



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 Email : tncgrade@gmail.com Website : www.teiea.com

ISSUE NO. 140

VOL : No. 12/2017

MONTHLY ISSUE NO. 10

PRIVATE CIRCULATION ONLY

OCTOBER 2017

DEHN PROTECTS.



Lightning risk analysis as per New IS/IEC 62305 Standard

Surge Protection device as per New IS/IEC 62305 Standard

Earthing as per IS 3043 and IEEE 80

Lightning protection design and consultancy

Earthing consultancy site study

Surge Protection requirement study

DEHN + SOHNE is 106 Years old German based company and leaders in the field of

DEHN India Pvt. Ltd Indian subsidiary of

Lightning and Surge Protection

DEHN + SOHNE Germany

Dehn Protects
as per new NBC 2016
(National Building Code)



Look forward to associate esteemed organization like yours and serve better on "Lightning & Surge Protection"

For more Information about DEHN, please visit www.dehn.in.

DEHN India Pvt. Ltd.: Plot 213, Sector 7, IMT, Manesar, Gurgaon (Haryana) - 122 050. Tel: +91 124-4007680. Mobile: 9500006620, E-mail: shaji.s@dehn.in

EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings and Deepavali Greetings to One and All!

The Months of October and November makes us remember Mahathma Gandhi, Sardar Patel and Pandit Nehru, the three great architects of Independent India. Their Birth Days are celebrated respectively on the 2nd October, 31st October and 14th November. It will be appropriate to look at India through the past 70 years with reference to all these three Leaders, as their roles and guidance is the undercurrent even now for our country's growth. **Gandhi created an identity and respect for us in the world while taking the Freedom Struggle to its success in 1947.** Though he did not live long enough to guide the 'Free India', he had groomed both Nehru and Patel to lead the Nation. Patel, **'The Iron Man' completed the task of creating a united and strong India and unfortunately died soon in 1950.** Nehru had the **Vision, Courage and the Stature to take the country forward laying a strong foundation of Secular Democracy and a Non Aligned Independent Nation of the World, commanding respect and support from all over the world.** Being very conscious about the Glory and the Heritage of India including the fact that India was one of the top two economies of the World till about the late 18th Century, Nehru planned large Dams, Fertilizer Plants, a number of Steel Plants and initiated a large number of Industrial activities like Heavy Engineering, Heavy Electricals and various other projects all over the country. After the Chinese aggression and the Pakistan war, he also went ahead with a large number of Defence Factories like Heavy Vehicles Factory, Small Arms Factories and so on in various parts of the country. All these really laid the foundation for India to become a leading manufacturing hub of the World. This process planned on the basis of various 5 Year Plans took us forward steadily and the progress galloped after the 90s and we certainly are in a strong pedestal today to become a world economic super power soon.

Efforts are on at present to exploit all opportunities to speed up the Economic growth and also streamline our own Governance and simplify and standardize all procedures and taxation to score better on **'Ease of Doing Business'** aspect. This can help improve investments and increase employments. Parallel measures are also on to reduce corruption at all levels which had grown very wildly over the years.

One other area requiring better attention is **'Equitable Distribution of all Waters'** in our country and many plans like interlinking of rivers etc have not yet taken off in a big way, in spite of pressures from the highest courts of our country. Studies say that addressing waters issue can, not only help growth of Agricultural sector but also the Energy sector and all other economic activities of the country.

We thank all those members who have helped us by participating in the advertisement appearing for the issue September 2017 – Galaxy Earthing Electrodes (P) Ltd., Consul Neowatt Power Solutions Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., Universal Earthing Systems Pvt. Ltd., Dehn India Pvt. Ltd., Elmettler, Alfa Switchgear (I) Pvt. Ltd., Supreme Power Equipment Pvt. Ltd., Safvolt Switchgears Pvt Ltd., Ashlok Safe Earthing Electrode Ltd.

EDITOR

	PARTICULARS	PAGE NO.
President : S.D. POONGUNDRAN	Events	4
	Editorial	5
	Contents	6
Secretary : S. GOPALAKRISHNAN	Members Details	7
	Know Thy Power Network – 121	8-10
Treasurer : M. BALAMURUGAN	In 10 years, Renewable sources will dominate half of India's Energy capacity	11-12
	ABB brings reliable power Supply to the Himalayas	13
Editor : G. VENKATESH	Ultrathin device Harvests Electricity from Human motion	14-15
	New bladeless Wind Turbine claimed to be twice as efficient as conventional designs	15
Advisor: S. MAHADEVAN	New World efficiency record with Perovskite Solar cells	16
	World's largest Electric vehicle will generate more Electricity than it uses	17
Printer : M. VENKATARAMAN	A bittersweet Milestone for the World's safest Nuclear reactors	18-19
	US Scientists achieve 21.7% efficiency with new Perovskite design	19
No part of the material protected by this copyright notice may be reproduced or utilised in any form or by any means, the electronic or mechanical including photocopying, recording, or by any information storage and retrieval systems, without prior written permission from the copyright owner.	Danfoss India opens a Rs.500 cr manufacturing facility in Oragadam, Chennai	20
	California's big battery experiment: a turning point for the Energy Storage?	21-22
	A rooftop Farmers rises with Rice	22
	Thermal Energy storage a budding HVAC option	27-29
	The Solar revolution is reaching the remotest parts of the World and changing the lives of Women otherwise trapped in poverty	29-30
	Tata Motors electric bus pilot run commenced in Chandigarh	31
	Energy, Electrical Energy and Renewable Energy-1	32-34
	Shree Gopalkabra has taken on as the role of the President of the Association, for the year 2017-18	34
	Book List	35
	7 Short stories shared by Satya Nadella, CEO-Microsoft	36
	The Seven Wonders of the World	36
	Entrepreneur – V.K. Bansal	37
	Humour	37
	Top 10 Major Dams of India – 4	38
	அறநீர் – சிறுகதை	39-40
	Effort	40
	நோய்களை விரட்டும் முருங்கைக்கீரை	41
	புரதச் சுரங்கம் - 3	42-43
	Tirukkural and Management in a 'Nutshell' – 54	44
	Home Festivals – 11	44
	ADVERTISEMENTS	PAGE NO.
	Alpha Associates	2
	Ashlok Safe Earthing Electrode Ltd.	46
	Consul Neowatt Power Solutions Pvt. Ltd.	25
	Dehn India Pvt. Ltd.	1
	Elmetlerr	3
	Galaxy Earthing Electrodes Pvt. Ltd.	23
	K Dhandapani & Company (Chennai) Pvt. Ltd.	45
	Power Cable Corporation	26
	Supreme Power Equipment Pvt. Ltd.	24
	Universal Earthing Systems Pvt. Ltd.	48
	Wilson Power and Distribution Tech. Pvt. Ltd.	47

YOUR CONTRIBUTION TOWARDS NEWS LETTER

(A) FOR BLACK & WHITE ONLY

1. Full Page (Per Issue)
Rs. 2500

(B) FOR FOUR COLOUR PRINTING

1. Full Page (Per Issue)
Rs. 5000

Same Size Positives
CD/Zip
to be supplied
by the Advertiser

Demand Draft be drawn in favour of the "Tamilnadu Electrical Installation Engineers' Association 'A' Grade" payable at Chennai

DISCLAIMER: Readers are requested to verify & make appropriate enquiries to satisfy themselves about the veracity of an advertisement before responding to any published in this **NEWSLETTER**. The printer & Tamilnadu Electrical Installation Engineers Association does not vouch for the authenticity of any advertisement or advertiser or for an advertiser's products and or Services. In no Event can The Printer & Tamilnadu Electrical Installation Engineers Association be held responsible / liable in any manner whatsoever for any claims and / or damages for advertisements / articles in this **NEWSLETTER**. **In any Manner we don't vouch for any reach and response.**

MEMBERS DETAILS

S.No.	Company Name	District	Contact No.	License No.
31.	Dhanalakshmi Enterprises	Chennai	044-42088553, 94441 88553	EA 1831
32.	EA Facilities Services P. Ltd	Chennai	044-26645458, 98403 27419	EA 2983
33.	Elco Engineering P. Ltd	Chennai	044-24914738, 92821 16344	EA 1462
34.	Elecproj India	Chennai	044-24852230, 98407 90077	EA 1859
35.	Electro Mechanical Engineers	Chennai	044-24984887, 94980 27093	EA 2117
36.	Electro Rak India Pvt. Ltd.	Chennai	044-24991277, 87545 09123	ESA 349
37.	Elneed Technologies Ltd	Chennai	044-24491595, 94449 76737	EA 2045
38.	Elsytech Engrs. & Consultants P. Ltd.	Chennai	044-23719002, 94449 54745	EA 2332
39.	Emaar Electricals	Chennai	044-23741902, 98409 36400	EA 1212
40.	Eskay Enterprises	Chennai	044-23661051, 94440 63691	EA 1764
41.	Ess Enn Power Controls P Ltd.	Chennai	044-26512296, 72999 09466	EA 2122
42.	Essar Electricals	Chennai	044-43538542, 98406 28053	EA 2396
43.	Esswin Electro Controls P. Ltd.	Chennai	087555 13755	EA 2911
44.	Ess Yen Electricals P. Ltd.	Chennai	044-28141721, 98410 26136	EA 2095
45.	Excellent Power Engineering Services	Chennai	94443 82546, 72990 65008	EA 3071

OBITUARY



(19.04.1952 - 13.09.2017)

*On behalf of
The Tamilnadu Electrical Installation
Engineers Association 'A' Grade
extends **Heartfelt Condolences**
for the demise of Our
Thiru. N. Thiruwazhimarphapillai,
Retired Chief Electrical Inspector
Government of Tamilnadu.*

*We pray the almighty
to rest his Soul in Peace.*



KNOW THY POWER NETWORK - 121

Let us move further. Safety of the people shall be the highest law says CICERO. Do we follow this golden law in our day-to-day life? You are the better judge; please give your ruling. My simple answer is a “Big No”. We never follow this golden rule in our life. It is because we value our “asset” (this includes our devices, equipment system and other things which provide comfort to us) more than our lives. In a sense, we invariably give secondary importance to “Safety”. This attitude of ours make us vulnerable or expose us to all kinds of problems associated with electrical energy (Electrocution, fire accidents and damages to our assets that include equipment / devices).

Among the areas that exist in our vicinity and emit danger signals are,

1. Switchyards of power stations, Substations and Distribution Transformers stations and their earthing arrangements that include “Fencing”.
2. Transmission Towers and Distribution Lines including their supporting structures like stray wires and UG cables.
3. Snapped or broken HT and LT lines and UG cables
4. Lightning conductors and their associated earth pits in a building.
5. Metering points in our premises.
6. Over loaded plug sockets, equipment and devices in our premises.
7. Use of defective equipment / device
8. Poor wiring, inadequate earthing arrangements.
9. Poor crimping or termination works; joining of aluminium and copper cables / wires without using bimetallic clamps

Power Station / EHV, HV Substation Premises

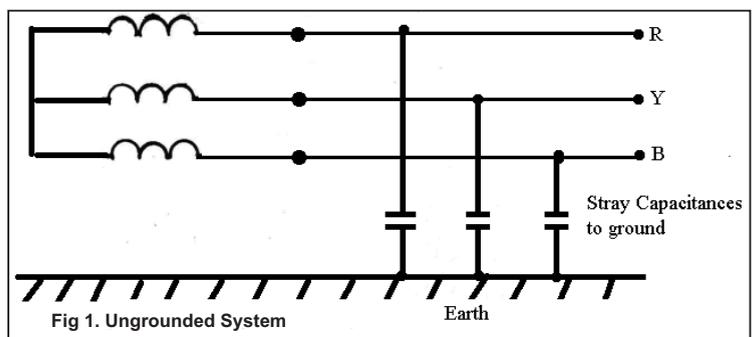
These are highly dangerous areas. It is mainly because of the large quantum electrical power and the associated heavy fault currents in the grounding system of these station. Please note that on these locations nearly 90 percent of high potential difference exists between the grounded apparatus and the earthing system and it may appear within the reach / stride of the human being / animal who enters there at any time. Moreover, because of its high frequency components, the lightning grounds always present themselves as potential danger zones. The potential drop per foot or between the feet of any person will be of high value in these stations.

Presently the details of one of the danger area are have been given as an illustration. It does not mean other cases are less significant. They are not given wide coverage here because the dangers associated with them are well known to all.

Now let us learn the merits and demerits of a few grounding systems currently in practice.

I. Ungrounded System

This system is preferred when the expected ground fault currents are small and the places where the continuity of electrical supply is essential (eg Power stations). In this system, as the neutral is not grounded, its phase angle can freely move under normal operating conditions and balanced loads, phase-to-ground voltages are equal in magnitude and separated by 120° . Then there is no voltage difference between the neutral and the ground. During single line-to-ground faults, the majority of the fault moves from the source and the fault current flows through the fault location and finally returns back to the source through the systems stray capacitances.



In this case (a) the magnitude of the ground fault current depends on (i) Faulted feeder parameters (ii) System stray capacitance (L-G Capacitance) (The return path of the ground fault current is decided by the L-G Capacitance of unaffected (healthy) phase and the unaffected phases of all other feeders connected to the same power transformer)

(b) There will be high voltage use on the other unfaulted phases (from phase-to-ground to phase-to-phase levels). The insulation levels of the feeders should be high enough to accommodate this voltage increase. This leads to increased cost. This is the main demerit of this system. Among its other disadvantages are, the fault current are normally do not self-extinguish and present themselves as arcing grounds. When the capacitance currents are high, the intermittent arcs formed cannot be extinguished. All these will lead to high frequency oscillations with the attended very high voltages (several times the rated voltage of the system). Fundamental (50Hz) frequency voltage rises on the healthy phases; single phase-to-ground fault can develop into phase-to-phase faults if a second phase to ground fault occurs. Then very high ground fault currents will occur.

II. Solidly, Multi-grounded System

Its schematic is depicted in Fig.3

It is widely adopted; It facilitates the supply of three and single phase loads. Phase-to-ground faults do not excessively affect voltage on the other two unfaulted phases since the neutral is solidly grounded and it can shift itself duly in the case of higher grounding resistances. No doubt, through ground fault currents are experienced but most of these return back to the source through the neutral conductor / ground wire and not higher ground. This helps to avert higher touch and step voltages in a power station / HV sub-station switchyards. The magnitude of the ground fault current mainly depends on the system voltage faulted, feeder parameters and the grounding resistance. However these currents are independent of the rest of the system. The possible protection against ground faults are simple and inexpensive and reasonably quick. Main disadvantage of this system lies in the fact that the ground fault should be cleared as quickly as possible otherwise it may lead to severe damages of the equipment and the associated structures.

III. Resonant grounded System

In this method, the transformer neutral is grounded through a reactance, (a coil called Peterson coil). The reactance of this coil is resonantly tuned to the fundamental frequency of the system. To compute the reactance of this coil, the stray capacitance of all feeders are considered with that of the transformer. This system is generally followed in Europe.

