ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
Old No.82 / New No. 123, Lloyds Enclave, Avvai Shanmugam Road, Royapettah, Chennai - 600 014.
Phone : 2811 1300 Fax : 2811 1908 Email : tnagrade@gmail.com Website : www.teiea.com

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WELCOME

Er. V. JAYAVEL

Chief Electrical Inspector to Government

TNEIEA extends a hearty welcome to **Er. V. JAYAVEL**, S/o Sri. G. Varadarajan and Smt. Baby Saroja, who has taken charge as the *Chief Electrical Inspector to Government* on 01.04.2015.

He was born on 25th February 1959 at Krishnagiri, TamilNadu. He completed school education at Government High School in Gajalnaickanpatti, Tirupattur Taluk and Pre - University course at Sacred Heart College, Tirupattur, Vellore district. He graduated in Electrical and Electronics Engineering at Alagappa Chettiyar College of Engineering and Technology, Karaikudi. He joined the department of the Tamil Nadu Electrical Inspectorate during the year 1983, as Junior Electrical Inspector. He served the department in various positions throughout Tamilnadu and now he become the Chief Electrical Inspector to Govt. Tamilnadu.

TNEIEA *congratulates Er. V. Jayavel, Chief Electrical Inspector to Government for his dedication & sincerity and ensures with his guidance, shall work towards optimum usage of Energy to the nation and provide a safe environment for electricity consumers & Society.*

"WE WISH HIM ALL BEST & SUCCESS DURING HIS ENTIRE TENURE"

EDITORIAL

Dear Members, Fellow Professionals, Friends and Well wishers,

Seasons Greetings To One And All!!

Technology, Development, Growth, Prosperity, Environment and Welfare are some of the positive and important terms that are part of many discussions and debates about Governments, Governance in the past and at present and so on. There are also many other terms like Corruption, Black Money, Scams, Terrorism and so on which are negative and detrimental to Growth, Prosperity and Security of the Nation and the people in particular.

Our Country is blessed with the best of weather conditions and good rains to support agriculture and all other activities to provide growth and prosperity. History over thousands of years prove that we have had a great heritage of Civilization, Culture and Prosperity and have held pre eminent position among top economies of the world till about few hundred years ago. Invasions and Colonial rule turned us into a country of poverty and very poor economy.

After Independence in 1947 and after becoming Republic in 1950, our journey of Governance and Growth started in right earnest. Reviewing the journey with the events and mile stones in the past 65 years, we can certainly feel happy that we have established ourselves as a stable Democracy with decent growth in all sectors and overall economy. We can feel proud about the Technology levels we have attained, be it Nuclear or Space or IT or Manufacturing. In Agriculture, we have just attained Self Sufficiency levels, though the potentials are very big.

Minute analysis will show that the growths are on account of favourable Natural Conditions and availability of various Resources in general and the level of Intelligence and Enterprise of people in particular, which helped achieve growth against all odds. Actually the 'odds' have also been increasing steadily with deterioration of Moral Standards in the Government and in all walks of life, resulting in communal and social disturbances on one hand and corruption, black money, hoarding and so on, on the other. Irresponsibility on the part of successive Governments and lawlessness and greed on the part of people have contributed to turning us into a dirty country.

Though the situation looks bleak and irreparable, the present Government seems to be taking steps to correct things for betterment and stability, through transparency, e Governance and more of IT Enabled approaches to welfare measures and so on. One of the media, to sum up the performance of the present Government in 1 year, remarked that 'the present Government gives us hope though it does not seem to have achieved anything substantial' and this seems quite acceptable. The approach of the present Government to provide – Banking for the unbanked, Insurance for the uninsured, and Finances for the unfinanced gives us a positive feeling that Welfare and Growth will be achieved over a period of time. Recognition and support, in the recent Budget, for the millions of Micro and Small Enterprises of the Country who contribute substantially to the Economy and Employment, is one of the many positive approaches of the present Government. The resolve of the people to support and contribute to the Nation Building can help speed up the process of cleaning up and the march towards Growth and Stability.

We thank all those members who have helped us by participating in the advertisements appearing for the issue May 2015 – Faith Power Solutions - I.P.L. Products, Galaxy Earthing Electrodes Pvt. Ltd., Cape Electric Pvt. Ltd., Abirami Electricals, JL Seagull Power Products, Supreme Power Equipment Pvt. Ltd., Power Links, Vector Solutions, Max Electric Co., Vie Soleil, Velohar Infra Pvt. Ltd., Universal Earthing Systems Pvt. Ltd., OBO Bettermann India Pvt. Ltd., Electrotherm India Ltd., Ledgeo Ligts Pvt Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., P2 Power Solutions Pvt. Ltd., FLIR Systems India Pvt. Ltd., Ashlok Safe Earthing Electrode Ltd.

EDITOR

Ensure Fire Safety, Save Life Save Property

ELECTRICAL INSTALLATION ENGINEER

President : U. BASKARAN
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Treasurer : P. SUYAMBU

Editor :
G. VENKATESH

Printer :
M. VENKATARAMAN

Advisor :
S. MAHADEVAN

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MEMBERS DETAILS

S.No.	Company Name	License No.	District	Contact No.
46.	Ganapathy Electrical Engineering Co.	ESA 326	Chennai	044-22391870, 94441 71928
47.	Ganesh Electrical Contractors	EA 2756	Chennai	98415 85658, 98417 24262
48.	Ganesh Electricals, *Porur*	ESA 283	Chennai	044-22523330, 98841 82037
49.	Ganesh Electricals, *West Mambalam*	EA 2087	Chennai	044-24839373, 95000 39373
50.	The Ganga Consultants and Contractors	ESA 158	Chennai	044-23633849, 98410 68816
51.	George Associates	EA 1999	Chennai	044-65375422, 98400 72836
52.	Godrej & Boyce Mfg Co. Ltd.	EA 2494	Chennai	044-66544414, 97909 64179
53.	Goms Electricals Pvt. Ltd	ESA 231	Chennai	044-24611648, 94457 50016
54.	Guru Engineers	EA 2762	Chennai	044-22471252, 94447 82802
55.	Henry and Farad P. Ltd.	ESA 360	Chennai	96861 90888, 95662 84411
56.	Immanuel Electricals	EA 2568	Chennai	044-24986566, 94440 38369
57.	Inel Power System Engineers (P) Ltd.	ESA 263	Chennai	044-23712710, 98410 99221
58.	J.K. Engineering Associates	EA 2673	Chennai	044-24360053, 94444 05967
59.	J.L. Electricals	EA 2270	Chennai	98408 65021, 98841 36717
60.	Jaico Electricals	EA 2681	Chennai	044-24951050, 98848 33253

EVENTS

Integrated Carbon Footprint Assessment Reporting Essentials (i-CARE) for Building Products

Events Profile: Jointly organised by SGBC and BCA's Centre for Sustainable Buildings and Construction (CSBC), the course is specially designed for the Building Industry. It provides an in-depth understanding of the carbon footprint of buildings and the products and materials therein. The course will impart the skills to enable participants to assess the environmental impact of their buildings and products.

Course Date / Time: 1, 2, 23 & 30 Jul 2015 – 9.00am to 5.00pm
9 Jul & 6 Aug 2015 – 9.00am to 1.00pm

Venue: M2 Academy, 218 Orchard Road #09-00 Orchard Gateway @ Emerald, Singapore

Website: http://www.sgbc.sg/

Events Profile: Organized by Genesis Resources Consulting China, will gather 300+ senior decision makers from worldwide to discuss the strategies and solutions for you to map out your future success. This provide you with a precious platform to get updated industry development information, build up profitable and sustainable partnership and help you to capitalize in china tidal energy industry.

Date: 9th – 10th July 2015 **Venue:** Shangri-La Hotel Wenzhou, China

Website: http://www.ctes2015.grccinc.com/?en=1

Events Profile: This is a rare platform to display your environment friendly products and services and promote your distinctiveness among the world's most discerning participants.

Date: 10th – 11th July 2015

Venue: Hotel Le Meridien, New Delhi

Website: http://www.iodonline.com/wcem-2015.html

Events Profile: POWER-GEN Africa and its sister event DistribuTECH Africa, will once again provide comprehensive coverage of the power needs, resources and issues facing the electricity generation industries across sub-Saharan Africa.

Date: 15th – 17th July 2015

Venue: Cape Town International Convention Centre, Cape Town, Republic of South Africa

Website: http://www.powergenafrica.com/index.html#pgaf_3

Events Profile: Ministry of New and Renewable Energy, Government of India: pushing top agenda with a 2022 generation target of projects in Renewables Energy Sectors in India 100 GW of Solar, 60 GW of Wind, 10 GW of Bio-Energy & 5 GW of Small Hydro

Date: 21st – 23rd August 2015

Venue: Expo & Convention Centre, Manekshaw Centre, Delhi, India

Website: http://wretc.in/

LETTER TO THE EDITOR

Sir,

Sub: Preparation of Guide Line Book on Electrical Installation for Practicing Electrical Contractors Book – Reg.

Ref: Electrical Installation Engineer NEWSLETTER - Issue 110 - April 2015

In the above Newsletter, you have given a brief, about the history of the Guideline Book. In this connection I wish to furnish the following additional information about the Guide Line book.

During the year 1962, The Electrical Inspectorate was made as a separate department of the government and Mr. P. Rajagopal Pillai was appointed as a full time Chief Electrical Inspector to Government for a period of three years, after his retirement as principal of college of Engineering, Guindy, Madras university. He was a very strict and honest officer and enforced the rules and regulations of the IE Act 1910 and IE rules 1956 strictly.

After him Mr. Narayana Rao from TNEB became CEIG. After him Mr. Krishnaswamy from TNEB, on deputation became CEIG. During his period he wanted a guide to be prepared on this rules enforced by the Inspectorate for electrical installations. During his period Mr. M.J. Anandamurthy was Electrical Inspector (Technical) and I was Assistant Electrical Inspector (Technical). In consultation with leading electrical contractors at Chennai, Crompton Engg. Co., GEC, Easun Engg. Co., Sethuraman Thiagarajan Co. etc, the Guideline on Electrical Installations was prepared and about 30 copies of this Guideline Book was printed and distributed to the officers of the inspectorate and leading electrical contractors at that time.

The "A" Grade Contractors Association was formed during the period of Mr. M.J. Ananadamurthy as CEIG, during the year 1979. During period of Mr. M.J. Anandamurthy as CEIG and myself as Electrical Inspector the Technical and Secretary Electrical Licensing Board (1982-1986). The association wanted the "Guide" to be updated with more informations. A committee was formed with four members from the inspectorate side Mr. M.J. Anandamurthy CEIG, Mr. T. Chuharaj E.I. (Technical), Mr. Pughazhenthi Assistant Electrical Inspector, Mr. S. Kalayana Sundaram Assistant Electrical Inspector and four leading electrical contractor at Chennai. The committee sat together and conducted several meetings and prepared the revised edition of the Guide.

The revised edition of the guide line book was printed by the "A" Grade Electrical Contractors Association and released by the CEIG at Savera Hotel Chennai on the eve of the retirement of Mr. M.J. Anandamurthy CEIG August 1985.

For being a committee member and who took active part in the preparation of the revised edition of the guide line book, Mr. N.S. Venkataraman, the President of the Association presented me a memento.

Yours Sincerely

T. Chuharaj
Electrical Inspector (Retd)

KNOW THY POWER NETWORK - 93

Good Morning! Shall we move on to our topic of discussion viz. "Smart Grid" with a *le mot juste*. Smart use of any smart device or network will always be an express way to success. The smart thrills experienced with them have no parallel nor expressed in words. They always bring **"value additions"**. In this context, kindly note the latest definition of "SMART CITY" – " A city with smart physical, social, institutional and economic infrastructure. Its focus is on clean water supply, effective and efficient sanitation and waste management, good urban mobility, best electricity and communication networks, 'e' governance and citizen participations in all areas that include health and education.

Kindly permit me to add a new item viz. SMART LED to our earlier list of smart items. It is nothing but a Smart LED lamp made up of "GRAPHENE", an allotrophy of carbon. It is 100 times stronger than steel and capable of conducting both heat and electricity more efficiently. It gives a light which is brighter than the one normally given by ordinary LEDs but uses 10% less energy and lasts longer. Its cost works out to $20 approximately.

By this time, you would have mastered the basics of the Smart Grid, its salient features, operations, advantages and the threats commonly faced in the cyber space. In this context, it is to be stated that the year "2014" is called the year of "CYBER HACKS".

Being the knowledgeable consumers of the future multilayered electricity grid (smart grid), will it not be fair on your part to peep into some of the latest hot topics in the cyber space? Then the first topic that draws our attention is NET NEUTRALITY and NET EQUALITY issues which are being debated at a high pitch today. Let us know why these topics become a cause célèbre suddenly. I would like to compress the available information in a "**capsule form**" so that it will become palatable for your easy consumption.

(a) WHAT IS NET NEUTRALITY AND NET EQUALITY?

In simple terms, Net Neutrality is nothing but making the "internet" neutral for all. i.e. it will be a level playing field between all sites, content, people, organizations and corporations in the cyber space. It accords non discriminatory or equal treatment to all the "traffic" in the net irrespective of the nature / capacity of the person, entity, company or organization. i.e. "no" discrimination or priority will be shown for the "traffic" or "flows" in the net. It keeps the movements in the cyber space similar to the flow of electricity in an "energy grid" where consumers get equal treatment irrespective of their loads, capacity, status, and the nature of appliances employed by them.

NET EQUALITY

This measure will ensure and enable "barriers-free or obstacles-free access" to internet by all the people irrespective of their social status and income category. *It deals with the non discriminatory or equal access or connection or entry to the net where as net neutrality concerns about the "free flow or movement of traffic" in the cyber space. In both the cases, the equal treatment to all is essentially the basic need or foundation. Thus this measure alone helps all the people to enjoy the fruits of* ***"Digital India Vision"***.

(b) WHAT IS THE PRESENT STATUS?

Now net neutrality and net equality exist in India. i.e. Restriction – free access and traffic are presently practiced in our cyber space

(c) WHY DO THESE TOPICS COME TO THE CENTRE STAGE TODAY?

We all know that internet is a powerful media. Some telecom and internet service providers like AIRTEL and RELIANCE, see it as an "Asset" to be leveraged and used it to generate a set of specific benefit that include profits. They want to make it as a market determined product. Because of their unjustifiable attitudes and their demands to TRAI, these topics attain great importance today. These organizations have planned to alter the present neutral setup in the internet and try to leverage the factors existing there to their advantage so that "internet" or cyber space will become a "hand maid" (subservient) to them i.e. it will become a product of push and pull from different forces. Then they, can control the cyber space as per their tunes and keep this "free commodity" (internet) in shackles. So they demand / seek certain policy changes from TRAI (Telecom Regulatory Authority of India) which in effect facilitate them to decide or control which websites should get free or preferential access. Further they want to have the discriminating authority or power to decide which content or traffic needs priority and also to manipulate the online traffic in the cyber space. In simple terms, they want to monopolise the net areas. Based on their request, TRAI have floated a consulation paper or discussion paper titled "Regulatory Frame Work For The Top Services" on 27.03.2015 and invited comments and counters from all the internet users. They pose various questions to know whether the present neutral character of the net can be continued or not. This process is still going on and no policy decision has been taken so far. *The stand taken by TRAI and Govt of India on this policy issue are expected in the near future.*

(d) WHAT ARE THE ADVANTAGES OF THE PRESENT ARRANGEMENT IN THE INTERNET (NET NEUTRALITY)

Net neutrality is always liked by all internet users especially by those who want to have "free traffic" in the net. They always demand equal access, equal treatment and opportunity irrespective of the provider who helps to connect the users to the cyber space (internet). Net neutrality alone allows anyone to make his / her choice to select, visit and experience every site or app. with out any discrimination either in terms of price, speed or availability from a telecom company. This freedom helps every user to create, communicate and collaborate with people across the globe for business, to combine audio, video and text. It is really a boon for young and new entrepreneurs who use the net as one of their for capital assets. Further to make this issue simpler, it can be stated that the amount of work a person must go through to access a large company website should be same as that for a "new or local start up". Thus the denial of this net neutrality will be a receipe for disaster. In short, it will be a 'rupture' which cannot be healed or closed easily, if at all. Then the internet will become a slave to a bigger force of some kind.

(e) WHAT WILL HAPPEN IF THE PRESENT NEUTRAL CHARACTERISTIC OF INTERNET IS ALTERED (DIS ADVANTAGES ON THE REMOVAL OF NET NEUTRALITY)

This unjustified measure will cede the net to big corporates and facilitate the well established web based companies to drive away the small startap companies. These powerful firms will leverage their established consumer base and with the strong tie up of internet service providers, they will monopolise the cyber space and dictate who should have access to the net and whose traffic should have the priority in the net. This will bring "**unimaginable sufferings**" to all the users. Simply put, they will strangle the internet. The selfish internet service providers and Telecom companies will stop ordinary people from accessing the internet freely. Instead, they will charge nitizens discriminatory prices based on the websites and services they use.

In essence, the main disadvantages that are expected on the removal of "Net Neutrality" are,

- Start ups who put in their ideas and efforts by using internet as one of business capital will suffer. They will have to pay big amounts to telecom companies to get their products in the net.
- Stagnation or elimination of competition among start ups and in the e commerce space and there by impact our nations economy.
- Net users have to pay more money to access different parts of the internet. This will effectively destroy the internet as we know at present and create many small, segregated sub internets.
- A slower and more restrictive internet.

  and finally
- Digital growth in our country will suffer.

(f) WHAT ARE THE EXPECTATIONS OF COMMON INTERNET USERS AND WHAT ARE THE ISSUES THAT WARRANT A CLOSE LOOK BEFORE ANY DECISION IS TAKEN BY TRAI AND GOI

The issues that warrant a clear focus are,

- Traffic Management
- National security
- Integrity of the network and
- Investment in the infrastructure

Such a step will help to bridge the present divide between the digital haves and have nots to a greater extent. So far TRAI and GOI have not taken any stand on these issues. All the internet users earnestly expect that they will handle the present issues in an "even handed" way, without yielding to the pressure tactics and demands of the powerful telecom companies and ISPs and enact a legislation favouring Net Neutrality and Net Equality.

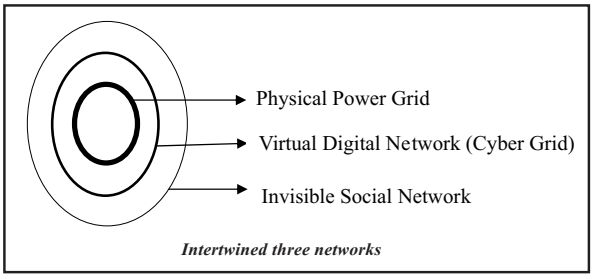
To continue further, let me pose a simple question? Do you know the powerful networks that control our life today?

(Ans) There are three influential networks – viz (i) the physical, electricity or power grid.

(ii) The invisible digital communication network(cyber network) and finally (iii) the social /community network.

