



ELECTRICAL

INSTALLATION ENGINEER

NEWS LETTER

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

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ISSUE NO. 144

VOL : No. 1/2018

MONTHLY ISSUE NO. 2

PRIVATE CIRCULATION ONLY

FEBRUARY 2018

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EDITORIAL

Dear Members, Fellow Professionals and Friends

Seasons greetings to one and all!

February is the Budget Month and it is seen from all indications that the Government is determined to take the Economy in 'Fast Forward' mode. We have had a number of Economic Jolts in the few years that passed by which has proven the withstanding capacity of the Economy and the People, which is a Good Sign of our Economic Stability. Overall activities of the Government and the Businesses in promoting Good Relationships, Good Practices, Good Products and Services and aiming at Excellence in everything, have helped to improve the Image of our Country in all spheres. The Great Democratic Country we are and the vibrant and growing Economy we possess are the very positive signs seen by all the Countries of the World and it will help us to achieve the higher position we deserve among the Economies of the World.

World Wetlands Day is observed on the 2nd of February. Agriculture will continue to be the back bone of our Country as we have a large and growing population to feed and we have to continue to ensure the Self Sufficiency we achieved by around the year 1980. We have grown further after that over the years in spite of vagaries of monsoon, in all the areas of Agricultural production of Food Grains, Commercial Crops and Fruits and Vegetables. Though we have the situation of small exportable surplus of food grains at present, the potential is very huge if we can tap all the rain and flood waters and ensure "Equitable Distribution" of all the waters. The Governments at the centre and the States must plan together for achieving equitable distribution through formation of National Water Grid or through Interlinking of rivers soon.

National Science Day is celebrated on the 28th of February and it is History that India possessed sound knowledge of Science in the areas of Mathematics, Astronomy, Ship Building, and Navigation and so on. We have at present, certainly caught up with the latest in various areas of Science, Engineering and Technology including Space and Nuclear and Electronics and Computers and so on. We have had a remarkable progress in the last 50/60 years and the Brand India has become popular the World over. We have built up Cost, Technology, Manpower and Skill advantages for speeding up the Economic growth. "**Clean India**" we are working on can certainly help in a big way in our progress.

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

EDITOR

PEACE BE AMPLIFIED, WORLD BE RECTIFIED - ELECTRICAL ENGINEERING

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105.	Shrishti Power Technologies P. Ltd.	Chennai	044-24426202 , 98840 90205	EA 2084

KNOW THY POWER NETWORK - 125

Let us proceed further.

I. Fear Psychosis

Fear psychosis is yet another important factor. If a worker has continuous nightmares about past accidents at his work site and if he harbours fear, just a trace or in significant measure, it percolates through his thinking and impacts his bearing. The existence of such fear-psychosis invariably makes him susceptible / vulnerable to the commission of costly errors. This fear-psychosis factor had a significant role in many industrial accidents. The individuals, who suffered from such fear-psychosis, had constituted the main cause for such accidents. You may wonder many normal individuals frequently get involved in minor / major accidents at their work sites. This fear-psychosis is responsible for such events.

You may ask what do you mean by “fear-psychosis”? It is nothing but a mental black that finally ends in “fear – related activities”. It is mainly due to physical problems such as defective vision, inadequate/impaired hearing, high/blood pressure and organic diseases, and other attributes like wrong attitudes/over confidence, failure to recognize/comprehend potential hazards, faulty judgement, improper attention, mal adjustment, impulsiveness, irresponsibility, nervousness and fear, slow reactions, affected by certain kinds of phobias, natural timidness, worry and depression. The post traumatic disorders mental affiliations and the impact of disproportionately severe punishments for minor lapses also fall under this fear-psychosis category.

II. Ageing

Physical ageing is another important factor that needs consideration in this regard. A marked tendency is discernible on the part of workers in their earlier years (young age) to take risks with a dare devil approach to their works. This aspect is mainly attributed to their mental attitudes and inadequate experience (immaturity) to appreciate/recognize the potential hazards of their jobs. The flow of adrolin (rush of blood flow) and their inexperience are prolific sources of undesirable accidents/events. This factor is well supported by the “accident statistics”. Disregard to safety precautions is notably high amongst the field workers whose service in the

department in the range of “0-5 years”. The accidents rates are comparatively less with the workers with the experience of 5-10 years, 10-15 years and above 15 years of service. Thus the “maturity” shaped by ageing and experience of the workers play an important role in industrial accidents. In this context, we have to note one important factor. *As age and experience of the workers go up, their efficiency comes down i.e. there is a marked decline in the performance of the workers when they cross the middle age band. All these make the “ageing process” to be reckoned with. The fall in mental alertness/sharpness and physical capacity brought by the ageing process neutralizes the benefits attained due to maturity and experience brought by it. This reversal of performance is always a factor to be counted upon in industrial accidents. That is young age/old age (Immaturity Vs Maturity) is always a problem. This issue has many dimensions/angles and it is generally found difficult to be resolved. So from our accident view point the workers ageing is one of the factors that require attention, that’s all.*

III. Working Environment

The contributions made by the working environment to accident needs no special focus since it is well known to all. The environment prevailing at the work place is one of the crucial factors for all industrial accidents. Poorly lit areas, inadequate moving/work space, poor air circulation, poor/defective wiring, inadequate/defective equipment and oil leaks (leaky surfaces) are some of the characteristic features of accident-prone areas brought by inadequate working atmosphere. The working environment should not cause fatigue or uneasiness; it should be well-lit and well-ventilated. As workers are exposed to this kind of environment during their working hours, it should be made conducive for their effective and efficient functioning and not to their fatigue or uneasiness, otherwise it will bring down their efficiency and lead to accidents.

IV. Ergonomics Factors

Many a time sufficient attention is not paid to simple ergonomics aspects. This failure to consider ergonomics issues may induce adverse bio-mechanical factors. An indicating instrument which is located beyond the vision/sight of the operator, an inaccessible control level, a seat that cause obstructions to vision, difficulty in identifying switches/knobs due to their poor arrangement and design may become the potential contributing sources for accidents. So ergonomics aspect of the working site should be given the attention it deserved.

Now we are clear about the factors that generally lead to accidents. Our next step is how to reduce/nullify the effects of the factors, thus far studied.

Suggested Remedial Measures

Before adopting any remedial measure, a clinical approach is needed for the detailed analysis of all electrical accidents especially the one involving departmental persons. Simply applying departmental rules and regulations will not solve the problems. A detailed analysis of the physical, mental and socio economical conditions of the individuals and the prevailing working environment is essentially required. This step alone helps to bring justice to the affected persons and also help to avoid the recurrence of such events. What is stressed here is the identification of the source of frustration requires more attention than the symptoms. Simply put psycho-technology should form the basic step while investigating the accidents. Further attention should be paid to the vital aspects of psychology and sociology in unveiling the mystery of human failure and to eliminate the factors responsible for it. Normally it is considered that punishment is a deterrent step to ward of the involvement of departmental workers in accidents. Actually this step brings a negative effect. It makes the workers to commit more mistakes because of the fear psychosis factor involved. Continued occurrence of departmental accidents despite stringent departmental rules is a proof for this.

Let me stop here. We will discuss more on accident mitigating measures in the next issue.



(To be continued...)
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***Science knows no country, because knowledge belongs to humanity,
and is the torch which illuminates the World. - LOUIS PASTEUR***

GROUND POTENTIAL – FACTS

First of all, ground potential rise is very important and very dangerous event. The grounding engineer will be required to develop safety systems to protect any personnel working where ground potential rise hazards are known to exist. Federal law mandates that all known hazards must be eliminated from the work place for the safety of workers.

There are many different worldwide laws that specifically states that step and touch potentials must be eliminated on transmission and distribution lines that include any related communication equipment. Substations are always considered workplaces and step and touch potentials must be eliminated.

Transmission and distribution towers or poles are not always considered work places and therefore are often exempt from these requirements. Take, for example, a lonely tower on a mountain side or in the middle of the desert — these towers are not typically considered workplaces.

However, any high voltage tower or pole becomes a workplace as soon as equipment is installed that is not related to the electric utility company and requires outside vendors to support the new equipment.

Hazardous Voltages

Fibrillation current is the amount of electricity needed to cause cardiac arrest, from which recovery will not spontaneously occur, in a person and is a value based on statistics.

IEEE Std. 80-2000 provides a method to determine the pertinent value of fibrillation current for a safety study, along with a good explanation of how it is derived. Many different methods exist for calculating fibrillation current; however the 50kg-IEEE method is the most commonly used in North America.

The formula used shows that the fibrillation current level is inversely proportional to the square root of the fault duration. However, it must be increased by a correction factor, based on the subtransient X/R ratio, which can be quite large for shorter fault durations. If personnel working at a site during fault conditions experience voltages that will cause a current less than the fibrillation current to flow in their bodies, then they are considered safe. If a worker will experience a greater voltage than is acceptable, additional safety precautions must be taken.

The subtransient X/R ratio at the site of the fault is important in calculating the acceptable fibrillation current and to determine the maximum allowable step and touch voltages that can occur at any given site.

Fault duration is a very necessary piece of data for properly calculating step and touch potentials. The fault duration is the amount of time required for the power company to shut off the current in the event of a fault.

Ultimately the engineer must determine two things:

1. The site-specific maximum allowable voltage that a person can safely withstand
2. The actual voltages that will be experienced at the site during a fault

Each site will have different levels of voltages for both of the above. Unfortunately, we cannot simply say that a human being can withstand X-level of voltages and use that value all the time, since this voltage is determined by the surface layer resistivity, the fault duration and the subtransient X/R ratio.

Additionally as each site has different fault durations and different soil conditions, it is critical that calculations be made for each and every possible fault location.

Step Potential

When a fault occurs at a tower or substation, remember that the current will enter the earth. Based on the distribution of varying resistivity in the soil (typically, a horizontally layered soil is assumed) a corresponding voltage distribution will occur. The voltage drop in the soil surrounding the grounding system can present hazards for personnel standing in the vicinity of the grounding system.

Personnel “stepping” in the direction of the voltage gradient could be subjected to hazardous voltages. In the case of step potentials, electricity will flow if a difference in potential exists between the two legs of a person (Figure 1).

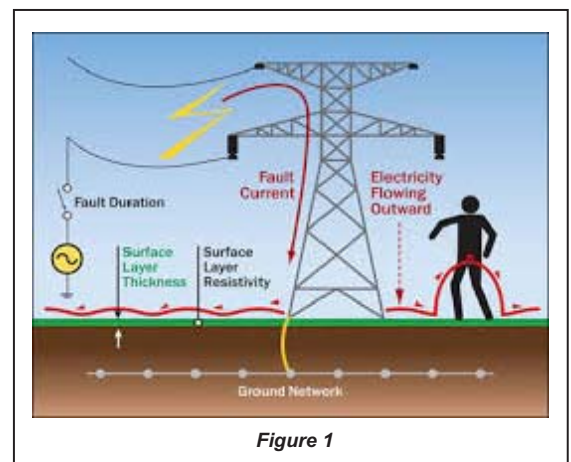


Figure 1

Calculations must be performed that determine how great the tolerable step potentials are and then compare those results to the step voltages expected to occur at the site. Hazardous step potentials can occur a significant distance away from any given site. The more current that is pumped into the ground, the greater the hazard. Soil resistivity and layering plays a major role in how hazardous a fault occurring on a specific site may be.

High soil resistivities tend to increase step potentials. A high resistivity top layer and low resistivity bottom layer tends to result in the highest step voltages close to the ground electrode.

The low resistivity bottom layer draws more current out of the electrode through the high resistivity layer, resulting in large voltage drops near the electrode. Further from the ground electrode, the worst case scenario occurs when the soil has conductive top layers and resistive bottom layers. In this case, the fault current remains in the conductive top layer for much greater distances away from the electrode.

Fault clearing time is an important factor to consider as well. The more time it takes the electric utility company to clear the fault, the more likely it is for a given level of current to cause the human heart to fibrillate.

An important note to remember is that most power companies use automated reclosers. In the event of a fault, the power is shut off and then automatically turned back on. This is done in case the faults occurred due to an unfortunate bird that made a poor choice in where to rest, or dust that may have been burned off during the original fault. A few engineers believe that fibrillation current for step potentials must be far greater than touch potentials, as current will not pass through any vital organs in the former case.

