavali is the major event of Aippasi**, celebrated everywhere Hindus live and by Buddhists and Jains, too. In one story of its origins, Vamana, the dwarf avatar of Lord Vishnu, requests the amount of land from King Bali that he can cover in three steps. Granted the request, Vamana

covers with his first step all of the Earth, with the second all of the sky, and then asks the king where to take the third step. The king offers his own head (lower left), and in commemoration of the king's humility, the day was established. In another story, Lord Vishnu (center) kills the demon Nagagasvaran with His discus. The various observances (lower right) of Dipavali include an oil bath, gifts of new clothes, fireworks (sufficiently indulged in Chennai to rattle dishes off the kitchen shelves), oil lamps for display and abundant pots of delicious food. The early morning bath is always considered to be in the Ganga itself, so one greeting of the day is, "Did you have the Ganga bath?"

(To be continued)

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