They dominate our daily life in a big way. There is no need to explain the important role played by the power grid in our daily life. The virtual cyber network also slowly assumed greater importance because smart grid technology finds its application on a wider scale and the third network viz. "Social Network" is deeply embedded in our utility culture. All these inter linked networks can be leveraged individually and combinedly so as to bring substantial benefits to the consumers at large, who will get adequate value. Let us probe how the convergence of all these networks is beneficial to us.

The foundational network (Electricity Grid) can bring more benefits to its consumers when it works in tandem with the modern communication networks. Situational awareness, smart meters, better voltage control, quick restoration after outages and elimination of outages altogether are some of the beneficial measures brought by the digital overlay. Presently distribution generation gains its momentum. Its pace can further be accelerated by the digital network that engulfs the physical electricity grid. The smart cities movement will also get its momentum with the leverage of these two networks. To cite an example, the smart street light control, which controls the networks of LED street lights, can be used remotely to dim lights for energy savings and to brighter when needed to meet safety requirements. Thus there lies a number of possibilities or solutions with better results when all these networks coverage together. To make another illustration a mobile app can be used to monitor the real time home usage of power. Thus the grid data gathered by the digital network and communicated to the social network can provide custom solutions to a broader audience or a large population of consumers at low transactorial costs. The three interconnected powerful networks are shown below



Intertwined three networks

Oh! my goodness? We have discussed so many topics and in the process lost the track of our regular topic viz. "Smart Grid". So to make justification, let us visit this site also before concluding this month's trip.

Let us learn some of the issues related to cyber security and modern electricity grid. Among them are cyber security concepts and the digitization of modern electricity grids. The history of these prolictive systems, challenges expected while dealing with the security of control systems and common security tools are some of the topic that draw attention.

Cyber security tools are used to achieve three characteristic properties like confidentiality, integrity and availability. "Confidentiality" is the property that ensures that only authorized entities have access to sensitive information. Integrity is a property that helps to detect the unauthorized modifications to data and information. Finally the availability is the property that ensures the availability of the critical systems and information whenever they are needed. *Let me stop here. Let us meet next month.*

(To be continued…)

V. Sankaranarayanan, B.E., FIE,
Former Addl. Chief Engineer/TNEB
E-mail : vsn_4617@rediffmail.com
Mobile: 98402 07703

SOLAR PUMP DRIVE USES SOLAR POWER TO PUMP WATER THROUGHOUT A SUNNY DAY SAVING WATER, ENERGY AND THE ENVIRONMENT

Half of the energy produced around the world is used to operate pumps. Compared to diesel generator pumps, the solar pumps are environmentally friendly, with a long lifetime and low maintenance costs. When enough radiation is available, the ABB solar pump drive starts automatically and the motor connected to it begins to run the pump to draw water. At sunset, the drive turns off the motor and the water flow ceases.

The complete system consists of four components: PV cell, ABB drive, motor and pump. The built-in maximum power point tracking functionality enables the pump to run at maximum power using available solar power. It is independent from the grid and produces no pollution or noise. The ABB solar pump drive can also be equipped to operate from the grid when there is not enough sunlight to run the pump. Embedded, pump-specific features such as dry run detection and sensorless flow calculation are used to protect and monitor the pumping station.

The ability to operate on both solar (DC power) and the grid (conventional AC power) is the greatest advantage of ABB's solar pump drive according to Indian pump supplier Shakti Pumps. The company recognized the market needs as solar pumping solutions are becoming increasingly popular among Indian farmers. Shakti designed an entirely new Shakti Solar Pumps series based on its own technology and the new ABB Solar pump drive. Various reasons impacting productivity such as load shedding, electricity supply cuts and increased energy prices, as well as burnt motors often caused by voltage fluctuations can be avoided with the solution. The Shakti Solar Pumps have also been successfully exported to African countries like Sudan.

Solar pumping systems are rapidly becoming more popular for uses in applications such as agricultural irrigation, forestry, fish farming, desert control, water supply for islands, wastewater treatment and municipal engineering. City parks, tourist sites, resorts, and even landscapes and fountains in residential areas can be run with solar power.

Courtesy: ABB

ALUMINUM-ION BATTERY

A new kind of flexible aluminum-ion battery holds as much energy as lead-acid and nickel metal hydride batteries but recharges in a minute. The battery also boasts a much longer cycle life than today's battery technologies.

The battery's low cost, long cycle life and stability are appealing for grid-scale storage, says Hongjie Dai, a professor of chemistry at Stanford University. The technology could also be developed to power wearable devices. Dai and his colleagues reported the details regarding the new device in the journal *Nature*.

Aluminum-ion batteries are an attractive alternative to lithium-ion batteries for a few reasons. For one, aluminum is abundant and hence cheap. It is less reactive, which would mean safer, less-flammable batteries. In a video, the researchers drill into the batteries and they continue working for a while without catching fire. For the same reasons, many teams are also working on alternatives to lithium batteries that feature potassium, sodium and manganese.

Delving into chemistry, aluminum has three valence electrons compared to lithium's one. So charge-discharge reactions transfer three electrons per atom, which means an aluminum battery could pack almost three times as much energy as its lithium-ion counterpart, and in a smaller, lighter package.

But scientists have been trying, unsuccessfully, for over three decades to develop an effective aluminum-ion battery chemistry. Most designs have used solid aluminum anodes, aluminum-containing ionic liquid electrolytes, and various cathode materials such as manganese oxide, vanadium nanowires and doped polymers.

The best of these systems have low discharge voltages, cycle lives shorter than 100 cycles, and large decays in energy-storage capacity. Their cathode materials also quickly disintegrate.

Dai and his colleagues say they have found a cathode that works much better than ones used before. The cathode is a flexible 3-D graphite foam, a highly porous and lightweight sponge like carbon material that they made in their lab. The airy material can hold a large number of aluminum ions. The ions also move through the material quickly, enabling fast charge and discharge.

The researchers packed the graphite cathode along with a thin aluminum foil anode and an ionic liquid electrolyte in a flexible pouch.

The pouch cell could be charged at a current density of 5 amperes per gram in about a minute. It could be discharged over 34 minutes at a specific capacity of close to 70 milliampere-hours per gram.

The energy density of the battery (40 watt-hours per kilogram) is comparable to lead-acid and NiMH batteries. But it has a much more impressive cycle life than competing technologies; it lasted for up to 7,500 charge cycles without any loss in capacity. Typical lithium-ion batteries last for only about 1,000 cycles.

Further, the new battery has a power density of 3000 W/kg, very high relative to that of super capacitors. What makes this a battery and not a super capacitor, though, is that it has a voltage plateau. "Super capacitors do not show voltage plateaus and the discharge voltage would decrease continuously," Dai says.

The Stanford team is still working to refine the energy storage breakthroughs. While the electrodes are made of very cheap materials, the ionic liquid electrolyte will have to be replaced with a more cost-effective electrolyte to make the battery market competitive. The research team is also trying to increase the energy storage capacity of the graphite foam cathode.

Several companies are trying to license the technology from Stanford, Dai says. ***Courtesy: IEEE***

I think science has enjoyed an extraordinary success because it has such a limited and narrow realm in which to focus its efforts. Namely, the physical universe. – ***KEN JENKINS***

MINISTRY OF NEW & RENEWABLE ENERGY

Programme/ Scheme wise Physical Progress in 2014-15
(During the month of February, 2015)

Sector	FY- 2014-15		Cumulative Achievements
	Target	Achievement	(as on 28.02.2015)
I. GRID-INTERACTIVE POWER (CAPACITIES IN MW)			
Wind Power	2000.00	1512.80	22644.63
Small Hydro Power	250.00	221.60	4025.35
Biomass Power & Gasification	100.00	0.00	1365.20
Bagasse Cogeneration	300.00	170.00	2818.35
Waste to Power	20.00	8.50	115.08
Solar Power	1100.00	750.77	3382.78
Total	**3770.00**	**2663.67**	**34351.39**
II. OFF-GRID/ CAPTIVE POWER (CAPACITIES IN MW_{EQ})			
Waste to Energy	10.00	10.54	143.27
Biomass (non-bagasse) Cogeneration	80.00	46.47	578.29
Biomass Gasifiers -Rural	0.80	0.75	18.56
-Industrial	8.00	6.20	153.40
Aero-Generators/Hybrid systems	0.50	0.22	2.48
SPV Systems	60.00	52.77	227.12
Water mills/micro hydel	4.00	2.00	15.21
Bio-gas based energy system	0.00	0.30	4.07
Total	**163.30**	**119.25**	**1142.40**
III. OTHER RENEWABLE ENERGY SYSTEMS			
Family Biogas Plants (numbers in lakh)	1.10	0.45	47.98
Solar Water Heating – Coll. Areas (million m^2)	0.50	0.66	8.76

Tentative State-wise break-up of Renewable Power target to be achieved by the year 2022 So that cumulative achievement is 1,75,000 MW

State/UTs	Solar Power (MW)	Wind (MW)	SHP (MW)	Biomass Power (MW)
Delhi	2762			
Haryana	4142		25	209
Himachal Pradesh	776		1500	
Jammu & Kashmir	1155		150	
Punjab	4772		50	244
Rajasthan	5762	8600		
Uttar Pradesh	10697		25	3499
Uttrakhand	900	700		197
Chandigarh	153			
Northern Region	**31120**	**8600**	**2450**	**4149**
Goa	358			
Gujarat	8020	8800	25	288
Chhattisgarh	1783	25		
Madhya Pradesh	5675	6200	25	118
Maharashtra	11926	7600	50	2469
D. & N. Haveli	449			
Daman & Diu	199			
Western Region	**28410**	**22600**	**125**	**2875**
Andhra Pradesh	9834	8100		543
Telangana		2000		
Karnataka	5697	6200	1500	1420
Kerala	1870		100	
Tamil Nadu	8884	11900	75	649
Puducherry	246			
Southern Region	**26531**	**28200**	**1675**	**2612**
Bihar	2493		25	244
Jharkhand	1995		10	
Orissa	2377			
West Bengal	5336		50	
Sikkim	36		50	
Eastern Region	**12237**		**135**	**244**
Assam	663		25	
Manipur	105			
Meghalaya	161		50	
Nagaland	61		15	
Tripura	105			
Arunachal Pradesh	39	500		
Mizoram	72		25	
North & Eastern Region	**1205**		**615**	
Andaman & Nicobar Islands	27			
Lakshadweep	4			
Other (New States)		600		120
All India	**99533**	**60000**	**5000**	**10000**

FUJITSU AND GLOBAL MOBILITY SERVICE TO BEGIN TRIAL OF ELECTRIC TRICYCLES IN THE PHILIPPINES

Fujitsu Limited and Global Mobility Service, Inc. (GMS *1), a venture company providing mobility services, today announced that they will commence field testing to expand services in the Republic of the Philippines so as to increase the prevalence of electric tricycles (a three-wheel taxi) that use ICT.

Photo 1: An electric tricycle in the Philippines

GMS has already conducted a trial in Metro Manila that ran from September 2014 through January 2015 using electric tricycles with proprietary sensing technologies and ICT, such as remote vehicle-control systems, fare-authentication systems, and anti-theft systems. The company plans to begin actual services the second quarter of the calendar year.

Fujitsu will be working with GMS to connect their system to the FUJITSU Intelligent Society Solution SPATIOWL (*2), for a field trial of additional services in Metro Manila that will begin in late 2015. These services will include a feature for estimating the available driving range based on the battery reserves and power-consumption profile, a service showing the routes to charging stations, and a service that plans routes to consume the least amount of power. Following the trials, these functions will be added to the service that GMS is launching in the second quarter, and will be put into operation in the Philippines in fiscal 2016.

This collaboration between GMS and Fujitsu will support more widespread use of electric tricycles in the Philippines and contribute to an improved environment and convenience. The companies are considering services in other Southeast Asian countries and China as the market for electric vehicles is expected to expand.

GMS's Initiatives to Date: - The more than 3.5 million gasoline-powered tricycles in the Philippines are a fixture of the country's everyday life. But as the air-pollution problem worsens, the government of the Philippines is moving to introduce 100,000 electric tricycles, which produce no exhaust gases. Also, as electric vehicles take hold in other Southeast Asian nations, opportunities will grow throughout the region.

But because most tricycle operators in the Philippines have low incomes, they can neither afford to buy an electric tricycle outright nor pass a credit check. GMS seeks to work around this problem by lending vehicles in the Philippines and providing electric vehicle services without requiring credit checks.

GMS developed Mobility-Cloud Connecting System, which enables remote vehicle control, and conducted a trial of mobility services that can track a vehicle's current location and disable a vehicle if usage-fee payments fall into arrears. The trial, which took place in Metro Manila, the capital area of the Philippines, ran from September 2014 through January 2015. Since then, GMS reached an agreement with one of the Philippines' leading infrastructure companies, the Tricycle Operators and Drivers Association (TODA), and Quezon City, the country's most populous urban area, to lead the large-scale deployment of electric vehicles equipped with this service, based upon their evaluation. Business is set to commence in the second quarter.

About the Field Trial:- By combining GMS's mobility services with Fujitsu's SPATIOWL location-information cloud service, drivers can see an estimate of their remaining driving range based on their battery reserves and years of battery usage, as well as the best places to recharge, minimizing the risk of running out of electric power. Furthermore, using the data stored in SPATIOWL, such as electric tricycle driving data, battery-status information, road conditions, and weather, the system creates a power-consumption map showing power-consumption rates for each road, so that drivers can pick the most power-efficient route. And because vehicle-status information such as battery condition and number of motor rotations will be stored, this information can be used to analyze ways to minimize deterioration over time, and to predict and give advance notice on breakdowns.

These measures will allow GMS and Fujitsu to make the most of the advantages of electric tricycles and raise the quality of the tricycles themselves. By providing services that encourage the widespread use of electric tricycles, the companies hope to reduce air pollution in the Philippines and maximize benefits for TODA, by their utilization of low-cost electricity.

Future Plans:- Late 2015: Start trial in Metro Manila, Philippines

Fiscal 2016: Commence services in Philippines

MOST POWERFUL DIESEL ENGINE IN THE WORLD

If the Seven Wonders of the World was updated for the 21 st century, the Wartsila-Sulzer RTA96-C turbocharged two-stroke diesel engine could be a contender. If you are a student of the internal combustion engine in all its wonderous configurations, then feast your eyes on this set of numbers which outline the truly astounding engineering feat. It is the most powerful and most efficient engine in the world today.

Designed to provide the motive force for a variety of supertankers and container ships, it comes in 6 cylinder in-line through to a whopping 14 cylinder version. The cylinder bore is 38 inches and the stroke is just over 98 inches. Each cylinder displaces 111,143 cubic inches (1820 litres) and produces 7780 horsepower. Total displacement comes out to 1,556,002 cubic inches (25,480 litres) for the 14-cylinder version.

At a length of 89 feet and a height of 44 feet, the total engine weight is 2300 tons - the crankshaft alone weighs 300 tons.

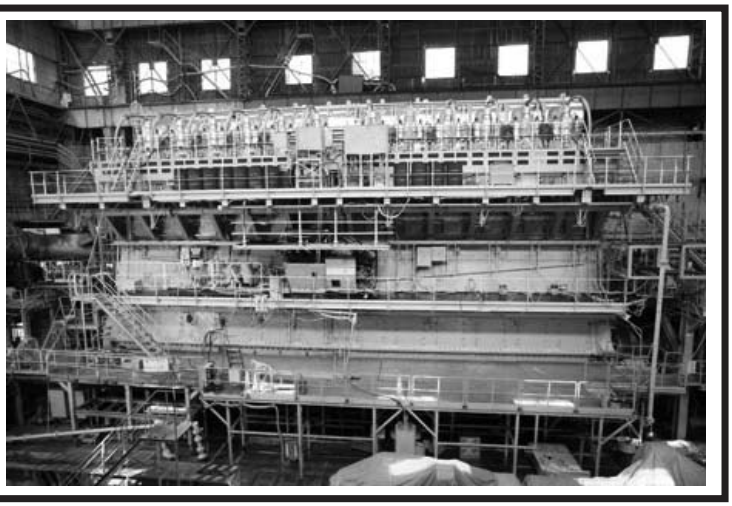
The RTA96C-14 can achieve a maximum power output of 108,920 hp at 102 rpm and astonishingly, at maximum economy the engine exceeds 50% thermal efficiency. That means, more than 50% of the energy in the fuel is converted to motion. Its Brake Specific Fuel Consumption (BSFC) at maximum power is 0.278 lbs/hp/hr.

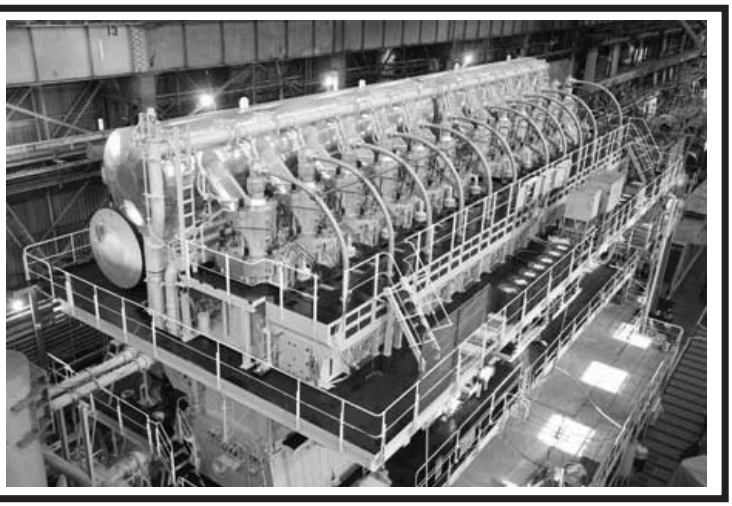
Ship owners like a single engine/single propeller design and the new generation of larger container ships needed a bigger engine to propel them.While engine cylinder configurations for large-scale container liners have been discussed in the magnitude of 14, 16 and 18 cylinders, the 14-cylinder in-line low-speed engine is the first to be offered by any engine designer.

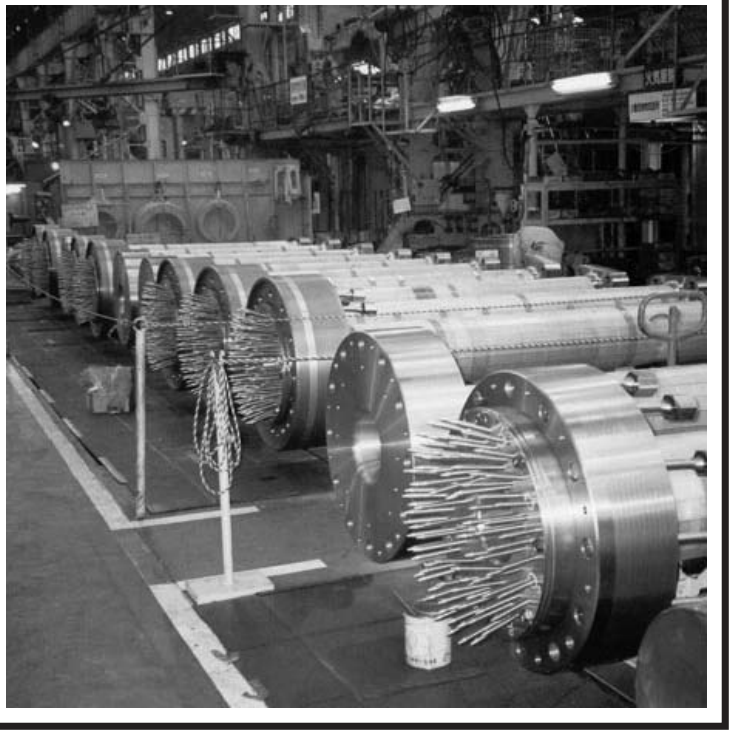
Ship owners prefer single engine/single propeller designs and the new generation of larger container ships (or post-Panamax) called for a bigger engine to propel them.