Touch Potentials

When a fault occurs at a tower or substation the current will pass through any metallic object and enter the earth. Those personnel “touching” an object in the vicinity of the ground potential rise will be subjected to these voltages which may be hazardous.

For example if a person happens to be touching a high voltage tower leg when a fault occurs, the current would travel down the tower leg into the persons hand and through vital organs of the body (Figure 2)

Engineering standards use a 1-m (3.28 ft) reach distance for calculating touch potentials. A 2-m (6.54 ft) reach distance is used when two or more objects are inside the ground potential rise event area.

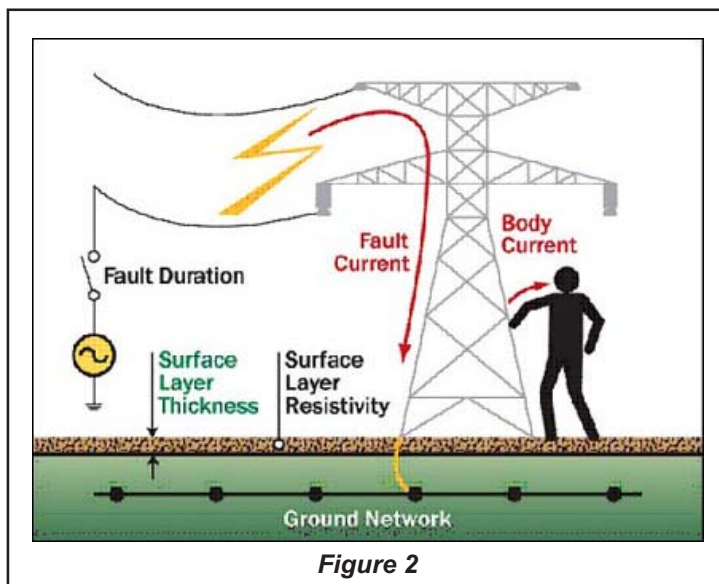


Figure 2

For example, a person could be outstretching both arms and touching two objects at once such as a tower leg and a metal cabinet. Occasionally, engineers will use a 3-m distance to be particularly cautious, as they assume someone may be using a power tool with a power cord 3 m in length.

The selection of where to place the reference points used in the touch potential calculations are critical in getting an accurate understanding of the level of hazard at a given site.

The actual calculation of touch potentials uses a specified object (such as a tower leg) as the first reference point. This means that the further away from the tower the other reference point is located, the greater the difference in potential.

If you can imagine a person with incredibly long arms touching the tower leg and yet standing many dozens of feet away, you would have a huge difference in potential between the feet and the tower.

Obviously, this example is not possible – this is why setting where and how far away the reference points used in the touch calculation is so important and why the 1-m rule has been established.

Courtesy: EEP

Many of the advances in the sciences that we consider today to have been made in Europe were in fact made in India centuries ago. - GRANT DUFF, British Historian

FLOATING SOLAR RIG PRODUCES HYDROGEN FUEL



A floating “solar fuels rig” could one day use solar energy to split apart seawater and generate hydrogen fuel. A team of scientists recently **described the design for the new rig** in the *International Journal of Hydrogen Energy*. A scaled-up version of their prototype could someday float out on the open sea, they say, producing renewable fuel from sunlight and seawater.

Scientists have long sought ways to harness sunlight to produce storable fuels that could be put to work when the sun doesn’t shine. One strategy aims to use solar-generated electricity to drive the electrolysis of water—the splitting of water (H_2O) into hydrogen (H_2) and oxygen (O_2). Hydrogen is a clean fuel, the burning of which generates only water as its byproduct.

When commercial electrolyzers split water, they rely on membranes to separate the resulting hydrogen and oxygen gases, since mixtures of these gases are potentially explosive. But these membranes are expensive, and prone to degradation and failure.

Moreover, solar-powered hydrogen fuel production would ideally make use of cheap, abundant seawater. But commercial electrolyzers require very pure water, because seawater contains impurities and microbes that can easily destroy their membranes.

Previously, scientists had tried to develop electrolyzers that did not require membranes. However, these electrolyzers used flowing electrolyte fluids to separate hydrogen and oxygen, which required pumps and added a layer of mechanical complexity to these devices.

The photos above show a prototype of a new solar-powered electrolyzer floating in a reservoir of liquid. Solar cells on top of the device convert sunlight into electricity that powers an electrolyzer submerged below. Now researchers have developed what they suggest “*is the first demonstration of a practical, floating photovoltaic-driven electrolysis device that is membrane-free and pump-free,*” says **Daniel Esposito**, a chemical engineer at Columbia University in New York who helped build the rig.

Esposito and his colleagues envision platforms of their solar-powered electrolyzers floating on the sea to make use of abundant sunlight and water to generate hydrogen fuel. These “*solar fuel rigs*” are reminiscent in some respects to deep sea rigs used to harvest fossil fuels today, they say. “*About 71 percent of the Earth’s surface is covered by water—why not use some of that space to harvest energy?*” Esposito says.

The new electrolyzer uses electrodes made of sheets of titanium mesh that are suspended in water. A platinum catalyst coats just one side of each sheet. “*These mesh electrodes are similar in nature to the metal window screens that allow desirable exchange of air between indoors and the outdoors while keeping bugs out,*” Esposito says.

When a mesh electrode is negatively charged, hydrogen bubbles develop on the side coated with the catalyst. When a mesh electrode is positively charged, oxygen bubbles develop on the catalyst-coated side instead. The mesh electrodes are each placed at diagonal angles in the water. When the bubbles of gas on them grow large enough, the bubbles’ buoyancy makes them detach from the mesh and float upward unimpeded. Depending on the arrangement of these electrodes, hydrogen bubbles can float into one set of chambers while oxygen bubbles can float into a separate array that vents the oxygen out into the atmosphere. **The simplicity of the device suggests that relatively few parts are required, which lowers the materials and assembly costs,** Esposito says.

In experiments, the floating electrolyzer the researchers developed could produce hydrogen gas with a purity as high as 99 percent. “**By using these electrodes, we can achieve efficient electrolysis with high product purity without a membrane and without a pump,**” Esposito says.

Future work can refine this design for more efficient operation in real seawater. For example, the researchers suggest developing catalysts that do not generate toxic chlorine gas from chloride ions dissolved in seawater. The researchers also plan to develop modular versions of their device that are suitable for implementation in large-scale rigs.

CHINESE 'UNMANNED FACTORY' REPLACES 600 HUMANS WITH 60 ROBOTS

Changing Precision Technology Company in Dongguan, a sprawling industrial city north of Shenzhen, has replaced some 600 human assembly line workers with 60 robots, resulting in a fivefold reduction in manufacturing errors and an increase in production of over 250 percent.



This is the "first unmanned factory in Dongguan," the article says, and the initial step of a comprehensive industrial automation plan for the region called the "Robot Replace Human" program.

Other robots in this factory, which manufactures "cell phone modules," according to the article, include "unmanned transport trucks" and some unspecified automated warehouse equipment. The introduction of the robots reportedly improved production capacity from 8,000 modules per person per month to 21,000, and the defect rate has dropped from over 25 percent (!) to under 5 percent.

Apparently, there are still some human workers in the factory, but most don't perform any actual assembly line task: the "technical staff just sits at the computer and monitors through a central control system."

The city of Dongguan plans to finish 1,000 to 1,500 "Robot Replace Human" programs by 2016, which (if done on a similar scale to the example above) would vastly increase production and improve quality while putting nearly a million people out of work.

If we look to slightly less state-run sources for some information on manufacturing robotics in China, it's certainly clear that China has been relying on relatively unskilled human labour, and that the country is starting to aggressively transition into factory automation: **by 2017, more industrial robots will be operating in China's production plants than in the European Union or North America:** over 400,000 individual units. To put that in context, China currently has just three robots per 1,000 humans in manufacturing settings. In Germany, it's five times that many, and in Japan, more than 10 times.

We're kind of not sure that we buy the whole story from *People's Daily*, although it's not so absurd that we'd say it's completely false. And at some point, it's definitely going to be true: **there simply aren't enough humans who want to be doing this kind of work, in China or anywhere else.** Turnover is huge, and the workforce is highly unstable, and to keep up with the insatiable demand that the world has for cheap electronics, we're going to have to depend on more and more robots to make up the difference.

INDIAN WIND ENERGY

A BRIEF OUTLOOK 2016 - 1



We are very pleased to release this summary report ‘**Indian Wind Energy – A Brief Outlook**’ produced jointly by GWEC and IWTMA in time for the Wind energy 2017 conference and exhibition in New Delhi. This report is an attempt to summarise the current state of the Indian Wind market for members of the industry, policy makers and participants alike to understand the market opportunities. In addition, it gives us insights into the challenges going forward and offers suggestions for overcoming remaining hurdles for wind power development. We invite you to attend the conference sessions and various networking events during Wind energy to get your own opportunity to know more about this exciting industry.

The Indian wind industry is nearly thirty years old, and now holds the **4th position in the world** with installations of over 31 GW (28.7 GW at the end of calendar year 2016), with almost 90% of the investment coming from the private sector.

The Indian manufacturing sector has developed state-of-the-art technology, a strong supply chain with 75 percent localization, championing the government’s **Make in India** campaign. Manufacturing capacity is about 10 GW which can be ramped up to 15 GW.

The Indian government has been committed to exploring the country’s vast renewable energy resources for several decades, and the time is here to work towards delivering on the political will through concrete action, both by policy makers and industry actors, to reap the domestic benefits from wind power development, and to build on India’s growing leadership internationally in resolving both the energy and climate challenges.

In this, the work done by the Ministry of New and Renewable Energy under the guidance of the Hon’ble Minister Shri Piyush Goyal is praiseworthy. We look forward to working closely with all stakeholders to strengthen the role that the Indian wind industry can play in driving wind power development not just domestically but also globally.

This Indian Wind Energy – A Brief Outlook is the industry’s contribution to these discussions, and the wind energy sector looks forward to continuing the dialogue with decision makers in order to allow India to reap the full benefit of this indigenous and clean energy source.



Sarvesh Kumar
Chairman IWTMA



Steve Sawyer
Secretary General GWEC

INDIAN WIND ENERGY – A BRIEF OUTLOOK

India is growing at a rapid pace. Energy is key to achieving India’s development goals, to support a rapidly developing economy, to bring electricity to those who remain without it, and to develop the infrastructure to meet the needs of what is soon expected to be the world’s most populous country.

India is surely and steadily moving towards complying with its climate change commitments under the Paris Agreement (COP21). India’s pledge at the climate summit stated the country’s intention to follow “**a cleaner**

path than the one followed hitherto by others at a corresponding level of economic development". To this end, India has established goals to expand its use of renewable energy and more efficient technologies.

India's well-developed wind power industry has the capability and experience to help meet the country's climate and energy security goals. Today India is the 4th largest wind market globally, with total installations having crossed the 31GW mark at the end of March 2017. The industry is firmly on track to meet the short-term national target of 60GW by 2022.



India has made great strides in improving access to modern energy in recent years. Since 2000, India has more than halved the number of people without access to electricity and doubled rural electrification rates. **Nonetheless,**

around 240 million people, or 20% of the population, remain without access to electricity. Wind power can play an important role in the coming decade to bring a clean and indigenous source of power to the people.

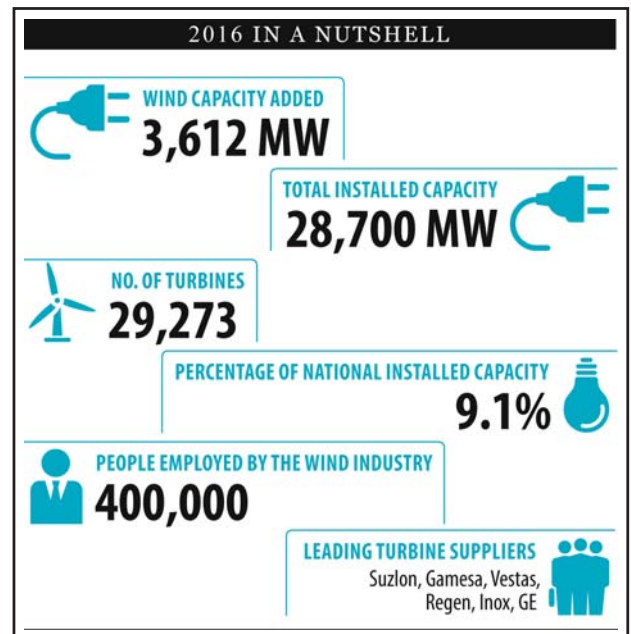
To date, the growth of the Indian wind sector has largely been led by private sector investment. The policy and fiscal support from the government has helped the industry to take the necessary business risks to advance the sector and galvanize investment in more and more states. In 2015, when the 60GW target was announced, the wind industry took on the challenge to meet this goal in a timely fashion. In 2016, the industry installed over 3.6 GW of new capacity, breaking all previous records in terms of annual installations. Following the Indian fiscal year 2016-17 reporting timeline, annual installations crossed 5.4 GW at the end of March 2017, bringing total installed capacity to over 31 GW.

