



# TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE

## NEWSLETTER

ISSUE NO. 187 VOL. NO. 17/2022 MONTHLY ISSUE NO. 6 PRIVATE CIRCULATION ONLY DECEMBER 2022



## 3Si Eco Power LLP



Distribution Transformer



Power Transformer



Compact Sub-stations



Cast Resin Transformers

**Energy Efficient Power and Distribution Transformers for safe and reliable Distribution**

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# Technical Seminar

On 19th November 2022 at Hotel Jayapushpam, Chennai



Respected dignitaries on the dias



Members Registration



Thiru R. Manivannan, Managing Director, Tantransco TNEB Lighting the Kuthuvilaku



Mr. P. Chandra Sekar, SE-North TANGEDCO Lighting the Kuthuvilaku



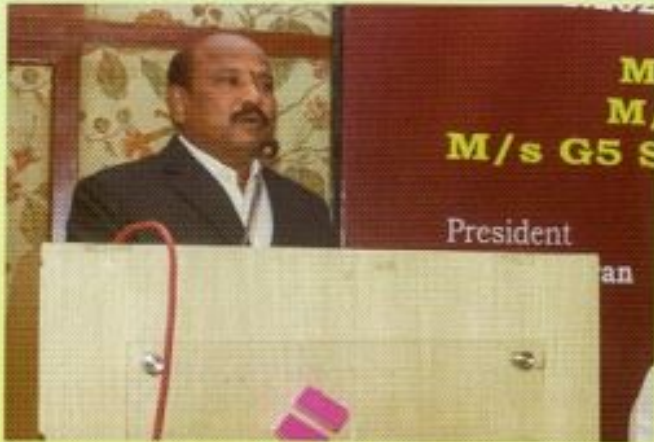
TNEIEA President, Secretary, Treasurer Lighting the Kuthuvilaku



**Mr. R. Pandurangan, M/s E Power Engineering**  
Lighting the Kuthuvilakhu



**Mr. P. Nithiyandam, M/s G5 Switchgear**  
Lighting the Kuthuvilakhu



Welcome address by **Mr. S.D. Poongundran**  
President, TNEIEA



Special address by **Mr. V. Rengarajan**  
Secretary-TNEIEA



**Mr. Thiru R. Manivannan, Managing Director**  
Tantransco, TNEB delivering the Inaugural address



**Mr. P. Chandra Sekar, SE-North, TANGEDCO.**  
delivering the Technical Speech



**Mr. R. Ramachandran, Senior Member, TNEIEA**  
honouring **Mr. Thiru R. Manivannan,**  
Managing Director, Tantransco, TNEB



**Mr. D. Chandran, Senior Member, TNEIEA**  
honouring **Mr. Thiru R. Manivannan,**  
Managing Director, Tantransco, TNEB



**Mr. S. Ponnambalam, Senior-Member TNEIEA**  
honouring **Mr. P. Chandra Sekar,**  
SE-North TANGEDCO



**Mr. GM Vishnuram, VP-TNEIEA**  
honouring **Mr. M. Ezhil, Chartered Accountant**  
(E-Invoice - Introduction)



**Members Gatherings in Seminar**



**Mr. V. Rengarajan, Secretary-TNEIEA**  
honouring **Mr. R. Pandurangan,**  
**M/s E Power Engineering**



**Mr. V. Rengarajan, Secretary-TNEIEA**  
honouring **Mr. P. Nithiyandam,**  
**M/s G5 Switchgear & Controls Pvt. Ltd.**



**Mr. Erode G. Kannan, Treasurer-TNEIEA**  
honouring **Mr. R. Pandurangan,**  
**M/s E Power Engineering**



**Mr. S.D. Poongundran, President-TNEIEA**  
honouring **Mr. P. Nithiyandam,**  
**M/s G5 Switchgear & Controls Pvt. Ltd.**



**Mr. AA Murali, VP-TNEIEA**  
honouring **Mr. M. Ezhil, Chartered Accountant**



**Mr. Jrk Anandaraman VP-TNEIEA** honouring  
**Mr. P. Chandra Sekar, SE-North TANGEDCO**

**Winners of Lucky draw for Members**  
 Technical Seminar on 19.11.2022 at Hotel Jayapushpam, Chennai



**Mr. B. Sasikumar,**  
 M/s Yesar Electric, Rajapalayam



**Mr. V. Venkatesan,**  
 M/s V Tech Engineering Service, Chennai



**Mr. G. Ravi Krishnan,**  
 M/s Essar Electricals, Chennai



**Mr. A. Rajendran,**  
 M/s King Electricals, Chennai



M/s Sri Bhagavaan Powers, Kanchipuram



End Session - Dinner

## EDITORIAL

Dear Members, Fellow Professionals and Friends,

*Greetings To All!*

*Advance Greetings For Happy 2023!!*

We extend a Hearty Welcome to the New Team of Dynamic and Committed Office Bearers of our Association. We have always had a tradition of 'Service to our clients and the Nation' with the Highest of Standards of 'Safety and Good Practices' and 'Codes of Ethics', which will continue.