The RTA96C-14 turbocharged two-stroke diesel engine is produced by Swiss company Wartsila-Sulzer and is the largest and most powerful diesel engine in the world today.

The peak capabilities of the 14-cylinder RTA96C engine now exceed 80 MW, making it adequate for a single-screw Post-Panamax container liner, which is as large as container liners will get considering their greater cost-effectiveness.







Sulzer have also managed to increase cylinder output since they began first operation in 1997, due to the maintenance experience accumulated with the large number of RTA96C engines currently in service. The new kW rating of the new engine achieves a power output of 68,640 kW, a four percent increase on the initial RTA96C.

Despite the large amounts of power produced by these engines, surprisingly low wear rates have been achieved. Diametral cylinder liner wear is in the order of only about 0.03 mm/ 1000 hours.

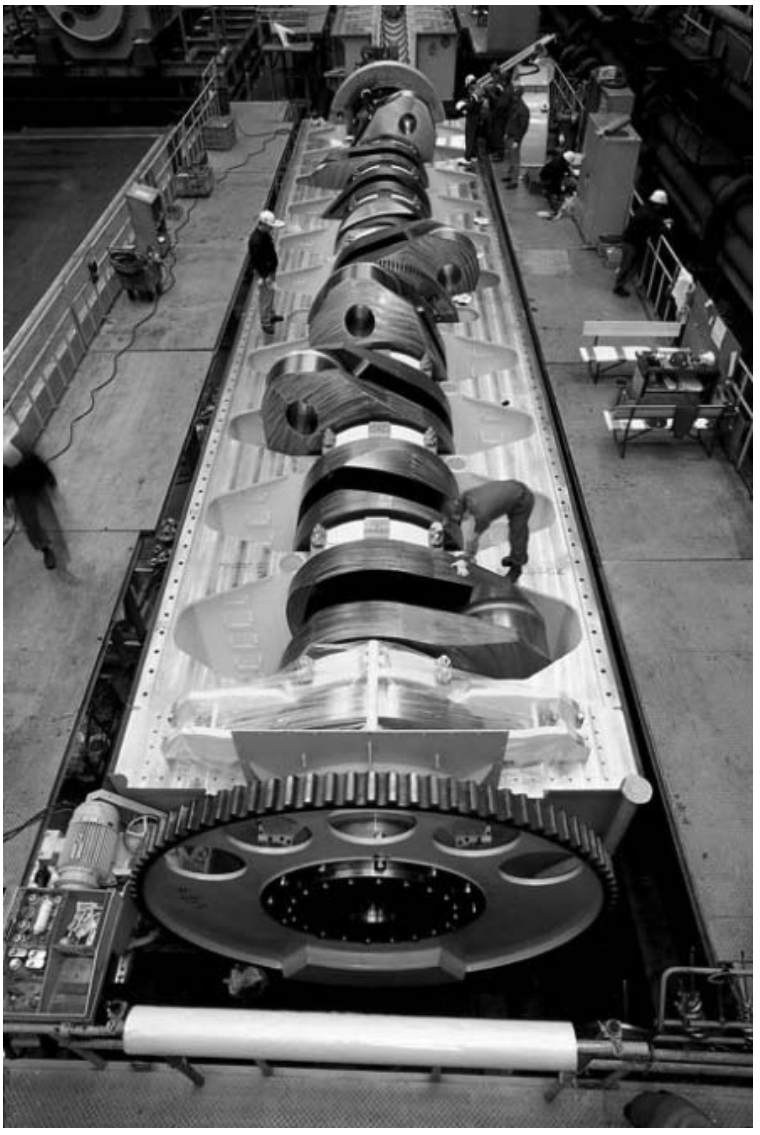
This low cylinder wear is possibly attributed to a connecting rod that attaches to a "crosshead" which rides in guide channels, a fundamental difference to most automotive engines where the top of the connecting rod is attached directly to the piston. Instead, in this engine the top of the connecting rod attaches to a "crosshead" and a long piston rod then connects the crosshead to the piston. This lowers the sideways forces produced by the connecting rod and is absorbed by the crosshead and not by the piston. Sideways forces are what makes the cylinders in an auto engine become oval-shaped over time.

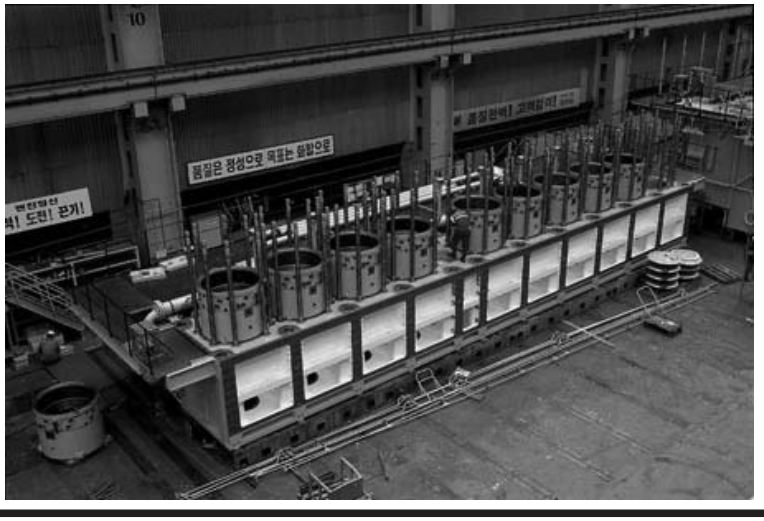
Fuel consumption at maximum economy is 0.260 lbs/hp/hour. Comparatively, most automotive and small aircraft engines can only achieve BSFC figures in the 0.40-0.60 lbs/hp/hr range and 25-30% thermal efficiency range.

The design and development of the RTA96C was close collaboration with the companies involved in the early stages of the first commercial project: the owner and operator P&O Nedlloyd BV, the ship designer and builder Ishikawajima Harima Heavy Industries Co Ltd (IHI), and the enginebuilder Diesel United Ltd.

The project began in March 1997 when the first engine, an 11-cylinder unit, was started on the test bed of Diesel United Ltd, Aioi.

Since then a total of 86 RT96C engines with eight, nine, ten, 11 and 12 cylinders in-line are in service or on order, 25 of these currently in service.





Learn to enjoy every minute of your life. Be happy now. Don't wait for something outside of yourself to make you happy in the future. Think how really precious is the time you have to spend, whether it's at work or with your family. Every minute should be enjoyed and savoured.

– **EARL NIGHTINGALE**

SUSTAINABLE BIOENERGY KEY TO FUTURE SAYS GOVT

Realizing its importance, the Indian government is now showing strong interest in bioenergy, putting efforts for focused approach critical to resolve issues and expedite growth in the sector.

Mr Pramod Chaudhari, chairman, CII National Committee on Bioenergy and executive chairman, Praj Industries speaking at the event.

"Bioenergy especially biomass has a strong potential in rural areas and growth in the sector will lead to economic growth in rural areas. It is also a key off grid solution and solar and biomass hybrids can be deployed. There is a need for a policy push for biomass as has been done for solar and wind and support mechanisms like incentives/ subsidies/tax holidays need to be put in place". This was stated by Mr. Alok Srivastava, joint secretary, ministry of new and renewable energy, while addressing inaugural Session at the Bioenergy Summit 2013, organized by the Confederation of Indian Industry (CII) recently at New Delhi.

Suggesting some solutions across the different bioenergy segments, the senior official said, "Companies need to be present across the feedstock value chain and mechanisation in collection and storage is critical. To distribute improved cook stoves, MNRE is rolling out the National Biomass Cook Stoves Programme in the 12th Plan whereby 3.5 million cook stoves will be distributed."

Giving his perspective, Dr S C Sharma, OSD (Petroleum), Planning Commission said, "The conversion of bio-energy to liquid and gaseous fuels has a strong potential to reduce the impact on the current account deficit and replacement of 5 per cent of the liquid fuels by biofuels would result in savings of $5-6 billion annually. This assumes significance as last year, the oil and energy import bill was the highest at $120 billion. The 5 per cent ethanol blending which has been mandated by the government is a step in the right direction and efforts have to be made to ensure that ethanol blending is remunerative. To make biodiesel competitive, states need to provide VAT exemption on biodiesel."

In the course of his welcome remarks, Mr. Pramod Chaudhari, chairman, CII National Committee on Bio-Energy and executive chairman, Praj Industries, said, "Bio-based economy will not only help in reducing dependency on the rising fuel imports but biomass based power production also has the potential to provide distributed power at the rural level. However, bio-energy programmes have not been at par with traditional energy sources and there are challenges related to commercial sustainability, feedstock availability, availability of appropriate technologies, appropriate financing and market linkages." Emphasising on the need for a strong policy push, he said, "While the Government has put in place policy levers for the development of this sector, more remains to be done. The growth of the bioenergy sector in India will benefit from the formation of a Task Force in this area."

Mr K Krishan, co-chairman, CII national committee on Bio-Energy and chairman, MPPPL Renewable Energy Pvt Ltd concluded by saying, "There is a need to efficiently utilise the 140 million tonnes of biomass which is being used for cooking in the country. Also biofuels and biomethane can be used to mitigate petrol imports and the current account deficit given that the country incurred an oil import bill $15 billion recently. Bioenergy can also address the issue of energy access and is a clean source of energy. Reiterating the importance of policy imperatives in this segment, he said, "Clearly, given all these benefits, there is a need to focus on bioenergy and as a step in this direction a separate Task Force on bioenergy is critical."

See more at: http://www.biospectrumindia.com/biospecindia/news/195758/sustainable-bioenergy-key-future-govt#sthash.iteq4Asv.dpuf

The end of law is not to abolish or restrain, but to preserve and enlarge freedom.
For in all the states of created beings capable of law,
where there is no law, there is no freedom. - ***JOHN LOCKE***

INDIAN THERMAL PLANTS WORST POLLUTERS

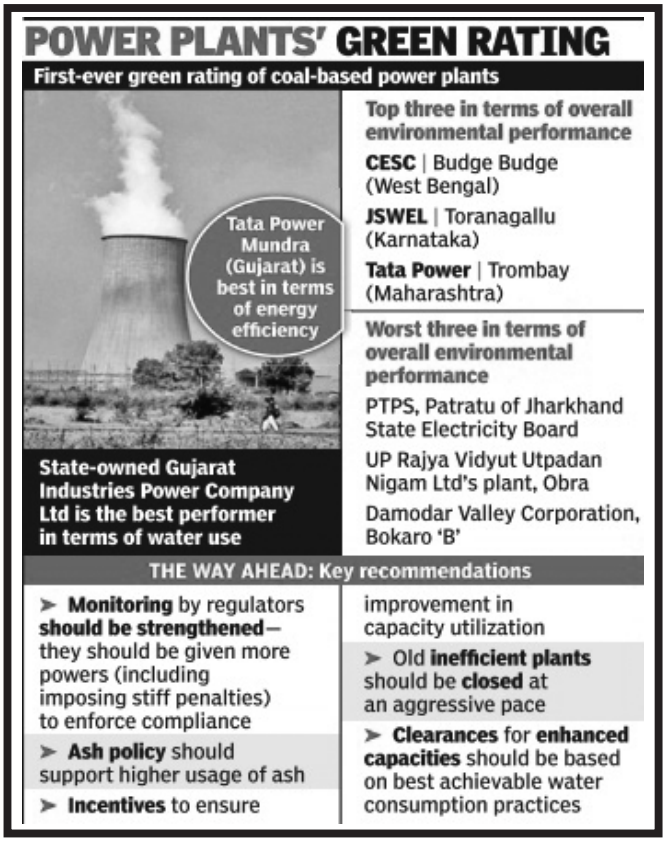
A first-ever environmental rating of coal-based power plants has found that India's thermal power generating units figure among the world's "most inefficient" in terms of compliance to pollution norms, use of resources and overall operation efficiency.

Though private sector thermal plants in the country perform better than government-owned ones, there is "immense scope for improvement" in almost all units so that they can pollute less and generate more electricity with efficient use of available resources.

The study behind the ratings, done by experts at the Centre for Science and Environment (CSE), also noted that Delhi is home to one of the most polluting power plants in the country- NTPC's Badarpur Thermal Power Plant- which has contributed in turning the capital into the most polluted city in the world.

The study, done under CSE's Green Rating Project (GRP), analysed and rated 47 coal-based thermal power plants from across the country on a variety of environmental and energy parameters. About half of all plants operating in 2011-12 were selected for the rating.

"The objective of the study was to give a clear picture of the environmental performance of the sector. Our finding is that in India, where demand for power is increasing, power plants are performing way below the global benchmarks", said Sunita Narain ahead of the study's release on Saturday.



She said, "Given the rapid increase in coal-based power projected by the government, stress on precious resources like water and land will increase and air and water pollution will worsen unless corrective measures are taken by the industry and policy-makers".

The study was released jointly by father of the green revolution M S Swaminathan, environment secretary Ashok Lavasa and chief economic advisor Arvind Subramanian in a function here, organized to award the greenest power plants.

Three top power plants (CSES- Budge Budge, JSWEL-Toranagallu and Tata-Trombay) were awarded for their overall environmental performance, while two others received awards for their efficient use of resources such as energy and water.

Speaking about the rating programme, CSE's deputy director general Chandra Bhushan said, "The Green Rating Project is one of the very few public-disclosure projects in the world in which a non-governmental, non-industry organization rates the environmental performance of industries and makes the results public. We follow a robust and transparent process and the outcomes of our ratings (of other sectors) have been used by companies as well as policymakers to improve policies and practices."

The study found that the country's thermal power plants are estimated to draw around 22 billion cubic meter of water, which is over half of India's domestic water need. It also noted that 55% of the units were violating air pollution standards which are already extremely lax.

"The performance of NTPC, the largest coal-power producing company in India, was found to be below par. NTPC did not disclose its data, and hence was rated based on a primary survey and publicly available information", said lead author of the study Priyavrat Bhati.

The six plants of NTPC that were rated received scored poorly on almost all parameters. The worst of the lot was Delhi's Badarpur plant.

Speaking about methodology of the rating study, Bhati said, "The project selected a diverse group of plants from all regions, of various vintages, sizes and technologies and owned by all major companies, including state and central ones, to ensure as wide a representation as possible. The GRP is a participatory process — companies voluntarily disclose data and permit the GRP team to independently scrutinize the plants and their records".

The plants were rated on around 60 parameters covering everything from coal and water use and plant efficiency to air and water pollution and ash management.

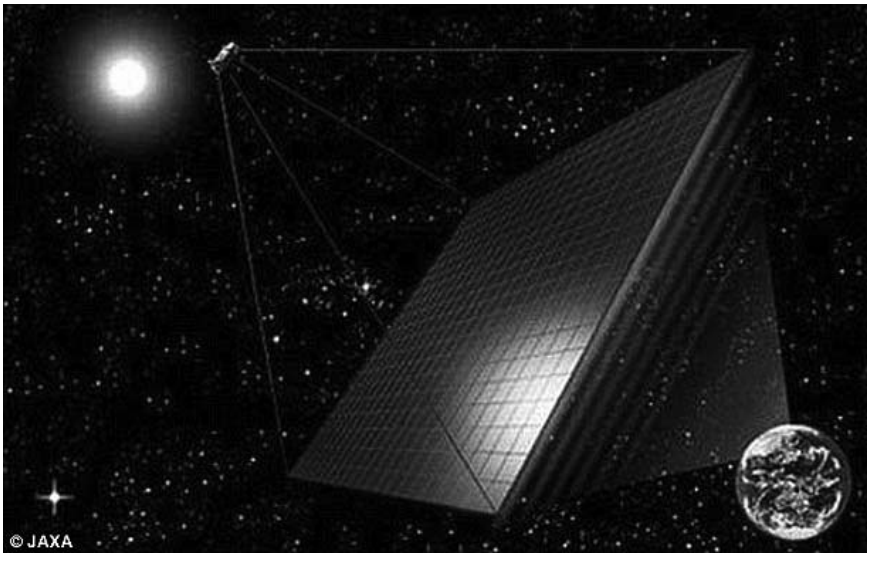
Local community views were given due weight age along with the plants' compliance record and environment policies. The ratings involved comparing performance of the plants against global best practices.

Bhati, programme director of CSE's sustainable industrialization team, said: "Some of the plants did not want to participate. Yet, we assessed them on the basis of field-level surveys and publicly available data. We were encouraged by the transparency showed by a number of state-owned plants that voluntarily disclosed data despite being inefficient and highly polluting."

Courtesy : Times of India

JAPAN SUCCEEDS IN BEAMING SOLAR ENERGY FROM SPACE TO EARTH

Japanese scientists have discovered a new method to generate solar power in space which can be used in Earth.



Recently, they have achieved new success in wireless technology by transmitting energy through space.

The Japan Aerospace Exploration Agency (JAXA) reports that scientists have succeeded in transmitting energy by using microwaves to deliver 1.8 KW of power with great accuracy to a target 170 feet away.

This is for the first time such a high output of power has been transferred via microwaves to such a small target.

For the first time, a high output of nearly two KW of microwaves has been send to a small target, using a delicate directivity control device.

For years, Japan's space agency has been working on devising Space Solar Power Systems (SSPS), under which microwave-transmitting solar satellites would be set up about 36,000 kilometers from Earth.

Satellites such as the ISS routinely collect solar power for their own functions, but sending solar-generated power down to Earth for uses on the surface has not seemed feasible until JAXA's revelation.

The Japanese research offers the possibility that humans will one day be able to farm an inexhaustible source of energy in space.

However, practical application of the technology will take a long time, overcoming all challenges to overcome.

JAXA researchers envision a future in which satellites carrying solar panels and antennae will send solar power down to receivers on Earth from about 22,300 miles up.

Solar power is easier to collect in space than on Earth due to the lack of interference from clouds and the ability of a satellite to spend more time in sunlight.

The SSPS concept emerged in the U.S. in the 1960 and Japan's version started in 2009.

In a separate project, a Japanese firm last year revealed plans to cover the moon in a huge swathe of solar panels and use them to power homes here on Earth.

In another development, Mitsubishi Heavy Industries has succeeded in transmitting 10 KW wirelessly to a receiver 500 meters away during a test.