Further, the government's vision of promoting a diversified manufacturing sector in India through the 'Make In India' initiative has had the wholehearted support of the wind power industry. The move to put manufacturing at the heart of India's growth model means a large rise in the energy needed to fuel India's development. The wind industry can not only provide much needed high-skilled jobs but also bring abundant clean and cheap power generation into the energy mix of the future. The next five years would require wind power installations of well over 5GW annually to meet the 2022 target. To meet this goal the policy and regulatory framework needs clarity and long-term stability. The direction that India's national and state renewable energy policies take, and the rigour and effectiveness with which they are implemented, will naturally play a critical role in India's energy outlook. Clarity of vision for the energy sector must be achieved in India, so as to prevent structural bottlenecks from preventing the industry's growth given the dual nature of the country's institutional arrangements with respect to the power sector.

WIND ENERGY IN INDIA

India had a record year and was the fourth largest market globally both in terms of cumulative capacity and annual additions last year. 3,612 MW of new wind power was added to reach a total of 28,700 MW at the end of December 2016. This total has risen to 31,177 MW at the end of March 2017.

The total renewable energy capacity installed in the country crossed the 50 GW mark at the end of 2016. Among renewables, wind power accounted for over 57 percent of the installed capacity.



India's wind power installations accounted for a 6.6 percent share of the global market in 2016. Wind power capacity accounted for over 9.1 percent of total domestic installed capacity.

In February 2015, India committed to installing 60 GW of wind and 100 GW of solar by 2022. Further, India made a commitment at COP21 to raise the share of non-fossil-fuel power capacity in the country's power mix to 40% by 2030.

WIND POWER RESOURCES IN INDIA

The National Institute for Wind Energy's (NIWE) latest estimate for India's wind power potential is 302 GW at 100 meters. The major wind power states are Tamil Nadu, Gujarat, Karnataka, Maharashtra and Rajasthan. To exploit the vast 7,600 km coastline for offshore wind energy in the Indian Exclusive Economic Zone, the National Offshore Wind Energy policy has been released.

India's Integrated Energy Policy projects 800 GW installed capacity in

2031-32. Around 40 per cent of this, or 320 GW, will come from renewable energy as per currently announced plans of the government. Considering the renewable energy potential in India, a rapid push is needed to meet this goal.

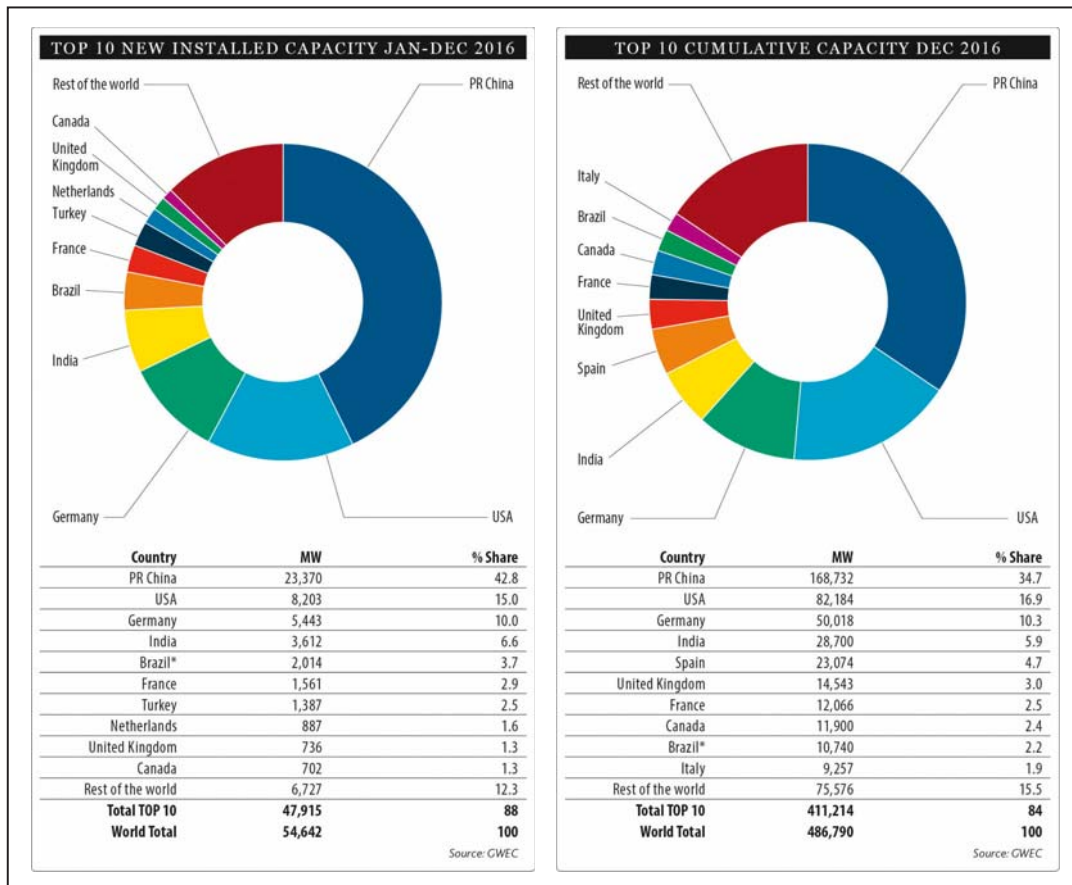
Wind power technology is evolving fast and the industry is involved in bringing new products to market that meet the needs of the local conditions across the country. However, in India R&D needs further support from the public sector and funds need to be made available to dedicated government agencies and universities for creating the necessary ecosystem for industry-specific projects. A public-private model for this purpose would be welcomed by the industry if a research agenda is jointly developed to meet the current challenges being faced by the national industry. This will further enhance the capacities of our technical institutions and create a robust research community.

The NIWE is a good example of this practice. It's mandate and capacity can be further strengthened to promote excellence in wind power development activities. NIWE published the latest Wind Atlas in 2015. The Table on next page shows the potential across sixteen states.

Gujarat leads the Wind Resource Assessment with an estimated potential of 84.4 GW, followed by Karnataka (55.85GW), Maharashtra (45.39 GW), AP (44.22 GW), Tamil Nadu (33.79 GW) Rajasthan (18.77 GW) and Madhya Pradesh (10.48 GW).

WIND MARKET IN 2016

2016 was a record breaking year for wind power in India. During 2016 wind power development grew at an unprecedented pace and the majority of wind farms have come up in the States of Andhra Pradesh, Gujarat,



Karnataka, Madhya Pradesh and Rajasthan. These projects were built by large IPPs such as Renew Power, Hero Future, Continuum, Mytrah, Oriental Green Power, CLP and others.

Wind power producers opted for the tax-based Accelerated Depreciation (AD) incentive (originally 80 percent depreciation in the first year of installation) or the Generation Based Incentive (GBI) of INR 0.5/kWh for at least four years and up to ten years with a cap of INR 10 million. The AD will be available at a reduced rate of 40 percent from April 2017 and the GBI could be discontinued. The new regime of GST may pose a challenge in the escalation of capital costs if it is not 'zero' rated.

Cumulative installed capacity by state (End of 2016)	
State	Total installed capacity (MW)
Andhra Pradesh	2,092.5
Gujarat	4,441.5
Karnataka	3,154.2
Kerala	43.5
Madhya Pradesh	2288.6
Maharashtra	4,666.1
Rajasthan	4,216.6
Tamil Nadu	7,694.3
Telangana	98.7
Other	4.3
Total	28,700.4

Wind power potential in India at 100m AGL (MW)				
STATE	Rank I: Waste land	Rank II: Cultivable land	Rank III: Forest land	Total
Andaman & Nicobar	4	3	1	8
Andhra Pradesh	22,525	20,538	1,165	44,229
Chhattisgarh	3	57	16	77
Goa	0	0	1	1
Gujarat	52,288	32,038	106	84,431
Karnataka	15,202	39,803	852	55,857
Kerala	333	1,103	264	1,700
Lakshadweep	3	3	1	8
Madhya Pradesh	2,216	8,259	9	10,484
Maharashtra	31,155	13,747	492	45,394
Odisha	1,666	1,267	160	3,093
Puducherry	69	79	4	153
Rajasthan	15,415	3,343	13	18,770
Tamil Nadu	11,251	22,153	395	33,800
Telangana	887	3,348	9	4,244
West Bengal	0.03	2.04	0	2
Total (in MW)	153,020	145,743	3,489	302,251
Total (in GW)	153	146	3	302

NIWE Indian Wind Atlas 2015: Re-assessment of wind potential at 100m AGL. Assessment carried out at spatial resolution of 500m. The resolution in the previous Atlas published in 2010 was 5km.

INDUSTRY DEVELOPMENTS

The top-five OEMs in terms of cumulative installed capacity in India are Suzlon (35.4%), WindWorld (18%), Gamesa (10.1%), Vestas (7.6%), Regen (7.3%) and Inox (5.68%). LM Wind Power set up its second blade factory in Vadodara, Gujarat. Senvion, an established European player, started up its operations in India and acquired the Kenersys manufacturing facility. Gamesa set up new factory at Nellore in Andhra Pradesh; Acciona entered the market last year, and Envision and Sany Global are expected to enter the market soon. Vestas opened their blade manufacturing unit in Gujarat. The current manufacturing capacity in the country is around 10 GW.

Support framework for wind energy

28 states and union territories have defined a Renewable Purchase Obligation (RPO) for renewables. However, the renewable energy certificate (REC) framework linked to the RPO, which was introduced for inter-state purchase and sale of renewable based power, has not been a great success. This is largely due to the non-compliance and weak enforcement of the RPO by the states and market regulators.

Wind power producers can either opt for prepotential tariffs decided by the state regulator or tradeable certificates to add to the average power purchase price from the utility.

TARIFF DETERMINATION AND LATEST POLICY DEVELOPMENTS

The State Electricity Regulatory Commissions determine the tariff for wind projects. However, the Central Electricity Regulatory Commission comes up every year with a tariff guideline for the entire country based on wind power density in five zones.

To address grid integration challenges, the government has initiated the Green Corridor programme. The objective is to improve linkage between India's regional grids with its national grid. This will facilitate interstate transmission.

The government's Green Energy Corridor initiative to facilitate the transfer of power from the high renewable energy installation states to other parts of the country, consists of 765 kV and 400 kV high voltage transmission lines and an associated 765/400kV substation and associated equipment; and four HVDC terminals (two at 800 kV and two at 320 kV) as part of the increased inter-regional connectivity between India's western and southern regional power grids.

2016 saw a number of new policies for promoting wind power including the draft wind-solar hybrid policy, Guidelines for Development of Onshore Wind Projects, Guidelines for Prototype Wind turbines, and the Proposal for Evaluation of Small Wind Energy and Hybrid Projects.

Further, in November 2016, the Ministry of New and Renewable Energy (MNRE) issued Guidelines for a transparent bidding process for 1000 MW of wind, to be connected to the interstate transmission system. The results were announced in March 2017, with winning bids coming in at INR 3.46 (USD 0.052/EUR 0.049)/kWh.