Time gallops fast and we are in the verge of saying 'Good Bye' to 2022 and Welcome 2023 with renewed hopes as the pandemic is over and the Economy and the Businesses have started to grow fast.

Modern India has had a strong focus on science and technology, realizing that it is a key element for economic growth. We can recollect with pride some of the important ones like the indigenous Aircraft carrier, High Tech and High Speed modern Trains, our own Technology Development for 5G Launch, Defense Technologies, Missiles and exports and so on so forth. India ranks third among the most attractive investment destinations for technology transactions in the world. With more and more multinational companies setting up their R&D centers in India, the sector has seen an uptrend in investment in recent years.

India is the top exporter of IT products, has the third-largest pharma sector and a fast-growing contract research segment.

India stands third globally in the number of peer-reviewed science and engineering publications.

India is among the top countries globally in the field of scientific research, positioned as one of the top five nations in the field for space exploration. The country has regularly undertaken space missions, including missions to the moon and the famed Polar Satellite Launch Vehicle (PSLV). India is likely to take a leading role in launching satellites for the SAARC nations, generating revenue by offering its space facilities for use to other countries.

The government has introduced multiple policies aimed at projecting India as a science and technology powerhouse and promoting both public and private sector involvement in the R&D practice. As a result, India's gross expenditure on R&D (GERD) has been consistently increasing over the years. The government has also implemented several skilling and fellowship schemes to nurture human capacity for advancements in the country.

According to the IMF report, one-third of the global economy is expected to see a contraction this year or next. "Global growth is forecast to slow from 6.0 per cent in 2021 to 3.2 per cent in 2022 and 2.7 per cent in 2023. This is the weakest growth profile since 2001 except for the global financial crisis and the acute phase of the COVID-19 pandemic," the report says. However, in its latest World Economic Outlook report, the IMF projects a growth of 6.8 per cent for India in 2023, a further 0.6 percentage point downgrade since its July forecast. Many other agencies, including Citigroup, Asian Development Bank and Fitch Ratings, also estimate India's growth rate at 7 per cent or lower. The forecast by S&P Global Ratings paints a relatively optimistic picture for India and suggests a growth rate of 7.3 per cent.

With all the above indications, but for the increasing disturbances at the borders and the terrorism wagging its tail periodically, which are all under adequate check, we can certainly hope to march ahead towards becoming the 'Economic Super Power of the World' in another decade.

**We thank all those members who have helped us by participating in the advertisement appearing for the issue October 2022 – 3SI Eco Power LLP, E Power Engineering, Gravin Earthing & Lightning Protection System (P) Ltd., Global EPC India Pvt. Ltd., MV Power Consultants & Engineers (P) Ltd., Pentagon Switchgear (P) Ltd., Power Cable Corporation (Cable Network), Power Cable Corporation (Cable Solution), RBB Electricals, Sri Bhoomidurga Marketing (P) Ltd., Supreme Power Equipment (P) Ltd.**

**Editor**

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*Demand Draft be drawn in favour of the “Tamilnadu Electrical Installation Engineers’ Association ‘A’ Grade” payable at Chennai*

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**CENTRAL ELECTRICITY AUTHORITY  
REGULATION 2010  
CHAPTER II – REGULATIONS – PART – 1**

**I. Designating person(s) to operate and carry out the work on electrical lines and apparatus –**

- (1) A supplier or a consumer, or the owner, agent or manager of mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor who has entered into a contract with a supplier or an consumer to carry out duties incidental to the generation, transformation, transmission, conversion, distribution or use of electricity shall designate persons for the purpose to operate and carry out the work on electrical lines and apparatus.
- (2) The supplier or consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor referred to on sub-regulation (1) shall maintain a register wherein the names of the designated persons and the purpose for which they are engaged, shall be entered.
- (3) No person shall be designated under sub-regulation (1) unless-
  - (i) He possesses a certificate of competency or electrical work permit, issued by the Appropriate Government
  - (ii) His name is entered in the register referred to in sub-regulation (2).