The company hopes to find practical applications for the technology in five years, such as for charging electric vehicles or powering warning lights on power transmission towers.

Sabeena Wahid
editor@greentechlead.com

SOLAR-POWERED TRAM NETWORK PROPOSED IN MELBOURNE (WORLD'S LARGEST)

Jumping off the tram or bus to roam city streets, or just arrive at work in an urban area would be so much better if air quality were fresh and fine. Melbourne, Australia, considers this very thing and intends to leave behind those suffocating, smelly fossil fuels… at least, to a degree. With a blueprint for an entirely solar-powered tram network in Melbourne (which would be the world's largest), the capital city of Victoria could soon become a world leader while seeking pure air.

Australians in Melbourne have been negotiating with the various state (Victorian) government bodies for the past four years. They project how much better the tram would be as a viable alternative transportation mode if the tram's energy source were solar, resulting in zero emissions. A solar tram or bus will keep the urban air cleaner, quieter, and more breathable through cutting atmospheric and noise pollution in large cities.

Australian Solar Group (ASG) is the company supporting this proposal. ASG is intent on establishing this project, and its progress appears one step closer towards gaining approval from the Victorian Government. *The Age Victoria* magazine comments that Melbourne's plans to power its entire tram network by solar waits on the state government, which needs to give this ambitious renewable energy proposal the green light.

Expecting to see rooftop panels on the top of trams? You won't. In fact, two new solar farms will generate the power if the project proponents do what they intend to do (build near Swan Hill and Mildura). The two solar farms would generate about 80 gigawatt-hours of electricity a year, about the same amount used by Melbourne's tram network.

Yes. It is an important undertaking to phase out conventional fuels such as coal, oil, and gas. Melbourne claims to have the world's largest tram network — averaging over 3.5 million trips per week across a 250-kilometre double-track network. Solarizing that would be a wonderful step forward.

Stoking the renewable push, *The Age Victorian* reports this proposal would neither increase fares for commuters nor cause rises in electricity bills for PTV. Additionally, such a project will create many jobs in the green technology industry. Avoiding 100,000 tons of greenhouse gas emissions per year (reported by *The Age Victoria)*, the transition to solar sets a standard for other cities to meet.

Courtesy: Clean Technica

"Our long-term growth story in India is intact... Since 2008, we have more than doubled our sales in India. I believe the global megatrends mobility, urbanisation, water and agriculture will be the drivers for growth"
*– **AXEL C HEITMANN,** Chairman, Lanxess*

WIND TURBINE THAT WOULD ALSO BE A LIVING SPACE

Wind turbine technology is turning a new leaf in the Netherlands. A futuristic project coming up in the country would not only help harness green energy but also provide people with space to live. Named The Dutch Wind wheel, the ambitious concept utilizes electrostatic wind energy converter technology, or EWICON, to generate electricity. The structure will also house apartments, a restaurant and a hotel.

EWICON was developed based on research conducted at Delft University. The project was the subject of a doctoral dissertation in 2008. The advantage the technology offers is that it involves no moving rotor unlike the traditional turbines. The bladeless technology works by first rendering water droplets with a positive charge. The positively charged particles are then allowed to be blown away by wind from a negative ion collector. The double-ring construction built of light, open steel and glass is submerged to create the effect of a floating wheel.

One blind spot of the technology, however, is the quantity of renewable energy it would produce. It wouldn't be as efficient as a traditional wind turbine, according to experts. But the building-cum-turbine will showcase several sustainable design practices including rainwater collection, passive solar design and waste-to-biogas conversion, besides photovoltaic modules.

Ajith Kumar S : editor@greentechlead.com

HANWHA UNVEILS SOLAR-POWERED ISLAND PLAN

Hanwha Group has unveiled an ambitious plan to turn a small islet off the coast of Korea into a 100% solar-powered community.

Hanwha Q cells and two other subsidiaries of the Korean solar group will lead on the $2.3 million project, which will transform the island of Jukdo into a renewable haven, removing the four diesel power generators that currently provide electricity for the island's 70 residents and replacing them with solar panels. The island's diesel generators currently produce 560kW of electricity daily.

Hanwha will also build an **"industrial cluster"** on the island that is committed to solar energy and will work on ways to boost the commercial value of the island's agricultural products.

The project forms part of a wider plan by Hanwha to pour $140 million into the region of Chungcheong to aid its agricultural, commercial and energy development, and was announced at the opening of the Chungnam Center for Creative Economy in provincial capital Cheonan on Friday.

"Korea is still a major energy importer, but if we take one step further to secure clean energy technologies and commercialize them, our business model could lead the world's renewable energy market," said President Park Geun-hye at the opening ceremony.

After the completion of the Jukdo project, Hanwha will also seek to bring clean solar energy to six other small islands around Korea.

Read more: http://www.pv-magazine.com/news/details/beitrag/hanwha-unveils-solar-powered-island-plan_100019553/#ixzz3b3iKOV8E

Lightning Arresters For Electrical Power Systems Protection

1. Introduction: Lightning is the most frequent cause of overvoltages on distribution systems. Basically, lightning is a gigantic spark resulting from the development of millions of volts between clouds or between a cloud and the earth. It is similar to the dielectric breakdown of a huge capacitor. The voltage of a lightning stroke may start at hundreds of millions of volts between the cloud and earth. Although these values do not reach the earth, millions of volts can be delivered to the buildings, trees or distribution lines struck. In the case of overhead distribution lines, it is not necessary that a stroke contact the line to produce overvoltages dangerous to equipment. This is so because "induced voltages" caused by the collapse of the electrostatic field with a nearby stroke may reach values as high as 300 kV.

Lightning is classified as a transient event. In order to understand the effect of lightning, it is best to acquire some knowledge as to what lightning is, how it is caused, and where it is most likely to occur. The amount of energy contained in a lightning stroke is very high and it can be extremely destructive, even a single stroke to a distribution line can be sufficient to cause a blackout throughout a feeder.

Lightning is the main reason for outages in transmission and distribution lines. When lightning strikes a power line, it is like closing a "big switch" between a large current source and the power line circuit. The sudden closing of this "big switch" causes an abrupt change in the circuit conditions, creating a transient. There is also the case when the lightning strikes the vicinity of the power line and the large magnetic field generated from the lightning current cause mutual coupling between the power line and the lightning. The event alters the conditions of the power line circuit, as a result, produce an electrical transient.

The study of lightning strokes in power lines is very important because it is known that lightning does strike the same structure over and again. This can be a very serious problem for power lines, typically, the highest structures located in high incidence lightning regions. Any structure, no matter its size, may be struck by lightning, but the probability of a structure been struck increases with its height. Very close dart leaders can make as significant a contribution as return strokes in inducing voltages and currents on power systems.

2. Explanation of a Lightning: The duration of the lightning stroke is usually less than a couple of hundred microseconds. The industry accepted 8 x 20 current wave as a reasonable approximation of a lightning surge.

Cloud to ground flashes are composed of a single stroke or a multiple number of component strokes. Multiple stroke ashes have 3 to 4 strokes. The strokes are typically 40 to 50 ms apart. The typical lightning peak currents measured at ground range from 10 kA to 20 kA, but occasionally they range up to hundreds of thousands of amperes. The peak current is reached in a few millionths of a second, and then it decreases in a thousandth of a second or so unless continuing current flows. Lightning flashes which contain continuing currents are called hot lightning. The continuing current lasts for one or two tenths of a second and has a typical peak value of 100 A. Hot lightning ignites fires. The lightning that does not contain a continuing current is called cold lightning and it does not set fires, but it is very destructive.

Lightning current magnitude is one of the most important lightning parameters, but the subject of lightning current magnitudes is controversial and confusing. Most experts agree that the stroke currents have been measured in excess of 200 kA, while almost all of the national and international standards on lightning protection are based on lightning current measurements made in Switzerland and usually described by the median value and standard deviation or by 5, 50, and 95%.

3. Lightning Prevention: Lightning rods are used as prevention mechanisms to avoid lightning hitting tall buildings or houses where lightning incidence is high, but no lightning rod can offer absolute protection. *A lightning rod protection system has three main parts: 1. The rods on the top of the protected structure; 2. The wires which connect the rods together and those which run down the sides of the structure to the grounding arrangement; 3. The grounding arrangement.*

To protect high voltage transmission lines from lightning, the metallic rods and wire conductors are replaced by a system of wires suspended between tall towers arranged around the structure. These grounded wires are strung above the high voltage lines to intercept strokes that would otherwise hit the power lines.

If a lightning stroke hits a power line, the only way to protect it is using a lightning arrester (LA). The lightning arrester is a non-linear device that acts as an open circuit to low potentials, but conducts electrical current at very high potentials. When lightning strikes a line protected with a lightning arrester, the non-linear resistance draws the current to ground. One of the most common lightning arresters is the MOV (Metal Oxide Varistor). The MOV has a piece of metal oxide that is joined to the power and grounding line by a pair of semiconductors. The semiconductors have a variable resistance dependent on voltage. When the voltage level in the power line is at the rated voltage for the arrester, the electrons in the semiconductors flow in a way that creates a very high resistance. If the voltage level in the power line exceeds the arrester rated voltage, the electrons behave differently and create a low resistance path that conducts the injected lightning current to the ground system.

Please refer page nos. 28 & 29

இடி, மின்னல் - பாதுகாப்பு வழிமுறைகள்

மின்னலிலிருந்து நம்மையும் நம் உடமைகளையும் பாதுகாப்பது பற்றி அறிவோம்.

ஒவ்வொரு வருடமும் மின்னலினால் குறிப்பிட்ட அளவில் உயிர் இழப்பும், பெருமளவில் காயங்களும் உண்டாகிறது. பொருள் சேதங்களும் பெருமளவில் ஏற்படுகின்றன.

நாம் எப்போதாவது மின்னலில் சிக்கிக்கொள்ள நேர்ந்தால் (அருகாமையில் பாதுகாப்பான இடம் இல்லாதபட்சத்தில்), இரு காதுகளையும் கைகளால் மூடியபடி, கால்களை ஒருங்கிணைத்து, குனிந்தபடி அமர்ந்து நம்மை பாதுகாத்துக் கொள்ளவேண்டும் - எந்தவித பாதுகாப்பும் இல்லாத பதட்டமான நிலையில் மட்டுமே மேலே குறிப்பிட்டுள்ளவற்றை செய்யவேண்டும் என்பதை கவனத்தில் கொள்ளவும்.

ஒருபோதும்

மின்னலின்போது மரத்தின் கீழ் ஒதுங்கக்கூடாது. மழையினால் உயிரழப்பு ஏற்படாது. ஆனால், மின்னலினால் ஏற்படும்.

பாதுகாப்பான உறைவிடம் இல்லாத வெளி இடங்களில் சிக்கிக்கொண்டால்:

- உயர்வான இடங்கள், மலையும், மலை சார்ந்த இடங்களையும் **தவிர்க்கவும்.**
- நீர் நிலைகள் சம்பந்தமான பொழுதுபோக்குகள், அதாவது நீச்சல், படகு சவாரி மற்றும் மீன் பிடித்தல் போன்றவற்றை **தவிர்க்கவும்.**
- திறந்த வெளி சுற்றுலா கூடாரங்கள், மழைக்கு ஒதுங்குமிடங்கள் மற்றும் பேருந்து நிறுத்தங்கள் போன்ற பாதுகாப்பற்ற இடங்களை **தவிர்க்கவும்.**
- மின்னல் தாக்குதலின்போது **ஒருபோதும்** நிலத்தில் சமமாக படுக்கக்கூடாது.

மின்னல் - தெரிந்துகொள்ள வேண்டியவை:

- இடியுடன் கூடிய மின்னல் ஒலியை கேட்டால், ஆபத்து என்பதை உணர வேண்டும்.
- **திறந்த வெளி நிலப்பரப்பு** பாதுகாப்பற்றது.
- இடி ஓசை கேட்டதும், உடனடியாக பாதுகாப்பான உறைவிடம் சென்றுவிடுவது நன்று.
- கற்கூரை வீடு அல்லது முழுவதும் உலோகத்தினால் செய்யப்பட்ட வாகனங்கள், அதாவது நான்கு சக்கர வாகனம் (Car), பேருந்து (Bus), இரயில் (Train) போன்றவை மிகவும் பாதுகாப்பானவை.

கட்டிடத்தின் உட்புறத்தில் மின்னல் தாக்கும்போது

- மின்சாரம் கடத்தக்கூடிய பொருள்களை ஒருபோதும் தொடக்கூடாது.

வீட்டிற்கான இடி மின்னல் பாதுகாப்பு உபகரணங்கள்

*Surge Protection Device

கட்டிடங்கள் மற்றும் கட்டிட அமைப்புகளுக்கான மின்னல் பாதுகாப்பு

Source	* கட்டிடத்தின் மேல் நேரடி மின்னல் தாக்குதல்	** அருகாமையில் உள்ள மரம், தொலைபேசி கோபுரம், ஒலிபரப்பு கோபுரங்கள்.	*** மின்சார கம்பிகள், தொலைபேசி அல்லது கேபிள் டிவி மின்கம்பிகள் மீது மின்னல் நேரடியாக தாக்கினால்.
பழுதடையும் வாய்ப்புகள்	மின்னல் தாக்குதல் குறைவான நிலையில் 1 சதவீதத்திற்கும் குறைவான வாய்ப்புகள்.	அதிகபட்ச மின்னலினால் 45 சதவிகிதம் வாய்ப்புகள்.	அதிகபட்ச மின்னலினால் 45 சதவிகிதம் வாய்ப்புகள்.
பழுதடையும் வகைகள்	முழு/பகுதி மின்னலினால் கட்டிட அமைப்பில் சேதம், உபகரணங்கள் தீயில் எரிந்து நாசமாதல்.	தரையின் வழியாக கடக்கும் மின்னலினால் உபகரணங்கள் தீயில் எரிந்து நாசமாதல்.	ஒன்றிணைக்கப்பட்ட பரிமாற்றத்தின் வழியாக கடக்கும் மின்னோட்டத்தினால் உபகரணங்கள் தீயில் எரிந்து நாசமாதல்.

கட்டிடத்தின் உட்புறத்தில் மின்னல் தாக்கும்போது தெரிந்துகொள்ள வேண்டியவை:

- ஜன்னல் வழியாக மின்னலை பார்ப்பது ஆபத்து.
- உட்புற அறைகள் மிகவும் பாதுகாப்பானது.
- நேரடி மின்சார தொடர்புடைய மின்சாதன பொருட்களை உபயோகப்படுத்தாமல் இருப்பது பாதுகாப்பானது.
- **Corded** தொலைபேசியை உபயோகப் படுத்தாமல், கைபேசி மற்றும் கம்பியில்லா தொலைபேசியை மட்டும் பயன்படுத்துவது சிறந்தது.
- நீர் குழாய், நீர் தொட்டி, குளிப்பது, எரிவாயு குழாய் தொடர்புடைய பணிகளை தவிர்ப்பது பாதுகாப்பானது.
- சுற்று சுவர்கள், ஜன்னல்கள், கதவு மற்றும் கட்டிடத்தின மேல் கூரை இவற்றில் இருந்து தள்ளி இருப்பது பாதுகாப்பானது.
- மின்சார தொடர்புடைய இணைப்புகள் அதாவது வெளியிலிருந்து உள்வரும் கேபிள் டி.வி இணைப்புகளை (cables & antennas) SPD பொருத்தி பாதுகாக்கவும் (Power and Dataline).

பாதிப்படைந்தவரை அருகில் உள்ள மருத்துவமனைக்கு கொண்டு செல்லும் வரை செயற்கை சுவாசம் அளித்து முதலுதவி அளிக்க வேண்டும்.

இதன் மூலம் பாதிக்கப்பட்டவரின் மூச்சு மற்றும் இதய துடிப்பு சீராகும் வாய்ப்பினை நல்கலாம்.

பாதிக்கப்பட்டவரை அருகில் உள்ள மருத்துவமனைக்கு கொண்டு செல்வதன் மூலம் இதயம் மற்றும் நுரையீரல் சிகிச்சை நிபுணரின் கவனம் கிடைக்க செய்யவேண்டும்.

THE SOLAR PRICE REVOLUTION

A silent revolution is under way. In November, Dubai announced the construction of a solar energy park that will produce electricity for less than $0.06 per kilowatt-hour – undercutting the cost of the alternative investment option, a gas or coal-fired power plant.

The plant – which is expected to be operational in 2017 – is yet another harbinger of a future in which renewable energy crowds out conventional fossil fuels. Indeed, hardly a week seems to pass without news of a major deal to construct a solar power plant. In February alone, there were announcements of new solar power projects in Nigeria (1,000 megawatts), Australia (2,000 MW), and India (10,000 MW).

There can be no doubting that these developments are good for the fight against climate change. But the major consideration driving them is profit, not the environment, as increased efficiency in energy distribution and where necessary, storage, reduces the cost of producing renewable energy.

As efforts to improve the management of electricity from fluctuating sources yield further advances, the cost of solar power will continue to fall. Within ten years, it will be produced in many regions around the globe for 4-6 cents per kilowatt-hour, according to a recent study by the Fraunhofer Institute for Solar Energy Systems (commissioned by the think tank Agora Energiewende). By 2050, production costs will fall to 2-4 cents per kilowatt-hour.

As Patrick Graichen, Agora's executive director, points out, most forecasts of the world's future energy supply fail to take into account solar power's looming victory over its fossil-fuel competitors. Updating them would paint a realistic picture of the costs and impact of our energy production and consumption on the world's climate, reveal the importance of renewable energy to economic development, and enable better planning of energy infrastructure.

We should not underestimate the tremendous potential the sun and wind have for building global wealth and fighting poverty. As solar power becomes increasingly cost-effective, countries located within the planet's sun belt could develop entirely new business models as cheap, clean energy enables them to process their raw materials locally, adding value – and profit – prior to export.

Unlike large-scale conventional power plants, solar installations can be built in months; in addition to being cost-effective, they provide a quick means of responding to growing global demand. And, because solar plants can generally be operated independently of complex interregional electricity grids, they provide less developed countries a way to electrify their economies without building expensive new infrastructure.

Solar power plants thus could play the same role for energy that mobile phones did for telecommunications: rapidly reaching large, underserved communities in sparsely populated regions, without the need to invest in the cables and accompanying infrastructure that once would have been necessary. In Africa, 66% of the population has gained access to electronic communications since 2000. There is no reason why solar power could not do likewise for access to electricity.

The time to invest in large-scale solar energy production is now. For starters, construction costs for solar power plants are finally low enough to produce electricity at a competitive, stable price for more than 25 years. The price of oil may have plunged for now, but it will rise again. Solar power plants provide insurance against fossil fuels' inherent price volatility.

Even more important, the cost of capital currently is very low in many countries. This is a decisive factor for the economic viability of solar power plants, because they need very little maintenance but require relatively high upfront investment. The Fraunhofer study shows that differences in capital expenditure are as important for costs per kilowatt-hour as differences in sunlight. Solar power is currently cheaper in cloudy Germany than in sunny regions where the cost of borrowing is higher.