In the event of an earth fault (Fig 5) the reactance and stray capacitance will cause the same amount of fault current to flow in opposite directions through the fault leading to the cancellation of each other and finally ends in a very small fault current i.e. a very small amount of fault current flows through the fault and a major portion

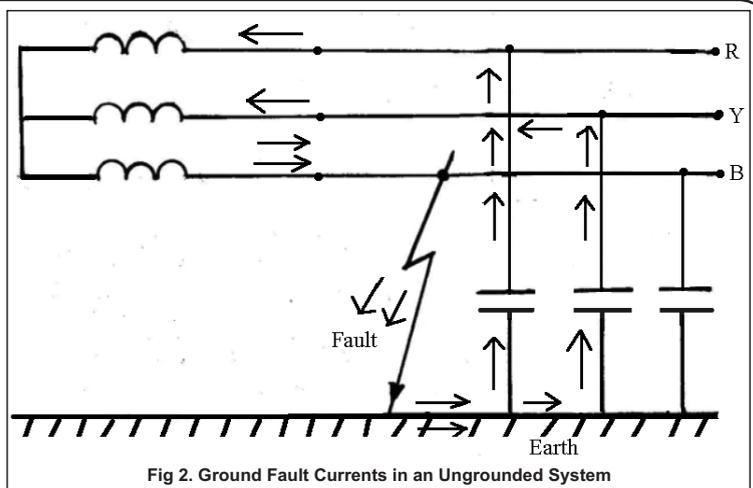


Fig 2. Ground Fault Currents in an Ungrounded System

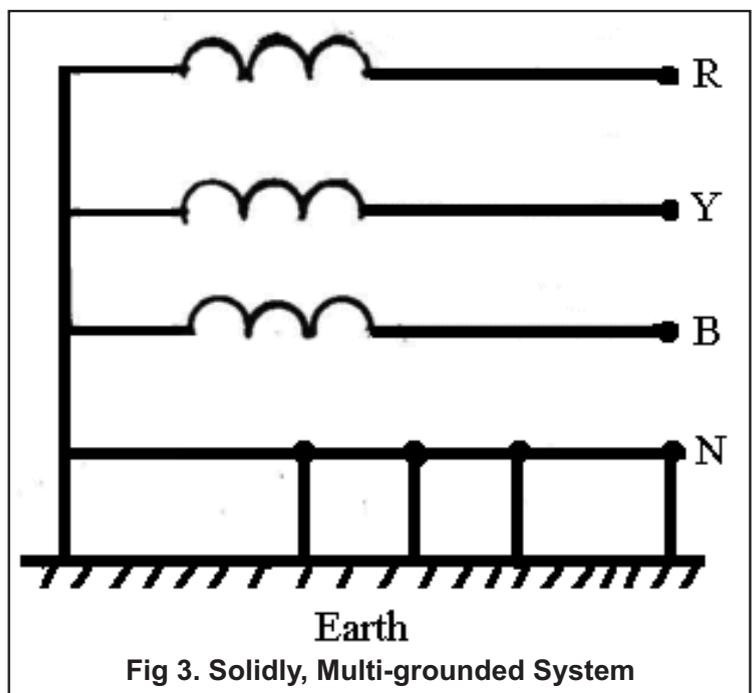


Fig 3. Solidly, Multi-grounded System

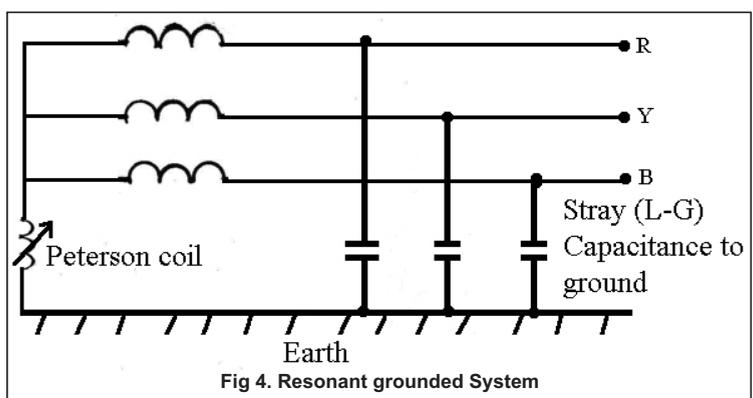


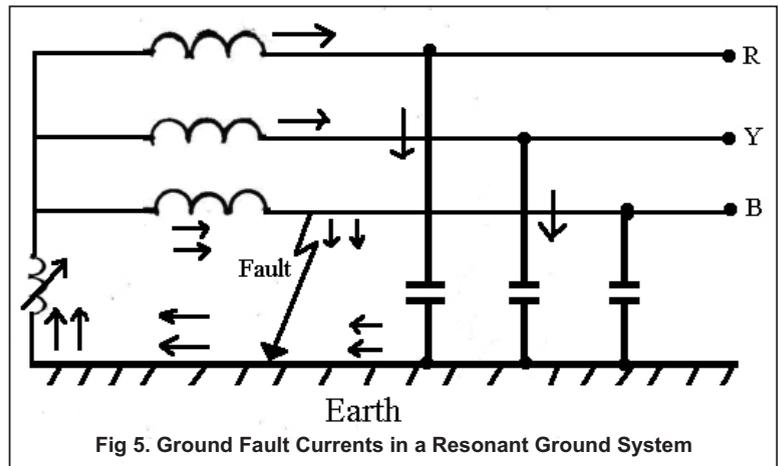
Fig 4. Resonant grounded System

of the fault current returns to the source through the reactance.

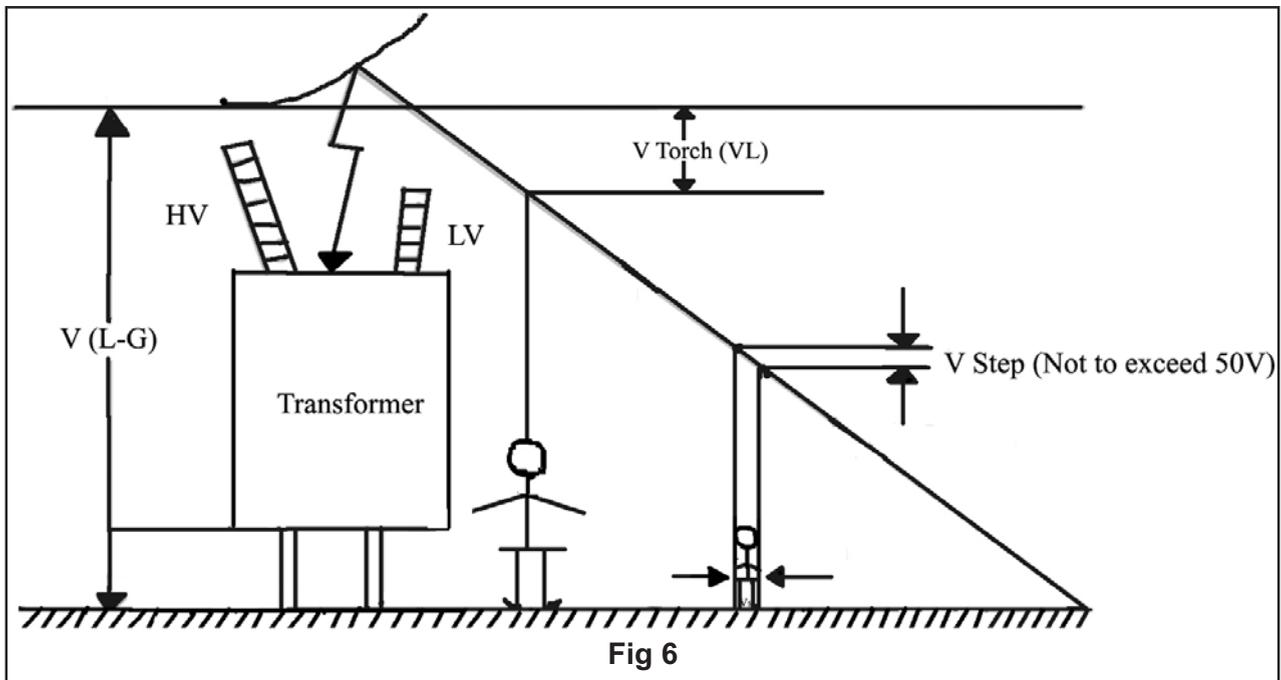
The merits of this method are,

- Ground fault currents are small
- Arcs are self extinguished
- Touch and step potentials are small
- Intermittent ground faults are avoided

Its demerits are phase-to-ground voltages will be high during line-to-ground faults. It mainly due to the introduction of the reactance (Peterson coil) in the neutral. Surge arrester protective levels are required to be kept at higher levels; insulation of the equipment has to be increased because of the neutral shifting during transients. This method is not effective in the case of arcing cable faults. (cable capacitance cannot be easily tuned).



A schematic showing touch and step potentials experienced in a switchyard is given below.



By this time, you would have reasoned out the wide application of the layers of 4" blue granite stone pieces (blue metals) in the switch yards of power stations and EHV and HV substations. If you cannot find out the reason, let me specify. These blue metal layers are mainly provided to reduce the “step and touch potentials” in the switchyard and also to provide an “insulated platform for the operating personnel”. Thus the crushed stone layers are mainly used as a part of safety measures. These are not to stop the movement of snakes or for the quick cleaning transformer oil leaks. These are totally false views / wrong perceptions held by commoners. I think by now, you have got the correct information.

Ok let me sign off here.

In the next article, let us probe into the Human factors of Electrical Accidents.



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

IN 10 YEARS, RENEWABLE SOURCES WILL DOMINATE HALF OF INDIA'S ENERGY CAPACITY

Net Meter

- Net metering is a billing mechanism that credits solar energy system owners for the electricity they add to the grid. For example, if a residential customer has a PV system on the home's rooftop, it may generate more electricity than the home uses during daylight hours. If the home is net-metered, the electricity meter will run backwards to provide a credit against what electricity is consumed at night.

According to reports, non-fossil fuels—renewables, nuclear and large hydroelectric power plants—will account for more than half (56.5%) of India's installed power capacity within the 10 years to 2027, according to a draft of the third National Electricity Plan (NEP3) released in December 2016.

The draft notes that if India achieves its target to install 175 gigawatts (GW, which consists of 1,000 megawatts) of renewable energy capacity by 2022—as it has committed to under the 2015 Paris Agreement—it will not need to install, at least until 2027, any more coal-fired capacity than the 50 GW currently under construction.



The Ministry of Power produces a National Electricity Plan every five years, in which it reviews the progress made over the previous five years, and sets out a detailed action plan for the next 10 with the overarching aim of achieving universal access to electricity across India and ensuring that power is supplied efficiently and at reasonable prices.

NEP3 outlines how the government expects India's electricity sector to develop over the five years from 2017 to 2022, as well as the subsequent five years to 2027.

When the draft was released in December 2016, India had installed just over 50 GW of renewable power capacity, of which wind energy made up 57.4% and solar 18%. This gave renewables a 15% share in India's total installed capacity of just over 314 GW, while coal made up 60%—the remaining being large hydropower, nuclear, gas and diesel.

Renewables will have to scale rapidly to meet a national target set in 2015 to increase capacity to 175 GW by 2022—100 GW from solar, 60 GW from wind and the remainder from sundry smaller sources such as biofuels and biomass.

NEP3 projects that not only will the 2022 target be achieved, renewable power capacity will reach 275 GW in 2027. This is three times the projection made in NEP2, of 70 GW, and significantly more ambitious than publicly proclaimed targets.

Comparing NEP3 with India's Intended Nationally Determined Contribution (INDC) under the Paris Agreement reached at the 21st Conference of Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 shows a higher level of ambition to reach a low-carbon economy faster.

In its INDC, India had said it planned to achieve 40% cumulative installed capacity from non-fossil fuel-based energy resources by 2030.

NEP3 is significantly more upbeat, predicting that non-fossil power will make up 46.8% of total installed capacity by 2021-22 and 56.5% by 2027–10 years from now. If the NEP3 target is met as per the projected timelines, total installed renewable capacity in India will surpass coal-based capacity sometime around 2024. Such ambitions are underpinned by the rapidly changing economics of wind and solar, whose price is falling rapidly. In February 2017, solar power was auctioned at a record low of Rs 2.97-Rs 2.979 per kilowatt-hour (kWh). Soon after, in auctions for wind power projects in March 2017, the winning bid quoted an all-time low price of Rs 3.46/kWh. Solar and wind are expected to reach grid parity—when they cost as much as conventional power—in the near future, perhaps as early as next year, as India Spend reported on 28 January 2017.

As for other zero-emission sources like nuclear and large hydropower, NEP3 projects an addition of 7.6 GW of nuclear and 27.3 GW of large hydroelectricity capacity up to 2027, up from 6.7 GW and 44.4 GW of hydro installed as of March 2016, as ongoing and approved projects come online during 2017-22.

While expecting renewable capacity to surge, NEP3 says no new coal-based capacity addition is required for the 10 years to 2027 beyond the 50 GW under different stages of construction and likely to come online between 2017 and 22.

As per NEP3 projections, the 2022-27 period would require an addition of about 44 GW of coal-based capacity to meet projected demand, a requirement that would be adequately met by the 50 GW that will come online during 2017-22. This leaves India with 6 GW of extra capacity.

The NEP’s projections for coal are different from India’s INDC, which suggested the country would require 100 GW, and perhaps as much as 300 GW, of additional coal-fired capacity by 2030.

The downgrading of coal expansion is not unexpected because rapid expansion of renewables means fossil fuel-based power plants are already under-utilized. NEP3 shows the average coal plant load factor—a measure of how much plants are used—has fallen from around 70% to just over 62% in the last four years, an “exceptionally low” level, according to the Economic Survey 2016-17.

While renewable capacity is rising globally, developing countries including India are widely expected to continue using cheap coal.

“Surging consumption of coal in power generation and industry makes India, by a distance, the largest source of growth in global coal use,” the International Energy Agency, an intergovernmental organization that provides key information and statistics about the international oil and energy markets, emphasized in its 2015 India Energy Outlook. It forecast that India would witness massive growth in coal-fired capacity, with 438 GW of cumulative capacity by 2040, assuming India’s power system would quadruple in size to keep up with demand increasing by 5% every year. Currently, India’s grid and distribution companies are in no shape to handle such capacity addition, IndiaSpend reported on 13 April 2017.

NEP3 agrees with the IEA’s projections about growth in India’s coal capacity up to 2022, reflecting the 50 GW of capacity currently under construction, but suggests the IEA’s projections for the post-2022 scenario—made just two years ago—may need to be adjusted downwards.

The current NEP concerns itself with the next 10 years only, but if the current trend of falling renewable power prices continues and India remains committed to cutting emissions—prodded, in no small part, by rising concerns about the health impacts of air pollution associated with conventional power plants—India may well beat IEA forecasts while upholding and perhaps surpassing its INDC.

10 IMPORTANT ONE-WORD LIFE LESSONS

1. The most selfish one letter word “ I ” – <i>Avoid it.</i>	6. The fastest spreading six letter word “ GOSSIP ” – <i>Ignore it.</i>
2. The most satisfying two letter word “ WE ” – <i>Use it.</i>	7. The hardest working seven letter word “ SUCCESS ” – <i>Achieve it.</i>
3. The most poisonous three letter word “ EGO ” – <i>Kill it.</i>	8. The most enviable eight letter word “ JEALOUSY ” – <i>Distance it.</i>
4. The most used four letter word “ LOVE ” – <i>Value it.</i>	9. The most powerful nine letter word “ KNOWLEDGE ” – <i>Acquire it.</i>
5. The most pleasing five letter word “ SMILE ” – <i>Keep it.</i>	10. The most essential ten letter word “ CONFIDENCE ” – <i>Have it.</i>

ABB BRINGS RELIABLE POWER SUPPLY TO THE HIMALAYAS

Upgrade of substations with ABB Ability™ based digital technology in the north Indian state of Himachal Pradesh

ABB will upgrade 20 substations in India's northern state of Himachal Pradesh, located in the foothills of the western Himalayas. The substations will be equipped with the latest control and protection technology to enable future digitalization. The order, placed by the local state utility, Himachal Pradesh Electricity Board Limited (HPSEBL), supports India's Smart Grid Vision and the government's ambition to provide reliable power to the country's most remote regions.

"We are pleased to support India's Smart Grid vision that is vital to meeting its vast and growing electricity needs by providing our latest digital solutions to increase automation and improve the reliability of power supply," said Massimo Danieli, head of ABB's Grid Automation business within the company's Power Grids division. "It exemplifies our commitment to bring reliable power to the people and reinforces our position as a partner of choice in enabling a stronger, smarter and greener grid."

ABB will deploy its Relion® electronic relays for the protection, control, measurement and supervision of power systems at all twenty substations.

Six of the substations will also be equipped with ABB's state-of-the-art MicroSCADA (Supervisory Control and Data Acquisition) system, which will ensure the optimized control and reliable operation of the substation through seamless integration and connectivity between different devices and systems. Both products are a part of the company's ABB Ability™ portfolio of digital solutions and will help turn data insights into actionable intelligence.

A digital substation is a key component to enabling a smarter grid. Digital communications via fiber optic cables replace traditional copper connections using analog signals, increasing safety, flexibility and availability, while reducing cost, risk and environmental impact. Built on the international standard IEC 61850, ABB's world-leading digital substations bring increased reliability, interoperability and real-time performance.

ABB has played an integral part in the development of India's power infrastructure. For example, ABB recently commissioned the Khandukhal substation in the foothills of the Himalayas, which evacuates power generated from rivers in Uttarakhand and integrates it with the national grid.

ABB (ABBN: SIX Swiss Ex) is a pioneering technology leader in electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport & infrastructure globally. Continuing more than a 125-year history of innovation, ABB today is writing the future of industrial digitalization and driving the Energy and Fourth Industrial Revolutions. ABB operates in more than 100 countries with about 132,000 employees. (www.abb.com)



All conventional wisdom has an element of truth to it, but good design requires more than an element of truth - it requires an ensemble of correct assumptions and valid calculations.

- HENRY PETROSKI

ULTRATHIN DEVICE HARVESTS ELECTRICITY FROM HUMAN MOTION

Imagine slipping into a jacket, shirt or skirt that powers your cell phone, fitness tracker and other personal electronic devices as you walk, wave and even when you are sitting.