The tariff for FY 2016-17			
	Levelised total tariff (FY 2016-17) INR / kWh	Benefit of accelerated depreciation (if availed) INR / kWh	Net levelised tariff (adjusted for AD benefit, if availed) INR / kWh
Wind Energy			
Wind Zone -1 (CUF 20%)	6.61	0.70	5.90
Wind Zone -2 (CUF 22%)	6.01	0.64	5.37
Wind Zone -3 (CUF 25%)	5.29	0.56	4.72
Wind Zone -4 (CUF 30%)	4.40	0.47	3.94
Wind Zone -5 (CUF 32%)	4.13	0.44	3.69

CUF: Capacity Utilization Factor

OFFSHORE WIND

The MNRE announced India's Offshore Wind Policy in October 2015. India's NIWE was designated as the nodal agency for implementing the policy and creating the necessary ecosystem for the sector.

The first comprehensive assessment of offshore wind potential in two key coastal states is being undertaken by the FOWIND (Facilitating Offshore Wind in India) project. This is a four-year European Union co-financed project, implemented by a GWEC-led consortium. Gujarat Power Corporation Limited is also providing co-finance for FOWIND, as is industry partner ReNew Power. NIWE is the knowledge partner to FOWIND. FOWIND is undertaking the first offshore wind resource measurement in the Gulf of Khambhat, off the coast of Gujarat. India's first offshore wind research platform is being installed under this project. FOWIND, the Indian Ministry of New and Renewable Energy, and the NIWE have developed the platform jointly. Further to this, NIWE is in the process of finalising the first geo-physical surveys along the Gujarat coast. Another offshore platform is in the works for the coast along Tamil Nadu.

The Offshore Wind Policy outlines an international competitive bidding mechanism for the sector. The first tender is likely to be announced in 2019.

BARRIERS TO WIND ENERGY DEVELOPMENT

While there is strong support from the central government for increased uptake of renewable energy, there remain a number of barriers to wind power reaching its full potential and the fulfillment of the ambitious targets for 2022 and beyond. A part of this is due to the fact that in local parlance the power sector is a 'concurrent' subject, meaning that both central and state governments exercise control. The reality is that it is often the states and local utilities which play the larger role.

Most of the state level power sector utilities in India are not in good financial health and are unable to comply with the National RPO announced in 2016. Delayed payments of up to six months or more by certain state utilities (DISCOMs) are also an on-going concern. The government has floated the idea of a Performance Based Initiative (PBI) which would be of particular use to financially distressed DISCOMs, where the DISCOM would receive payments from central government for the timely payment of tariffs and other performance related issues.



Further, recent interconnections between key southern states in India have at least created the wires which would facilitate the transfer of power from windy states to other parts of the country. More are needed, but in addition to wires there needs to be both a mechanism and an incentive to trade renewable power, to assist with overall system reliability as well as load balancing. A truly effective interstate market, properly incentivized, would be major boost to the renewables sector and the Indian power system as a whole.

Land acquisition and title-clearing continues to be a challenge for most onshore installations in India, and the reform of this sector is long overdue. Sourcing affordable debt finance remains a challenge. High interest rates and limited availability of affordable debt are challenges for developers as well as OEMs in the country. Until now, equity investors have filled the gap sufficiently, but there are limits, and having a healthy mix of debt and equity will put projects in a stronger position.

Potential state-wise break-up of renewable energy target of 60,000 MW by 2022	
State/union territories	Wind installation (MW)
Northern region	
Rajasthan	8,600
Western region	
Gujarat	8,800
Madhya Pradesh	6,200
Maharashtra	7,600
Southern region	
Andhra Pradesh	8,100
Telangana	2000
Karnataka	6,200
Tamil Nadu	11,900
Other	
(New States)	600
Total	60,000
<i>Source: MNRE http://mnre.gov.in/file-manager/UserFiles/Tentative-State-wise-breakup-of-Renewable-Power-by-2022.pdf</i>	

(To be continued)

YAMAHA TEASES MOTOROID ELECTRIC MOTORCYCLE AI FOR TOKYO

Yamaha has a bevy of tech that it plans on displaying at the **Tokyo Motor Show** later this month, and one of the more intriguing world premieres is the Yamaha MOTOROiD concept.

A futuristic take on the motorcycling condition, Yamaha’s MOTOROiD seems to be part motorcycle and part pet dog, with the two-wheeler able to recognize its owner and interact with them, like a living creature.

This is because the Japanese brand boasts that it will use artificial intelligence to bring people new experience of “**Kando**” – the Japanese word for the simultaneous feelings of deep satisfaction and intense excitement that we



experience when we encounter something of exceptional value.



The concept is certainly an interesting take on how humans interact with their motorcycles, perhaps taking the notion that some motorcyclists perceive their motorcycle as having personality or character (usually when it decides not to function quite properly).

Dimensions	Vehicle weight	Seating capacity	Motor type	Fuel supply system
L: 2,060mm × W: 600mm × H: 1,090mm	213kg	1	Rear-wheel hub motor	Lithium-ion

The rest of the machine appears to be electrically powered, with a unique chassis design (note the rethink on the telescoping forks, and the body-grabbing seat for the rider). The Yamaha MOTORiD is outside-of-the-box thinking from the Iwata brand, and it will be interesting to see the reaction to this concept – both here on *Asphalt & Rubber*, and also in Japan.

image recognition AI
React only to one's owner by facial recognition. Gesture recognition is also incorporated, recognizing movements of the hand such as 'come forward', 'stop' and 'go back'.

by-wire system
Steering, throttle, braking and other vehicle controls are all done with handle switches.

3Dprint wheel
Carbon-containing 3D-printed wheel.
(For both Front and Rear wheels)

lithium ion battery
The battery unit also serves as counterweight for the self-balancing function.

balance control (AMCES)
A control system that governs MOTORiD's balance. The actuator is controlled based on the vehicle's posture information. The battery is being used as counterweight to modify the center of gravity for self-balancing during both stationary and in motion conditions.

haptic HMI
A device that creates a sense of unity between the vehicle and its rider. Interacts according to the rider's riding behavior.
(HMI = Human Machine Interface)
※HMI function currently not available in current model

in wheel motor
Integrated with a wheel motor. Reverse motion is also possible.

Source: Yamaha

RENEWABLE ENERGY INVESTMENT ACROSS INDIA GETS USD 400 MILLION BOOST - YES BANK INITIATIVE

Expansion of renewable energy power generation across India will be supported by a new USD 400 million joint initiative backed by the European Investment Bank and YES BANK, India's 5th largest private sector bank. YES BANK will manage the new co-financing programme for construction of new solar power plants and wind farms across the country.

The new USD 400 million private sector renewable energy financing programme was announced in New Delhi today by Donal Cannon, Head of the European Investment Bank Representation to South Asia and Arun Agrawal, Group President, International Banking, YES BANK. It will be supported by USD 200 million from the European Investment Bank, alongside financing from YES BANK, project promoters and other financial institutions.

The 15 year USD 200 million EIB loan was approved by the EIB Board of Directors on 12th December and financial details of the new initiative are expected to be finalised in the coming weeks.

The new financing programme will streamline financing for a range of renewable energy projects being built and operated by leading Indian corporations and private sector developers. Eligible solar projects have already been identified in the states of Rajasthan, Telangana, Maharashtra and Karnataka and additional wind and solar projects are currently being examined.

"India and the European Union are committed to the Paris Agreement and tackling climate change. This new USD 400 million initiative demonstrates the shared vision and commitment of both the European Investment Bank and Yes Bank to increasing renewable energy power generation across India. This new financing programme will make a significant contribution to harnessing wind power and solar energy to produce green energy, create thousands of jobs during construction and strengthen technical and financial skills for the renewable energy sector to expand." said Andrew McDowell, European Investment Bank Vice President.

"The new cooperation between YES BANK and the European Investment Bank, demonstrates another milestone in our leadership as India's pre-eminent 'Green Bank'. The highly successful transaction showcases continued trust and enthusiasm of Global multilaterals and Finance Institutions in partnering with YES BANK. With this transaction we remain well on track to achieve our commitment to finance 5,000 MW of RE made at the 1st RE-INVEST Summit in Feb 2015 and is also synchronous with our COP 21 commitment of mobilizing USD 5 Bn for Climate Finance by 2020." said Mr. Rana Kapoor, Managing Director & CEO, YES BANK.

This new initiative is the first EIB cooperation with YES BANK, and represents the first support for renewable energy in Asia with a commercial bank. This is also the longest tenor borrowing facility for YES BANK in the international loan market. The European Investment Bank is the world's largest international public bank, owned directly by the 28 European Union member states and the largest lender for renewable energy investment worldwide.

Last year the European Investment Bank provided EUR 19.6 billion for climate related investment worldwide. In recent months the EIB has made new investment in sustainable transport in India, backing expansion of the Bangalore and Lucknow Metro systems.



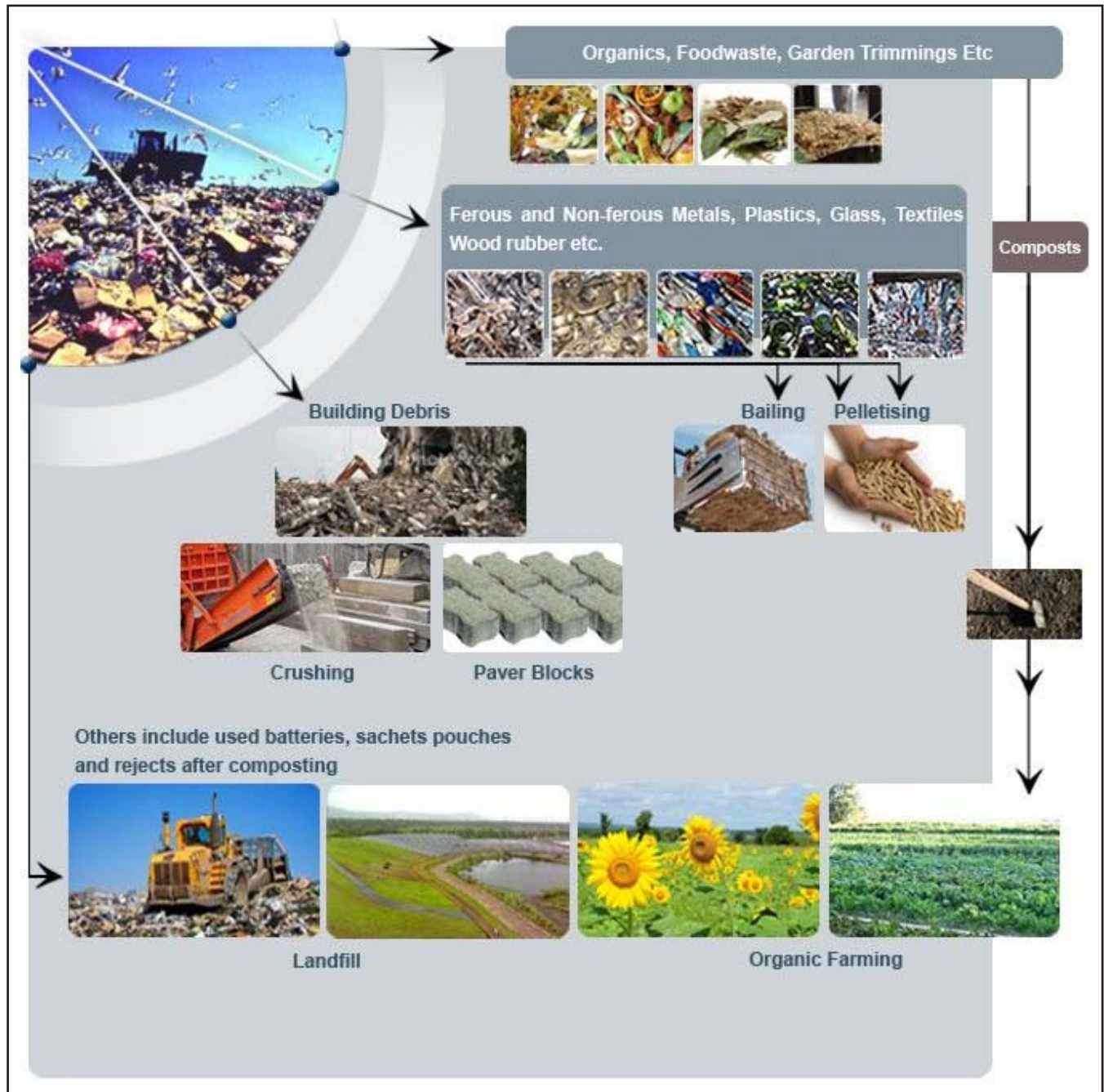
Mr. Rana Kapoor, MD & CEO
YES Bank

Economic growth without social program lets the great majority of people remain in poverty, while a privileged few reap the benefits of rising abundance.