The amount of sunlight that shines on a country is impossible to change. But the cost of capital is something over which a country can maintain a certain amount of control. By creating a stable legal framework, providing credit guarantees in the context of international agreements, and involving central banks in large-scale investments, governments can help to make solar power more accessible.

Factors like these explain why international climate policies increasingly focus not only on solar power, but on other forms of renewable energy as well. Technological breakthroughs have boosted these energy sources' competitiveness relative to fossil fuels. As a result, instruments that make their adoption more affordable are becoming some of the most important weapons we have in the fight against climate change.

Klaus Töpfer, former Executive Director at the United Nations Environment Programme, former Under-Secretary-General of the United Nations, and a former German environment minister, is Executive Director at the Institute for Advanced Sustainability Studies in Potsdam.

Read more at http://www.project-syndicate.org/commentary/solar-power-economic-growth-by-klaus-topfer-2015-04#WmD3l8fYQYgHOGUx.99

POWERING ENGINEERS THROUGH TRAINING – L & T

The Switchgear Training Centres have been set up with an aim to impart knowledge related to the selection, application, installation, operation and maintenance of Low and Medium Voltage switchgear, Industrial and Building Automation products. Depending on the kind of professional enrolled and course content, the programmes involve a blend of classroom sessions, practical training and case studies. These programmes offer participants an invaluable experience, thereby promoting good engineering and management practices among Electrical and Automation professionals, panel builders, project professionals and electrical consultants.

CODE	PROGRAMME NAME	DAYS	JUN 2015	JUL 2015	AUG 2015	FEES Rs.
LT 01	**SELECTION OF LV SWITCHGEAR AND APPLICATIONS** Need for switchgear, LV switchgear terminologies, product standards, fault current calculation for LV system, Selection & application of low voltage switchgears - like contactors, thermal overload relays, motor starters.	5	1-5		3-7	**14000**
LT 02	**BEST MAINTENANCE PRACTICES IN LV SWITCHGEAR** Safety & good maintenance practices, complete hands-on workshop sessions on testing, troubleshooting & maintenance of low voltage switchgear.	5		6-10		**12500**
LT 03	**BREAKER MAINTENANCE WORKSHOP - C POWER ACB** Thorough hands-on training on C-Power range of Air Circuit Breakers, testing, setting & programming of various types of ACB microprocessor based protection releases like SR-71/SR21i.	3		20-22		**6750**
LT 04	**BREAKER MAINTENANCE WORKSHOP - U POWER OMEGA ACB** - Complete hands-on training on U-Power Omega range of air circuit breakers. Including pole assembly replacement, Fixing & testing of various accessories. Testing, setting & programming of various types of microprocessor based releases.	2		23-24		**4500**
LT 05	**SWITCHBOARD ELECTRICAL DESIGN** - Introduction to various standards for LV switchboard assembly including IEC 61439, types of panels, forms of seperation, fault current calculations as applicable to low voltage switchgear, bus bar selection & design.	3				**10000**
LT 06	**POWER DISTRIBUTION IN BUILDINGS** Design parameters relevant to large buildings. Procedure for load estimation; sizing of transformers and DG sets. Sizing of Low Voltage switchgears.	3		1-3		**10000**
LT 07	**ELECTRICAL SAFETY** - Basics – Safety, Importance of Safety, Electrical Safety, Types of Hazards, Fire, Shock, Effects of Fire and Shock, Safety in Residences, Safety in Industrial and Commercial premises.	1			24	**2500**
LT 08	**SELECTION & APPLICATION OF DRIVES** - Basics of LV motors, inverter duty motor, basics of LV AC VFDs, selection & application of AC VFDs, wiring diagram, parameter setting, salient features, energy conservation with AC VFDs, VFD vs soft starter. Classroom sessions supported by workshop demonstrations.	3			24-26	**10000**
LT 09	**REACTIVE POWER & HARMONICS MITIGATION** What is PF, types of LV capacitors, selection criteria, power factor improvement - concepts, methods & advantages, APFC panels, dynamic compensation.	2		9-10		**6750**
LT 10	**INTRODUCTION TO MEDIUM VOLTAGE SWITCHGEAR** Selection & application of vacuum circuit breaker, specification of vacuum circuit breaker, fault current calculation, vacuum vs SF6 as a medium of CB.	2	11-12			**6750**
LT 11	**INDUSTRIAL PROTECTION WITH NUMERICAL RELAYS** Introduction to protective relaying, terminologies,	4	1-4			**12500**

CODE	PROGRAMME NAME	DAYS	JUN 2015	JUL 2015	AUG 2015	FEES Rs.
	ANSI codes, CTs, PTs, Fault current calculations, relay co-ordination, feeder protection, motor protection, transformer protection, generator protection.					
LT 12	**CONSERVATION & MANAGEMENT OF ELECTRICAL ENERGY** Importance of energy conservation & management, fundamental concepts of ECM, terminologies, software, energy efficient technologies in electrical installations, Energy Conservation Act, ECBC, etc. including some case studies.	2	24-25			**6750**
LT 13	**REQUIREMENT OF SYSTEM & EQUIPMENT EARTHING** - Need & purpose of earthing, various types & methods of earthing, selection of earthing system, system & equipment earthing, sizing of earth conductors, generator earthing, transformer earthing, earthing of sensitive electronic equipment.	2	22-23			**8000**
LT 14	**INTRODUCTION TO INDUSTRIAL ELECTRICAL SYSTEMS** Overview of Indian power system, typical industrial electric power distribution scheme, classroom sessions with workshop demonstrations giving exposure to a wide range of low voltage switchgear like contactors.	3	8-10, 15-17	13-15, 27-29	10-12, 19-21	**3000**
LT 15	**FIRE DETECTION & SECURITY SOLUTIONS** - Basics of Fire Alarm System, Conventional & Addressable FAS, Field devices, Panels & Software, Design / BOQ from Floor plans.	1			27	**3500**
LT 16	**BUILDING MANAGEMENT & ENERGY MANAGEMENT SYSTEMS** - Basics of BMS, Components of BMS, Input & output devices, Controllers & Software, Installation & Commissioning, Energy Saving and Green building certification through BMS, Basics of Energy management, hardware and software features.	1			28	**3500**
LT 17	**SELECTION, PROTECTION & MAINTENANCE OF TRANSFORMER** - Selection, Classification, Operation of Power and Distribution transformer, Vector groups, Transformer protections, Routine tests for transformer, Testing of transformer oil, Transformer maintenance, Earthing of transformer, relevant IS/IEC standards.	2			13-14	**6750**
LT 18	**INDUSTRIAL ELECTRICIAN TRAINING PROGRAMME** - Safety & good maintenance practices, hands-on workshop sessions on testing, troubleshooting & maintenance of low voltage switchgear such as contactors, overload relays, motor starters, switch disconnector fuse, good termination practices.	2		29-30		**2000**
LT 19	**ELECTRICIAN TRAINING PROGRAMME FOR RESIDENTIAL BUILDINGS** - Basics of electricity, Selection of MCB, ELCB, domestic Switches, Wires and accessories e.g. Time switch, Introduction to Distribution boards, wiring demo staircase , godown lighting etc.	1		31		**1000**
LT 20	**SWITCHGEAR SELECTION - MOTOR CONTROL CENTRE (MCC)** - Motor control and protection techniques, Selection of Controlgear product range includes Contactor, O/L Relay, starter - Type-2 coordination.	2		14-15		**5500**
LT 21	**SWITCHGEAR SELECTION - POWER CONTROL CENTRE (PCC)** LV Power distribution, Latest trends and selection of ACB, MCCB, SDF, Changeover and related accessories.	2		16-17		**5500**
LT 22	**DESIGN OF CONTROL CIRCUITS** - Control Circuits & Schemes Fundamental Graphical Symbols & Nomenclatures of Various Components, Guidelines for Control Circuit Diagram.	2				**6750**

For more information about the Training Calendar and programmes.

Contact:- **Coonoor** Larsen & Toubro Limited Switchgear Training Centre, Ooty-Coonoor Main Road Yellanahalli P.O., The Nilgiris - 643 243 Tel. : 0423 251 7107 Fax : 0423 251 7158 E-mail: stc-coonoor@Lntebg.com.

THINGS HEAT UP FOR SELF-DESTRUCTING ELECTRONIC DEVICES

Expanding on previous research into electronic devices that dissolve in water once they have reached the end of their useful life, researchers at the University of Illinois have developed a new type of "transient" electronic device that self-destructs in response to heat exposure. The work is aimed at making it easy for materials from devices that usually end up in landfill to be recycled or dissolved completely.

The research involved a group led by aerospace engineering professor Scott R. White teaming up with John A. Rogers, who previously led work in the development of transient electronics that biodegrade in water. These previous devices dissolved in water after a predetermined period of time, which was related to the thickness of outer protective layers encapsulating the actual electronics. But using heat as a trigger has now enabled the creation of electronic devices that can be prompted to self-destruct on demand.

The technology involves first printing magnesium circuits on thin, flexible materials. Microscopic droplets of a weak acid are then trapped in wax, which is coated onto the devices. When exposed to heat, the wax melts and releases the acid, which completely dissolves the device. The researchers were also able to create devices that can be remotely triggered to self-destruct by embedding a radio-frequency receiver and inductive heating coil. In response to a radio signal, the coil heats up and melts the wax, leading to the destruction of the device.

"We have demonstrated electronics that are there when you need them and gone when you don't need them anymore," says White. "This is a way of creating sustainability in the materials that are used in modern-day electronics. This was our first attempt to use an environmental stimulus to trigger destruction."

Similar to the devices that dissolve in water, the time it takes for the heat-triggered devices to dissolve can be controlled by tuning the thickness of the wax, the concentration of the acid, and the temperature. The researchers say it is possible to create a device that dissolves in as little as 20 seconds or up to a couple of minutes after the heat is applied.

Additionally, by encasing different parts in waxes with different melting temperatures, it is possible to create devices that degrade in a series of predefined steps. This gives control over which parts of the device are operative at what time, thereby providing the potential for devices that can sense and respond to conditions in their environment. The team is also exploring the potential for other triggers, such as ultraviolet light and mechanical stress.

"If you can't keep using something, whether it's obsolete or just doesn't work anymore, we'd like to be able to bring it back to the building blocks of the material so you can recycle them when you're done, or if you can't recycle it, have it dissolve away and not sit around in landfills," says White.

The team's work was supported by the National Science Foundation and DARPA, whose Vanishing Programmable Resources (VAPR) program has been investigating the potential for transient electronics designed to self-destruct on command to prevent classified technology finding its way into enemy hands.

The University of Illinois team's research is detailed in a paper in the journal *Advanced Materials*.

RICOH DEVELOPS ENERGY-GENERATING RUBBER

As digital technology becomes more ubiquitous and the Internet of Things takes shape, the question of how to power it all becomes more pressing. Japanese technology firm Ricoh is looking at its new **"energy-generating rubber"** as one solution. According the company, the new piezoelectric polymer converts pressure and vibration into electric energy with high efficiency, yet is extremely flexible and durable.

Piezoelectric materials come in two major forms; ceramics and polymers. Both are based on the principle of using mechanical strain to generate electricity and are used in electronics to provide power in specialized applications, such as vibration and pressure sensors. Unfortunately, both have their downsides. Ceramics convert vibration to energy with high efficiency, but they're heavy, fragile, and often include toxic lead, while polymers are lighter, more flexible, and more durable, but not very efficient.

According to Ricoh, its new energy-generating rubber combines flexibility and high energy output. It's not only less fragile than ceramics, but it's also more flexible and durable than other polymers; surviving several million uses in testing. In addition, it's sensitive to light loads, yet generates high output under heavier ones.

Ricoh isn't giving much away about how the new rubber works, its composition, or specifications, but it does say that it's engaged in further research to produce a commercially viable version of the polymer for both sensors and energy applications.

Source: Ricoh

THE NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE

The National Environmental Engineering Research Institute (NEERI), Nagpur was established in 1958 as Central Public Health Engineering Research Institute (CPHERI), when environmental concerns were limited to human health with a focus on water supply/sewage disposal/ communicable diseases and to some extent on industrial pollution and occupational diseases. The chemical and biological solutions to address these problems were simple, though challenging. However, slowly world wide public awareness on the contamination of environment on regional to global scale started getting attention in 1970's.Shrimati Indira Gandhi, the then Prime Minister of India, rechristened the Institute as National Environmental Engineering Research Institute (NEERI) in the year 1974.

National Environmental Engineering Research Institute (NEERI), Nagpur is devoted to research and innovations in environmental science and engineering besides solving a range of problems posed by industry, government and public. It is a constituent of Council of Scientific & Industrial Research (CSIR), New Delhi and has a nation-wide presence with its five zonal laboratories at Chennai, Delhi, Hyderabad, Kolkata and Mumbai. The mandate of NEERI is:

- To conduct research and developmental studies in environmental science and engineering
- To render assistance to the industries of the region, local bodies, etc. in solving the problems of environmental pollution by S&T intervention
- To interact and collaborate with academic and research institutions on environmental science and engineering for mutual benefit
- To participate in CSIR thrust area and mission projects

Thus, the Institute is dedicated to the service of mankind by providing innovative and effective S&T solutions to environmental and natural resource problems by conducting effective R&D programmes in environmental science and engineering essentially comprising:

- Characterization of environmental quality in terms of physical, chemical and biological parameters
- Technologies for prevention and control of air pollution, wastewater and solid waste in terms of their reduction, reuse, recycle, and finally safe disposal
- Innovative approaches to optimal utilization and conservation of environmental resources

NEERI is served by competent and experienced team of about 125 scientists in various core disciplines of relevance to environmental science and engineering, viz. environmental engineering, chemical engineering, environmental chemistry, environmental biology and fourteen other science and engineering disciplines. Professionally competent and highly skilled and experienced technical officers and technicians support the scientific personnel.

The Director, NEERI has a mandate to realize the mission of the Laboratory by leading the high class R&D and S&T activities and seek the advices of Research Council (RC) and Management Council (MC) of the laboratory under the overall supervision of Director General, CSIR. The Research Council has a mandate to advise on the formulation of R&D programmes and future directions for research keeping in view the Five Year Plans, National priorities and opportunity areas besides review of R&D activities and research programmes. The Management Council has a mandate to recommend resource allocation for R&D activities/facilities of the Laboratory besides monitoring of R&D and other activities.

Over the years, the Institute has contributed to the reorientation of environmental policy towards prevention of pollution, developed technologies for substitution of non renewable resource base with renewable resources, recycle and reuse of industrial and domestic wastewater, and conducted environmental impact and risk assessment studies for developmental projects in industrial, mining, nuclear power, thermal power, river valley and urban infrastructure sectors as also the environmental audit of industrial and mining projects.

The Institute has necessary infrastructure and around 500 scientific and technical staff to monitor, analyze and characterize various elements and substances in the environmental samples on a national/regional scale with state of art equipments and methodologies.

Based on the directives from Hon'ble Supreme Court of India, besides Hon'ble High Courts of various States, NEERI has submitted several reports from time to time for resolving various critical environmental disputes/ issues concerning industry, ecology and environment.

The Institute has considerable capabilities and experience in the domain of environmental management and at present, the major R&D thrust areas pursued by the Institute include:

- R&D Thrust Areas
  - Environmental Monitoring
  - Environmental Modelling
  - Environmental Biotechnology & Genomics
  - Environmental System Design and Optimisation
  - Environmental Impact & Risk Assessment
  - Environmental Policy
- Advisory
  - Industries
  - Central Govt. Ministries/Boards
  - State Govt. Ministries/Boards
  - Judiciary

In the realm of uncertainty and changing regimes of environmental governance, NEERI envisions a futuristic perspective of a formal knowledge organization in terms of providing reliable data, coupled with modeling efforts to mimic the reality, adding its tacit knowledge with a collective perception of work ethic by effective interaction of its scientists and users.

NEERI'S FOCUS AREAS are:

- Indoor Air Quality (IAQ) – VOCs, Monitoring, Health Impacts, Public Awareness and Training.
- Ambient Air Quality (AAQ) – Urban AQ data-bank, inventorization, source apportionment analysis, analytical techniques, cost effective control, conservation of monuments.
- Drinking Water – WQ surveillance and assessment, water treatment, supply and distribution, training for rural sector.
- Water Resources – EIA of river linking projects, artificial recharge of groundwater and aquifers, eco-restoration of lakes and reservoirs, ecological minimum flows, watershed planning, catchment areas treatment, salinity ingress in coastal areas.
- Wastewater - Recycling for zero discharge, color and pathogen removal, treatability studies, and Design or revamping ETPs/STPs/CETPs through innovative solutions.
- Industry - Waste minimization, Recovery and recycling of wastes, Environment and process audit, EIA, Carrying capacity, LCA, Global environmental policies.
- Bio/Phyto Remediation – Reclamation and restoration of degraded lands (mine spoil dumps/tailings, saline soils, etc.), Carbon sequestration applications, Land application of treated sewage, nutrient dynamics.
- Municipal Solid & Hazardous Wastes - Design of landfills and disposal systems, Composting and biomethanation, stabilization.
- Energy security - Biogas systems, Enrichment of methane, Microbial production of hydrogen.
- Health - Single Nucleotide Polymorphism (SNP) analysis for delineation of genetic disturbances due to exposures of air pollutants.

With focus on above areas, NEERI endeavors to sustain itself as a pioneer CSIR Laboratory in the field of environmental science and engineering.

Facilities available

Analytical

- AOxAnalyser : IDC Multi X2000
- Atomic Absorption Spectrophotometers : GBC 904AA and Hitachi Z8000
- CHNS-O Analysers : Carlo Erba EA 1108 &Thermoquest-Fissons EA 1110
- Fluorescence Spectrophotometer : Hitachi F-4000
- Fourier Transform IR Spectrometer : ATI Matson Infinity 60 AR
- Gas Chomatograph Mass Spectrometer: Varian saturn III

- High Performence Liquid Chromatographs : Waters 204 and 501, Shimadzu LC-10
- Inductively Coupled Plasma Atomic Emission Spectrometer : JobinYvon JY-24
- Ion Chomatograph:Dionex 2000i
- IR Spectrophotometer : Perkin-Elmer 983 G
- Mercury Analysers : Perkin-Elmer MAS-50 and MAS-50B
- Total Organic Carbon Analyser: Beckman 915 A and Ionics 1555B
- UV-VIS-NIR Spectrophotometer : Perkin Elmer Lambda 900, Hitachi 330

Computation

- 02 3D Console with 20"Colour Monitor for Internet/Intrant Servers
- Additional Softwares
- Compilers & Libraries
- Digital Image Processing
- Fire Well Software (TIS CAUNTELET 3.2 INTERNET FIRE WELL SOFTWARE ON IRIX OS)
- Geographics Information System
- Knowledge Based System
- Personal Workstation with Network Browsers and Graphics Capabilities
- Programming and Application Development Environment
- Silicon Graphics 02 Workstation
- The POLLO 9000/730 Workstation
- The Silicon Graphics Interner/Intranet Server
- The Sun ultra workstation

NEERI's Vision

Leadership in environmental science and engineering for sustainable development

NEERI's Mission

NEERI would continue to strive for providing innovative and effective solutions for environmentally sustainable development and to help government, industry and the society, especially the 800 million underprivileged people of India.