A new, ultrathin energy harvesting system developed at Vanderbilt University's Nanomaterials and Energy Devices Laboratory has the potential to do just that. Based on battery technology and made from layers of black phosphorus that are only a few atoms thick, the new device generates small amounts of electricity when it is bent or pressed even at the extremely low frequencies characteristic of human motion.

"In the future, I expect that we will all become charging depots for our personal devices by pulling energy directly from our motions and the environment," said Assistant Professor of Mechanical Engineering Cary Pint, who directed the research.

The new energy harvesting system is described in a paper titled "**Ultralow Frequency Electrochemical Mechanical Strain Energy Harvester using 2D Black Phosphorus Nanosheets**" published Jun.21 online by the journal *ACS Energy Letters*.

"This is timely and exciting research given the growth of wearable devices such as exoskeletons and smart clothing, which could potentially benefit from Dr. Pint's advances in materials and energy harvesting," observed **Karl Zelik, assistant professor of mechanical and biomedical engineering at Vanderbilt**, an expert on the biomechanics of locomotion who did not participate in the device's development.

Currently, there is a tremendous amount of research aimed at discovering effective ways to tap ambient energy sources. These include mechanical devices designed to extract energy from vibrations and deformations; thermal devices aimed at pulling energy from temperature variations; radiant energy devices that capture energy from light, radio waves and other forms of radiation; and, electrochemical devices that tap biochemical reactions.

"Compared to the other approaches designed to harvest energy from human motion, our method has two fundamental advantages," said Pint. "The materials are atomically thin and small enough to be impregnated into textiles without affecting the fabric's look or feel and it can extract energy from movements that are slower than 10 Hertz — 10 cycles per second — over the whole low-frequency window of movements corresponding to human motion."

Doctoral students Nitin Muralidharan and Mengya Li co-led the effort to make and test the devices. "When you look at Usain Bolt, you see the fastest man on Earth. When I look at him, I see a machine working at 5 Hertz," said Muralidharan.

Extracting usable energy from such low frequency motion has proven to be extremely challenging. For example, a number of research groups are developing energy harvesters based on piezoelectric materials that convert mechanical strain into electricity. However, these materials often work best at frequencies of more than 100 Hertz. This means that they don't work for more than a tiny fraction of any human movement so they achieve limited efficiencies of less than 5-10 percent even under optimal conditions.

"Our harvester is calculated to operate at over 25 percent efficiency in an ideal device configuration, and most importantly harvest energy through the whole duration of even slow human motions, such as sitting or standing," Pint said.

The Vanderbilt lab's ultrathin energy harvester is based on the group's research on advanced battery systems. Over the past 3 years, the team has explored the fundamental response of battery materials to bending and stretching. They were the first to demonstrate experimentally that the operating voltage changes when battery materials are placed under stress. Under tension, the voltage rises and under compression, it drops.

The team collaborated with Greg Walker, associate professor of mechanical engineering, who used computer models to validate these observations for lithium battery materials. Results of the study were published Jun. 27 in the journal *ACS Nano* in an article titled "The MechanoChemistry of Lithium Battery Electrodes."

These observations led Pint's team to reconstruct the battery with both positive and negative electrodes made from the same material. Although this prevents the device from storing energy, it allows it to fully exploit the voltage changes caused by bending and twisting and so produce significant amounts of electrical current in response to human motions.

The lab's initial studies were published in 2016. They were further inspired by a parallel breakthrough by a group at Massachusetts Institute of Technology who produced a postage-stamp-sized device out of silicon and lithium that harvested energy via the effect Pinter and his team were investigating.

In response, the Vanderbilt researchers decided to go as thin as possible by using black phosphorus nanosheets: A material has become the latest darling of the 2D materials research community because of its attractive electrical, optical and electrochemical properties.

Because the basic building blocks of the harvester are about 1/5000th the thickness of a human hair, the engineers can make their devices as thin or as thick as needed for specific applications. They have found that bending their prototype devices produces as much as 40 microwatts per square foot and can sustain current generation over the full duration of movements as slow as 0.01 Hertz, one cycle every 100 seconds.

The researchers acknowledge that one of the challenges they face is the relatively low voltage that their device produces. It's in the millivolt range. However, they are applying their fundamental insights of the process to step up the voltage. They are also exploring the design of electrical components, like LCD displays, that operate at lower than normal voltages.

"One of the peer reviewers for our paper raised the question of safety," Pinter said. "That isn't a problem here. Batteries usually catch on fire when the positive and negative electrodes are shorted, which ignites the electrolyte. Because our harvester has two identical electrodes, shorting it will do nothing more than inhibit the device from harvesting energy. It is true that our prototype will catch on fire if you put it under a blowtorch but we can eliminate even this concern by using a solid-state electrolyte."

One of the more futuristic applications of this technology might be electrified clothing. It could power clothes impregnated with liquid crystal displays that allow wearers to change colors and patterns with a swipe on their smartphone. "We are already measuring performance within the ballpark for the power requirement for a medium-sized low-power LCD display when scaling the performance to thickness and areas of the clothes we wear." Pinter said.

Pinter also believes there are potential applications for their device beyond power systems. **"When incorporated into clothing, our device can translate human motion into an electrical signal with high sensitivity that could provide a historical record of our movements. Or clothes that track our motions in three dimensions could be integrated with virtual reality technology. There are many directions that this could go."**

Vanderbilt doctoral students Rachel Carter, currently a postdoctoral researcher at the Naval Research Laboratory, and Nicholas Galioto, an undergraduate mechanical engineering student also contributed to the research, which was supported by National Science Foundation grant CMMI 1400424 and Vanderbilt University's discovery grant program.

NEW BLADELESS WIND TURBINE CLAIMED TO BE TWICE AS EFFICIENT AS CONVENTIONAL DESIGNS

When it comes to the future of wind power, one company thinks it looks a lot different than you would expect, and cheaper and more efficient to boot. Saphon, out of Tunisia, is interested in finding partners to mass-produce and market their unique wind energy device, based on their own Zero Blade technology.

According to the company, their zero-blade technology devices are capable of overcoming the Betz' limit, which states that no turbine can capture more than 59.3 percent of the kinetic energy of the wind. An average wind turbine captures only 30 to 40%, while the Saphon turbine is said to be 2.3 times more efficient. Additionally, the cost is expected to be 45% less than a conventional turbine, mostly due to the fact that there are no blades, no hub, and no gearbox on the units. The Saphon Zero Blade technology is different in other ways as well, most significantly being storage of energy. Most of the kinetic energy can be stored (via a hydraulic accumulator) or converted to electricity with a hydraulic motor and generator.



NEW WORLD EFFICIENCY RECORD WITH PEROVSKITE SOLAR CELLS

A recent study, affiliated with UNIST finds key to produce a new cost-efficient way to produce inorganic-organic hybrid perovskite solar cells (PSCs) which sets a new world-record efficiency performance of 22.1 % in small cells and 19.7 percent in 1-square-centimeter cells. This breakthrough comes from a research, conducted by *Distinguished Professor Sang-Il Seok* of **Energy and Chemical Engineering at UNIST** in collaboration with *Professor Jun Hong Noh* of **Korea Research Institute of Chemical Technology** and *Professor EunKyu Kim* of **Hanyang University** who both partook as co-authors of the study. A key feature of this technology is its ability to fix the dominating defect in perovskite-halides, which is known to decrease the photoelectric efficiency. Their results, published online in the June 30th issue of the prestigious journal *Science*, demonstrates that careful control of the growth conditions of perovskite layers with management of deficient halide anions is essential for realizing high-efficiency thin-film PSCs based on lead-halide-perovskite absorbers.

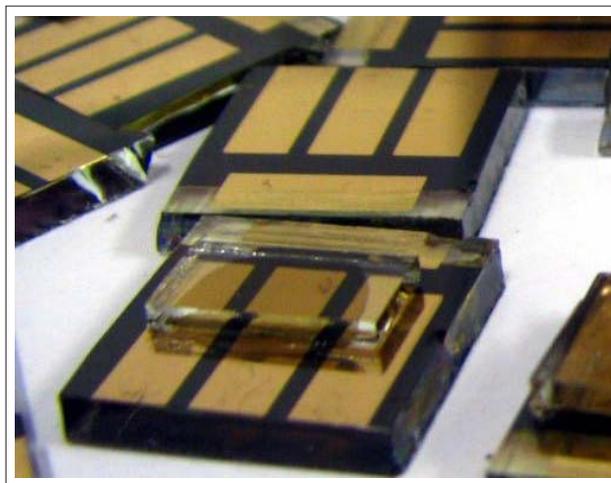
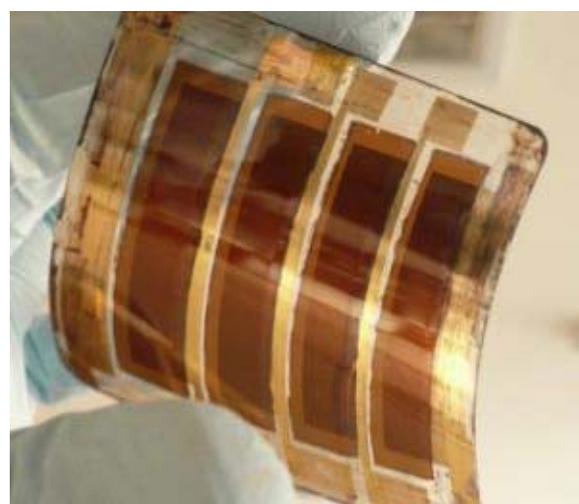
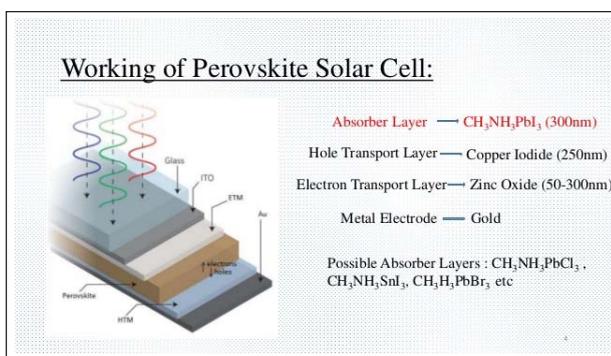
A perovskite is a unique crystal structure, consisting of formamidinium with multiple cations and mixed halide anions. A perovskite solar cell (PSC) is a type of solar cell, which includes the perovskite structured compound, most commonly a hybrid organic-inorganic lead or tin halide-based material, as the light-harvesting active layer.

An organic-inorganic hybrid PSC is a type of solar cell, which includes the perovskite structured compound, as the light-harvesting active layer. Such devices have inspired much research interest owing to their applications in high-efficiency solar cells and light emission. Indeed, these solar cells not only show relatively high photovoltaic energy conversion efficiencies (above 22%), but can be also easily fabricated using cheap inorganic-organic perovskite compounds. The formation of a dense and uniform thin layer on the substrates is crucial for the fabrication of high-performance PSCs. The concentration of defect states, which reduce a cell's performance by decreasing the open-circuit voltage and short-circuit current density, needs to be as low as possible.

The research team reports that careful control of the growth conditions of perovskite layers with management of deficient halide anions is essential for realizing high-efficiency thin-film PSCs based on lead-halide-perovskite absorbers.

In their study, the research team demonstrated the introduction of additional iodide ions into the organic cation solution, which are used to form the perovskite layers through an intramolecular exchanging process, decreases the concentration of deep-level defects. The result showed that the defect-engineered thin perovskite layers enable the fabrication of PSCs with a certified power conversion efficiency of 22.1% in small cells and 19.7% in 1-square-centimeter cells. The energy conversion efficiency of those PSCs with reduced defects is 22.1% and has been officially certified by the National Renewable Energy Laboratory (NREL).

Source: Ulsan National Institute of Science and Technology (UNIST)



WORLD'S LARGEST ELECTRIC VEHICLE WILL GENERATE MORE ELECTRICITY THAN IT USES

A consortium of Swiss companies is working on an electric vehicle project that will never hit public roads, but which could be pivotal for electric mobility, and a gamechanger for heavy industry. The so-called “e-dumper” is being built from a massive Komatsu dump truck that weighs 45 tons when empty and has tires as tall as a person, and although that might initially seem like a strange choice for electrification, its intended usage is expected to produce a net surplus of electricity rather than draw a huge amount of grid power.



The project will capitalize on one of the strengths of electric

vehicles, which is that the electric motors that drive them can also be used to brake the vehicle, which generates electricity. This regenerative braking feature isn't meant to, or able to, fully recharge the vehicle's battery in most cases, but for a big electric vehicle that travels downhill while fully loaded, using the electric motors as brakes and generating electricity, and then travels back up again when empty, it can produce a surprising amount of electricity. In this case, the Swiss e-dumper will generate an estimated 10% surplus with each trip it makes, essentially becoming an “**energy plus**” vehicle instead of a net consumer of electricity.

Although the most visible example of the future of electric mobility is the consumer electric car, the commercial transportation sector and heavy industry are two major areas where transitioning to cleaner fuels will have a big impact on air quality, GHG emissions, and other undesirable consequences of fossil fuels. Electric city buses, trains, semi trucks, delivery vehicles, shuttles, and even airplanes are either already in operation or currently under development, but the news of this particular project caught my attention for another reason. It's an example of a potential application for clean electric drive systems to meet a need that isn't obvious to industry outsiders, and one that could potentially also have a high rate of return in the right locations.

If you've never spent any time around large mines or quarries, it can be hard to visualize how massive some of these mining and heavy industry machines are, and although there are plenty of larger ones than the Komatsu model that will become the e-dumper, this one is still an enormous piece of equipment. When complete, the empty vehicle will weigh a hefty 45 tons (90,000 pounds, or 40,800 kg), and can carry a payload of another 65 tons, which would burn a lot of diesel in a day's work, but this one is outfitted with a storage capacity of 700 kWh in its batteries (said to be the equivalent of 8 Tesla Model S battery packs). The battery packs, which consist of some 1,440 nickel manganese cobalt battery cells, weigh a total of 4.5 tons and will be mounted on the truck's chassis.

In a few months, it's expected that the e-dumper will resume its 20-trip per day task of hauling full loads of material from a quarry on a mountain slope down to cement plant in the valley below, and to then return empty to the quarry for another load. In this application, the truck will essentially be under a heavy load and using the electric motors to brake the entire way down to the lower elevation, which is expected to generate a surplus of 10 kWh of electricity with each roundtrip it takes. Not only will the converted Komatsu HD 605-7 dump truck be able to export electricity to the grid each day, but it will make for a much quieter and cleaner vehicle than anything else on the site.

Of course, all of this is new territory, so any expectations or estimations need to be taken with a grain of salt, and an understanding that this vehicle is essentially a prototype of a retrofitted heavy hauler for a specific location and application (which also happens to remind me of the train battery). The actual results of the harsh conditions and heavy loads and high electrical currents involved in the e-dumper project should also serve to inform and inspire other electric mobility technology development efforts in the industrial and commercial space.

The e-dumper project is being funded by Ciments Vigier SA, but a team of people from two project partners, Lithium Storage GmbH and the Kuhn Group, is working to bring it to life, and the vehicle is currently undergoing the conversion process at Kuhn Schweiz AG. According to Ciments Vigier SA, if the project is as successful as hoped, the company could put 8 of the electric dump trucks to work at its operations in the future.

A BITTERSWEET MILESTONE FOR THE WORLD'S SAFEST NUCLEAR REACTORS

By late this year or early in 2018, two nuclear reactors could start operating in China—an event that might be a lifesaver for the units' crippled builder and designer, Westinghouse Electric Co., and for the technology they represent. Both Westinghouse and its prized AP1000 reactor design have suffered a series of humbling setbacks this year.

The AP1000 is arguably the world's most advanced commercial



reactor. It is designed to passively cool itself during an accidental shutdown, theoretically avoiding accidents like those at Ukraine's Chernobyl power plant and Japan's Fukushima Daiichi. And for over a decade, it has been the presumed successor to China's mainstay reactors, which employ a 1970s-era French design.

Yet after more than three decades of engineering, regulatory reviews, salesmanship, and construction, the AP1000 has yielded zero electricity and plenty of trouble. Delays and cost overruns at the four reactors under construction in China and another four in the United States drove Westinghouse into bankruptcy this March. And in July, South Carolina utilities abandoned their pair of partially built AP1000s—on which they and Westinghouse have spent US \$9 billion. But the Chinese reactors, at the Haiyang Nuclear Power Plant in Shandong and at the Sanmen plant in Zhejiang, could press the reset button for the AP1000 and Westinghouse. And China is where success really matters most because it is the only country building reactors by the dozen. The question, say experts, is what share the AP1000 can capture of a Chinese reactor market that has taken a downturn since the Fukushima accident and may slow even further. Government plans to tie nuclear power rates to wholesale prices for coal-fired power will “definitely mean a slowdown of nuclear power construction down the road,” says Henry Chan, an Asian geopolitics expert at the National University of Singapore who tracks China's nuclear energy sector.