- JOHN F. KENNEDY(1917-1963) 35th President of the USA

WASTE MANAGEMENT – INDIAN CHALLENGE

The urban affairs ministry will soon launch star rating of cities on a scale of zero to seven (0-7) in its bid to push cities to achieve “garbage free” status. The 10 parameters identified for rating the cities include percentage of door-to-door collection of waste, segregation of garbage at source, cleaning public areas and waste treatment.



One of the parameters will be charging user fees and imposing penalties and spot fines for littering. The cities will also get scores for enforcement of ban on using thin plastic. Daily sweeping including night sweeping will also be a parameter for rating of cities. The ministry will issue the guidelines next month and to appraise city managers it shared the main features of the new initiative last week with state government representatives.

“Like the SwachhSurvekshan ranking, competition will be the driving force in the star rating of cities to get the ‘garbage free’ tag. The cities will get five and seven star rating only after third party agencies certify them. For all ratings, citizens groups besides local municipal representatives will be involved,” said a ministry official.

Going by the parameters set by the Centre, it's unlikely that any municipality in the country will qualify for five and seven star ratings since they need to get 100% score in every identified targets. Considering that unlike in rural areas where half the task is done by building toilets in cities filth, mounds of garbage dumps, littering and open urination, the urban ministry guidelines has greater focus on installation of waste storage and litter bins. Cities will be required to enforce bulk waste generators like hotels, restaurants and banquets have their own waste treatment facility. To get the seven star rating cities will need to achieve quantifiable reduction in waste generation on per capita basis.

India alone generate more than 1,00,000 metric tonnes of solid waste every day, which is higher than many countries' total daily waste generation taken together, Y S Chowdary, minister of state of science and Technology said at an **Assocham** event held in New Delhi.

“Large metropolis such as Mumbai and Delhi generate around 9,000 metric tonnes and 8,300 metric tonnes of waste per day, respectively. India suffers from inefficient and insufficient waste **infrastructure** and also from increasing rates of solid waste generation per capita. Issues of service quality and waste quantity need to be handled together. Besides, the infrastructure and technologies, we must also concede that we have not addressed the issue from a systemic perspective,” said Chowdary, inaugurating an **Assocham Conference** on 5th national conference and awards on waste to wealth.

Management of solid waste through collection, processing, transportation and disposal in India is the responsibility of urban local bodies (ULBs). ULBs are responsible for segregated waste collection, transporting waste in covered vehicle, processing, and recyclables, separating domestic hazardous waste and disposing inert material in sanitary landfills.

But most ULBs in India struggle to provide efficient waste management services due to financial problems, lack of infrastructure and technology, and a lack of involvement from the private sector and non-governmental organisations.

“We all generate waste and we want the government to handle the waste generated by us. When I say that, waste management is a totally public funded or government funded activity. This is not the case in many parts of the world. That has to change, as the burden can't be local government or urban local bodies,” said Chowdary.

Indian government has taken up a number of initiatives to augment the country's waste management infrastructure. Under the **Jawaharlal Nehru Renewal Mission**, the government of India funded 49 solid waste management projects in various cities between 2006 and 2009.

Waste or Resource? Facts at a glance

- About 0.1 million tonnes of municipal solid waste is generated in India every day. That is approximately 36.5 million tonnes annually.
- Per capita waste generation in major Indian cities ranges from 0.2 Kg to 0.6 Kg.
- Difference in per capita waste generation between lower and higher income groups range between 180 to 800 gm per day.
- The urban local bodies spend approximately Rs.500 to Rs.1500 per tonne on solid waste for collection, transportation, treatment and disposal. About 60-70% of this amount is spent on collection, 20-30% on transportation and less than 5% on final disposal.
- Calorific value of Indian solid waste is between 600 and 800 Kcal/Kg and the density of waste is between 330 and 560 Kg/m³.
- Waste collection efficiency in Indian cities ranges from 50% to 90%.
- Out of the total municipal waste collected, on an average 94% is dumped on land and 5% is composted.

DOUBLE-GLAZED SOLAR PANELS: NEW APPROACH TO SOLAR ENERGY EFFICIENCY

Upon acknowledging that at present, the improvement of solar cell's efficiency has already reached its maximum with only gradient increases if any, the two physicists from the University of Warwick, Coventry took the works of Einstein and Tesla as inspiration and came up with a new design of solar panels – double-glazin.

The proposed solar panel design of Dr. Gavin Bell and Dr. Yorck Ramachers is fundamentally similar with a double-glazed window, which is composed of two glass layers and the space between them is filled with an inert gas.

Whereas existing solar panels use vacuum as the filler between two layers, the new design uses an inert gas as the filler, acting as an additional insulation. Replacing the vacuum with gas could make manufacturing cost lower.

How does the double-glazed solar panel work? When the sunlight strikes it, electrons are ejected from the photocathode, which is the inner layer applied with a special coating that releases those electrons during a radiation. These free electrons then transcend through the inert gas, argon in this case, and finally collected by the transparent outer layer that conducts electricity.

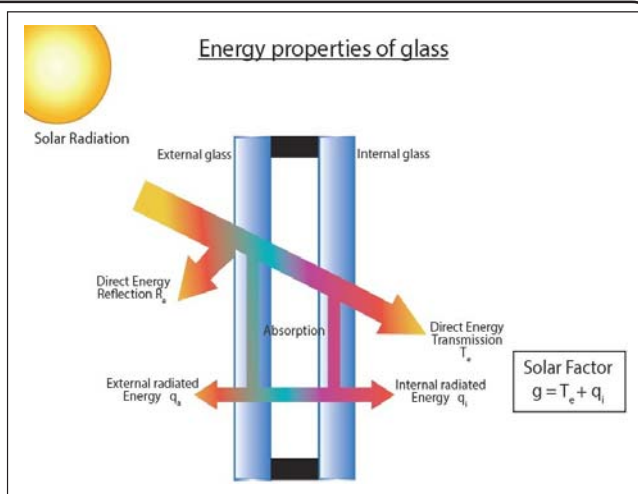
“It’s satisfying to find a new twist on ideas dating back to the start of the 20th century, and as a materials physicist it is fascinating to be looking for materials which would operate in an environment so different to standard photocathodes,” Dr. Bell states.

Double Glazing Technique

The scientists are hopeful that they have just initiated a new path for improving solar panels, especially by materials engineers. **“Our device is radically different from standard photovoltaics, and can even be adapted for other green technologies such as turning heat directly into electricity, so we hope this work will inspire new advances.”**

Although the physicists consider a thin diamond film is a very good candidate, they have not yet established the photocathode’s optimum composition. They also recommend that the photocathode’s transparency is made variable to make it applicable to solar windows.

“We think the materials challenge is really critical here so we wanted to encourage the materials science community to get creative,” Dr. Bell says.



KAKINADA PLANS FOR TAPPING 5 MW SOLAR POWER THROUGH ROOFTOPS

Kakinada, Dec 27(UNI) The Kakinada Smart City Corporation Limited has initiated steps to generate 5 MW solar power through solar panels installing on rooftops of various government office buildings.

The Board of Director of the Corporation at its meeting here on Wednesday with District Collector Kartikeya Mishra in the chair has discussed the project threadbare, which was planned under Public Private Partnership (PPP) mode. The Corporation has already entered Power Purchase Agreement (PPA) for 1.2 MW and agreements are ready for another 0.82 MWs. Plans are underway for the utilization of the balance of 3 MWs.

Mr Mishra has suggested to officials to study the present power utility, power generation for effective implementation of the project. He wanted them to discuss with the officials of various departments on the availability of roof top space for installation of the solar panels besides their power requirement.

Mr. Mishra further directed the officials to identify the suitable land for establishing sewage treatment plant under smart city works to be taken up with Rs.10.46 Crore funds earmarked. Other vital issues discussed at the meeting included setting up of Bio-methanation plan, formation of model smart road in the city, constitution of different committees and finalization of corporation accounts. It was also decided to constitute a coordination committee with members of line departments like Municipal Corporation, APEPDCL, Railways, NREDCAP, Port, APSRTC, National Highways, Roads and Buildings, Bhagyanagar gas Limited, Police and Telecom operators for implementing various smart city projects.

TOWARDS A SOLAR BASELOAD

Recently it's become fashionable to talk about the disruption brought on by the powerful combination of falling renewable energy and battery prices. In fact, it's fast becoming conventional wisdom that energy markets worldwide are about to be drastically reshaped. As anybody familiar with Younicos knows, it was precisely this notion that storage in general – and batteries in particular – would be a crucial driver of the transformative potential of renewables. That conclusion led us to investigate just what sort of technologies and business models would be needed.

Ten years later, a number of business models are emerging. Many will become reality. However, the combination of utility-scale PV and batteries to provide a new kind of solar base-load is what excites us at the moment. Why?

Disruptive price trend

For a start, there's the obviously disruptive price trend for both solar PV and battery storage. This year we saw PV record chasing record with prices as low as US\$0.07 per kilowatt-hour in India. Even if not all places are as sunny, recent German utility scale tenders have dropped as low as EUR0.085 - even in cloudy northern Europe.

Add to that Tesla's promise to sell "naked" lithium-ion batteries at US\$250 per kWh at utility scale, which implies about US\$500 for a plug-and play system complete with the latest software and controls. Over the battery system's lifetime, that translates to a levelised cost of storage of US\$0.15 per kilowatt-hour – or less.

As it's neither economical nor necessary to store every kilowatt-hour of solar energy, particularly at a cost of only a few cents, sensible investors will choose to install (significantly) more solar than storage. Storing about a third to a quarter of all kilowatt-hours produced by a given PV power plant will suffice to smooth intermittent generation so as to provide predictable, and thus tradable, energy blocks during the day – as well as at night, when consumption is much lower in any case. Add it all up and you reach about EUR0.12 - for dispatchable solar base-load.

But doesn't the same math pencil out for distributed (residential) solar plus storage? Well, we think many business models will flourish, but we're convinced that there's particular scaling potential in utility-scale solar plus storage.

Utility-scale is closer to competitive edge than residential

Residential PV plus storage is exciting, too, but demand here does not have the same price sensitivity as the utility case and thus won't grow quite as rapidly as prices fall. Of course, economic considerations are certainly also important in the residential case, but not quite as much. High prices will deter some people from making an investment, but the primary motive for getting rooftop solar plus storage is the seemingly universal desire to become "independent", even if all of these homes, very sensibly, still rely on the grid for final backup.

On the other hand, co-located utility-scale solar and storage will exploit economies of scale through better location, as well as lower investment and financing costs. It's also better suited to tap into the Swiss-Army-knife-like versatility of storage by exploiting various revenue streams for the provision of system services, whereas residential customers will have to add the cost of being grid connected to their calculation.

Finally, utility-scale solar PV and battery storage has a seemingly endless market to exploit. While increasingly attractive in already industrialised energy economies, it has even more to offer in fast-growing markets with rapidly rising energy needs, but poor infrastructure. Rather than build large and expensive thermal power plants that will only pay back over 30 years, along with the centralized grid infrastructure to match, why not spend months and put in place a clean solar-powered grid, backed up efficiently by batteries that also stabilize the grid far more effectively than inflexible thermal units?

"India is the cradle of the human race, the birthplace of human speech, the mother of history, the grandmother of legend and the great grandmother of tradition. Our most valuable and most constructive materials in the history of man are treasured up in India only" - MARK TWAIN

ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 5

Sustainable Growth, Sustainable Electrical Energy and Renewable Energy:

Waste to Energy

Energy from Biomass has the advantage that it can provide “Firm” Energy of continuous nature for long durations of months and years provided the Fuel Supply Chains are organized and maintained and as seen earlier, with all the types of Biomass considered and all kinds of wastes included, substantial quantities of Biomass are generated and the challenges are Supply Chain and Storage.

Another advantage is that the remains after extraction of Energy from Biomass, either through Bio Chemical or Thermo Chemical Processes, can be processed further for use as Manure or Fertilizer.

Biomass to Electricity

In the past 2, 3 decades, efforts in India to generate Electricity from Biomass, at a reasonable scale of MW size plants, were focused to the use of woody Biomass, either moisture free or with a small percentage of moisture. There are also successful plants using other easily combustible Biomass like Rice Husk etc.