INDIA EYES $1.1 BILLION SOLAR LOAN FROM GERMAN BANK KFW

German development bank KFW could lend India $1.1 billion for rooftop solar projects, on top of another loan it has extended to help the Asian country fund its ambitious green energy plans, India's top renewable energy bureaucrat told Reuters.

Prime Minister Narendra Modi wants to quintuple India's renewable energy capacity to 175 gigawatts by 2022, making clean energy part of his fight against climate change without necessarily committing to a timeline for emission cuts.

KFW has already offered India a loan of about 1.38 billion euros ($1.55 billion) to help build a "green corridor" of power lines through nine states, and Modi's visit last month to Germany helped advance talks on the rooftop plans, said Upendra Tripathy, secretary in the Ministry of New and Renewable Energy.

"The prime minister discussed this and KFW in principle agreed to examine our request," Tripathy said on Tuesday. "We are looking for low-cost loans."

KFW, which said in December it would extend a 1 billion euro loan for the power transmission project, could not be reached for comment on Tuesday.

Tripathy said the government had also sought $750 million from the World Bank and $500 million from the Asian Development Bank to help keep up the momentum in expanding its clean energy programmes.

India's renewable energy investments rose to $4 billion last fiscal year to March 31 from $3.4 billion a year earlier.

Capacity addition was 12 percent higher than a year earlier, helping India cut its carbon emission by a similar margin to 8.78 million tonnes, Tripathy said.

India reckons its renewable energy industry could generate business opportunities worth $160 billion in the next five years, making it a lucrative market that has already attracted big global players such as Sun Edison <SUN E.N> and First Solar (FSLR.O).

INFOSYS BECOMES THE FIRST INDIAN COMPANY TO JOIN RE100 RENEWABLE ENERGY CAMPAIGN

Bangalore, May 18, 2015: The Climate Group today announced that one of India's largest Information Technology corporations has become the first Indian company to join RE100, a global platform for major companies committed to 100% renewable power.

Infosys (NYSE: INFY), a leader in consulting, technology, outsourcing and next-generation services, with clients across 50 countries, has taken great strides during the past seven years to become sustainable in its operations. As part of its commitment to RE100, Infosys aims to become carbon neutral by 2018. The company is already working to reduce its per capita electricity consumption by 50 per cent from its 2007-2008 levels and source all its electricity from renewable resources by 2018.

Speaking about the announcement, **Ramadas Kamath, Executive Vice President and Head - Infrastructure and Sustainability, Infosys,** said: "We are working towards building a clean energy future. Expanding the share of renewables is key to addressing the chronic energy crisis our country is facing today. By taking the first step towards hundred per cent renewables, we want to lead the way in creating a sustainable future and bring about an energy transformation in India."

During fiscal year 2015, Infosys met 29 percent of its electricity needs - about 72.08 million units - for its locations across India through green power. During the same period, Infosys generated over 2911 MWh of electricity through its onsite solar PV installations across India.

Krishnan Pallassana, Executive Director, The Climate Group India, said: "We are delighted to welcome an innovative and forward thinking organization such as Infosys into the campaign. We need more companies that are willing to set bold targets and demonstrate the business case for renewable power. India plays a crucial role in sealing a global climate deal and could benefit the most from investing into a low-carbon future, which can generate sustainable and consistent energy for all."

Damandeep Singh, CDP India Director, said: "Infosys has been a pioneer in embedding sustainability into their business practices and is a leading example of how long-term vision can save company money. RE100 is a perfect fit for this global IT bellwether company . We are proud to welcome them to the community and this will surely inspire others to join."

Infosys joins some of the world's most influential companies such as IKEA, Swiss Re, BT, Formula E, H&M, KPN, Mars, Nestlé, Philips, among others, which are taking bold steps to create transformative change needed to drive a clean energy revolution.

RE100 was launched at Climate Week NYC on September 22, 2014. Seventeen companies have now joined the campaign and made a public commitment to become 100% renewable, including founding members IKEA and Swiss Re. As the campaign spreads in India, it is expected that more Indian companies will switch to renewable power and demonstrate the huge opportunity that exists in India's growing clean economy.

About RE100

RE100 is a global initiative that celebrates and supports major companies committed to 100% renewable power across their operations. Its goal is that 100 of the world's most influential businesses commit to 100% renewable power within a specified timeline.

Led by The Climate Group, in partnership with CDP, with the support of the International Renewable Energy Agency (IRENA), RE100 shares the compelling business case for renewable power, addresses barriers to wide-scale adoption, develops transparent reporting mechanisms, and identifies the necessary regulatory reforms.

By massively increasing private sector demand for renewable power, RE100 will accelerate the transformation of the global energy market, thus enabling the transition to a prosperous low carbon future.

The following companies have joined RE100 and made a public commitment to going 100% renewable: BT Group, Commerzbank, Elion Resources Group, Formula E, H&M, Infosys, IKEA, KPN, Mars, Nestlé, Philips, Reed Elsevier Group, J. Safra Sarasin Bank, SAP, SGS, Swiss Re, YOOX Group.

About The Climate Group

The Climate Group is an award-winning, international non-profit. Our goal is a prosperous, low carbon future. We believe this will be achieved through a **'CLEAN REVOLUTION'**: the rapid scale-up of low carbon energy and technology. We work with corporate and government partners to develop climate finance mechanisms, business models which promote innovation, and supportive policy frameworks. We convene leaders, share hard evidence of successful low carbon growth, and pilot practical solutions which can be replicated worldwide.

Since 2009, The Climate Group has been the convenor of Climate Week NYC, an annual international platform for governments, businesses and civil society to collaborate on bold climate action and low carbon leadership. In September 2014, Climate Week NYC hosted 150 events as the collaborative space in support of the UN Climate Summit.

The Climate Group has offices in Greater China, North America, India and Europe.

REAPING ENERGY AND PRECIOUS RAW MATERIALS FROM RUBBISH

Overflowing landfills, growing demand for energy and resources, and the need to reduce greenhouse gas emissions are drivers for change in waste management systems across the world.

When it comes to energy recovery, waste incineration is often the first technology that comes to mind. This is because waste incinerators can handle large amounts of municipal solid waste, reduce volume drastically and recover energy from what we throw away.

But there are challenges in this approach to handling waste. Incinerators need a constant flow of fuel and have difficulty dealing with variations in the amount of waste.

Water doesn't burn, so humid waste that is typically produced in many Asian countries is not a good fuel for incineration and the energy yield will be low.

Furthermore, incinerators are expensive to build and local municipalities often find it difficult to get financing for such projects. Incinerators are most efficient when they have a bigger capacity, needing more trash than what medium-sized towns can supply.

In these instances, incineration falls short and can be complemented or replaced by mechanical and biological waste treatment technologies, which are more flexible.

Mechanical biological treatment (MBT) follows a different approach to mass burning. Most MBT plants divide their mixed input or sources of waste into a wet fine fraction for biological treatment (composting and/or producing biogas) and a dry coarse fraction that picks out recyclables as well as materials that can become solid fuel with high energy content.

The process upgrades waste to quality solid fuel (RDF/SRF, in industry terms) for efficient energy production and can even produce biogas from wet trash.

The market is full of promising technologies, but which is the right one to choose? Which technologies are approved by governments and what's the economic viability? How do MBT plants perform over the longer term and how do they compete with other technologies?

The single best place to learn about MBT is where it's done and demonstrated by the folks who know the most about it. Happening only once every two years, the Waste-to-Resources conference and exhibition in Germany was founded a decade ago by the renowned MBT expert Dr. Matthias Kuehle-Weidemeier, CEO of the Germany-based waste treatment specialists Wasteconsult International.

This year, in cooperation with Germany's association of MBT operators (ASA), the event will gather experts from 17 countries to present their knowledge of the technology.

The conference will cover a wide range of topics, including:

- Waste management strategies, new waste treatment technologies, source separated collection
- Anaerobic digestion of organic waste fractions
- Practical experience, optimisation and new developments
- Functionality, economic efficiency and life cycle balance
- Energy recovery by refuse derived fuel (RDF) power plants and cement kilns, liquefaction
- Conditioning, use and sale of output fractions from mechanical and biological treatment
- Hydrothermal carbonisation (HTC)

With participants from 41 countries having attended the event's previous five editions since 2005, Waste-to-Resources 2015 is the world's largest conference on MBT.

For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled. – RICHARD P. FEYNMAN

ENERGY CONSERVATION THROUGH ENERGY EFFICIENCY – 4

Main Reasons for Technical Losses in Transmission and Distribution can be listed as under:

1. Lengthy Distribution lines

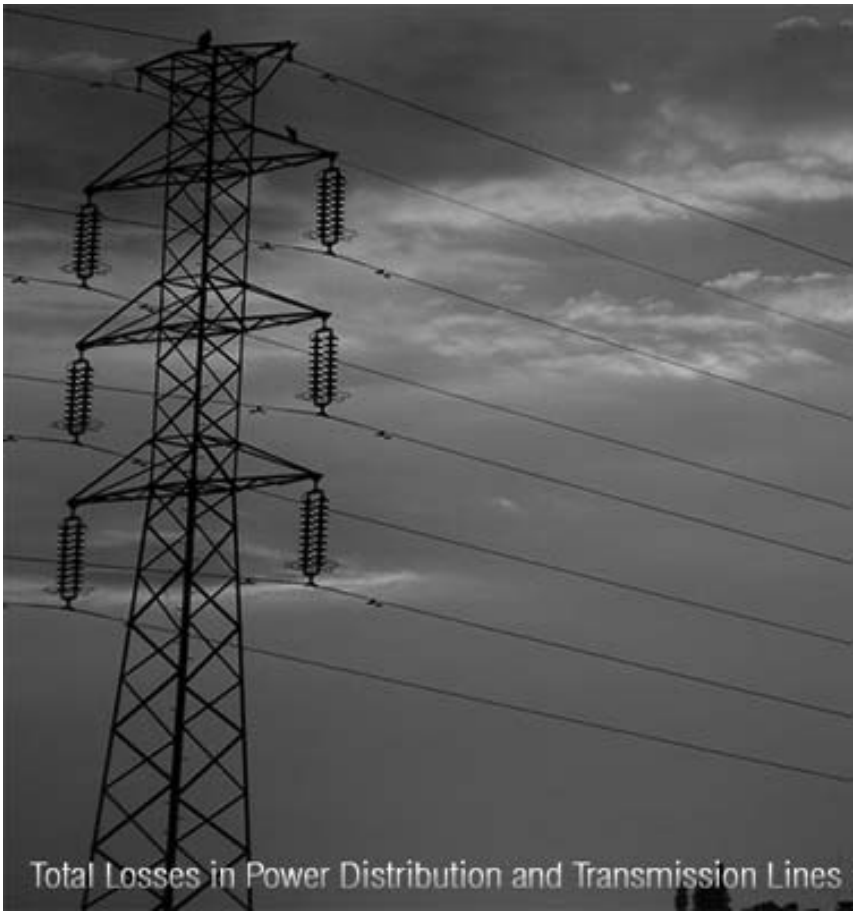
In practically ***11 KV*** and ***415 volts lines***, in rural areas are extended over long distances to feed loads scattered over large areas. Thus the primary and secondary distributions lines in rural areas are largely radial laid usually extend over long distances.

This results in high line resistance and therefore high I^2R losses in the line.

- Haphazard growths of sub-transmission and distribution system in to new areas.
- Large scale rural electrification through long 11kV and LT lines.

2. Inadequate Size of Conductors of Distribution lines

The size of the conductors ***should be selected on the basis of KVA x KM capacity of standard conductor for a required voltage regulation***, but rural loads are usually scattered and generally fed by radial feeders. The conductor size of these feeders should be adequate.



3. Installation of Distribution transformers away from load centers

Distribution Transformers are not located at Load center on the Secondary Distribution System.

In most of case Distribution Transformers are not located centrally with respect to consumers. Consequently, the farthest consumers obtain an extremity low voltage even though a good voltage levels maintained at the transformers secondary.

This again leads to higher line losses. (*The reason for the line losses increasing as a result of decreased voltage at the consumers end therefore in order to reduce the voltage drop in the line to the farthest consumers, the distribution transformer should be located at the load center to keep voltage drop within permissible limits.*)

4. Low Power Factor of Primary and secondary distribution system

In most LT distribution circuits normally the Power Factor ranges from 0.65 to 0.75. A low Power Factor contributes towards high distribution losses.

For a given load, if the Power Factor is low, the current drawn in high and the losses proportional to square of the current will be more. Thus, line losses owing to the poor PF can be reduced by improving the Power Factor.

This can be done by application of shunt capacitors.

- Shunt capacitors can be connected either in secondary side (*11 KV side*) of the 33/11 KV power transformers or at various point of Distribution Line.
- The optimum rating of capacitor banks for a distribution system is 2/3rd of the average KVAR requirement of that distribution system.
- The vantage point is at 2/3rd the length of the main distributor from the transformer.

- A more appropriate manner of improving this PF of the distribution system and thereby reduce the line losses is to connect capacitors across the terminals of the consumers having inductive loads.
- By connecting the capacitors across individual loads, the line loss is reduced from 4 to 9% depending upon the extent of PF improvement.

5. Bad Workmanship

Bad Workmanship contributes significantly role towards increasing distribution losses.

Joints are a source of power loss. Therefore the number of joints should be kept to a minimum. Proper jointing techniques should be used to ensure firm connections.

Connections to the transformer bushing-stem, drop out fuse, isolator, and LT switch etc. should be periodically inspected and proper pressure maintained to avoid sparking and heating of contacts.

Replacement of deteriorated wires and services should also be made timely to avoid any cause of leaking and loss of power.

6. Feeder Phase Current and Load Balancing

One of the easiest loss savings of the distribution system is balancing current along three-phase circuits.

Feeder phase balancing also tends to balance voltage drop among phases giving three-phase customers less voltage unbalance. Amperage magnitude at the substation doesn't guarantee load is balanced throughout the feeder length.

Feeder phase unbalance may vary during the day and with different seasons. Feeders are usually considered "balanced" when phase current magnitudes are within 10. Similarly, balancing load among distribution feeders will also lower losses assuming similar conductor resistance. This may require installing additional switches between feeders to allow for appropriate load transfer.

Bifurcation of feeders according to Voltage regulation and Load.

7. Load Factor Effect on Losses

Power consumption of customer varies throughout the day and over seasons.

Residential customers generally draw their highest power demand in the evening hours. Same commercial customer load generally peak in the early afternoon. Because current level (*hence, load*) is the primary driver in distribution power losses, keeping power consumption more level throughout the day will lower peak power loss and overall energy losses.

Load variation is Called load factor and it varies from 0 to 1.

Load Factor = Average load in a specified time period / peak load during that time period.

For example, for 30 days month (720 hours) peak Load of the feeder is 10 MW. If the feeder supplied a total energy of 5,000 MWH, the load factor for that month is (5,000 MWh) / (10MW x 720) = 0.69.

Lower power and energy losses are reduced by raising the load factor, which, evens out feeder demand variation throughout the feeder.

8. Transformer Sizing and Selection

Distribution transformers use ***copper/ Aluminium conductor windings*** to induce a magnetic field into a grain-oriented silicon steel core. ***Therefore, transformers have both load losses and no-load core losses.***

Transformer copper or load losses vary with load based on the resistive power loss equation (P loss = I^2R). For some utilities, economic transformer loading means loading distribution transformers to capacity-or slightly above capacity for a short time-in an effort to minimize capital costs and still maintain long transformer life.

However, since peak generation is usually the most expensive, ***total cost of ownership (TCO)*** studies should take into account the cost of peak transformer losses. Increasing distribution transformer capacity during peak by one size will often result in lower total peak power dissipation-more so if it is overloaded.

Transformer no-load excitation loss (iron loss) occurs from a changing magnetic field in the transformer core whenever it is energized. Core loss varies slightly with voltage but is essentially considered constant. Fixed iron loss depends on transformer core design and steel lamination molecular structure. Improved manufacturing of steel cores and introducing amorphous metals (*such as metallic glass*) have reduced core losses.

9. Balancing 3 phase loads

Balancing 3-phase loads periodically throughout a network can reduce losses significantly. It can be done relatively easily on overhead networks and consequently offers considerable scope for cost effective loss reduction, given suitable incentives.

10. Switching off transformers

One method of ***reducing fixed losses*** is to switch off transformers in periods of low demand. If two transformers of a certain size are required at a substation during peak periods, only one might be required during times of low demand so that the other transformer might be switched off in order to reduce fixed losses.

This will produce some ***offsetting increase in variable losses*** and might affect security and quality of supply as well as the operational condition of the transformer itself. However, these trade-offs will not be explored and optimized unless the cost of losses are taken into account.

11. Other Reasons for Technical Losses

- Unequal load distribution among three phases in L.T system causing high neutral currents.
- leaking and loss of power
- Over loading of lines.
- Abnormal operating conditions at which power and distribution transformers are operated
- Low voltages at consumer terminals causing higher drawl of currents by inductive loads.
- Poor quality of equipment used in agricultural pumping in rural areas, cooler air-conditioners and industrial loads in urban areas.

(To be continued)

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

HUMOUR

It may sound like a joke but it is serious!!!

Sarcasm at its best.

Checking out at the store, the young cashier suggested to the older woman that she should bring her own shopping bags because plastic bags weren't good for the environment.

The woman apologized and explained, "We didn't have this green thing back in my earlier days".

The cashier responded, "That's our problem today. Your generation did not care enough to save our environment for future generations".

She was right — our generation didn't have the green thing in its day.

Back then, we returned milk bottles, pop bottles and beer bottles to the store. The store sent them back to the plant to be washed and sterilized and refilled, so they could use the same bottles over and over. Yes, they really were recycling.

We refilled writing pens with ink instead of buying a new pen; and we replaced the razor blades in a razor instead of throwing away the whole razor just because the blade got dull.

But, we didn't have the green thing back in our day.

We walked up the stairs, because we didn't have an escalator in every shop and office building. We walked to the grocery store and didn't climb into a 300-horsepower machine every time we had to go two blocks.

But, she was right. We didn't have the green thing in our day.

Back then, we washed the baby's nappies because we didn't have the throw-away kind. We dried clothes on a line, not in an 'energy gobbling machine burning up 220 volts;' wind and solar power really did dry our clothes back in our early days. Kids got hand-me-down clothes from their brothers or sisters, not always brand-new clothing.

But, that young lady is right. We didn't have the green thing back in our day.

Back then, we had one TV, or radio, in the house — not a TV in every room. And, the TV had a small screen the size of a handkerchief (remember them?).

In the kitchen, we blended and stirred by hand because we didn't have electric machines to do everything for us.

When we packaged a fragile item to send in the post, we used wadded up old newspapers to cushion it, not Styrofoam or plastic bubble wrap.