The AP1000's ascent in China began in 2004 when the government launched a rigorous two-year evaluation aimed at selecting an advanced Western reactor design that would underpin its future nuclear sector. The Westinghouse reactor beat out the latest French-German EPR and Russian VVER designs, thanks to its promised blend of safety, affordability via modular construction, and the company's willingness to progressively transfer ownership of the intellectual property to China.

China's domestic nuclear giants, China National Nuclear Corp. (CNNC) and China General Nuclear Power Corp. (CGN), opposed reliance on a Western design. So, in 2009, Beijing launched a new entity, the State Nuclear Power Technology Corp. (SNPTC), to oversee construction of two pairs of AP1000s: the plants at Haiyang and Sanmen.

The Fukushima accident, in 2011, seemed to further cement the AP1000's status as the preferred reactor for the future, with its emphasis on passive safety. However, to seal the deal, Westinghouse and SNPTC needed a completed AP1000 project in order to prove that the design worked and was cost effective. It has been a long wait for the first Sanmen and Haiyang reactors, which were to begin operating in 2013 and 2014.

Post-Fukushima safety inspections and requirements have contributed to the delays, but no more so than design flaws and construction mishaps. In 2015, safety inspectors discovered that the steam pipe exiting one of Sanmen's reactor pressure vessels had been improperly installed.

Meanwhile, water circulation pumps critical to the reactors' safe operation had to be modified after delivery. The massive pumps worked fine under normal conditions. But when the power shut off, their blades stopped spinning—and cooling water stopped flowing—before the AP1000's signature passive cooling could kick in. Such delays mean major cost overruns. The projected cost to complete the AP1000 pair abandoned in South Carolina had spiraled upward from \$10 billion to an estimated \$25 billion. The Chinese AP1000s' ultimate price tag is hard to project. "We know very little about the actual costs. The data sources are pretty opaque," says M.V. Ramana, an expert in international security and energy supply issues at the University of British Columbia, in Vancouver.

What is clear, says Ramana, is that missed deadlines and cost escalation have hurt the AP1000's future prospects. While the AP1000 schedule slid, CNNC and CGN raced to certify their own competing enhanced-safety design.

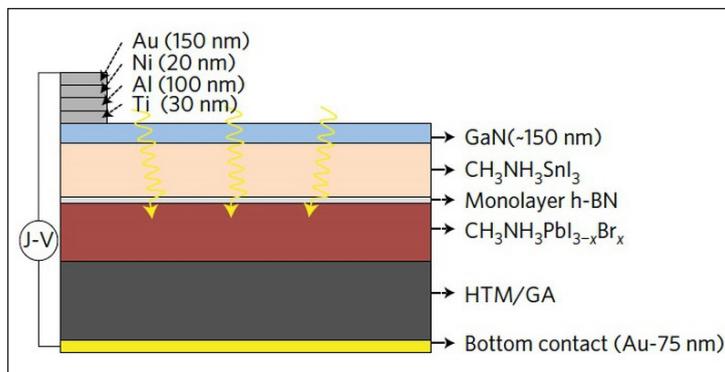
The Hualong One reactor design was certified by China's nuclear authorities in 2014, and construction of the first four units began in 2015 and 2016. Since then, several projects originally slated to feature AP1000 reactors have switched camps.

Westinghouse and SNPTC, meanwhile, have recently shifted strategy, according to the World Nuclear Association. As of May 2017, AP1000s had accounted for over half of the 38 reactors in the advanced planning stages. By August, nearly all of the planned AP1000s had been supplanted by an SNPTC domestic adaptation of the Westinghouse reactor, dubbed the CAP1000.

Regardless of which design dominates, a bigger question remains: How big a piece of China's overall energy sector will nuclear command? Renewable power has eclipsed nuclear in terms of investment and output. And at the current rate of construction, say analysts, China is likely to fall short of its 2020 nuclear generation target. That goal was set at 70 to 80 gigawatts in 2010, then slashed to 58 GW after the Fukushima accident. But even with the completion of all reactors being built as of August 2017—several of which are scheduled to start up in 2021—China's output will be less than 56 GW.

US SCIENTISTS ACHIEVE 21.7% EFFICIENCY WITH NEW PEROVSKITE DESIGN

US scientists have designed a perovskite solar cell that achieves an average steady-state efficiency of 18.4%, with a high of 21.7% and a peak efficiency of 26%. The scientists at the University of California, Berkeley and Lawrence Berkeley National Laboratory use a new technique to sandwich two types of perovskite into a single photovoltaic (PV) cell. The two perovskite solar cell materials, each tuned to absorb a different wavelength or color of sunlight, are combined into one "graded bandgap" solar cell that, the researchers say, absorbs nearly the entire spectrum of visible light. They have succeeded in mating the two materials thanks to using a single-atom thick layer of hexagonal boron nitride between the perovskite layers.



They have succeeded in mating the two materials thanks to using a single-atom thick layer of hexagonal boron nitride between the perovskite layers.

"The efficiency is higher than any other perovskite cell – 21.7 percent – which is a phenomenal number, considering we are at the beginning of optimizing this," said Alex Zettl, senior author of the paper that was published online on Monday. The perovskite/boron nitride sandwich is placed atop a lightweight aerogel of graphene that, among other things, serves as a moisture barrier. The cell is then capped at the bottom with a gold electrode and at the top by a gallium nitride layer that collects the electrons that are generated within the cell, the scientists explain. Perovskite is a promising, inexpensive material for photovoltaics. The UC Berkeley and Berkeley Lab scientists see the first perovskite solar cells potentially going on the market next year. Their cell design is described as a "major advance" in the field.

DANFOSS INDIA OPENS A RS.500 CR MANUFACTURING FACILITY IN ORAGADAM, CHENNAI

Danfoss India, the Indian subsidiary of Danfoss Global, the leader in climate and energy space, inaugurated its new manufacturing, Research and Development (R&D) and administrative campus in Oragadam, Chennai. The plant also includes a solar power plant which will generate 1MW of electricity, sufficient to power 10 % of electricity requirements of the campus.

Taking forward the national appeal to make in India, Danfoss, through its focus on local manufacturing and R&D in the new campus, plans on making India a manufacturing cum export hub for its regional subsidiaries. Danfoss will also be sourcing products from local suppliers, thereby creating ancillary jobs.



“India being a high-growth market for us, we kick started our ‘Make in India’ initiative two years ago having assessed the tremendous potential for growth in the Indian manufacturing sector. We are pleased to commence our manufacturing at the right place and at the right time and believe this will enable Danfoss India operations to become the export hub for Asia-Pacific markets”, said Niels B Christiansen, President and Chief Executive Officer, Danfoss Global.

The in-house 1MW solar park is touted to help generate 1.5 million units per annum. Some of the key features of the campus include energy efficient structural glazing, re-use of construction waste generated, use of recycled material as much as possible, insulated roofs to minimize heat ingress, roofs with natural lighting and a courtyard (2x500 Sqm) inside the administrative building.

The new campus encompasses facilities for research and development, skill development, and product development along with customer application development center and testing labs with a focus on innovation for customised solutions.

The Product Development Centers and Customer application development center will support developing improved energy efficiency applications in Cold Chain and Infrastructure which can be customised to cater to different customers. A dedicated Customer Application Development Centre includes a Psychrometric Laboratory that will help in testing of Danfoss products to gauge its application prowess and thus aid informed decisions.

Danfoss foresees growth opportunities in the cooling sector in India and has identified skill gaps in the industry. **Skill Development Programs of Danfoss such as the *Danfoss Learning Center* within the campus will help facilitate knowledge transfer about Refrigeration and Air-Conditioning and Commercial Compressor products, applications and technologies and services to customers and industry stakeholders. With the Ammonia Training Unit which is an operational demonstration and training ammonia system the company will strive to improve awareness about Ammonia and train in its application as a feasible low GWP refrigerant.**

“With the launch of the new campus, we are keen on revolutionising manufacturing in the country by empowering India to become a hub for energy efficient solutions. Our new campus will focus on refining Research and Development capabilities that will help us serve customers better. It will provide an impetus to customers as local manufacturing will make solutions more cost effective and ensure speedy delivery”, added Mr. RavichandranPurushothaman, President, Danfoss India.

**“Do not follow where the path may lead. Go instead where there is no path and leave a trail.”
- RALPH WALDO EMERSON**

CALIFORNIA'S BIG BATTERY EXPERIMENT: A TURNING POINT FOR ENERGY STORAGE?

The world's largest lithium-ion battery installed after the Aliso Canyon gas blowout has become a test case for the grid storage industry

On a paved expanse next to an electrical substation in Escondido, 30 miles north of downtown San Diego, sits a row of huge silver boxes. The site resembles a barracks, but instead of soldiers, the 24 containers house racks of battery packs. This is the largest lithium-ion battery in the world, according to its developers. When the local grid needs more power, these batteries deliver, almost



instantaneously. They can discharge up to 30 megawatts – roughly equivalent to powering 20,000 homes – and can sustain that level for up to four hours.

AES Energy Storage built the system in less than six months for utility San Diego Gas & Electric (SDG&E) in response to a four-month blowout at southern California's Aliso Canyon natural gas storage facility. The rupture in October 2015 leaked more gas into the atmosphere than any other spill in US history.

After the leak was finally plugged in February 2016, utilities needed a fast-response energy source to deploy quickly in the densely populated areas around Los Angeles and San Diego. They wanted to prevent blackouts during periods of high demand, especially when customers crank up the air-conditioning on hot summer days.

Traditional grid solutions didn't make sense. Gas peaker plants – which can be turned on quickly to meet demand – can take years to gain permission and be built, and they burn fossil fuels. You can't drop a hydroelectric dam in the middle of a city. Solar power doesn't help much in the evening, when summer demand is highest. Instead, utilities Southern California Edison and SDG&E chose something relatively new: grid-scale batteries. What followed was the Escondido battery plus several others totalling about 100MW. The project became a major test case for the grid storage industry's ability to make the grid more efficient and clean. "To go from something that we thought of as kind of the future technology to, all of a sudden, it coming to the rescue so quickly – yeah, I think that's a huge success story," said John Zahurancik, president of AES Energy Storage.

Cleaner energy

A battery can absorb whatever power is available, whether it's from coal, solar or nuclear. The ability to store and discharge power, though, has particular value for regions pursuing high levels of renewable energy. "As more of our electricity starts to come from wind and solar, grid storage can collect extra electricity when the sun is shining and the wind is blowing, and then give it back during still nights when we need it to power homes and businesses," says Sonia Aggarwal, vice president of San Francisco-based consultancy Energy Innovation.

California already gets about 8% of its power from solar and 9% from wind. This month, the legislature is voting on a 100% renewable target; if passed, the opportunity for storage to move that power around will grow.

Grid batteries offer a tantalising longer term application, displacing the gas plants needed to quickly meet peak electricity demand. Batteries like those in Escondido deliver power instantaneously, but unlike a gas plant they emit no greenhouse gases or air pollution on-site. That makes them easy to slip into populated urban areas, where electricity users are clustered.

That ease of gaining permission and of construction made it possible for California to deal with the Aliso Canyon shortfall in months rather than the years needed for traditional gas plant construction. "This is unprecedented speed for power infrastructure – it's unheard of," Aggarwal said. "If future projects can match

this timeline – or even beat it – as grid storage prices continue to plummet, owners of old power plants should be shaking in their boots.”

An industry comes of age

Storage has taken time to catch on. The falling prices of batteries helped, but companies had to build up a track record to earn customers’ trust. In September 2016, Tesla won a competitive bid for a 20MW project near LA for Southern California Edison (SCE); it delivered by the end of the year. Developer Greensmith launched one of the same capacity in Pomona, part of the Aliso project, also in less than four months. Commercialising new battery technology is difficult and capital intensive. But companies that install battery projects have gained enough success to attract attention from corporations with deep pockets.

Just months after finishing its Aliso Canyon project, Greensmith was purchased by Wartsila, a global power equipment company. AES announced in July that it would spin off its storage unit into a joint venture with Siemens. Tesla’s involvement in stationary storage followed its innovation in electric vehicles. Several automaker competitors are following suit, including Mercedes-Benz and BMW.

An ecosystem of home-storage providers has sprung up as well, although that market is hampered by the lack of economic return for homeowners. At the grid scale, utilities can measure the benefits of storage and pay for it. As for the Aliso project, the first summer since installation is drawing to a close and the potential blackouts haven’t been an issue, says DedeSubakti, who directs operations-engineering services at the California Independent System Operator, a non-profit that oversees the flow of electricity through California’s grid. “Energy storage allows us the flexibility to be able to manage what we need,” says Subakti. “[Batteries] became such a part of normal life for us that it’s just like any other resource.”

A ROOFTOP FARMER RISES WITH RICE

Terrace of college employee’s house in Mangaluru yields paddy from grow bags.

A flourishing paddy crop in 200 grow bags has turned the terrace garden of a government employee in Mangaluru into an attraction. **Krishnappa Gowda Paddambail**, who works at the Government College of Teacher Education here, **has been cultivating 30-50 kilos of paddy on the roof of his home in the Maroli area for five years.** He does not sell his produce.

Childhood memories of paddy cultivation at his family’s ancestral farmland near Sullia, and the memory of waiting for hours at a place of worship to procure stalks of paddy for a ritual, made him plant paddy in ten grow bags in 2014. The number of bags increased as his home-made bio-manure gave him bountiful harvests, free from paddy blast fungus and other diseases.

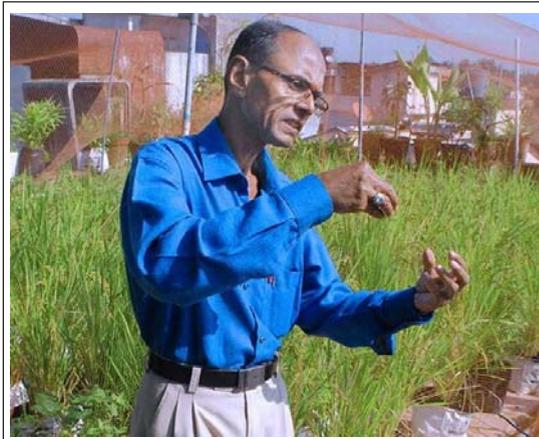
Unlike traditional cultivation, Mr. Paddambail uses water minimally, and his bags of soil mixture, sand and cow dung last four years with careful maintenance. He turns coconut husk into hanging planters. After de-husking, he fills soil and ties up the husk to hang it around the house.

Crop Rotation

The 120-day paddy cultivation cycle begins in April-May and he grows only one crop, distributing the harvest among friends and relatives. **He then uses the same bags to grow radish, a three-month crop. “Last year, I harvested 10 kilos of radish,” Mr. Paddambail says.** He also grows fruits, vegetables and turmeric on his 1,200 sq. ft. terrace. Last year, he got eight kilos of turmeric.

The urban farmer has three grow bags of sugarcane, which he has stopped purchasing for the Ganesha festival. The garden provides drumstick, yam and guavas, too.

Mr. Paddambail’s garden boasts a pomegranate tree, although the coastal region is a non-traditional area for the fruit. The yield is low. “I have been getting five or six fruits for three years. Unlike pomegranates of the dry belts in central and north Karnataka, its taste is very sour. But it makes a good juice,” he says.



Courtesy: The Hindu, dt. 25.09.2017

THERMAL ENERGY STORAGE A BUDDING HVAC OPTION

Thermal energy storage has been a proven commodity for years in Europe, but the technology has seemingly been on the peripheral of the HVAC industry in the U.S. Now, energy storage is gradually stepping into the industry spotlight, and manufacturers are ready and willing to showcase their offerings in this important space. In fact, according to a report published by MarketsandMarkets, titled “The Thermal Energy Storage Market, By Technology, Storage Material, Application, End-User, and Region - Global Forecast To 2022,” the market is expected to grow from an estimated \$3.67 billion in 2017 to \$6.20 billion by 2022, registering a compound annual growth rate (CAGR) of 11 percent from 2017 to 2022.

According to Steve Benz, a 35-year veteran of the thermal storage industry and Evapco’s director of global thermal storage and district energy, the genesis of today’s thermal energy storage market began in the 1980s, years after the Arab oil embargo. In the 1970s, many Americans experienced firsthand the painful vulnerabilities of energy dependence via this event.

Then came the economic boom of the early 1980s, which brought a new set of problems as electric utilities were unable to build power plants to meet surging demand for electricity. Energy rates increased sharply as a result.