*7.5 MV Biomass based Power Plant at Sipcot Industrial Complex,
Pudukottai Dist, Tamilnadu*

Problems started when the woody biomass availability shrunk and their prices also went up steeply, making the Power Generation uneconomical. Presently there are attempts to grow Energy Plantations to provide Biomass for the Power Plants. Co Generation Plants in Sugar Mills are also Biomass Power Plants which are all working well in many parts of India.

Co Generation Plants use Bagasse generated after crushing the Sugar cane, as fuel, but here again the use of Bagasse as fuel for burning in Boilers is being re looked as use of Bagasse for “Paper Making” provides better value. In fact quite a few of the Sugar Mills in Tamilnadu are using



Coal instead of Bagasse for Co Generation and the Bagasse being used by Tamilnadu News Print Limited (TNPL) as raw material for paper making.



*30 MW Cogen Power Plant at Sahakarmaharshi Bhausaheb Thorat
Sahakari Sakhar Karkhana Ltd., Sangamner, Maharashtra.*

There are successful efforts of Power Generation using Bio Gas produced from Bio Chemical processing of Biomass like animal and poultry wastes etc, but here again there are problems of scaling up as well as cost of power generated etc.

Considering the various kinds wastes (Biomass) that are available and are being generated continuously in very large quantities, requiring disposal as well as providing opportunity for Power Generation, there seems to be a huge potential available. It is possible that running costs and costs of Power Generated could be low as the Fuel Costs per Ton could be low. Potential to Generate Power in 1000s of MWs can be real provided we can get appropriate Technological Solutions to address use of these “Difficult to use” Biomass.

We will examine some of the Technologies that are developed over the past decade or so in many countries of the World and are being used successfully and they can prove to very valuable to us and to the World, as we seem to have availability of very huge quantities of wastes and Biomass.

Biomass to Electricity – Technology Challenges

The Technology must be able find solution to handle mixed and difficult to burn fuels – not uniform like coal or wood

It will be very good and cost effective if the Technology can ensure complete combustion or gasification of fuels even with ‘High Moisture’ content

The Technology should also be able to ensure efficient combustion preferably with least preparation of fuel – like bulk loading, for example.

The Technology must preferable address use of mixed fuels and different fuels at ease with least time for adjustments etc.

Combustion:

Combustion is one of the most important “Thermo Chemical” processes of Power Generation, in particular for Biomass, more particularly for ‘Difficult Biomass’. Most of the Electrical Power in India is generated through combustion of Coal at present and when it comes to Power Generation using Biomass, the main challenges are in Combustion and Heat Transfer and Production of Steam. After this stage, the processes involving Turbines and Generators are not very different compared to Coal fired Power Stations.

Biomass combustion technology development – It is all about chemical details and complete combustion

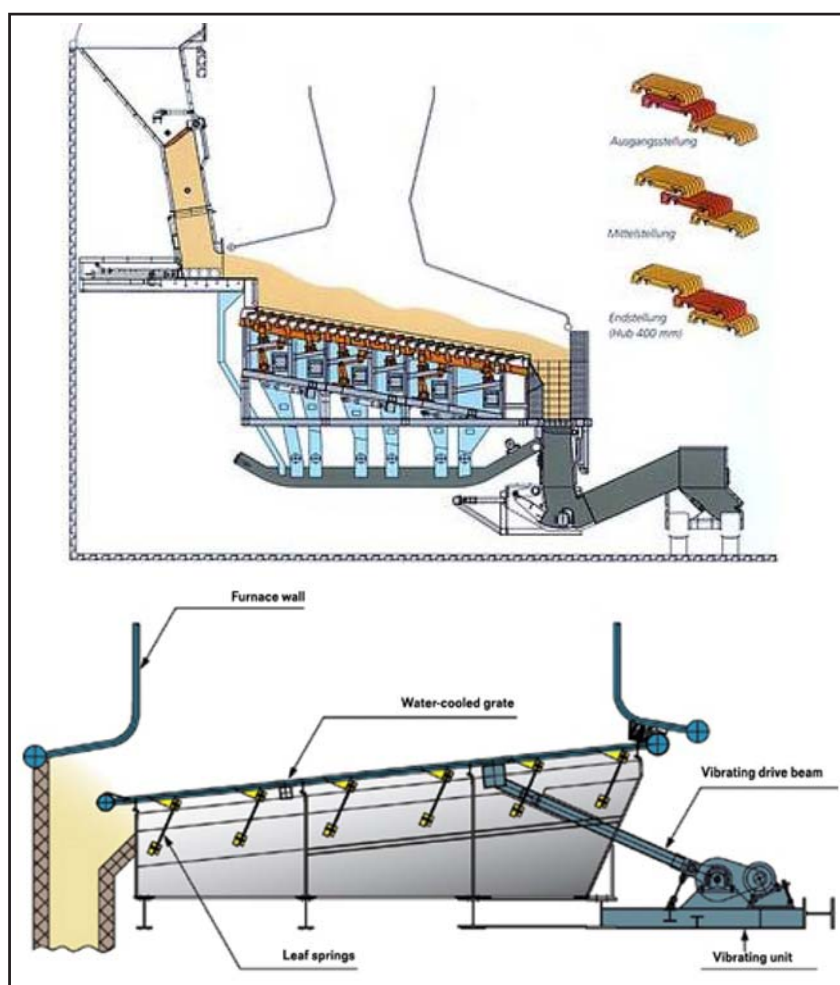
Biomass fuels differ in many ways from the conventional fossil fuels used in combustion processes, such as coal. They often have high moisture contents, lower heating values, and a variety of minor constituents, such as chlorine, sulfur, phosphorus, nitrogen, and a variety of ash-forming metals. These special properties of biomass

fuels cause several challenges, but in many cases also provide advantages, to their use in combustion processes. Design of the combustion devices and choice of their operating parameters are very dependent on the detailed properties of the biomass fuel or fuels to be used. Often these challenges are connected to the chemistry of the many minor constituents or impurities of the fuels.

The technology must address such issues and details related to biomass combustion processes. The technology can also focus on medium and large, industrial scale combustion technologies for biomass and biomass derived waste fuels for power production. Areas to be addressed by the technology are biomass particle conversion and biomass char oxidation reactivity, nitrogen and sulfur reactions in furnaces, super heater fouling and corrosion due to biomass ashes, low-temperature corrosion and other related issues. The advances in understanding chemical details and difficulties of biomass combustion have strongly contributed to the development of more reliable and efficient boiler technologies finding solutions for simultaneous combustion of several different biomasses and so on.

Developments revolve around Combustion Grate - Some of the “Special Grates” Developed

Reviewing some of the successful technologies and developments, it is seen that attention is given largely to ‘Grate’ design providing large area and moving and vibrating design, preferably broken up to 2 or 3 stages, providing different speeds for the moving grates to ensure complete and efficient combustion.



(To be continued)

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“Many of the advances in the sciences that we consider today to have been made in Europe were in fact made in India centuries ago”. – GRANT DUFF, British Historian

POWER PRICES GO NEGATIVE IN GERMANY DUE TO AN EXCESS OF RENEWABLE ENERGY SOURCES

Germany has invested an estimated 200 billion Euros over the past two decades to promote the production of cleaner electricity, with over a third of the country's energy production coming from renewable sources in 2016. While this may sound like a good thing, it does introduce problems for the electricity market, issues that have to be resolved to make energy grids based on renewable energy sources more viable.



The energy prices became negative in Germany, with unseasonably warm weather and an abundance of wind power causing an oversupply of electricity.

Having too much electrical power is not a good thing, as it disrupts the balance of the power grid and can even cause appliances to break or damage the network to cause power outages. The electricity that is delivered to the grid needs to go somewhere, which means that in an oversupply situation users can be paid to utilise the grid's excess energy.

Energy prices go negative to encourage consumers to consume more electricity and force energy suppliers to invest in more flexible infrastructure. Nuclear and coal power plants cannot be simply turned off, with both requiring lengthy and costly startup times and run down times, making it easier and cheaper to provide electricity at a loss. The potential for negative electricity prices makes the investment in energy storage systems more economical for suppliers, allowing Germany's power grid to more naturally adapt to the changing market.

In Germany prices have gone negative over 100 times in 2017, showcasing the need for power storage solutions within a nation's power grid when using renewable energy sources. There are several solutions to this problem, be it the use of energy storage solutions like a large battery bank or a pumped hydro station, where water is pumped into an uphill reservoir when electricity is oversupplied to later run downhill through generators to offer cheap power when required. Another alternative is to create a system where consumers are notified when electricity is cheap and plentiful to encourage citizens to use their washing machines and other appliances to alleviate the issue.

As the world moves away from fossil fuels, energy storage will become increasingly important when managing a nation's power grid, forcing suppliers to invest in new technologies to prepare the world for a future where renewables can be a dominant energy source.

One thing to note here is that Germany's electricity prices have only increased in recent history, with electric bills coming with a lot of taxes and fees to fund the development of the country's power grid and finance renewable energy incentives. Negative power pricing does lower the average German power bill; it doesn't pay customers for using electricity directly.

HUMOUR

At School

Mother: "How was school today, Patrick?"

Patrick: "It was really great mum! Today we made explosives!"

Mother: "Ooh, they do very fancy stuff with you these days. And what will you do at school tomorrow?"

Patrick: "What school?"

Catching the Train

A man asks a farmer near a field, "Sorry sir, would you mind if I crossed your field instead of going around it? You see, I have to catch the 4:23 train."

The farmer says, "Sure, go right ahead. And if my bull sees you, you'll even catch the 4:11 one."

Jumping

Can a kangaroo jump higher than a house?

Of course, a house doesn't jump at all.

Diagnosis

Doctor: "I'm sorry but you suffer from a terminal illness and have only 10 to live."

Patient: "What do you mean, 10? 10 what? Months? Weeks?!"

Doctor: "Nine."



*Left to right – Naresh Mittal (Vice chairman)
Ashok Mittal (President)
Ramesh Mittal (Chairman)*



Lovely Professional University (LPU) is spread over 600 acres at the entry of Jalandhar city with over 25000 students with hostel accommodation for 18,000 students.

In India, entrepreneurship miracles are happening and one among them is: LPU. Baldev Raj Mittal, an Army canteen contractor decided to become a tiny entrepreneur by opening Lovely Ladoo Shop, Jalandhar. He focused on quality and keeping his promises to his employees and his customers. Over the years he got so profitable that he and his three sons, Ramesh, Naresh and Ashok got dealerships

of Maruti and Bajaj. Ashok Mittal is the man behind the evolution of LPU which is the largest University in the country, in the context of number of students in a single campus spread over 600 acres of lush green area. Mittal has been honoured with “**Punjab Gaurav**” award by Shri Shivraj Patil, the Honourable Governor of Punjab for the path breaking changes that he has brought in the realm of higher education in the state. Recently, LPU has been awarded with the “**Best Emerging University of Asia**” at Singapore and has been awarded as Indian Emerging Power Brand in Dubai. With a never-ending zeal to improvise, Mittal has strived to arrange for the best of everything that goes into the making of a really World class University – be it infrastructure, faculty, curriculum, pedagogy or facilities for overall development of students. LPU followed the concept of quality and made themselves a winning proposition to form professional associations with several universities abroad – UK, US, Australia, Canada, Brazil, Singapore, Malaysia, Poland, Ghana – exchange of students and faculty. This enables students to get exposure outside India. They focused on its faculty by getting best of teacher including 100+ IITians. It has attracted students from more than 20 countries and 26 states because it provides intercontinental and culturally diverse atmosphere. *LPU operates on the American system of grading and has also introduced the US system of open credit to its students to provide them opportunity to explore additional fields of their interest apart from the core field.* More than 300 global Super-Brands & leading companies visited the LPU and hired about 6,000 students.

HUMOUR

Catching fish...

Two buddies are fishing, but they haven’t caught anything all day. Then, another fisherman walks by with a huge load of fish. They ask him “excuse me, but where did you get all those fish?”

The other fisherman replies, “If you just go down the stream until the water isn’t salty, there are a ton of hungry fish.”

They thank him and go on their way. 15 minutes later, one fisherman says to the other “fill the bucket up with water and see if the water is salty.”