Back then, we didn't fire up an engine and burn petrol just to cut the lawn. We used a push mower that ran on human power.

We exercised by working so we didn't need to go to a health club to run on treadmills that operate on electricity.

But, she's right. We didn't have the green thing back then.

We drank water from a fountain or a tap when we were thirsty instead of demanding a plastic bottle.

We actually cooked food that didn't come out of a packet, tin or plastic wrap and we could even wash our own vegetables and chop our own salad.

But, we didn't have the green thing back then.

Back then, people took the tram or a bus, and kids rode their bikes to school or walked instead of turning their mothers into a 24-hour taxi service.

We had one electrical outlet in a room, not an entire bank of sockets to power a dozen appliances.

And we didn't need a computerized gadget to receive a signal beamed from satellites 2,000 miles out in space in order to find the nearest pizza joint.

But, isn't it sad the current generation laments how wasteful we old folks were just because we didn't have the green thing back then.

WE CAN NO LONGER RELY ON ANTIBIOTICS

Six reasons superbugs will be worse than Aids

Antibiotics: rapidly becoming useless.

Idea for a movie. The year is 2015. We open in a London hospital, where a surgeon (I'm thinking Cara Delevingne) is performing a routine operation. Her hand slips and she pricks her finger on a rib. A week later, she is dead. Meanwhile, her sister (Rachel Weisz?) is giving her fractious toddler some amoxil, but its ear infection just gets worse and worse. Soon the toddler is dead. On the way to the double funeral Rachel Weisz falls in a puddle. Dead. People start to panic. Antibiotics don't seem to work anymore. East London hipsters look paler than usual, coughing up blood into vintage handkerchiefs: tuberculosis; and Hooray Henrys meet green, agonising ends on the King's Road: cholera. These diseases have not been seen in Britain in a hundred years! But there's a modern twist. The clean water in the taps is dangerous. The healthy imported food in the supermarkets is dangerous. People flood into shiny, reassuring 2014 hospitals, but this is a bad mistake. Enter those buildings and you are dead. The hospitals are the worst place to hide.

This state of affairs is closer than you might think. The World Health Organisation has warned that there is an **"antibiotics crisis"** looming. What they mean is that antibiotics are becoming increasingly useless as resistance to them rises. Soon, we could very well run out of new antibiotics, which means we could start dying of the kinds of infections we learned how to treat 100 years ago.

The World Health Organisation has warned this could be "worse than Aids." They're right, it would be much, much worse. Here are six reasons why.

1. There'll be nowhere to hide. Avoiding HIV/Aids means avoiding unprotected sex and needle swapping. Avoiding superbugs means avoiding falling off your bike, getting a bladder infection, entering a care home, entering a hospital, breaking any bones, catching the flu, diarrhoea, and minor scratches and bruises.
2. In 2012, germs resistant to antibiotics infected 2 million people and HIV infected 2.3 million people. But new HIV infections have been on a 33 per cent decrease since 2001. By contrast, between 2005 and 2012, the World Health Organization found cases of multidrug-resistant tuberculosis in Africa rose by 650 per cent.
3. No one is working on a solution, because the financial motivation for finding new antibiotics just isn't there. In fact, development of new drugs has slowed hugely. Between 1980 and 1984, the US Food and Drug Administration approved 20 new antibiotics. Between 2005 and 2009 it approved 3.

This is because it takes hundreds of millions to develop a new drug, and antibiotics don't give investors much return. When a doctor prescribes you antibiotics, you only take it for a couple of weeks, so these drugs just can't compete with drugs for lifelong diseases, such as HIV.

It's also because people aren't scared enough yet. They are terrified of Aids. Sepsis: not so much.

Infectious disease expert Brad Spellberg has said:

"We will pay US$50,000 for a course of cancer chemotherapy that prolongs life by 3 months, but we don't want to pay more than $100 for a course of antibiotics that cures the target infection."

And why? "People are terrified of cancer, but not of infections".

4. Unlike HIV/Aids, raising awareness about drug resistance could make the situation worse. As experts (correctly) preach the need to use fewer antibiotics, only using them when absolutely necessary, pharmaceutical companies are given less and less motivation to develop new ones.
5. Antibiotic-resistant enzymes can spread through food and through water. Last year 341 tonnes of seafood from Vietnam were found to have antibiotic residue. China's rivers are increasingly full of drug-resistant enzymes.
6. Drug resistant diseases thrive in the very places set up to treat them. Hospitals bring people together, resistance pre-lowered, and provide them with handy disease carriers, in the form of doctors, nurses, cleaners and the laundry service. This is what experts mean when they say the new superbugs could destroy the infrastructure of the health system. In the event of an antibiotopocolypse, we are screwed.

Courtesy: The Telegraph

தேங்காய் எண்ணெய் மருத்துவம்

குழந்தைகளுக்கு சளி பிடித்திருந்தால் தைலம் தேய்ப்பார்கள்.

ஆனால். அதைவிட சிறந்த மருந்து தேங்காய் எண்ணெய் கற்பூரம் தான்.

தேங்காய் எண்ணெயை நன்கு சூடாக்கி இறக்கி அதில் கற்பூரம் சேர்த்து அதனை குழந்தையின் உடல் சூடு தாங்கும் அளவிற்கு ஆற வைத்து நெஞ்சில் தடவ சளி குணமாகும். *Courtesy: Pesot, March 2015*

வந்து பாருங்கள் – தாராசுரம்

சிற்பங்களின் கலைக்கூடம்

தஞ்சாவூர் பெரிய கோயில் பிரம்மாண்டத்தின் உச்சம் என்றால் தாராசுரம் ஜராவதீஸ்வரர் கோயில் நுட்பத்தின் உச்சம். 40,000-க்கும் மேற்பட்ட சிற்பங்களைக் கொண்டு **சிற்பங்களின் சரணாலயம்** என்ற சிறப்பைப் பெற்றிருக்கிறது தாராசுரம்.

கும்பகோணத்திலிருந்து மூன்று கி.மீ. தொலைவில் இருக்கும் தாராசுரம் மிகவும் சிறிய ஊர். மொத்த மக்கள்தொகை கிட்டத்தட்ட 13,000. ஆனால், உலகப் புகழ்பெற்ற **ஜராவதீஸ்வரர் கோயில்** இருக்கும் ஊர் இது. இங்குள்ள சிற்பங்களில் பெரும்பாலானவை மிகமிகச் சிறியவை. விரல் நுனியளவுச் சிற்பங்களும் உண்டு. ஓரிரு அங்குலச் சிற்பங்களும் உண்டு, ஆளுயரச் சிற்பங்களும் உண்டு.

இங்குள்ள பல சிற்பங்கள் பல்வேறு காரணங்களுக்காகப் புகழ்பெற்றவை. அன்னபூரணி சிற்பத்தைப் பார்க்க ∴பிரான்ஸ் உள்ளிட்ட நாடுகளிலிருந்து ஆயிரக்கணக்கானோர் வருகிறார்கள். அன்னபூரணியின் சிரித்த முகத்தை, டாவின்சியின் மோனாலிசா ஓவியத்துடன் ஒப்பிட்டுப் பலரும் மகிழ்கிறார்கள். காளையின் தலையும் யானையின் தலையும் ஒன்றாகச் சேர்ந்திருக்கும் புகழ்பெற்ற சிற்பம் ஒன்று இங்கு இருக்கிறது. காளையை மட்டும் பார்க்கும்போது அந்தத் தலை காளைத் தலையாகவும், காளையை மறைத்துக்கொண்டு பார்க்கும்போது அது யானையின் தலையாகவும் காட்சியளிக்கும்.

குதிரைகள் பூட்டப்பட்டு, ஓடிக்கொண்டிருக்கும் ஒரு தேரின் மேல் அமைந்திருப்பதைப் போல கோயில் அமைக்கப்பட்டிருப்பது காலத்தேரின் மேல் இந்தப் பிரபஞ்சம் பயணிப்பதை உணர்த்தும் விதத்தில் இருக்கிறது. இந்தக் கோயிலுக்கு வந்த **கார்ல் சகன்** என்ற **வானியலாளர்**, பரவெளியின் ரகசியத்தைச் சுட்டிக்காட்டும் விதத்தில் இந்தக் கோயில் அமைந்திருக்கிறது என்று வியந்ததாகச் சொல்வார்கள்.

இரண்டாம் ராஜராஜன் காலத்தில், அதாவது 12-ம் நூற்றாண்டில் இந்தக் கோயில் கட்டப்பட்டது. தஞ்சாவூர் பெரிய கோயில், கங்கை கொண்ட சோழபுரம், மாமல்லபுரம் ஆகியவற்றுடன் இந்தக் கோயிலையும் பாதுகாக்கப்பட வேண்டிய கலைச்சின்னங்கள் என்று யுனெஸ்கோ அறிவித்திருக்கிறது.

Courtesy: தி இந்து, ஜய வருட மலர் 2014

20 MOST PEACEFUL COUNTRIES IN THE WORLD - 7

BELGIUM

According to the Global Peace Index, **Belgium** is one of the best and most peaceful places to live in Europe and on Earth. Situated in the heart of Europe, this small country holds a special place. Brussels, the capital of Belgium, is home to the European Union and NATO. Belgium boasts medieval cities, beautiful town halls, majestic castles, and captivating natural beauty. Homicide and imprisonment rates are low in this country, even though Belgium did experience a crisis within its government over the 2008-2011 period.

(To be continued)
Courtesy: Amerikanki

மலச்சிக்கல் மற்றும் சிறுநீரகக்கல் நோய்களுக்கு...!

நார்த்தம் பழம் எலுமிச்சை வகையைச் சார்ந்தது. இதன் பழங்கள் பெரிதாக அளவில் காணப்படும். காய்கள் நன்கு பச்சையாக இருக்கும். நார்த்தம் பழத்தின் மணத்திற்கு மற்ற மணங்களைக் கட்டுப்படுத்தும் குணமுண்டு. நார்த்தம் பழத்தில் நன்கு கனிந்த பழமே சாப்பிட உகந்தது. இந்தப் பழம் எல்லாக் காலங்களிலும் கிடைக்கும். நன்கு பழுத்த பழம் மஞ்சள், பச்சை கலந்து காணப்படும். பழத்தின் தோல்பகுதி கனமானதாக இருக்கும். இவற்றில் நீர் நிரம்பியிருக்கும். புளிப்பு சுவை மிகுதியாக இருப்பதால் இந்தப் பழத்தை சிலர் விரும்பி சாப்பிடுவதில்லை. ஆனால் நன்கு கனிந்த பழம் நல்ல சுவையுடன் இருக்கும். கிராம மக்களின் சாத்துக்குடியாக நார்த்தம்பழமே விளங்குகிறது.

நார்த்தை மரங்கள் நூறு ஆண்டுகளுக்கு மேல் வாழக்கூடியவை. நார்த்தையில் வேர், மலர், கனிகள் பயன்கொண்டவை.

செயல்திறன் மிக்க வேதிப்பொருட்கள்:

கனிகளில் அமினோ அமிலங்கள், வைட்டமின்கள், கொழுப்பு அமிலங்கள் உள்ளன. அஸ்கார்பிக் அமிலம், அலனைன், நியசின், வைட்டமின் பி, அஸ்பார்டிக் அமிலம், இனிசைன், குளுடாமிக் அமிலம், பெர்கமோட்டின், நாரிங்கின், சிட்ரல், லிமோனின், நார்டென்டாடின், வெலென்சிக் அமிலம் மலர்கள் தசை இறுக்கி, செயல் ஊக்கி, வேர் வாந்திக்கும் வயிற்றுப் புழுக்களுக்கும் எதிரானது. மலச்சிக்கல் மற்றும் சிறுநீரகக்கல் நோய்களுக்கு மருந்தாகிறது. கனியின் தோலுறை வயிற்றுப் போக்கை நிறுத்தும். வயிற்றில் ஏற்பட்ட புண்ணிற்கு நார்த்தங்காய் ஊறுகாய் நல்ல மருந்தாக அமைகிறது.

நார்த்தங்காயை அல்லது பழத்தை எந்த வடிவத்திலாவது உணவில் சேர்த்து வர ரத்தம் சுத்தமடையும். வாதம், குன்மம் (வயிற்றுப் புண்). வயிற்றுப் புழு இவை நீங்கும்.

பசியை அதிகரிக்கும்

கனிந்த கனிகள் வலுவேற்றி, ஊக்குவி, இதன் சாறு வாந்தி நிறுத்தும். பசியை தூண்டிவிடும், தசை இறுக்கி குளிர்ச்சி தரும். காய்ச்சலின் வெப்பம் மற்றும் தாகம் போக்கும். நார்த்தை பழத்தின் மேல் தோலை தேன் அல்லது சர்க்கரை பாகில் ஊற வைத்து நன்கு ஊறிய பின் சீதக் கழிச்சல் உடையவர்களுக்கு கொடுக்க நல்ல பலன் தரும்.

உடல் சூடு தணியும்

உடல் சூடு அதிக பாதிப்பை ஏற்படுத்தும். உடல் சூடு தணிய தினமும் ஒரு நார்த்தம்பழம் சாப்பிட்டு வந்தால் உடல் சூடு தணியும். உடலுக்கு புத்துணர்வு கிடைக்கும். இப்பழச்சாறு மதிய வேளையில் அருந்தி வந்தால் வெயிலின் தாக்கம் குறையும்.

பித்த அதிகரிப்பால் ஈரல் பாதிக்கப்படுவதுடன் இரத்தமும் அசுத்தமடைந்து பல நோய்கள் ஏற்படுகின்றன. இந்த பித்த அதிகரிப்பால் தலைச்சுற்றல், வாந்தி, மயக்கம் உண்டாகிறது. இதற்கு நார்த்தம் பழத்தை காலையில் சாப்பிட்டு வந்தால் பித்தம் தணியும்.

உடல் வலுப்பெற

நார்த்தம் பழத்தை சாறு எடுத்து அதனுடன் பனங்கற்கண்டு அல்லது தேன் சேர்த்து அருந்தி வந்தால் உடல் வலுப்பெறும். இரத்தம் மாசடையும்போது இரத்தத்தில் உள்ள வெள்ளையணுக்கள் பாதிக்கப்படுகின்றன. இதனால் உடலில் நோய் எதிர்ப்பு சக்தி குறைகிறது. நார்த்தம் பழத்தை தினமும் சாப்பிட்டு வந்தால் இரத்தம் சுத்தமடையும். நோயின் தாக்கத்தினால் அவஸ்தைப்பட்டு விடுபட்டவர்களின் உடல்நிலை தேற நார்த்தம் பழச்சாறு அருந்துவது மிகவும் நல்லது.

சுகமான பிரசவம்

கர்ப்பிணிகள் காலையும், மாலையும் நார்த்தம் பழச்சாறு எடுத்து தண்ணீர் கலந்து அதில் ஒரு ஸ்பூன் தேன் விட்டு நன்றாகக் கலந்து அருந்தி வந்தால் சுகப்பிரசவம் எளிதில் நடைபெறும்.

சிலர் கொஞ்சம் சாப்பிட்டால்கூட வயிறு பெரிதாக பலூன் போல் காணப்படும். சில சமயங்களில் வாயுத் தொல்லையும் அதிகரிக்கும். இவர்கள் நார்த்தம் பழத்தை சாறு பிழிந்து வெந்நீர் கலந்து அடிக்கடி பருகி வந்தால் வாயுத்தொல்லையிலிருந்து விடுபட்டு வயிற்றுப் பொருமல் நீங்கும். எல்லாக் காலங்களிலும் கிடைக்கும் நார்த்தம் பழத்தை தினமும் சாப்பிட்டு நீண்ட ஆயுளோடு வாழலாம்.

Courtesy: Pesot, March 2015

POWER YOUR MIND – THE REAL GOAL

Everyone says 'first set your goal'
But they themselves don't know
What is the real goal
Many have struggled to
Achieve their goal
But after reaching there,
Found it an empty hole.

There are many temporary goals
But sages have declared
Only one goal.
Realize your Self, that is the goal
By reaching there
You will be whole.

Courtesy: Swami Srikantananda

This universe has come out
From that real whole.
Still that whole remains
Ever the whole.

That is the eternal
Abode of the soul
Arise, awake and stop not
Till you reach that goal.

Each soul is potentially divine.
The goal is to manifest this
Divinity within by controlling
nature, external and internal.
- Swami Vivekananda

SUBRAHMANYAN CHANDRASEKHAR

Subrahmanyan Chandrasekhar, (October 19, 1910 – August 21, 1995), was an Indian American astrophysicist born in Lahore, Punjab. Chandrasekhar was awarded, along with William A. Fowler, the 1983 Nobel Prize for Physics, with Chandrasekhar cited for his mathematical theory of the physical processes of importance to the structure and evolution of the stars. This work led to the currently accepted theory on the later evolutionary stages of massive stars, including black holes. The Chandrasekhar limit is named after him.

Chandrasekhar - in distinct periods - worked in various areas, including stellar structure, theory of white dwarfs, stellar dynamics, theory of radiative transfer, quantum theory of the hydrogen anion, hydrodynamic and hydromagnetic stability, equilibrium and the stability of ellipsoidal figures of equilibrium, general relativity, mathematical theory of black holes and theory of colliding gravitational waves. At the University of Cambridge, he developed a theoretical model explaining the structure of white dwarf stars that took into account the relativistic variation of mass with the velocities of electrons that comprise their degenerate matter. He showed that the mass of a white dwarf could not exceed 1.44 times that of the Sun – the Chandrasekhar limit. Chandrasekhar revised the models of stellar dynamics originated by Jan Oort and others by considering the effects of fluctuating gravitational fields within the Milky Way on stars rotating about the galactic centre. His solution to this complex dynamical problem involved a set of twenty partial differential equations, describing a new quantity he termed 'dynamical friction', which has the dual effects of decelerating the star and helping to stabilize clusters of stars. Chandrasekhar extended this analysis to the interstellar medium, showing that clouds of galactic gas and dust are distributed very unevenly.

Chandrasekhar studied at Presidency College, Madras (now Chennai) and University of Cambridge. He spent most of his career at the University of Chicago, spending some time in its Yerkes Observatory, and serving as editor of *The Astrophysical Journal* from 1952 to 1971. He served on the University of Chicago faculty from 1937 until his death in 1995 at the age of 84.

Chandrasekhar married Lalitha Doraiswamy in September 1936. He had met her as a fellow student at Presidency College, Madras.

Chandrasekhar was the nephew of Sir Chandrasekhara Venkata Raman, who was awarded the Nobel Prize for Physics in 1930.

He became a naturalized citizen of the United States in 1953.

Early life and education

Chandrasekhar was born on 19 October 1910 in Lahore, Punjab, India in a Iyer family, to Sitalakshmi (1891–1931) and Chandrasekhara Subrahmanya (1885–1960) who was posted in Lahore as Deputy Auditor General of the Northwestern Railways at the time of Chandrasekhar's birth. He was the eldest of their four sons and the third of their ten children. His paternal uncle was the Indian physicist and Nobel laureate C. V. Raman. His mother was devoted to intellectual pursuits, had translated Henrik Ibsen's *A Doll's House* into Tamil and is credited with arousing Chandra's intellectual curiosity at an early age.