Because of significant research conducted by Electric Power Research Institute (EPRI), electric utilities were encouraged to promote the use of thermal energy storage.

WHERE WE ARE

Mike Hopkins, CEO, Ice Energy, said energy storage has only entered the mainstream over the last four years. In that time, the technology has been adopted by businesses, homes, and utilities.

“Now you have policymakers wondering how to make this happen faster because it is so important,” he said. “It’s like what happened with renewable energy. That is the trajectory I see for energy storage generally. It will become more commonly accepted and costs will keep being driven down.”

The mainstream acceptance of energy storage, according to Hopkins, was spurred on by the state of California passing the Assembly Bill (AB) in 2013. Per the California Energy Commission, this legislation “was designed to encourage California to incorporate energy storage into the electricity grid. Energy storage can provide a multitude of benefits to California, including supporting the integration of greater amounts of renewable energy into the electric grid, deferring the need for new fossil-fueled power plants as well as transmission and distribution infrastructure, and reducing dependence on fossil fuel generation to meet peak loads.”

Hopkins said the legislation had an immediate impact there, and the decision got the attention of policymakers across the country. Now, the impact is being felt across the nation.

“Building owners and facility managers are facing mounting pressure to reduce electricity and water consumption to support corporate sustainability and environmental stewardship goals,” said Owen Smith, director of utility and grid solutions, Trane. “These challenges combined with regional water conservation regulations and the uncertainty of future energy prices spurred Trane to invest in thermal storage solutions to help its customers unleash the full potential of their buildings.

“Today, thermal storage systems are mature, cost-effective solutions that provide energy savings and operational flexibility,” continued Smith. “These systems will become increasingly valuable as renewable energy drives changes to the utility grid.”

CURRENT APPLICATIONS

The actual applications for energy storage have changed to a degree over time, but most manufacturers have chosen to expand offerings rather than change them entirely.

“In many ways, applications haven’t changed,” said Benz. “What has changed is related to the electric market — with an emphasis today on sustainable energy production and electricity storage. This has driven media attention. In many ways, its reduced attention on thermal energy storage because it’s considered ‘mature’ technology — it’s not ‘sexy’ anymore. When government dollars aren’t flowing, research and market interest is diverted, and that’s when the best and most viable, sustainable technologies lose.”

Smith said thermal energy storage is a mature, proven solution to sustainably cool a commercial building, and while the technology itself has not changed, Trane has adjusted its controls and schemes to address changes to utility rate structures.

“The increased use of renewable energy has shifted the focus of high-performance design to net zero-energy buildings,” said Smith. “When the sun doesn’t shine, thermal energy storage provides ample energy, which eliminates the need to take load off the grid. As a result, peak utility demands — and costs — can be reduced and properly managed. Trane anticipates this trend will continue across North America.”

Evapco’s latest core product was the Extra-Pak® ice coil technology with elliptical tube design, which was introduced in 1998.

“Since then, we have developed and introduced more advanced controls — like our ice thickness controller — to improve system operation and efficiency,” said Benz. “Our explanation is that the mature technology works and works optimally. This is a positive because the long track record of great performance points to superb, reliable, energy-efficient operation. If it hasn’t changed in all these years, we must be doing something right.”

Ice Energy’s latest offering is the Polar Bear, which provides energy storage for refrigeration.

“There are some changes in the controls [from the Ice Bear versions of the product], and we are adding a certain amount of glycol to water, which allows us to lower the freezing temperature of our thermal battery enough for refrigeration, supermarket displays, or process cooling situations,” Hopkins said. It’s a whole new market segment for us. This will be a new application with a continual demand and not just a seasonal load.”

CONTINUED GROWTH

Manufacturers tend to agree that thermal energy storage is on an upward trajectory with no clear signs of slowing down in the near future.

“If you read different reports about the market, you would consistently see the projections undershooting what actually happens,” said Hopkins. “I don’t know how long it will continue, but we are in a period of exponential growth, and I don’t see that changing over the next few years. This is overdue. I think there are great products coming out at great price points. People understand there are different technologies that have different attributes. Demand will grow, and products will become more optimized to specific applications. You will see continued growth in the market and eventually, years from now, it will level off, but that is a long time away.”

Benz believes demand for Evapco’s technology here in the U.S. will grow as the economy improves and demand for electricity increases.

“We’ve been stuck at less than 2 percent GDP growth in the U.S. for a decade,” he said. “If we achieve the Trump administration’s goal of 4 percent sustained economic growth, we will likely see higher demand for our technology as has been the case for us in places like China.”

Smith highlighted that renewable energy sources, like wind and solar power, are not always available.

“We must find a way to store and conserve it,” he said. This need will drive demand for thermal energy storage solutions in the future. Customers investing in 30-year assets want solutions that work today and can adapt to tomorrow’s modern electric grid.

“Right now, high-performance buildings can install transparent, functional energy storage to store energy when it’s readily available along with the ability to use that stored energy during peak periods,” Smith continued. “Customers want energy savings, cost savings, and the ability to adapt over the equipment’s life while being comfortable and productive.”

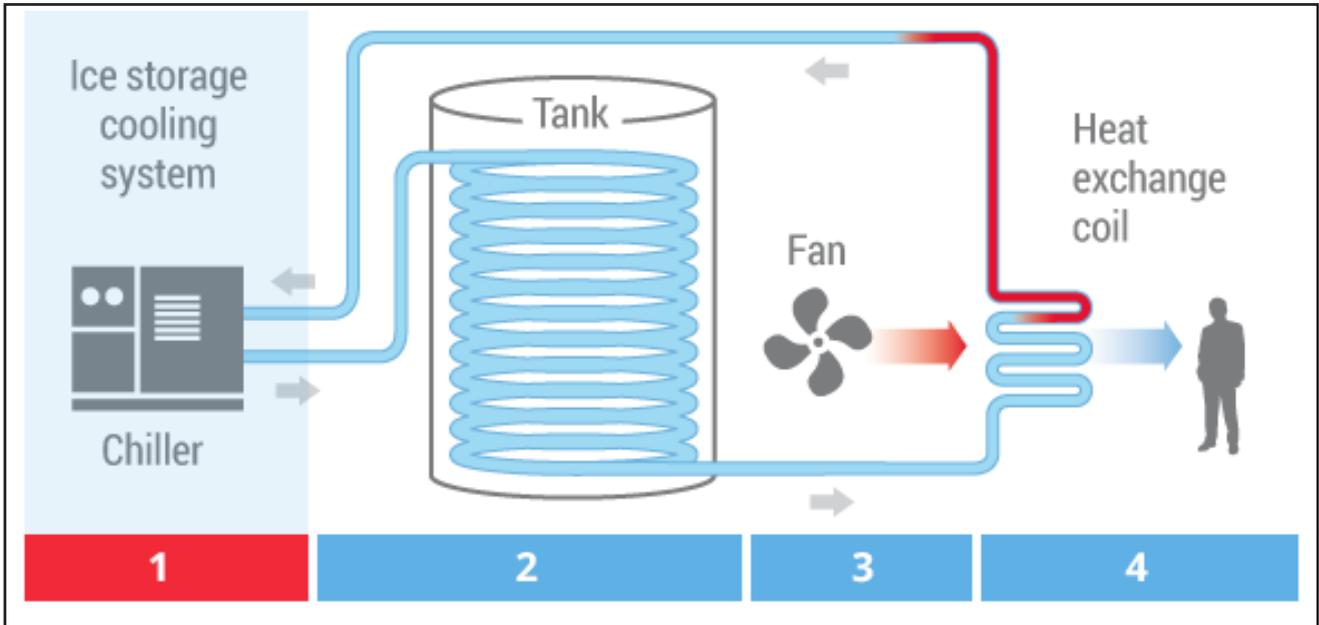
How Thermal Energy Storage Works

Thermal energy storage is like a battery for a building’s air-conditioning system. It uses standard cooling equipment, plus an energy storage tank to shift all or a portion of a building’s cooling needs to off-peak, night time hours. During off-peak hours, ice is made and stored inside IceBank energy storage tanks. The stored ice is then used to cool the building occupants the next day.

Ice at Party, A Simple Metaphor

Imagine holding a party. You’re not likely to make ice the moment people arrive. You couldn’t make it fast enough. You’d buy or make ice ahead of time, store it in your freezer, and use it as needed. The promise of thermal energy storage is similar, with this important stipulation. You still make the ice ahead of time, at night. But, the electricity you use to make that ice, is far less expensive at night than it is during the day.

(Hover over the graphic below to see how thermal energy storage works.)



Step 2

Ice is created uniformly inside the IceBank tank via CALMAC's, counter-flow-heat exchanger tubes. As ice forms, water still moves freely, which prevents damage to the tank. To fully charge an IceBank tank takes from six to 12 hours.

THE SOLAR REVOLUTION IS REACHING THE REMOTEST PARTS OF THE WORLD AND CHANGING THE LIVES OF WOMEN OTHERWISE TRAPPED IN POVERTY

A solar revolution is transforming the lives of women in the remotest parts of Asia. They no longer have to wait decades to be connected to a power grid but are able today to exploit the huge potential of the abundant sunshine.

In societies where women normally play a subservient role and spend much of their time on menial chores, solar businesses are creating a new breed of female entrepreneur who are bringing electricity to their villages.

In the last two years two schemes designed to encourage women to bring the solar revolution to parts of rural India and Nepal have won international **Ashden Awards**, which bring the organisations involved £20,000 (US\$26,360) each in prize money and a lot of guidance to improve and extend their businesses.

The 2017 winner of the Ashden Award for clean energy for women and girls, **Empower Generation**, has enabled 23 women in Nepal to set up clean energy businesses and manage a network of 259 sales agents. They in turn gain a commission on sales of solar panels, lights, clean cooking stoves and water filters.



In a country where all but 12% of women are engaged in farm work, Empower Generation's staff are now able to lead their communities out of energy poverty. Overcoming family and cultural resistance, they are developing leadership skills and setting up businesses employing women and also men as agents.

For customers who have no chance of a grid connection, solar lanterns and solar home systems bring clean electric light and 'phone charging, often for the first time. Even those who are connected to the grid use the products as a back-up during the frequent blackouts, or for attending to crops and animals after dark.

Customers include both local families and NGOs, many of which are working on programmes initiated as a response to the 2015 earthquake.

The scheme is designed to build women's confidence in themselves and their ability to run their own affairs and manage their finances. It also helps reduce the use of kerosene and therefore air pollution.

One of the entrepreneurs, Mina Mahato, said: "I can now balance doing good in my community with running a successful business. I am extremely proud of the sign outside my shop that bears my own name."

Another new businesswoman, Basanti Chaudhary, said: "Before Empower Generation, I was working in a food packaging factory, working long hours and earning very little. I felt like I was swimming in a tiny well. Now I am swimming in the ocean. I have ambitions, and there are possibilities for me."

Distant markets

Some of the businesses have been so successful that their CEOs are now selling many other household items. This success has inspired Empower Generation to expand beyond Nepal, and it has just moved into Myanmar.

The winner of the 2016 Ashden Award for clean energy for women and girls, Frontier Markets, runs an organisation called Solar Sahelis in the Indian states of Rajasthan and Andhra Pradesh.

Sahelis (the name means "solar women friends") had already provided clean, reliable light and energy to 630,000 people by the time it received its award. Its systems are also designed to replace kerosene lights, leaving families more money to buy food and other essentials.

Solar systems make cooking and studying easier, providing brighter, less smoky light than kerosene lamps. Robust long-range torches are particularly popular with women, for moving around outside after dark and checking livestock.

Solar torches are brighter and more reliable than battery-powered ones, and save users from running down 'phone batteries through using mobile 'phones for outdoor light.

Women decide

By the time Frontier Markets received its award 70,000 torches, 45,000 lamps and 12,000 solar home lighting systems had been sold. It estimates that, for around 70% of sales, women make the purchasing decision or are the main users of the products.

The cost of a single light product can be recovered within three to six months, through savings of typically US\$3/month on kerosene and dry cell batteries. Cutting kerosene use reduces greenhouse gas emissions by about 12,000 tonnes/year of CO₂, as well as cutting indoor air pollution and fire risk in homes.

To encourage people to give up kerosene, a Frontier Markets pilot programme gave a discount on a solar product to anyone who handed in a kerosene lamp. Around 50,000 customers took up this offer.

The products are sold with a written guarantee and warranty. Prices range from about \$7.5 for the smallest lamp to \$17 for a long-range torch, and \$100 for a 15W solar home system with two LED lights, fan and mobile phone charger.

These are the latest in a series of Ashden Awards aimed at helping women and girls. Since the Awards were founded in 2001 Ashden has helped more than 200 enterprises around the world, which so far have collectively improved the lives of some 80 million people, saving more than ten million tonnes of CO₂ emissions every year.

– *Climate News Network*

ABOUT AUTHOR

Paul Brown, a founding editor of **Climate News Network**, is a former environment correspondent of **The Guardian newspaper**, and still writes columns for the paper.

TATA MOTORS ELECTRIC BUS PILOT RUN COMMENCED IN CHANDIGARH

Tata Motors has commenced the trial run of its 9 metre electric bus in Chandigarh. The Tata Ultra Electric 9 metre bus will run for a period of 15 days as part of the trial, in collaboration with the Chandigarh Transport Undertaking (CTU) and the State Transport Department. Tata's pilot-run is part of the



city administration's process of introducing electric buses under its Smart City plan.

Tata has said that the Chandigarh trial run is in continuation to the trial of the 9 metre electric bus from Parwanoo to Shimla a few weeks ago. In the previous run, the buses covered a distance of 160 km in a single charge. With respect to the trials in Chandigarh, the automaker said that the initial runs show very encouraging results in a running of 143 km, covering approximately 70 per cent of the charge.

The trials are part of the Ministry of Road Transport's agenda for the electrification of public transport. For the same, Tata Motors is getting ready with its range of electric vehicles, from 9 metres and 12 metres with various seating configurations. There will also be its last mile passenger vehicle - Tata Magic Iris.

Speaking on the commencement of the pilot run, Tata Motors - Engineering Research Centre Head, Dr. AK Jindal said, "Tata Motors is participating in similar trials currently under way in Nagpur, where these buses were flagged off very recently by Union Ministry of Road Transport and Highways and the Government of Maharashtra. These trials are part of Tata Motors larger strategy to be present with its electric vehicle offerings, with best-in-class value proposition, helping the company better understand its customer requirements under different operating conditions, to suitably optimize its offerings. Tata Motors is also working with various study groups formed by the central government to work out various business models for operating electric vehicles and to optimize the overall economics of these buses."

Tata is all set to deliver the first set of the modern, full low floor Hybrid buses to MMRDA (Mumbai Metropolitan Region Development Authority). The approval for commencement of supplies for these buses was recently received from the government body for 25 such buses, making it the single largest order awarded for Hybrid Electric vehicle technology in India.

With the newfound focus towards electric technology, Tata Motors certainly is aiming to capture the market with an early presence. The company has launched the 9 metre and 12 metre Starbus Electric bus, 12 metre Starbus Hybrid bus and has also showcased the futuristic 12 metre Hydrogen Fuel-Cell bus, along with a range of electric small commercial vehicles.

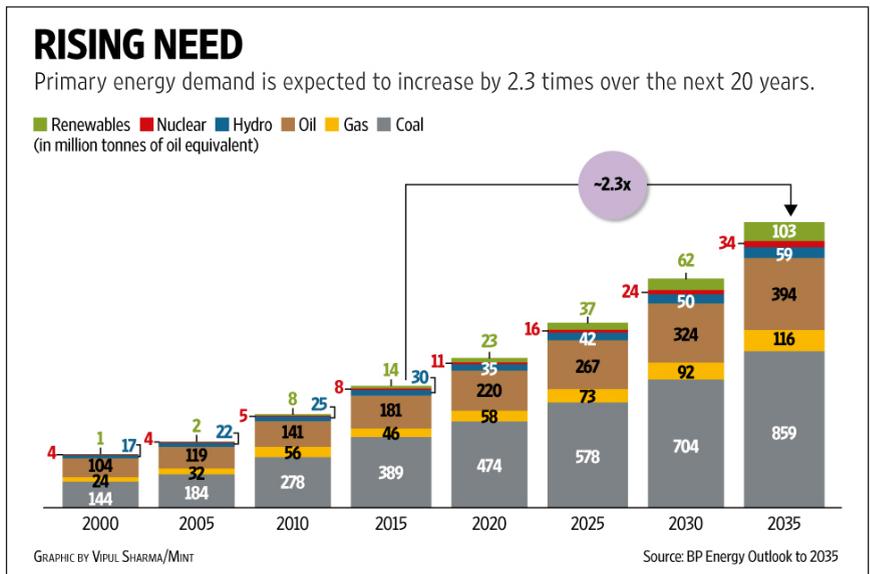
ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 1

Introduction: Economic growth requires more and more of Energy and India as a large and growing economy needs Energy to be sourced in large measure. Some details gathered with regard to present and future demands, from some of the reports are presented in this part. In the present mix of final forms of energy for use, namely Heat, Fuel and Electricity for various applications, Electricity forms almost 60% and this percentage is fast increasing. These energies can be from Renewable or Non Renewable sources and India has a huge potential of renewable energy sources of all kinds like Wind, Solar, Hydel and Bio Energy. As we are aware, India has ongoing plans for tapping more and more of renewable energy sources and technological developments and costs becoming more affordable are also helping increased use of renewable energy sources.