He dips the bucket in the stream and drinks some. “Nope. Still salty.” 30 minutes later, he asks him to check again.

“Nope, still salty.” One hour later they check again. “Nope. Still salty.”

“This isn’t good,” the fisherman finally says. “We have been walking for almost two hours and the water is still salty!”

“I know,” says the other. “And the bucket is almost empty!”

HR Interview...

The best answer to the question asked in an interview, “Where do you see yourself in 5 years’ time?” . . .

“In the mirror as always . . .”

வியப்பூட்டும் இந்தியா - 4 மிகப் பெரிய கொல்கத்தா ஆலமரம்!

ஆலமரம்தான் இந்தியாவின் தேசிய மரம். நம் நாட்டில் உள்ள ஆலமரங்களில் மிகப் பெரியது கொல்கத்தா ஆச்சார்ய ஐதகீஷ் சந்திரபோஸ் இந்தியத் தாவரவியல் தோட்டத்தில் இருக்கிறது. 270 ஏக்கரில் பரந்து விரிந்துள்ள இந்தத் தோட்டம், கி.பி 1786-ல் கிழக்கிந்திய கம்பெனியில் வேலை செய்த கர்னல் அலெக்சாண்டர் கிட் என்பவரால் உருவாக்கப்பட்டது. சுதந்திரம் அடையும்வரை 'கம்பெனி தோட்டம்' என்றே அழைத்து வந்தனர். சுதந்திரத்துக்குப் பிறகே இந்தியத் தாவரவியல் பூங்காவாகப் பெயர் மாற்றம் செய்யப்பட்டது.



12,000 வகை தாவரங்கள் இங்கே உள்ளன. ஐந்து கண்டங்களில் இருந்து கொண்டுவரப்பட்ட அரிய தாவரங்களும் இருக்கின்றன. விதவிதமான மூங்கில் மரங்கள், பனை மரங்கள், ஆர்கிட் பூ வகைகள், மிகப் பெரிய இலைகளைக் கொண்ட விக்டோரியா அமேசோனிகா அல்லி போன்றவற்றை இங்கே மட்டும்தான் பார்க்க முடியும். **இவ்வளவு தாவரங்கள் இங்கே இருந்தாலும் மக்களைப் பெரிதாக ஈர்ப்பது பெரிய ஆலமரம்தான்!**

இந்த ஆலமரம் 18,918 ச.மீ. பரப்பளவுக்குப் பரந்து விரிந்துள்ளது! மிக உயரமான கிளை 25 மீட்டர் நீளமானது. ஆசியாவிலேயே இது மிகப் பெரிய மரம் என்று கணிக்கப்பட்டுள்ளது. 3800க்கும் மேற்பட்ட விழுதுகள் இந்த மரத்தைத் தாங்கி நிற்கின்றன.. இந்த மரம் சூரிய வெளிச்சம் கிடைக்கும் கிழக்கு திசையிலேயே வளர்ந்துகொண்டு செல்கிறது. தூரத்திலிருந்து பார்க்கும்போது அடர்ந்த காடுபோல் தோற்றம் அளிக்கிறது. அருகே சென்று பார்க்கும் போதுதான் இது ஒரே ஒரு மரமாக இருப்பது தெரிகிறது. **இந்த மரத்தை பார்ப்பதற்காகவே உலகம் முழுவதிலுமிருந்து மக்கள் வருகின்றனர். பத்தாயிரத்துக்கும் அதிகமான மக்கள் இந்த மரத்தின் நிழலில் அமர்ந்து இளைப்பாறலாம்!**

"India is the cradle of the human race, the birthplace of human speech, the mother of history, the grandmother of legend, and the great grandmother of tradition. Our most valuable and most constructive materials in the history of man are treasured up in India only". - MARK TWAIN

ஆலமரத்தின் வயது சுமார் 250 வருடங்கள். பத்தொன்பதாம் நூற்றாண்டைச் சேர்ந்த பயணிகள் தங்களுடைய பயணக் குறிப்புகளில் இந்த மரத்தை பற்றி குறிப்பிட்டுள்ளனர்.

1864, 1867-ம் ஆண்டுகளில் ஏற்பட்ட புயல்களால் இந்த மரத்தின் நடுப் பகுதி சேதமடைந்தது. 51 அடி சுற்றளவில் இருந்த இந்த மரத்தின் அடிப் பகுதியை 1925-ம் ஆண்டு எடுத்துவிட்டார்கள். நடுமரம் இல்லாமல் விழுதுகளால்தான் இந்த மரம் நிற்கிறது. இத்தனை வருடங்களுக்குப் பிறகும் தனது விழுதுகளை இன்னும் பெருக்கிக்கொண்டே இருக்கிறது. அதனால் இதன் சுற்றளவும் பரப்பளவும் அதிகமாகிக்கொண்டே போகிறது. மரத்தைச் சுற்றி பார்ப்பதற்காக 330 மீட்டர் சுற்றளவில் பாதை போடப்பட்டுள்ளது. மரம் வளர்ந்து கொண்டே இருப்பதால் இதை 'நடமாடும் மரம்' என்று அழைக்கிறார்கள். பத்தாயிரத்துக்கும் அதிகமான மக்கள் இதன் நிழலில் அமர்ந்து இளைப்பாறலாம் என்றால் அதன் பரப்பளவை உங்களால் ஊகிக்க முடிகிறதா!



ஆலமரத்தைப் பராமரிப்பதற்கென்று தாவரவியல் ஆராய்ச்சியாளர்களும் ஊழியர்களும் உள்ளனர். மரத்தில் பூஞ்சையோ, கரையானோ வராமல் உன்னிப்பாகப் பாதுகாக்கின்றனர். மரத்திலிருந்து விழுதுகள் கீழ்நோக்கி இறங்கும்போது, நீண்ட உலோகக் குழாய்களுக்குள் விடுகிறார்கள். அந்தக் குழாய்கள் பூமிவரை செல்கின்றன. பூமியில் இந்த விழுதுகள் ஊன்றியவுடன் உலோகக் குழாய்களை அகற்றி விடுகின்றனர். மிகக் குறுகிய காலத்தில் விழுதுகள் பூமியில் ஊன்றி, வலுவாக மாறிவிடுகின்றன. உலகிலேயே மிக அகண்ட மரம் என்ற புகழ் இந்த ஆலமரத்துக்கு உண்டு. 2005-ம் ஆண்டு கின்னஸ் புத்தகத்திலும் இந்த மரம் இடம் பெற்றுவிட்டது.

தொடர்புக்கு: ஆம்பூர் மங்கையர்க்கரசி, mangai.teach@gmail.com

Courtesy: தி இந்து, தேதி: 15.11.2017

கோபம் வந்தபோது வாயை மூடிக்கொள்!
குழப்பம் வந்தபோது கண்களை மூடிக்கொள்!
தோல்வி வந்தபோது காதுகளை மூடிக்கொள்!
வெற்றி வந்தபோது மனதை மூடிக்கொள்!

கொழுப்பைக் குறைக்கும் பயறு – தட்டைப்பயிறு

தட்டைப்பயறு அல்லது காராமணி என்றழைக்கப்படும் பயறு வகை, நமது கிராமங்களில் மட்டுமல்லாமல் உலகெங்கும் பரவலாகப் பயிரிடப்படும், அதிகம் பயன்படுத்தப்படும் ஒன்று என்ற தகவல் ஆச்சரியமாக இருக்கலாம். ஆனால், அது அக்மார்க் உண்மை.



தட்டைப்பயறைத் தனியாகச் சாப்பிட்டாலே சுவையாக இருக்கும். துவர்ப்போடு இனிப்பும் கலந்த சுவையுடையது. தட்டைப்பயறு சுண்டல், தட்டைப்பயறு புளிக்குழம்பின் தனிச்சுவை மிகப் பிரபலம். தமிழகத்தில் மாசி, பங்குனி மாதங்களில் செய்யப்படும் கொழுக்கட்டைகளிலும் கேரளத்தில் சுகியன்களிலும் மசிக்கப்பட்ட தட்டைப்பயறு சேர்க்கப்படுகிறது.

கறுப்புக் கண்

தட்டைப்பயறின் அறிவியல் சிற்றினப் பெயரான unguiculata என்பதற்குச் சிறிய வளைந்த நகம் போன்றது என்று அர்த்தம். இவற்றின் மலர் இதழ்களின் காம்புப் பகுதிகள், சிறிதாக வளைந்திருப்பதே இந்தப் பெயருக்குக் காரணம். தட்டைப்பயறு நெற்றை உடைத்தால் பயறு பச்சையாக இருக்கும். காய வைத்தால் பழுப்பு நிறத்துக்கோ, மங்கலான மஞ்சள் நிறத்துக்கோ மாறும். நேற்றில் பயறு ஒட்டியுள்ள பகுதி, சிறிய கறுப்புக் கண்ணைப் போன்றிருக்கும்.

ஆப்பிரிக்காவில் உள்ள சவானா காடுகளில் வளர்ந்து, உணவாக பயன் தரும் முக்கியப் பயறு வகை இது. மேற்கு ஆப்பிரிக்காவில்தான் முதலில் காட்டுப் பயிர்களிலிருந்து வயல்வெளி பயிராக இது மாற்றப்பட்டது. மத்திய கானா பகுதியில் 4000 ஆண்டுகளுக்கு முன்னால் இது நடந்திருக்கலாம். அதன் பிறகு, இரண்டாவது முறையாகத் தென்கிழக்கு ஆசிய நாடுகளில் பயிராக்கப்பட்டிருக்க வேண்டும். இன்றைக்கு ஆசியா, ஆப்பிரிக்கா, தெற்கு ஐரோப்பா, மத்திய-தெற்கு அமெரிக்கக் கண்டங்களில் அதிகம் சாப்பிடப்படும் மிகவும் முக்கியமான பயறு வகையாக உள்ளது.

வறட்சியைத் தாங்கக்கூடிய, வெப்பத்தைத் தாங்கக்கூடிய பயிர் என்பதால் வறண்ட பகுதிகள், வெப்பமண்டலப் பகுதிகளில் பயிரிட ஏற்றது. அது மட்டுமல்லாமல் சோளம், சிறுதானியங்கள்,

இருங்குசோளம், கரும்பு, பருத்தி ஆகியவற்றுக்கு இடையே ஊடுபயிராகவும் இதைப் பயிரிடலாம். தட்டைப்பயறின் மேலுறையை – தட்டையைக் கால்நடைத் தீவனமாகவும் பயன்படுத்தலாம்.

பயன்பாடு

சமைப்பதற்கு முன் தட்டைப்பயறை 5-7 மணி நேரம் ஊற வைத்தே பயன்படுத்த வேண்டும். இதைச் சுண்டலாகவோ, மசித்தோ பயன்படுத்தலாம். நேரடியாக மட்டுமில்லாமல் முளைகட்டியும் பயன்படுத்தப்படுகிறது. சிறிதளவு உப்பு சேர்த்தால் சுவை கூடும். இதைப் பயன்படுத்தி டோ.பு, மாவு, சாலட், சூப் போன்றவையும் செய்யப்படுவது உண்டு. உளுந்துக்கு மாற்றாக இட்லி, தோசை மாவில் தட்டைப்பயறைச் சேர்த்து அரைத்துப் பயன்படுத்தலாம். சுவை மிகுந்து இருக்கும்.

ஊட்டச்சத்து

- தட்டைப்பயறில் நார்ச்சத்து அதிகம், கொலஸ்ட்ரலைக் குறைக்க இது உதவுகிறது.
- இறைச்சிக்குப் பதிலாக இதைச் சாப்பிட்டு அதிகப் புரதத்தை உடலில் சேர்த்துக்கொள்ளலாம்.
- உடலின் நீர்ச் சமநிலையைப் பராமரிக்க, ரத்த அழுத்தத்தைக் கட்டுப்பாட்டில் வைக்க, இதயத் துடிப்பு சீராக இருக்கத் தட்டைப்பயறு உதவும்.
- பெரும்பாலான பயறு வகைகளைப் போலவே, மண்ணில் நைட்ரஜன் வளம் அதிகரிக்கத் தட்டைப்பயறு பயிர் உதவுகிறது. அதன் காரணமாக ஊட்டச்சத்தும் இதில் அதிகம். கால்சியம் 41 மி.கி., ∴போலேட் 356 மைக்ரோ கிராம், புரதம் 13 கிராம், நார்ச்சத்து 11 கிராம், வைட்டமின் ஏ உள்ளிட்ட சத்துகள் உள்ளன.
- தட்டைப்பயறு தாவரத்தின் இலை மிக அதிகப் புரதச் சத்தையும், ஊட்டச்சத்தையும் கொண்டது. அதனால் தட்டைப்பயறைப் பச்சையாகப் பயன்படுத்துவதைப் போலவே, தட்டைப்பயறு இலையையும் சமைத்துச் சாப்பிடலாம்.