Chandrasekhar was tutored at home initially through middle school and later attended the Hindu High School, Triplicane, Madras during the years 1922–25. Subsequently, he studied at Presidency College, Madras from 1925 to 1930, writing his first paper, "The Compton Scattering and the New Statistics", in 1929 upon inspiration from a lecture by Arnold Sommerfeld and obtaining his bachelor's degree, B.Sc. (Hon.), in physics in June 1930. In July 1930, Chandrasekhar was awarded a Government of India scholarship to pursue graduate studies at the University of Cambridge, where he was admitted to Trinity College, secured by Professor R. H. Fowler with whom he communicated his first paper. During his travels to England, Chandrasekhar spent his time working out the statistical mechanics of the degenerate electron gas in white dwarf stars, providing relativistic corrections to Fowler's previous work (see Legacy below).

In his first year at Cambridge, as a research student of Fowler, Chandrasekhar spent his time calculating mean opacities and applying his results to the construction of an improved model for the limiting mass of the degenerate star. At the meetings of the Royal Astronomical Society, he met Professor E. A. Milne. At the invitation of Max Born he spent the summer of 1931, his second year of post-graduate studies, at Born's institute at Göttingen, working on opacities, atomic absorption coefficients, and model stellar photospheres. On the advice of Prof. P. A. M. Dirac, he spent his final year of graduate studies at the *Institute for*

Theoretical Physics in Copenhagen, where he met Prof. Niels Bohr.

After receiving a bronze medal for his work on degenerate stars, in the summer of 1933, Chandrasekhar was awarded his PhD degree at Cambridge with a thesis among his four papers on rotating self-gravitating polytropes, and the following October, he was elected to a Prize Fellowship at Trinity College for the period 1933–1937.

During this time, Chandrasekhar made acquaintance with British physicist Sir Arthur Eddington. In an infamous encounter in 1935, Eddington publicly ridiculed the concept of the Chandrasekhar limit. Although Eddington would later be proved wrong, this encounter caused Chandra to contemplate employment outside the UK. Later in life, on multiple occasions, Chandra expressed the view that Eddington's behaviour was in part racially motivated.

Subsequent life and career

Early career

In January 1937, Chandrasekhar was recruited to the University of Chicago faculty as Assistant Professor by Dr. Otto Struve and President Robert Maynard Hutchins. He was to remain at the university for his entire career, becoming Morton D. Hull Distinguished Service Professor of Theoretical Astrophysics in 1952 and attaining emeritus status in 1985. Famously, Chandrasekhar declined many offers from other universities, including one to succeed Henry Norris Russell, the preeminent American astronomer, as director of the Princeton University Observatory.

Chandrasekhar did some work at Yerkes Observatory in Williams Bay, Wisconsin, which was run by the University of Chicago. After the Laboratory for Astrophysics and Space Research (LASR) was built by NASA in 1966 at the University, Chandrasekhar occupied one of the four corner offices on the second floor. (The other corners housed John A. Simpson, Peter Meyer, and Eugene N. Parker.) Chandrasekhar lived at 4800 Lake Shore Drive after the high-rise apartment complex was built in the late 1960s, and later at 5550 Dorchester Building.

During World War II, Chandrasekhar worked at the Ballistic Research Laboratories at the Aberdeen Proving Ground in Maryland. While there, he worked on problems of ballistics; for example, two reports from 1943 were titled, *On the decay of plane shock waves* and *The normal reflection of a blast wave*. Chandrasekhar's expertise in hydrodynamics led Robert Oppenheimer to invite him to join the Manhattan Project at Los Alamos, but delays in the processing of his security clearance prevented him from contributing to the project. It has been rumored however that he was called to discuss and visit the Calutron project and was the individual responsible for suggesting that young women be used to operate the calutrons as they would do so more efficiently than the male scientists assigned to the task. Chandraskhar had used top performing female high school students from Williams Bay, Lake Geneva, Elkhorn and Burlington, Wisconsin to calculate immensely difficult mathematical equations entirely by long hand, and found that their abilities and vigilance were unparalleled. He then applied this first-hand knowledge with the talents of local "hillbilly high school girls" to speed up the slow-moving centrifugal Calutron project. This in turn allowed the enriched radioactive materials to be completed on time, in order to fashion the atomic weapons ultimately used to end the war. Without these raw materials, developed at the Y-12 National Security Complex these weapons never would have been tested or dropped on Japan.

Philosophy of systematization

He wrote that his scientific research was motivated by his desire to participate in the progress of different subjects in science to the best of his ability, and that the prime motive underlying his work was *systematization*. "What a scientist tries to do essentially is to select a certain domain, a certain aspect, or a certain detail, and see if that takes its appropriate place in a general scheme which has form and coherence; and, if not, to seek further information which would help him to do that." Chandrasekhar developed a unique style of mastering several fields of physics and astrophysics; consequently, his working life can be divided into distinct periods. He would exhaustively study a specific area, publish several papers in it and then write a book summarizing the major concepts in the field. He would then move on to another field for the next decade and repeat the pattern. Thus he studied **stellar structure**, including the theory of white dwarfs, **during the years 1929 to 1939**, and subsequently focused on **stellar dynamics from 1939 to 1943**. Next, he concentrated on the theory of **radiative transfer** and the **quantum theory of the negative ion of hydrogen from 1943 to 1950**. This was followed by sustained work on **hydrodynamic and hydromagnetic stability from 1950 to 1961**. In the 1960s, he studied the equilibrium and the stability of ellipsoidal figures of equilibrium, and also general relativity. During the period, **1971 to 1983 he studied the mathematical theory of black holes** and finally, during the **late 80s, he worked on the theory of colliding gravitational waves**.

Work with students

Chandra worked closely with his students and expressed pride in the fact that over a 50-year period (from roughly 1930 to 1980), the average age of his co-author collaborators had remained the same, at around 30. He insisted that students address him as "Chandrasekhar" until they received their Ph.D. degree, after which time they (as other colleagues) were encouraged to address him as "Chandra".

Other activities

From 1952 to 1971 Chandrasekhar was editor of *The Astrophysical Journal*.

During the years 1990 to 1995, Chandrasekhar worked on a project devoted to explaining the detailed geometric arguments in Sir Isaac Newton's *Philosophiae Naturalis Principia Mathematica* using the language and methods of ordinary calculus. The effort resulted in the book *Newton's Principia for the Common Reader*, published in 1995. Chandrasekhar was an honorary member of the International Academy of Science.

Death

Chandrasekhar died of a sudden heart attack at the University of Chicago Hospital in 1995, and was survived by his wife, Lalitha Chandrasekhar, who died on September 2, 2013 at the age of 102. In the *Biographical Memoirs of the Fellows of the Royal Society of London*, R. J. Tayler wrote: "Chandrasekhar was a classical applied mathematician whose research was primarily applied in astronomy and whose like will probably never be seen again."

Atheism

Once when involved in a discussion about the Gita, Chandrashekhar said, "I should like to preface my remarks with a personal statement in order that my later remarks will not be misunderstood. I consider myself an atheist."

This was also confirmed many times in his other talks. In an interview with Kevin Krisciunas at the University of Chicago, on October 6, 1987, Chandrasekhar commented: "Of course, he (Otto Struve) knew I was an atheist, and he never brought up the subject with me".

Nobel prize

Professor Chandrasekhar was awarded the Nobel Prize in Physics in 1983 for his studies on the physical processes important to the structure and evolution of stars. Chandrasekhar accepted this honor, but was upset the citation mentioned only his earliest work, seeing it as a denigration of a lifetime's achievement. He shared it with William A. Fowler.

Legacy

Chandrasekhar's most notable work was the astrophysical Chandrasekhar limit. The limit describes the maximum mass of a white dwarf star, ~1.44 solar masses, or equivalently, the minimum mass which must be exceeded for a star to ultimately collapse into a neutron star or black hole (following a supernova). The limit was first calculated by Chandrasekhar in 1930 during his maiden voyage from India to Cambridge, England for his graduate studies. In 1999, NASA named the third of its four "Great Observatories" after Chandrasekhar. This followed a naming contest which attracted 6,000 entries from fifty states and sixty-one countries. The Chandra X-ray Observatory was launched and deployed by Space Shuttle *Columbia* on July 23, 1999. The Chandrasekhar number, an important dimensionless number of magnetohydrodynamics, is named after him. The asteroid 1958 Chandra is also named after Chandrasekhar. American astronomer Carl Sagan, who studied Mathematics under Chandrasekhar, at the University of Chicago, praised him in the book *The Demon-Haunted World*: "I discovered what true mathematical elegance is from Subrahmanyan Chandrasekhar."

Chandrasekhar guided 50 students to their PhDs.

Awards

- Fellow of the Royal Society (1944)
- Henry Norris Russell Lectureship (1949)
- Bruce Medal (1952)
- Gold Medal of the Royal Astronomical Society (1953)
- Rumford Prize of the American Academy of Arts and Sciences (1957)
- National Medal of Science, USA (1966)
- Padma Vibhushan (1968)
- Henry Draper Medal of the National Academy of Sciences (1971)
- Nobel Prize in Physics (1983)
- Copley Medal of the Royal Society (1984)
- Honorary Fellow of the International Academy of Science (1988)
- Gordon J. Laing Award (1989)
- Jansky Lectureship before the National Radio Astronomy Observatory
- Humboldt Prize

Works

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மாமன்னன் ராஜேந்திர சோழன்

தாய் எட்டடி பாய்ந்தால் குட்டி 16 அடி பாயும் என்பது முதுமொழி. இதற்கு ஏற்ப, ஹிந்து பண்பாட்டின் சின்னமாக தஞ்சை பெரிய கோயிலை தந்தை கட்டினால், மகனோ, ஹிந்து பண்பாட்டை வெளிநாடுகளிலும் பரப்பினான். ஆம்! தஞ்சை பெரிய கோயிலை கட்டிய ராஜராஜசோழனின் மகன் ராஜேந்திர சோழன்தான் நம் நாயகன்.

ராஜேந்திர சோழன் மன்னனாக முடிசூட்டிக் கொண்டதன் ஆயிரமாவது ஆண்டு தந்தை தஞ்சை பெரிய கோயில் (பிரகதீஸ்வரர் கோயில்) கட்டினார். அதற்கு ஒப்பான கோயிலை கங்கை கொண்ட சோழீஸ்வரர் கோயிலை ராஜேந்திர சோழன் கட்டினார்.

சூர்ய குலத்தில் இக்ஷ்வாகு வம்சத்தில் சிபி, தசரதன், ராமன் வழிவந்தவர்கள்தான் சோழர்கள். அந்த மரபில் பிறந்தவர் ராஜேந்திர சோழன். தனது ராஜ்ஜியத்தில் ஒரு பகுதி தரிசாகவும், மறு பகுதி வறண்ட பாலைவனமாகவும் இருப்பதை அறிந்த ராஜேந்திர சோழன், அந்த பகுதியை செழிப்படைய வைக்க, தனது தலைநகரை தஞ்சையில் இருந்து, தரிசுநில பகுதிக்கு மாற்றினார்.

அங்கு செயற்கையாக ஒரு ஏரியை உருவாக்கி, அதில் கங்கை நீரை கொண்டு வந்து சேர்த்ததால், அந்த நகர் கங்கை கொண்ட சோழபுரமானது. ராஜேந்திர சோழனால் உருவாக்கப்பட்ட செயற்கை ஏரிதான் வீராணம். அந்த ஏரி இன்றும் சென்னைவாசிகளின் குடிநீர் தாகத்தை தீர்ப்பதில் முக்கிய பங்கு வகிக்கிறது.

வளர்ச்சியில் பின்தங்கிய பகுதி வளரவேண்டுமானால் அங்கு அரசு நிர்வாகம் செல்ல வேண்டும் என்பதை ஆயிரம் ஆண்டுகளுக்கு முன்பே உலகத்திற்கு கற்றுக் கொடுத்த சிறந்த நிர்வாகி ராஜேந்திர சோழன்.

ஆயிரம் ஆண்டுகளுக்கு முன்பே, வலிமையான கடற்படையை வைத்திருந்தார். அதை கொண்டு இலங்கை, பர்மா, இந்தோனேசியா, கம்போடியா, மலேசியா, சிங்கப்பூர், பிஜ" தீவுகளில் வெற்றிக்கொடி நாட்டி, அங்கெல்லாம் ஹிந்து பண்பாட்டை தழைக்கச் செய்தார். ஒருவர் ஒரு நாட்டை வென்றால், அந்த நாட்டை தன் ஆளுமைக்கு கீழ் கொண்டு வந்து அந்த நாட்டினரை அடிமைகளாக நடத்திய மன்னர்களுக்கு நடுவே, உதவி கேட்டு வந்த சிற்றரசர்களுக்கு தனது படையை அனுப்பி வைத்து, அவர்களின் எதிரிகளை வென்று அந்த பகுதிகளை அந்த மன்னர்களுக்கே வழங்கிய பண்பாளன் ராஜேந்திர சோழன்.

இப்போது எந்த கட்சி ஆட்சிக்கு வந்தாலும், அவர்கள் ஆட்சியில் நிறைவேற்றும் திட்டங்களுக்கு அவர்களின் பெயர்களை வைத்துக் கொள்கின்றனர். ஆனால், ராஜேந்திர சோழன் தனது ஆட்சிக் காலத்தில் நிறைவேற்றிய திட்டங்களை எல்லாம், **'ஈசனின் அடிமையான ராஜேந்திர சோழன்'** என்ற பொருள் படும் பெயரிலேயே நிறைவேற்றியதை செப்பேடுகளும், கல்வெட்டுகளும் காட்டுகின்றன. **தான் ஈசனின் அடிமை, இறைவன் பணியில் நான் ஒரு சிறு கருவி மட்டுமே என்பதை ராஜேந்திர சோழன் தனது வாழ்நாள் முழுவதும் வாழ்ந்து காட்டினார்.**

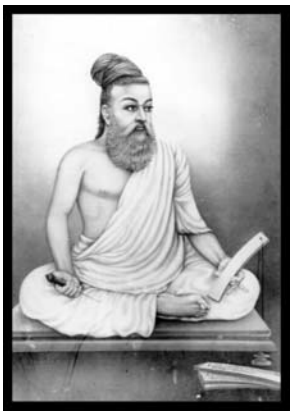
இவர் ஆட்சியில் தான் தமிழர்கள் கடல் கடந்து வாணிபம் செய்ய வழி ஏற்படுத்தப்பட்டது. பெரிய பெரிய கப்பல்கள் கொண்டு சீனா, மலேசியா, சிங்கப்பூர் போன்ற நாடுகளுடன் தமிழர்கள் வாணிபம் விரிவடைந்தது. நாட்டின் பொருளாதாரத்தை வளப்படுத்த, **திரைகடல் ஓடியும் திரவியம் தேடு** என்ற பழமொழிக்கு ஏற்ப, அன்னிய முதலீட்டை நாட்டுக்குள் முதலில் கொண்டுவந்து காட்டியவர் ராஜேந்திரசோழன்.

இப்படியாக சிறந்த ஆட்சிமுறை, நிர்வாகம், கலை, இலக்கியம், ஓவியம், சமயம், பொருளாதாரம், விவசாயம், வியாபாரம் என பலவகை திறன்களில் மேம்பட்டவன் ராஜேந்திர சோழன்.

ராஜேந்திர சோழன் படையில் இருந்த திறன்வாய்ந்த கடற்படையை கவுரவிக்கும் வகையில், மத்திய அரசு தனது கடற்படையில் ஒரு பிரிவுக்கு ராஜேந்திர சோழனின் பெயரை சூட்டியுள்ளது. மத்திய அரசு அவரது புகழை கௌரவிக்கும் பொருட்டு சிறப்பு தபால்தலையையும் வெளியிட்டுள்ளது.

வாழ்க ராஜேந்திர சோழன்! வளர்க அவனுடைய பண்பு!

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' – 26



In a Democracy, the Kings are the People of the Nation, who elect their Government and the Governance is carried out by the Council of Ministers headed by the Prime Minister. The new Government at the Centre elected in 2014 has completed one year and there are lot of debates and analysis in all the media about the performance of the Government in 1 year.

Tiruvalluvar devotes 10 Kurals to deal with the specification of Good Ministers and Ministry and some of which are given below. Our present PM scores well in many of the qualities specified by Tiruvalluvar like Fearlessness, manly exertion, addressing the welfare of people, positive expressions, powerful in speech fitting the occasion and so on.

Vankan Kudikaththal Katrarithal Aalvinaiyodu
Ayinthudan Mandathu Amaichchu Kural 632

வன்கண் குடிகாத்தல் கற்றறிதல் ஆள்வினையோடு
ஐந்துடன் மாண்டது அமைச்சு குறள் 632

"Fearlessness, attention to the welfare of people, study, resolution and manly exertion; these five make the qualification of the councilor."

Therithalum Therntthu Seyalum Oruthalaiyach
Chollalum Vallathu Amaichchu Kural 634

தெரிதலும் தேர்ந்து செயலும் ஒருதலையாச்
சொல்லலும் வல்லது அமைச்சு குறள் 634

"Judgement in the choice of Projects and the means of their execution and positiveness in the expression of opinionate necessary qualities in the councilor."

Aranarinthu Aandruamaintha SollanEn Gnandrum
Thiranarinthan Therchchith Thunai Kural 635

அறன்அறிந்து ஆன்றுஅமைந்த சொல்லான்எஞ் ஞான்றும்
திறன்அறிந்தான் தேர்ச்சித் துணை.
குறள் 635

"Behold the man who knoweth the law and aboundeth in instructions, is deliberate in his speech and always understandeth what is fit for each occasion; he is the councilor for thee."

HOME FESTIVALS – 7

ஆடி - Adi (July/August)

There are two major home festivals this month. The first is Adi-Perukku, in honour of the Kaveri River. Women and girls go to the nearest river where they place offerings on a bamboo tray (upper left) into the water, then have a feast upon the riverbank. Varalakshmi Vratam ("Vow to bring Lakshmi") is also a ladies' festival, in which paintings of the Goddess of Wealth are made upon the walls (upper right), kumbha pots intended for worship are decorated with Her image. Beside the pot are placed various cosmetics, comb, beads, etc and worship is done. Then the ladies sing songs inviting the Goddess to their home. Kozhukkatai, rice and jaggery cakes are a favourite of the day. In the evening, friends are invited to the home and given clothing, coconuts and sweets.

(To be continued)

It may be asked: "Why all these elaborate rituals? Will not silent prayer do?" The significance of the ritualistic offerings is that a true devotee acknowledges the ultimate source and the inner substance of these objects of his enjoyment. He uses them only after tendering them to that source in humble gratitude. Since only the best and the purest should be offered to God. (and since nothing should be enjoyed which is not so offered), this practice will ensure that every man will seek and take delight only in such things as can be fit objects for such offering. This will go a long way in making our lives perfect and pure. – ***H.H. SHRI PARAMACHARYA***

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