India's economic growth is linked to the fortunes of the energy sector:

India is firmly set on a path of economic growth that is estimated to usher in prosperity like never before. This economic prosperity will need to be built on the back of significant transformations across several facilitating elements, the primary ones being infrastructure build-out, energy availability and sustainability. India's per capita energy consumption currently is almost one-third the global average, and trails far behind the mean figure for the developed world. Our energy consumption is largely based on coal, along with a preponderant dependence on other fossil fuels. Although per capita energy consumption has more than doubled over the past 15 years, almost 240 million people do not have access to affordable energy supply today. Our PM has recently inaugurated a Scheme to address this on priority.

Energy consumption in India has grown at a compound annual growth rate of about 6% during the last decade. *BP Energy Outlook 2035* expects India to achieve the fastest energy consumption growth among all major economies, despite rapid increases in non-fossil fuel production. The total energy consumption is expected to grow by 128% by 2035. Demand for gas is expected to expand by 155%, followed by coal (121%) and oil (118%), while demand for renewables, nuclear and hydro are estimated to rise by 656%, 334%, and 99%, respectively (see chart). Our potential clearly positions us as the leading global driver of growth



in energy consumption in the next 20 years, possibly surpassing China in the process. Even under the most sombre growth scenarios, it is fully expected that India's growth ambitions will lead to a 100% increase in energy consumption, thereby requiring double the existing energy sources.

On the supply side, India is significantly dependent on coal as a primary fuel, which accounts for 58% of the energy consumption in the country. It is estimated that we have one of the largest resource bases of coal, with the policies and gains of the past few years positioning us strongly for the future. It is expected that India will be the largest consumer of coal, equivalent to over 435 million tonnes of oil by 2035. According to current estimates with respect to oil and gas, India is home to only 0.3% of the world's sedimentary basins. Further, we account for a mere 0.3% of the global oil and 0.8% of the global gas reserves. We are, however, blessed with abundant natural resources in the form of sun and wind and Bio Energy. The total wind potential in the country is estimated to be over 30 times the current installed capacity of 27 gigawatts (GW), while our solar potential is expected to grow by about 90 times the current installed capacity of 8GW. Already, the government has an aggressive target of 60GW of wind capacity and 100GW of solar capacity by 2022. India's Bio Energy potentials are also very sizable and unlike Wind and Solar sources which are 'In Firm', Bio Energy sources can help provide 'Firm' Energy and as we understand Bio Energy sources are very largely, wastes from Agriculture, Agro Industries, Plantations, Industries, Animals and Poultry wastes and wastes from human habitations.

Successive governments have embarked on addressing the forthcoming challenge at varying intensities and levels of aggressiveness. There are, however, some structural issues that affect the sector. Firstly, we have successively underpriced our resources, making the economics of the sector unattractive to a large number of serious investors. The energy subsidies over the years have been a major burden to the economy. The total subsidy for 2014-2015 was Rs76,285 crore. The diesel price deregulation and direct benefit transfer of liquefied petroleum gas subsidy coupled with low oil prices, led to a 64% drop in the subsidy burden for 2015-2016, which now stands at Rs27,571 crore. Gas prices in the country have also been fixed by the government based on different regional benchmarks. Domestic prices were reduced by over 50% from \$5.1 per million British thermal units (mmBtu) in November 2014 to \$2.5 per mmBtu for the period between October and December 2016, making the sector unviable for producers, even though the country is in a supply deficit.

Given this scenario, the newly announced pricing regime that promises market prices for natural gas produced from forthcoming fields is a favourable step to attract investment in the sector. While the government has provided support to several segments of our polity at different points in time, the mechanism of delivering such support has been inefficient.

Secondly, past events in the policy and governance ecosystem have created the impression of a less-than-desirable regime of instability and lack of administrative efficiency.

Thirdly, the relative naivety of infrastructure financing in the early years resulted in increased corporate leverage, without commensurate assets to underpin the debt levels, thus putting pressure on stakeholders, including financial institutions.

These three factors, coupled with inefficient underlying processes and systems, have reduced the attractiveness of the sector to investors, whose participation is crucial for us to fulfill our 2035 aspirations.

Our current path of growth and evolutionary reforms is likely to widen the gap between the supply and demand of energy, and has potential to cripple any “aggressive” growth plans. If no significant changes are made to the current trajectory, India might increase the burden on the fiscal front associated with energy independence and sustainability. We will then need to import significantly larger quantities of primary resources to fulfill our growth ambitions. It is expected that India’s energy production as a share of consumption to decline from 57% in 2014 to 54% by 2035, and imports to rise by 153%. The country’s oil imports are expected to increase by 161%. This will account for 52% of the increase in imports, followed in volumetric terms by increases in coal imports by over 122%, and gas by over 301%.

The future of India and its economic growth plans are critically linked to the fortunes of the energy sector. To propel this key primary sector to the next level, we need a combination of bold and aggressive moves, and a “clean up” to bring in more efficiency and effectiveness. The moves need to be comprehensive and coordinated. They must be focused on all aspects of managing the demand side, while fomenting the supply side, ensuring that critical enablers are in place, and firing on all cylinders. Given our requirements, the Indian energy landscape will continue to be a combination of fossil and new energy based solutions over the next 20 years. It will be important to get the balance right.

The key question is, “is it time to get even bolder on renewables”? The present government has certainly made huge strides in achieving our renewables aspirations. Can we be the country that sets the course for a new development model for the energy sector? Can we blaze a new trail by learning from the mistakes of the more developed countries with regards to renewables? Is it possible for us to create a new paradigm for sustainable and viable development of the sector as the core to energy independence? All these would imply significant public and private investments in developing cost-effective technologies for the generation, storage and distribution of energy.

So the main concern here is, “is it better to channel government money earmarked for resource segments toward bets on the future of renewables”? Significant innovation, both in terms of technologies and business models, will have to be made to turn the entire value chain into an attractive proposition. The key is to accelerate the process of building scale, experience, talent and knowledge, in order to help us advance the large-scale viability of the sector by many years.

Secondly, commodity cycles normally go through high and lows. Currently, we are in one such trough. Is it time to make some aggressive moves that secure our fossil-related resources? The prolonged run of lower oil prices afforded the government an opportunity to create an investment fund to help Indian oil and gas companies bolster domestic as well as overseas investments. While some companies are actively seeking overseas

opportunities by leveraging their own financials, we seem to have missed the opportunity for setting up a sovereign oil fund. The basis of this one-time infusion of funds to secure everything from resources to strategic reserves is paramount to our future energy independence. The often-mentioned challenge of “how would we administer such a fund?” is, at best, rhetorical. Our inability to find answers to such administration challenges has laid many a good idea to an early rest.

Thirdly, we must consider complementing our initiatives for supply augmentation with measures that help increase our efficiency in managing demand. These initiatives also need to be supported by policies and regulations like time-of-day pricing, incentives and so on, along with large-scale investment in efficiency boosting technologies across the value chain.

Finally, there is a need to rationalize the energy governance software infrastructure. The existing resource-focused governance structure (coal, oil and gas, renewables, etc.) should give way to a more integrated and comprehensive mechanism. Such a mechanism must help us understand the complex trade-offs, and allocate both human and financial resources with energy independence in mind, rather than just the “oil versus gas versus coal versus renewables” paradigm. The audit and licensing mindset must be replaced with effective measures to drive flexible administrative mechanisms that are more facilitative and supportive.

The future of the economic growth of India is dependent on our ability to leverage energy sources to fuel our ambitions for the sector. A nation that can’t control its energy sources can’t control its future. Securing our energy future is thus critical for India to become a superpower in the future.

(To be continued)

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

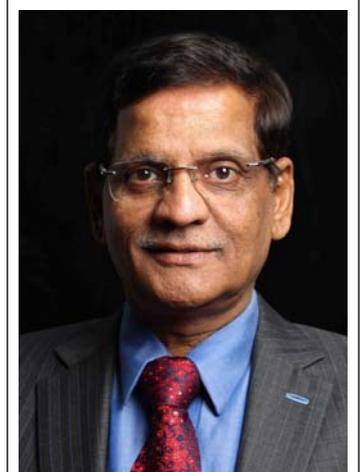


SHREEGOPALKABRA HAS TAKEN ON AS THE ROLE OF THE PRESIDENT OF THE ASSOCIATION, FOR THE YEAR 2017-2018

*Indian Electrical and Electronics Manufacturers’ Association (IEEMA) is pleased to announce that **Mr. ShreegopalKabra** has taken on as the role of the **President of the Association, for the year 2017-2018**. Mr. Kabra, a business leader, philanthropist & global entrepreneur often recognized as a trend setter in the industry, is the **Managing Director and President of RR Global**, a 650 Million USD diversified group of industries focusing mainly on infrastructure & electrical solutions.*

*As the President of IEEMA, **Mr. ShreegopalKabra**, plans to facilitate the growth and sustainability of all 800+ members, proactively engage on behalf of all members with the government and its agencies on issues of concern and challenges faced by the industry. Besides acting as just a voice for the industry, he is particularly keen in undertaking activities **which will help in capacity building of all members and encourage the industry to be more export competitive and growth oriented.***

Talking about the priority areas to focus on in his new role as President IEEMA, Mr. Kabra said, “We will proactively engage on behalf of its membership with the government and its agencies, on issues of concern and challenges faced by the industry and also undertake activities which help in capacity building of our members. Our foremost priority is to encourage the industry to become export competitive & growth oriented, while ensuring safety across the entire value chain. We will strive to bring non-utility centric industry also in the mainstream of IEEMA. We will have an integrated approach with various divisions to effectively represent the industry at various Government Policy & Regulatory bodies and Standards Committees.” Commenting on the appointment, Mr. Sunil Misra, Director General, IEEMA said, “We are glad to have Mr. Kabra leading the Association. His outstanding professional credentials and extensive international experience make him exceptionally well placed to provide leadership to IEEMA at this important juncture. He is very well known in the Industry for his work across Electrical Equipment spectrum and people management.”



MR. SHREEGOPALKABRA

7 SHORT STORIES SHARED

BY SATYA NADELLA, CEO-MICROSOFT

1. LOOKING BACK:

Today, I interviewed my grandmother for part of a research paper I'm working on for my Psychology class. When I asked her to define success in her own words, she said, **"Success is when you look back at your life and the memories make you smile."**

2. LOVE CONQUERS PAIN:

Today, after I watched my dog get run over by a car, I sat on the side of the road holding him and crying. **And just before he died, he licked the tears off my face.**

3. LOOKING BACK:

Today, as my father, three brothers, and two sisters stood around my mother's hospital bed, my mother uttered her last coherent words before she died. She simply said, **"I feel so loved right now. We should have gotten together like this more often."**

4. AFFECTION:

Today, I kissed my dad on the forehead as he passed away in a small hospital bed. About 5 seconds after he passed, **I realized it was the first time I had given him a kiss since I was a little boy.**

5. JOY:

Today, when I witnessed a 27 year old breast cancer patient laughing hysterically at her 2 year old daughter's antics, **I suddenly realized that I need to stop complaining about my life and start celebrating it again.**

6. KINDNESS:

Today, a boy in a wheelchair saw me desperately struggling on crutches with my broken leg and offered to carry my backpack and books for me. He helped me all the way across campus to my class and as he was leaving he said, **"I hope you feel better soon."**

7. SHARING:

Today, I was travelling in Kenya and I met a refugee from Zimbabwe. He said he hadn't eaten anything in over 3 days and looked extremely skinny and unhealthy. Then my friend offered him the rest of the sandwich he was eating. The first thing the man said was, **"We can share it."**

Cheers to life..!

THE SEVEN WONDERS OF THE WORLD

A group of American school children were asked to list what they thought were the present **"Seven Wonders of the World"**.

Though there were some disagreements, the following received the most votes:

1. Egypt's Great Pyramids
2. Taj Mahal
3. Grand Canyon
4. Panama Canal
5. Empire State Building
6. St. Peter's Basilica
7. Great of China

While gathering the votes, the teacher noted that one student had not finished her paper yet. So she asked the girl if she was having trouble with her list.

The little girl replied, "Yes, a little. I couldn't quite make up my mind because there are so many".

The teacher said, "Well, tell us what you have, and maybe we can help".

The girl hesitated, then read, **"I think the Seven Wonders of the World are:**

1. To see
2. To hear
3. To touch
4. To taste
5. To feel
6. To laugh
7. And to love".

The room was so quiet you could hear a pin drop. **The things we overlook as simple and ordinary and that we take for granted are truly wondrous.**

A gentle remainder – that the most precious thing in life cannot be built by hand or bought by man. **Happiness in your life.**

BEAUTIFUL EXPLANATION BY SWAMI VIVEKANANDA ON ASSOCIATION

Explaining the meaning of **'ASSOCIATION'**. He said: "The rain drop from the sky: if it is caught in hands, it is pure enough for drinking. If it falls in a gutter, its value drops so much that it can't be used even for washing the feet. If it falls on hot surface, it perishes. If it falls on lotus leaf, it shines like pearl and finally, if it falls on oyster, it becomes a pearl. The drop is same, but its existence & worth depend on with whom it associates". **Always be associated with people who are good at heart.**



V.K. BANSAL
Bansal Classes



Most inspiring Entrepreneurial success story for a physically challenged person of India and the world! Bansal has made Kota into "Educational Tirath Yatra".

The success story of V.K. Bansal seems something like miracle. A will to survive made him a teacher. And his Courage, Determination and Vision changed the course of fate and gave him a new lease of life.

Results of his students are so encouraging that students from all over India and neighbouring countries are approaching him. The success of his institute is the success of a man, who is handicapped in both his legs. Bansal's life has been full of ups and downs. Bansal was a talented

engineer working at a chemical plant in Kota, Rajasthan. He was bright and cheerful till the age of 25 when in 1975 he developed a physical disease - incurable muscular dystrophy. It was shocking when his efforts to get treatment of the disease failed. In such a situation an advice by communication from a doctor in London, proved to be a boon. The doctor advised him to turn to teaching and forget about the disease. Bansal resigned his position at the Chemical Plant and focused full-time on "Bansal Classes". **It had its humble beginnings in the year 1983 with a single student.** His dedication, sincerity, and hard work in training the students resulted in commendable success by producing the maximum results in IITJEE from Bansal Classes. The number of students selected for IIT after getting his coaching went on increasing from 1986 till date. **Soon the students from Bansal Classes started producing single digit rank and the star came in 2000 when Bansal Classes produced (All India Ranking) 1 from its classroom.** The story continued and history repeated itself year after year. **Bansal Classes has produced more than 12000 IITians from its classroom contact program.** The Institute has "**perfected**" an innovative and integrated approach with the present scenario of globalization.

Bansal Classes have developed the required expertise and skills to prepare each of its students to achieve success by providing knowledge and skill through pioneering efforts and usage of appropriate methodology.

HUMOUR

Computer Analogies...

1. Home is where you hang your @.
2. The email of the species is more deadly than the mail.
3. A journey of a thousand sites begins with a single click.
4. You can't teach a new mouse old clicks.
5. Great groups from little icons grow.
6. Speak softly and carry a cellular phone.
7. In some places, C: is the root of all directories.
8. Oh, what a tangled Website we weave when first we practice.
9. Pentium wise, pen and paper foolish.
10. The modem is the message.
11. Too many clicks spoil the browse.
12. The geek shall inherit the earth.
13. Don't byte off more than you can view.
14. Fax is stranger than fiction.
15. What boots up must come down.
16. Windows will never cease.
17. Virtual reality is its own reward.
18. Modulation in all things.
19. Give a man a fish and you feed him for a day, teach him to use the Net and he won't bother you for weeks.
20. There's no place like your homepage.