<p>தெரியுமா? இன்றளவும் முதலில் பயிராக் கப்பட்ட தாய்மண்ணான ஆப்பிரிக்கக் கண்டத்தில்தான், உலகின் 66 சதவீதத் தட்டைப்பயறு உற்பத்தி செய்யப்படுகிறது. தற்போது ஒலிம்பிக் போட்டிகள் நடைபெற்றுக் கொண்டிருக்கும் பிரேசில்தான், உலகில் தட்டைப்பயறு உற்பத்தியில் முன்னணியில் இருக்கும் இரண்டாவது நாடு. அமெரிக்காவின் தெற்கு மாகாணங்களில் புத்தாண்டு நாளில் தட்டைப்பயறைச் சாப்பிடுவது, அதிர்ஷ்டத்தைக் கொண்டுவரும் என்பது நம்பிக்கை.</p> <p>தட்டைப்பயறு / காராமணி ஆங்கிலத்தில்: Cowpea / Black – eyed Beans (சில நாடுகளில்) தாவரவியல் பெயர்: Vigna unguiculata</p>	<p>மருந்தாக... தட்டைப்பயறைக் காய வைத்துப் பொடி செய்து, மிதமான வெந்நீரில் கலந்து குடிக்க வயிற்றுப் புண்கள் ஆறும். கோழையை வெளியேற்றும் தன்மை கொண்டது. வீரிய விருத்திக்கு முளைகட்டிய தட்டைப்பயறு சுண்டலை ஆண்கள் சாப்பிடலாம்.</p> <p>தட்டைப்பயறுக்குப் பூஞ்சைத் தொற்றை அழிக்கும் தன்மை (Anti-fungal) இருப்பதாக ஆய்வுகள் தெரிவிக்கின்றன. எதிர் ஆக்ஸிகரணச் செய்கையும் (Anti-oxidant) இதற்கு உண்டு. சிக்கில் செல் அனீமியா எனும் நோயில் இதன் செயல்பாடு குறித்து ஆராய்ச்சி நடைபெற்றுக்கொண்டிருக்கிறது.</p> <p>முக்கியமான வாயுப் பதார்த்தம் என்பதால் மிளகு/சீரகம் சேர்த்தே பயன்படுத்த வேண்டும். இல்லையென்றால் வயிற்று மந்தத்தை உருவாக்கும். முறையாகப் பயன்படுத்தும்போது உடலுக்கு மிகுந்த வலிமையைக் கொடுக்கக் கூடியது.</p> <p><i>Courtesy: ஆதி வள்ளியப்பன், தி இந்து, 13.08.2016</i></p>
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***ஒரே எழுத்தில் ஆரம்பிக்கும் வார்த்தைகளைக்
கொண்டு கதை எழுத முடியுமா?***

அகரத்தில் ஓர் இராமாயணம்

இராமாயண கதை முழுதும், 'அ' என்று ஆரம்பிக்கும்
வார்த்தைகளால் வடிவமைக்கப்பட்டுள்ளது.

இதுவே தமிழின் சிறப்பு

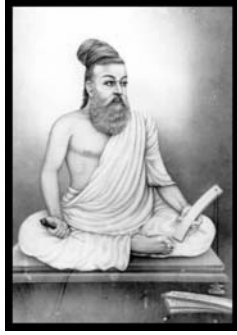
<p>அனந்தனே அசுரர்களை அழித்து, அன்பர்களுக்கு அருள அயோத்தி அரசனாக அவதரித்தான். அப்போது அரிக்கு அரணாக அரசனின் அம்சமாக அனுமனும் அவதரித்ததாக அறிகிறோம். அன்று அஞ்சனை</p>	<p>அவனிக்கு அளித்த அன்பளிப்பு அல்லவா அனுமன்? அவனே அறிவழகன், அன்பழகன், அன்பர்களை அரவணைத்து அருளும் அருட்செல்வன்! அயோத்தி அடலேறு, அம்மிதிலை அரசவையில் அரசனின் அரியவில்லை</p>	<p>அடக்கி, அன்பும் அடக்கமும் அங்கங்களாக அமைந்த அழகியை அடைந்தான். அரியணையில் அமரும் அருகதை அண்ணனாகிய அனந்தராமனுக்கே! அப்படியிருக்க அந்தோ! அக்கைகேயி அகூயையால் அயோத்தி அரசனுக்கும்</p>
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<p>அடங்காமல் அநியாயமாக அவனை அரண்யத்துக்கு அனுப்பினாள். அங்கேயும் அபாயம்! அரக்கர்களின் அரசன், அன்னையின் அழகால் அறிவிழந்து அபலையை அபகரித்தான் அந்த அடியார்களில் அருகதையுள்ள அன்பனை அரசனாக அரியணையில் அமர்த்தினர். அடுத்து அன்னைக்காக அவ்வானரர் அனைவரும் அவனியில் அங்குமிங்கும் அலைந்தனர், அலசினர். அனுமன், அலைகடலை அலட்சியமாக அடியெடுத்து அளந்து அக்கரையை அடைந்தான். அசோகமரத்தின்</p>	<p>அடியில், அரக்கிகள் அயர்ந்திருக்க அன்னையை அடிபணிந்து அண்ணலின் அடையாளமாகிய அக்கணையாழியை அவளிடம் அளித்தான் அன்னை அனுபவித்த அளவற்ற அவதிகள் அநேகமாக அனைந்தன. அன்னையின் அன்பையும் அருளாசியையும் அக்கணமே அடைந்தான் அனுமன். அடுத்து, அரக்கர்களை அலறடித்து, அவர்களின் அரண்களை, அகந்தைகளை அடியோடு அக்கினியால் அழித்த அனுமனின் அட்டகாசம், அசாத்தியமான அதிசாகசம். அனந்தராமன் அலைகடலின்</p>	<p>அதிபதியை அடக்கி, அதிசயமான அணையை அமைத்து, அக்கரையை அடைந்தான். அரக்கன் அத்தசமுகனை அமரில் அயனின் அஸ்திரத்தால் அழித்தான். அக்கினியில் அயராமல் அர்பணித்த அன்னை அவள் அதி அற்புதமாய் அண்ணலை அடைந்தாள். அன்னையுடன் அயோத்தியை அடைந்து அரியணையில் அமர்ந்து அருளிணான் அண்ணல். அனந்தராமனின் அவதார அருங்கதை அகரத்திலேயே அடுக்கடுக்காக அமைந்ததும் அனுமனின் அருளாலே.</p>
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உலகில் எந்த மொழியாலும் அசைக்க முடியாத நம் தமிழ்

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 58

In Management, particularly in Marketing Management and Services Management, 'People' are very important. People become one of the important 'P's like 'Product', 'Price' and so on. There are 2 important concepts that highlight the importance and role of People concerned with the whole operation of Business. "Everybody is involved in Marketing" is the concept to convey that any person in the organization has a role to play to create a Good impression about the organization with all the external persons they come in contact in course of their work. The concept that 'Front line Service Providers can set a Bomb to your Business' conveys that any misdeed or misbehavior by them can actually destroy your Business.



The Kural below brings out the essential qualities in the Leader to build and nurture the members of the organization.

*Aalvinaiyum Aanra Arivum Enairandin
Neel Vinaiyal Neelum Kudi Kural 1022*

ஆள்வினையும் ஆன்ற அறிவும் எனஇரண்டின்
நீள்வினையால் நீரும் குடி. குறள் 1022

"Manly exertions and sound understanding; it is the fullness of these two that exalteth the organization (family)"

The Kural below brings out the importance of choosing and nurturing people of Good Character and Duty Consciousness in your organization.

*Kadanenba Nallavai Ellam Kadan Arinthu
Sandranmai Merkol bavarkku Kural 981*

கடன்என்ப நல்லவை எல்லாம் கடன்அறிந்து
சான்றாண்மை மேற்கொள் பவர்க்கு குறள் 981

"Behold the men that know their duties and want to cultivate Worth in themselves; everything that is Good will be a duty in their eyes"

Tiruvalluvar terms the 'Bad People' as KAYAVAR and one of the many Kurals chosen below will convey the urgency of identifying such persons and getting rid of them.

*Sollap payanpaduvar Sandror; Karumbupol
Kollap payanpadum Keezh Kural 1078*

சொல்லப் பயன்படுவர் சான்றோர்; கரும்புபோல்
கொல்லப் பயன்படும் கீழ் குறள் 1078

"The Worthy can be commanded by a simple word; but, like a sugarcane, the low can be made to give only by a sound thrashing"

HOME FESTIVALS - 3

பங்குனி - Panguni (March/April)



This month brings the popular nine-day festival of Ram Navami, celebrating the birthday of Lord Rama, an incarnation of Lord Vishnu. When the full moon rises, Vishnu in the form of Satyanarayana is worshiped before a decorated kumbha pot with a branch of mango leaves placed in its mouth and a coconut on top. Rice is spread on banana leaves and the sacred vessel is completed with a tray of fruits, flowers and betel leaves and nuts. This month is also known for Sita's marriage to Rama. King Janaka, Dasaratha and priests surround the sacred fire, as Sita garlands Rama in Janaka's royal palace.

(To be continued)

NEW OFFICE POOJA PHOTOS - 31.01.2018



Ganapathy Homam & Pooja



**Garlanding Mr. P. Manohar, B.E.,
CEIG**



**Prasadam given to Mr. P. Manohar, CEIG
and Electrical Inspectors**



**Er. S. Gopalakrishnan, Secretary, TNEIA
Garlanding Mr. P. Manohar, CEIG**



**Er. S. Ponnambalanathan, Madurai VP,
TNEIA honouring Mr. P. Manohar, CEIG**



**Mr. P. Manohar, CEIG inaugurate the New
office Premises**



**Lighting the Kuthuvilakku by
Mr. P. Manohar, CEIG**



Lighting the Kuthuvilakku by
Mr. C. Karthikeyan, Electrical Inspector



Lighting the Kuthuvilakku by
Mr. M. Sakhivel, Electrical Inspector



Lighting the Kuthuvilakku by
Mr. J. John, Tirunelveli VP, TNEIEA



Lighting the Kuthuvilakku by
Er. S. Ponnambalanathan, Madurai VP, TNEIEA



Honouring **CEIG & Electrical Inspectors**



Er. S. Gopalakrishnan, Secretary, TNEIEA
honouring **Mr. P. Manohar, CEIG**



Left to Right (Sitting) : Mr. M. Balamurugan, Treasurer, TNEIEA, Mr. M. Sakthivel, Electrical Inspector, Mr. P. Manohar, CE/IG., Mr. C. Karthikeyan, Electrical Inspector, Er. S.D. Poongundran, President, TNEIEA, Er. S. Gopalakrishnan, Secretary, TNEIEA; Mr. U. Baskaran, Mr. K. Kannan.

Left to Right First Row (Standing): Mr. Srinivasan, Mr. R.P. Hariharan, Mr. N. Vasu, Mr. S. Manivannan, Mr. S. Ponnambalanathan, Mr. K. Buththan, Mr. D. Santhanam, Mr. V. Rengarajan, Mr. P. Selvanathan, Mr. M. Annadurai, Mr. N.N. Bharanidharan, Mr. G. Kannan, Mr. S. Karthikeyapandian, Mr. P. Suyambu, Mr. S. Krishnamurthy

Left to Right Second Row (Standing): Mr. J. John, Mr. S. Kalyana Venkataraman, Mr. R. Muralidharan, Mr. N. Senthil Kumar, Mr. D. Seenivasan, Mr. I.K. Gopakumar, Mr. P. Govindarajan, Mr. S. Meenakshi Sundaram

Third Row Standing: Mr. B. Kannan (Left); Mr. S. Jagadeesh (Right)

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