TOP 10 MAJOR DAMS OF INDIA - 4

7. Maithon Dam, Jharkhand

Maithon Dam is built on the river of Barakar located at Maithon and is a big dam in **tribal state** Jharkhand. Maithon Dam is one of the most popular dams in Jharkhand and one of the most successful multipurpose projects in India. This dam specially designed for flood control and generates high electric power. There is an underground power station, the first of its kind in the whole of South East Asia. Maithon Dam is the biggest reservoir in the **Damodar Valley**.



Height: 165 ft

Length: 15,712 ft

Type: Concrete cum Earthen dam

River: Barakar River

Location: Jharkhand

Installed capacity: 60 MW

8. Rihand Dam, Uttar Pradesh

The Rihand dam has been built across Rihand River a tributary of Sone river, near Pipri in the Sonbhadra district of Uttar Pradesh. The concrete gravity dam has its maximum height that is 91m. The reservoir made by Rihand dam is known as Govind Ballabh Pant (GBP) reservoir.

Height: 299 ft

Length: 3064 ft

Type: Concrete Gravity dam

River: Rihand River

Location: Uttar Pradesh

Installed capacity: 300 MW



(To be continued...)

அறநீர் - சிறுகதை

அப்பாவிற்ரு ஆரம்பத்தில் இருந்தே வேலை பிடிக்கவில்லை. பன்னிரெண்டாம் வகுப்பு முடித்த போது நான் நர்ஸிங்கில் சேருகின்றேன் என்ற போது கடுமையாக எதிர்த்தார். எனக்கு அந்த சேவை மீது அளப்பறிய ஆவல் இருந்தது. அதே போல, கிட்டதட்ட அதே போல இப்போது இந்த வேலை. சைக்காலஜியில் முதுகலை பெற்றிருந்தேன். அந்த சமயம் தான் இந்த நிறுவனத்தில் இருந்து பணிக்கு அழைத்தார்கள். பணி என்றாலும் இது ஒரு சமூகத்திற்கான சேவை தான்.

“தி சர்வீஸ்” என்ற நிறுவனம் அது. முழுக்க முழுக்க சேவை மனப்பான்மை கொண்ட நிறுவனமா அல்லது லாப நோக்கத்தில் செயல்படும் நிறுவனமா என்று என்னால் கணிக்க இயலவில்லை. பீடிகை இல்லாமல் அது என்ன நிறுவனம் எனச் சொல்லிவிடுகிறேன். *வயதானவர்களை இந்தியாவில் விட்டுவிட்டு அயல்நாடுகளுக்கு செல்பவர்கள் பயன்படுத்தும் சேவை இது.* எங்கள் நிறுவனத்தில் வயதானவர்களுக்கான சகல சேவைகளும் உண்டு. ஈமெயிலில் தங்கள் தந்தை/தாயின் தகவல்கள், வீட்டு முகவரி ஆகியவற்றை கொடுத்துவிடுவார்கள். நாங்கள் தினமும் அவர்களை கவனித்துக்கொள்ள வேண்டும். தினசரிகளை அவர்களே கவனித்துக்கொள்வார்கள். அவர்களுக்கான Emotional Balanceஐ கொடுக்கும் பணியில் தான் நான் அமர்த்தப்பட்டேன். இறுக்கமாக இருக்கும் அவர்களிடம் பேச வேண்டும். ஒவ்வொரு வீட்டிலும் சுமார் ஒரு மணி நேரம் இருந்தால் போதும். மாலை அலுவலகம் திரும்பி அன்று சந்தித்த நபர்கள், அவர்களின் நிலை பற்றி சின்ன அறிக்கையை அலுவலகத்தில் கொடுத்துவிட வேண்டும். இந்த சேவை என்று மட்டுமல்ல அவர்களுக்கு உடல்நல கவனிப்புகள், இதர சேவைகள் (வெளியே சென்று பில் கட்டுதல்) ஆகியவையும் எங்கள் நிறுவனத்தில் உண்டு. வாரத்தில் ஒருமுறை அவர்களின் பிள்ளைகளுக்கு பெற்றோர்களின் நிலை அனுப்பப்படும். எந்தெந்த சேவை தேவையோ அதற்கு ஏற்றார்போல பணம்.

ஆரம்ப நாட்களில் மிகவும் செயற்கைத்தனமாக இருந்தது. அவர்களிடம் செயற்கையாக நலம் விசாரிப்புகள். ஆனால் ஒரு வாரத்திலேயே ஒருவித நெருக்கம் எல்லா பெரியோர்களிடமும் ஏற்பட்டுவிட்டது. ஒதுக்கப்பட்டது என்னவோ ஒரு மணி நேரம் தான் ஆனாலும் கணக்கு வழக்கில்லாமல் அவர்களுடன் செலவழிக்க ஆரம்பித்தேன். அவர்களின் விருப்பங்கள் விசித்திரமாகவே இருக்கும், ஆனால் மிக மிக எளிதானவை தான். தாமோதரன் சாருக்கு அவருடன் வாக்கிங் போக வேண்டும். சரஸ்வதி அம்மாவிற்ரு அவர்களுடன் சில நிமிடங்களாவது தாயம் ஆட வேண்டும். மோசல் தம்பதிக்கு அன்றைய அரசியல் செய்திகளைப்பற்றி பேசிவிட வேண்டும். சின்னச்சின்ன ஆசைகள் தான். சைக்காலஜி படித்திருந்ததால் பேசியே அவர்களின் ஆசைகளை கேட்டுவிடுவேன். ஆனால் சாயர் சார் மட்டும் இதுவரைக்கும் எதுவே கேட்டதில்லை. கேட்ட கேள்விக்கு கூட பதில் சொல்லமாட்டார். எங்களுக்கு ஏற்கனவே பயிற்சி கொடுத்திருந்தார்கள். பெரியவர்கள் காட்டமாக நடந்துகொள்வார்கள், ஆனாலும் பொறுமையாக இருக்க வேண்டும் என்று. சாயரின் மனநிலையை என்னால் புரிந்துகொள்ள முடிந்தது. வழக்கமாக செல்லும் நேரத்தில் எனக்காக 15 மட்டும் போட்டுவைத்து மேஜையில் எனக்காக அமர்ந்திருப்பார். பெரும்பாலான நேரங்கள் தன் மனைவியின் புகைப்படத்தின் முன்னர் அமர்ந்து இருப்பார். எனக்கு இது வேண்டும் அது வேண்டும் என்று கேட்டதில்லை. அவர் பேசினால் அது அனேகமாக கொஞ்சம் மலையாளம் கலந்த தமிழில் தான் இருக்கும் என்பது என் பூகம். அவர்கள் முன் மகிழ்வாக இருந்தாலும், அலுவலகம் திரும்பி ஒவ்வொருத்தர் பற்றிய குறிப்புகள் எழுதும்போது கண்ணீரும் கோபமும் நிச்சயம் வந்துவிடும். ஆயிரம் ஆயிரம் கேள்விகள் அவர்கள் பிள்ளைகள் மீது எழும். ஆனால் அவர்கள் தங்கள் குழந்தைகளை குற்றவாளி கூண்டில் நிறுத்துவதே இல்லை. **“அவர்கள் வாழ்க்கையை அவர்கள் வாழ்கின்றார்கள்”** என்ற தொனியிலேயே அவர்கள் பேசுகிறார்கள். அதுவும் சரி தான் என்றும் தோன்றும் சாந்தா என்னுடைய ஜூனியர். நானும் அவளும் வாரத்திற்கு மூன்று முறையேனும் யாராவது கதையைச் சொல்லி அழுதுவிடுவோம். மெல்ல மெல்ல எனக்கு வெளிநாடு மீது வெறுப்பும் வராமல் இருக்கவில்லை.

அப்பா தீவிரமாக வரன்களை தேடிக்கொண்டு இருந்தார். அவருக்கு மிகுந்த கோபம் என்மீது. கைகூடிவந்த ஒரு வரனை நான் நிராகரித்துவிட்டேன். காரணம் மாப்பிள்ளை போனில் சொன்ன தகவல் தான். **“ரெண்டு பேரும் பாரின் போய் செட்டிலாகிடலாம். நிம்மதியா காசு பார்க்கலாம்” என்பது தான்.**

வாழ்க்கை கவிதைப்போல ஒடிக்கொண்டிருந்தது. ஒரு நாள் மொத்த உலகமும் ஸ்தம்பிக்கும்படியான செய்தி வந்தது. சைக்கிளில் சென்ற அப்பா விபத்தினை சந்தித்தார். ICUவில் சேர்த்துவிட்டார்கள். டாக்டர்கள் எங்கே அடி என்ன ஆனது என்றும் சொல்லவில்லை. யாரையும் பார்க்கவும் அனுமதிக்கவில்லை. வரன் பார்க்கத்தான் எங்கோ போயிருக்கார். அவர் பையில் இருந்த மாப்பிள்ளை போட்டோக்கள் அதையே காட்டியது. அலுவலகத்திற்கு தகவல் சொல்லிவிட்டேன். கையில் இருந்த மொத்த காசும் கட்டிவிட்டேன்.

மருத்துவமனையில் சேர்த்த இரண்டு மணி நேரத்தில் நான் கவனித்துக்கொள்ளும் பெரியவர்கள் எல்லோருமே மருத்துவமனைக்கு வந்துவிட்டார்கள். இதனை நான் எதிர்பார்க்கவேயில்லை. அலுவலகத்திற்கு செய்தி சொன்னதும் அவர்கள் இன்று நான் வீட்டிற்கு நேரடியாக வர இயலாது என தகவல் சொல்லி இருக்கின்றார்கள். எல்லோரும் மருத்துவமனை விலாசம் கேட்டுவிட்டு வந்துவிட்டார்கள். ஒரு சுவாரஸ்யம் என்னவெனில் வந்திருந்தவர்கள் ஒவ்வொருவரும் மற்றவர்களுக்கு அறிமுகம் இல்லாதவர்கள் தான். அவர்களை இணைக்கும் இரண்டு புள்ளிகள். ஒன்று முதுமை மற்றொன்று நான். ICU வாசலில் ஒருத்தருக்கு இவ்வளவு பேரா என விரட்டிவிட்டார்கள். எல்லோரையும் எல்லோருக்கும் அறிமுகம் செய்துவைத்தேன்.

சரஸ்வதி அம்மா ஒரு ப்ளாஸ்கில் 10 எடுத்து வந்திருந்தார். ஆனால் அவர் இத்தனைப்பேரை எதிர்பார்க்கவில்லை. அவர்கள் எல்லோரும் எளிதில் நண்பர்களாகிவிட்டார்கள். தங்கள் கதைகளையும் மருத்துவமனை அனுபவங்களையும் பேச ஆரம்பித்துவிட்டார்கள். தோள் மீது கைப்போட்டு கல்லூரி நண்பர்களைப்போல தாமோதரன் சாரும் மோசஸ் சாரும் பேசுவதை பார்த்ததே மனதிற்கு இதமாக இருந்தது. மருந்து மாத்திரைகள் பழக்கப்பட்டு இருந்தாலும் இந்த ஆஸ்பிட்டல் வாசம் ஏனோ பிடிக்கவே இல்லை.

மாலையில் தான் சாயர் சார் வந்தார். என்னிடம் என்ன விபத்து என்றெல்லாம் விசாரிக்கவில்லை. நேராக ரிப்போர்ட்டுகளை பலவந்தமாக பேசி வாங்கி எல்லா டாக்டர்களுக்கு டோஸ்விட்டார். ஏதோ சொதப்பி இருக்கின்றார்கள். உடனே ICU பரபரப்பானது. என்னிடம் வந்து “ஆப்பரேஷன் உடனடியாக செய்யனும் ஐம்பதாயிரம் கட்டுங்க” என்று சொல்லிவிட்டனர். கையிருப்பு தீர்ந்துவிட்டது. அலுவலகத்தில் கேட்டதற்கு பெரிய ப்ராசஸஸ், இன்று கிடைக்காது என சொல்லிவிட்டார்கள். தோழிகளுக்கு .:போன் அடிப்பதற்குள் சரஸ்வதி அம்மா பில்லை பிடிங்கி பணம் கட்டச்சென்றார். “நாளைக்கு பணம் வந்ததும் கொடுத்திட்டறேம்மா”

“நான் கேட்டேனா?” என்றார் புன்னகைத்தபடியே.

அந்த நொடி தான் உடைந்து போனேன். ஆஸ்பிட்டலில் மனங்களின் மனதினை கமழ்வதை நுகர்ந்தேன். எதற்காக இந்த வேகமான ஓட்டம் என்றே புரியவில்லை. எதனை எதிர்ப்பார்க்கின்றது மனது? இன்னொரு அதிர்ச்சி காத்துக்கொண்டிருந்தது. உடனடி ஆப்பரேஷன் என்பதால் உடனடியாக ரத்தம் தேவை என்று சொல்லிவிட்டார்கள். ரத்தம் கொடுத்தது சாயர் சார் தான். ரத்தம் கொடுத்தவர் மெல்ல நிதானமாக வெளியே வந்தார். காபி வாங்கிச்சென்றேன். வராண்டாவில் அமர்ந்தார். அருகினில் அமர்ந்தேன்.

அவர் என் கைகளைப் பற்றி

“காலையிலேயே, இந்த அப்பாகிட்ட ஒரு வார்த்தை சொல்லி இருக்கலாமில்ல” வழிந்தோடியது அறநீர்.

EFFORT

A ship owner was struggling with engine failure of one of his giant ships. He tried one expert after another, but no one succeeded. He then decided to bring an old man who had been fixing ships ever since he was a kid. The old man came fully prepared and immediately went to work. After looking things over, the old man pulled out a small hammer out of his bag.

He gently tapped something. Instantly, the engine came back to life. A week later, the owners received a bill from the old man for Ten Thousand Dollars.

“What?” the owners exclaimed. “He hardly did anything!”. So they wrote the old man a note saying, “Please send us an itemized bill”

The man sent a bill that read:

1. Tapping with a hammer \$ 2.00
2. Knowing where to tap \$ 9998.00

Effort is important, but knowing where to make an effort in your life makes all the difference

It is not enough to want to make the effort and to say we'll make the effort we must actually make the effort. It's in the doing, not just the thinking, that we accomplish our Goals if we constantly put our goals off, we will never see them fulfilled.

– THOMAS SPENCER MONSON

நோய்களை விரட்டும் முருங்கைக்கீரை

முருங்கை முந் நூறு
நோய்களை விரட்டும் என்பது கிராமத்துப் பழமொழி. நவீன மருத்துவமும் அதையே சொல்கிறது.

அளவில் சிறிய குட்டிக்குட்டி முருங்கைக்கீரையில் மனித உடலுக்கு அவசியமான அத்தனை சத்துகளும் அடங்கியிருப்பதாக அனுபவ பூர்வமாக நிரூபித்துள்ளார்கள். கீரையில் மரத்தில் முளைக்கும் ஒரே கீரை, முருங்கைக்கீரைதான்.

மற்ற கீரைகள் எல்லாம் தரையில் வளரக்கூடியவை. அவை வளரும் சூழல் எப்படி இருக்குமோ என்கிற எண்ணத்தில் அந்தக் கீரைகளை பலமுறை சுத்தப்படுத்திய பிறகே சமைக்க வேண்டும்.



ஆனால், முருங்கைக்கீரை மரத்தில் வளர்வதால், அந்தப் பிரச்சினை இல்லை. ஒரு மழை பெய்த உடனேயே எடுத்து ஒரு முறை அலசி, அப்படியே சமையல் செய்ய வேண்டியதுதான்.

வருடத்தின் எல்லா நாட்களிலும் நமது கைக்கு எட்டிய தூரத்தில் கிடைக்கக்கூடிய முருங்கைக்கீரையை வாரத்தில் மூன்றே நாட்கள் சமைத்து சாப்பிட்டுப் பாருங்கள். வாழ்க்கை முழுக்க ஆஸ்பத்திரிக்கு போக வேண்டிய அவசியமே வராது.

முருங்கை மரத்தின் இலைகள், பூக்கள், காய்கள் என எல்லாமே மருத்துவக் குணங்கள் கொண்டவை. முருங்கைக்கீரையின் சாறு ரத்த அழுத்தத்தை சரியான அளவில் வைத்திருக்கவும், மனப்பதற்றத்தைத் தணிக்கவும் வல்லதாம்.

சர்க்கரை நோயாளிகளுக்கு முருங்கையைப் போன்ற மாமருந்து இந்த உலகில் வேறு இல்லை. சோயாவில்தான் அதிகபட்ச புரதம் கிடைக்கும் எனச் சொல்லி வந்த உணவு ஆய்வாளர்கள் இப்போது முருங்கையை புரதச்சத்துக் குறைபாடுகளுக்குப் பரிந்துரைக்க ஆரம்பித்திருக்கிறார்கள். மனிதர்களுக்குத் தேவையான 20 அமினோ அமிலங்களில் 18 இந்தக் கீரையில் உள்ளது.

மனித உடலால் தயாரிக்கப்பட இயலாத எட்டு வகை அத்தியாவசிய அமினோ அமிலங்கள் அசைவ உணவுகளில் மட்டுமே கிடைக்கும்.

அந்த 8 அமிலங்களையும் கொண்ட ஒரே சைவ உணவு முருங்கைக்கீரை.

ஒரு கைப்பிடி முருங்கைக்கீரையை 1 டீஸ்பூன் நெய்யில் வதக்கி, மிளகு மற்றும் சீரகம் பொடித்துப் போட்டு, தினமும் காலையில் சூடான சாதத்தில் பிசைந்து சாப்பிட, ஹீமோகுளோபின் அளவு பல மடங்கு அதிகரிக்கும்.

குழந்தையின்மைப் பிரச்சினைக்கு முருங்கைக்கீரை மட்டுமின்றி, முருங்கைப்பூவும் மருந்தாகப் பரிந்துரைக்க வேண்டும். நரம்புகளுக்கு அதிக வலு கொடுக்கும்.

முருங்கைக்கீரையில் தயிரில் இருப்பதைவிட 2 மடங்கு அதிக புரதமும், ஆரஞ்சுப் பழத்தில் உள்ளதைப் போல 7 மடங்கு அதிக வைட்டமின் 'சி' கிடைக்கிறது.

வாழைப்பழத்தில் உள்ளதைவிட 3 மடங்கு அதிக பொட்டாசியமும், கேரட்டில் உள்ளதைப் போல 4 மடங்கு அதிக வைட்டமின் ஏவும், பாலில் உள்ளதைவிட 4 மடங்கு அதிக கால்சியமும் உள்ளனவாம்.

மற்ற கீரைகளைப் போல அல்லாமல் காய்ந்த முருங்கை இலைகளிலும் ஊட்டச்சத்துகள் அப்படியே இருப்பதுதான் இதன் இன்னொரு மகத்துவம்.

கொழுப்பை குறைத்து இதயம் காக்கும் பருப்பு
பாசிப் பயறு / பச்சைப் பயறு

பச்சை பயிர் என்று பலரும் எழுதுவதைப் பார்த்திருப்போம். அவர்கள் எழுத நினைத்தது என்னவோ, பச்சைப் பயற்றைப் பற்றித்தான் இருக்கும். ஆனால், தவறாகப் பச்சைப் பயிறு, பச்சை பயிரு என்றோ அது முடிந்திருக்கும்.



மேற்கு இந்தியாவின் ஈரமான தேக்குமரக் காடுகளைத் தாயகமாகக் கொண்டது பச்சைப் பயறு. இன்றைக்கு இந்தியா, பாகிஸ்தான், தென்கிழக்கு ஆசியாவில் அதிகம் விளைகிறது. தெற்காசிய உணவில் பரவலாகப் பயன்படுத்தப்படுகிறது. தமிழக / கேரள எல்லைப் பகுதியில் வாழும் **முதுவர் இனப் பழங்குடிகளின் உணவில் பச்சைப் பயறு முக்கிய இடம்பிடித்திருக்கிறது.**

ஆலிவ் பச்சை நிறத்தில் சிறிய, நீள்உருளை வடிவத்தில் வழுவழுவுவென்று. நல்ல மணத்துடன் இருக்கும். பச்சைப் பயறு காய வைக்கப்பட்டு, தோல் நீக்கப்பட்டு, உடைக்கப்பட்டால் மஞ்சள் நிறத்தில் இருக்கும்.

பயன்பாடு

முழு பச்சைப் பயறு முளைகட்டிப் பச்சையாகவோ வேக வைக்கப்பட்டோ, முளைகட்டாமல் வேக வைக்கப்பட்டோ சுண்டலாகப் பயன்படுத்தப்படுகிறது. பச்சைப் பயற்றை வேக வைப்பதற்குக் கொஞ்ச நெரம் ஊற வைக்க வேண்டும்.

முளை கட்டப்பட்ட பச்சைப் பயறு உப்பு – எலுமிச்சை சாறு கலந்தும் சாலட்டில் சேர்க்கப்படும் சாப்பிடப்படுவது உண்டு. பச்சைப் பயறு மிகவும் ஆரோக்கியமான நொறுவை. ஏனென்றால், தாவரங்கள் வளர வைட்டமின், கனிமச்சத்து, அமினோ அமிலங்கள், பைட்டோ கெமிக்கல்கள் போன்றவை தேவைப்படும் என்பதால், முளைவிட்ட பயறு வகைகளில் புரதத்துடன் மேற்கண்ட சத்துகளும் நிரம்பியிருக்கும்.

ஆந்திரப் பிரதேசத்தில் பச்சைப் பயறு மாவு பெசரட்டு என்ற பெயரில் அடைதோசையாகச் சாப்பிடப்படுகிறது. சீனாவில் நிலவு கேக் மற்றும் இனிப்பு பானம், பிலிப்பைன்ஸில் இறால் வதக்கல், இந்தோனேசியாவில் இனிப்பு, ஹாங்காங்கில் ஐஸ்கிரீம் என்று பல்வேறு வகைகளில் பச்சைப் பயறு பயன்படுத்தப்படுகிறது.

ஊட்டச்சத்து

- இதில் புரதச் சத்தும் அமினோ அமிலமும் அதிகம். உடலுக்குத் தீங்கு பயக்கும் டிரான்ஸ் ஃபேட், சாச்சுரேட் கொழுப்பு இதில் இல்லை.
- உடலுக்கு அவசியம் தேவைப்படும் ஒன்பது அமினோ அமிலங்களில் லைசீன் என்ற அமினோ அமிலத்தை அதிகம் கொண்டது.
- நீரில் கரையக்கூடிய, நீரில் கரையாத நார்ச்சத்தை அதிகம் கொண்டிருப்பதால், சரிவிகித உணவையும் உடலுக்குத் தேவையான ஊட்டத்தையும் பராமரிக்க உதவுகிறது.
- குறிப்பாக இதில் இருக்கும் நீரில் கரையக்கூடிய நார்ச்சத்து. எல்.டி.எல். கொலஸ்ட்ரால் குறைக்கவும் இதய நோய்களிலிருந்து பாதுகாக்கவும் செய்கிறது.
- ரத்தத்தில் மெதுவாகவும் படிப்படியாகவும் சர்க்கரைப் பொருளை இது வெளியிடுவதால், ரத்தச் சர்க்கரை அளவை பராமரிக்க உதவுகிறது.
- பச்சைப் பயற்றை மட்டுமில்லாமல் எல்லாப் பயறு வகைகளையுமே தோலை அகற்றாமல், உடைக்காமல் பயன்படுத்துவதுதான் அதிக ஊட்டம் தரக்கூடியது. ஏனென்றால், தோலில் இரும்புச்சத்து இருக்கிறது.
- காலரா, தட்டம்மை, சின்னம்மையின் போது பச்சைப் பயறு ஊற வைத்த தண்ணீரைக் குடிப்பது உடலுக்கு நல்லதாகக் கருதப்படுகிறது.
- இது எளிதில் ஜீரணமாகக் கூடியது, மலத்தை இளக உதவுகிறது.
- வயிற்றுப் பொருமலையோ, 'காலை'யோ ஏற்படுத்தாது.

தெரியுமா?

பச்சைப் பயறு மாவு அல்லது பயத்த மாவை சருமத்தில் தேய்த்துக் கொள்வது தோலைப் பராமரித்து, நல்ல நிறத்தைத் தக்க வைப்பதற்குப் பயன்படும். சோப்புக்குப் பதிலாகக் குளியல் பொடியாக இதைப் பயன்படுத்தலாம். குறிப்பாகக் குழந்தைகளுக்கும் வயது முதிர்ந்தவர்களுக்கும். தோல் நோய்களைக் கட்டுப்படுத்தும் 'நலங்கு மாவு'

எனும் மூலிகைக் கலவையில், பச்சைப் பயறு சேர்க்கப்படுகிறது.

மருந்தாக...

நோயில் இருந்து மீண்டவர்களுக்கு, பாசிப்பருப்பு சேர்ந்த கஞ்சியும் சாதமும் முக்கிய உணவு.

தலைக்கு எண்ணெய்க் குளியல் செய்த நாளன்று எடுக்கப்பட வேண்டிய பத்திய உணவுகளில் பச்சைப் பயறு முக்கிய இடம் வகிக்கிறது என்பதைத் தேரையரின் 'தைல விதி நூல்' குறிப்பிடுகிறது.

வெப்பம் தணிக்கும் மிகுந்த குளிர்ச்சி தன்மையுடையது. எனவே உடல் சூட்டைக் குறைக்க சிறந்த இயற்கை உணவாகிறது. வயிற்றுப் புண்கள், வாய்ப் புண்களைக் குணப்படுத்த மணத்தக்காளி கீரையோடு சேர்த்துச் சமைக்கப்பட்ட பாசிப்பருப்பு சாதம் சிறந்தது. தசை வலிமையை அதிகரிக்க, நெய் சேர்த்த பாசிப் பருப்பு சாதம் உதவும்.

ஆரோக்கிய நொறுவை: பாசிப்பருப்பை வறுத்து மிளகுத் தூளும், சிறிது உப்பும சேர்த்துப் புரதம் நிறைந்த நொறுவையாகப் பயன்படுத்தலாம். அதேவேளையில், 'மூங் தால்' (Moong Dhal) என்ற பெயரில் பதப்படுத்திகள் சேர்க்கப்பட்டு நெகிழிப் பைகளில் நீண்ட நாட்களாக அடைக்கப்பட்டுவரும் பாசிப்பருப்பு நொறுவையை தவிர்க்கலாம்.

நோயாளிகளுக்கு ஊட்டம்

பச்சைப் பயற்றின் தோலை நீக்கினால் கிடைக்கும் மஞ்சள் நிறப் பருப்புதான் பாசிப்பருப்பு. இது முழுதாகவோ, இரண்டாக உடைக்கப்பட்டோ இருக்கலாம். துவரம் பருப்பு மசியலுக்கு அடுத்தபடியாகப் பருப்பு மசியலுக்குப் பயன்படுவது பாசிப் பருப்புதான். இது சீரகம்,

பூண்டு சேர்த்துத் தாளிக்கப்படுகிறது. பாசிப் பருப்பை வேக வைப்பதற்கு முன்கூட்டியே ஊற வைக்க வேண்டியதில்லை.

எளிதில் ஜீரணமாகக் கூடியது, புரதச் சத்து நிரம்பியது என்பதால் குழந்தைகள், முதியோர், நோயாளிகளுக்குப் பாசிப்பருப்பு பரிந்துரைக்கப்படுகிறது. தமிழகத்திலும் கேரளத்திலும் பாசிப்பருப்பு பாயசம் மிகவும் பிரபலம். உணவின் இறுதியில் இந்த இனிப்பை சாப்பிடுவது, குடல் இயக்கத்தை ஆரோக்கியமாகப் பராமரிக்கும் என்று நம்பப்படுகிறது. பாசிப் பருப்பு வயிற்றுப் புண்களைக் குணப்படுத்தும்.

பயன்பாடு

வட இந்தியாவில் வறுக்கப்பட்ட பாசிப்பருப்பு நொறுவையாகப் பயன்படுத்தப்படுகிறது. மசியல், பொங்கல், பாயசம், இனிப்புப் பூரணம் போன்றவற்றில் பாசிப் பருப்பின் பயன்பாடு அதிகம்.

ஊட்டச்சத்து

இதில் நார்ச்சத்து, கனிமச்சத்தும் அதிகம். கொழுப்பு குறைவு என்பதால் உடல்நலனை மேம்படுத்தக்கூடியது. வயிற்றுப் பொருமலை ஏற்படுத்தாது என்பதால் நோயாளிகளுக்கு நல்ல ஊட்டத்தை அளிக்கும். அதே நேரம் பச்சைப் பயற்றின் மேல்தோல் அகற்றப் பட்டுவிடுவதால் நார்ச்சத்து சற்றுக் குறைந்திருக்கும்.

பாசிப் பயறு / பச்சைப் பயறு

நவதானியங்களில் ஒன்று / வேறு பெயர்கள் : சிறுபயறு, முற்கம்

தாவரவியல் பெயர்: Vigna radiata

ஆங்கிலப் பெயர்: Green Gram / Mung bean / Moong bean

Courtesy: ஆதி வள்ளியப்பன், தி இந்து, 16.07.2016

HUMOUR

Just for FUN; Don't feel offended!

This is crime story. Five friends lived in a room, Namely MAD, BRAIN, FOOL, NOBODY, SOMEBODY.

One day SOMEBODY killed NOBODY. At that time BRAIN was in bathroom, MAD called police.

MAD: Is it police station???

Police: Yes, what is the matter??

MAD: SOMEBODY killed NOBODY.

Police: Are you mad?

MAD: Yes, I'm MAD.

Police: Don't you have BRAIN.

MAD: BRAIN is in bathroom....

Police: you FOOL...

MAD: No, FOOL is reading this joke...

"Be an Indian"

I crossed my street, he asked my caste...

Crossed my district / town, he asked my religion and city...

Crossed my State, he asked my native language...

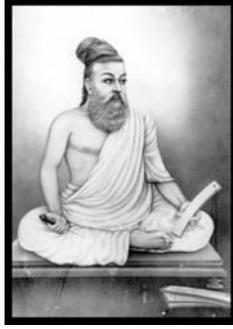
And I became an Indian only after I crossed my country !!!

A silent but strong message. Think about it.

"Exert your talents, and distinguish yourself, and don't think of retiring from the world, until the world will be sorry that you retire." - SAMUEL JOHNSON

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 54

In Practical Life, Actual Life and in particular, Management life, there are always uncontrollable situations when challenges will have to be faced. There are TWO distinct ways in which they are normally faced by any person, namely REACTIONRESPONSE.



Reaction is generally based on emotions and Response based on rationale. In the competitive world of Marketing and Management today, such situations are more common and frequent and they have to be faced and responded with a smile, courage and common sense. The challenges may look like troubles, but they have to be understood and handled as a natural part of the process.

Tiruvalluvar deals with this aspect troubles and obstacles of Management and Governance and its handling them with dimensions of intelligence, courage and exertion in full. Some of the Kurals below will illustrate the points.

*Vellaththu Anaiya Idumbai Arivudaiyaan
Ullaththin Ullak Kedum Kural 622*

வெள்ளத்து அனைய இடும்பை அறிவுஉடையான்
உள்ளத்தின் உள்ளக் கெடும் குறள் 622

“A whole sea of troubles will abase themselves the moment a shifty mind collecteth itself to face them”

*Inbam Vizhaiyaan Idumbai Iyalbuenbaan
Thunbam Urudhal Ilan Kural 628*

இன்பம் விழையான் இடும்பை இயல்புஎன்பான்
துன்பம் உறுதல் இலன் குறள் 628

“Behold the man who loveth not pleasure and who knoweth that difficulties are part of the law of things:he smarteth not ever under any check”

*Innaamai Inbam Enakkolin Aakumthan
Onnaar Vizhaiyum Chirappu Kural 630*

இன்னாமை இன்பம் எனக்கொளின் ஆகும்தன்
ஒன்னார் விழையும் சிறப்பு குறள் 630

“Behold the man who looketh upon the stress and strain of exertion as a veritable joy; he will be extolled by his very enemies.”

HOME FESTIVALS - 11

கார்த்திகை – Karttikai (November/December)



Krittika Dipa (right) is a joyous festival held on the Krittika nakshatra (when the moon is in Pleiades constellation). Also called **Sivalaya Dipa**, it is celebrated most famously at **Tiruvannamalai** (upper left in the painting),

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

(To be continued)

Energising The World

Responsibly



STAR EXPORTER OF THE YEAR

2009-2010 & 2010-2011

EEPC

ENGINEERING EXPORT
PROMOTION COUNCIL



Cast Resin Transformer



Power Transformer



Distribution Transformer

Wilson Power and Distribution Technologies- Part of Wilson Power Solutions Group Ltd, UK's leading Transformer supplier and power solutions provider is now in India to cater Indian Industry and homes.



- Distribution Transformers • Power Transformers • Cast Resin Transformers • Package Substations
- Energy Efficient Transformers • Unit Substations • Special Transformers

contact us for further details
WPDT
WILSON POWER

WILSON POWER AND DISTRIBUTION TECHNOLOGIES PRIVATE LIMITED

Orakkadu Village, Cholavaram, Chennai - 600067, India Ph: +91-44- 2633 0614 / 3243 0001

Fax: +91-44-2633 0615 Email: sales@wilsonpdt.com Web: www.wilsonpdt.com