**II. Inspection of designated officers and other safety measures –**

- (1) The register maintained under sub-regulation (2) of regulation 3 shall be produced before the Electrical Inspector when required by him.
- (2) If an inspection, the Electrical Inspector finds the designated person does not fulfill the required qualification, he shall recommend the removal of the name of such persons from the register.

**III. Electrical Safety Officer –**

- (1) All suppliers of electricity including generating companies, transmission companies and distribution companies shall designate an electrical Safety Officer for ensuring observance of safety measures specified under these regulations in their organization of construction, operation and maintenance of power stations, sub-stations, transmission and distribution lines.
- (2) The Electrical Safety Officer shall be an Electrical engineering degree holder with at least ten years of experience in operation and maintenance of electricity plants or an Electrical Engineering Diploma holder with at least fifteen years of experience in operation and maintenance of electric plant.
- (3) The Electrical Safety Officer designated under sub-regulation (1), shall ensure periodic inspection of such installations, get them tested and keep a record thereof and such records shall be made available to the Electrical Inspector if and when required.
- (4) For every factory registered under Factory Act, 1948, where more than 250 kW of electrical load is connected, the management of the factory shall designate a person having qualification specified in sub-regulation (2), for ensuring the observance of the safety provisions laid under the Act and the regulations made thereunder, who shall periodically inspect such installation, get them tested and keep a record thereof and such records shall be made available to the Electrical Inspector if and when required.

#### **IV. Safety measures for operation and maintenance of electric plants –**

- (1) Engineers and supervisors appointed to operate or undertake maintenance of any part or whole of a thermal power generating station and a hydro power plant together with the associated sub-station shall hold diploma in Engineering from a recognized institute, or a degree in Engineering from a university
- (2) The Technicians to assist engineers or supervisors shall possess a certificate in appropriate trade, preferably with a two years course from an Industrial Training Institute recognized by the Central Government or the State Government
- (3) Engineers, Supervisors and Technicians engaged for operation and maintenance of electric plants should have successfully undergone the type of training as specified in Schedule – I.

Provided that the existing employees shall have to undergo the training mentioned in sub-regulation (3) within three years from the date of coming into force of these regulations.

- (4) The owner of every thermal power generating station and hydro power plant together with their associated sub-station shall arrange for training of personnel engaged in the operation and maintenance of his generating station along with associated sub-station in his own institute or any other institute recognized by the Central Government or the State Government.

Provided that separate training shall be given to the persons engaged in operation and maintenance of thermal power stations and hydro power stations including associated sub-stations.

#### **V. Safety measures for operation and maintenance of transmission, distribution systems -**

- (1) Engineers or supervisors engaged in operation and maintenance of transmission and distribution systems shall hold diploma in Electrical, Mechanical, Electronics and Instrumentation Engineering from a recognized institute or university.
- (2) The Technicians to assist engineers or supervisors shall possess a certificate in appropriate trade, preferably with a two years course from a Industrial Training Institute recognized by the Central Government or State Government.
- (3) Engineers, Supervisors and Technicians engaged for operation and maintenance of transmission and distribution systems electric plants should have successfully undergone the type of training as specified in Schedule – II

Provided that the existing employees shall have to undergo the training mentioned in sub-regulation (3) within three years from the date of coming into force of these regulations.

- (4) Owner of every transmission or distribution system shall arrange for training of their personnel engaged in the operation and maintenance of transmission and distribution system in his own institute or any other institute recognized by the Central Government or State Government.

#### **VI. Keeping of records and inspection thereof –**

- (1) The generating company or licensee shall maintain records of the maps, plans and sections relating to supply or transmission of electricity and submit the same to the Electrical Inspector for inspection as and when required by him.
- (2) The Electrical inspector shall supply a copy of the report of inspection referred to in sub-regulation (1), to the generating company or licensee, as the case may be.

#### **VII. Deposit of maps –**

When license has been granted, two sets of maps showing, as regards such licensee, the particulars specified in application for license shall be signed and dated to correspond with the date of notification of the grant of the

license by an officer designated by the Appropriate Commission in this behalf, one set such maps shall be retained by the said officer and the other one shall be furnished to the licensee.

### **VIII. Deposit of printed copies –**

- (1) Every person who is granted a license, shall within thirty days of the grant thereof, have copies of the license and maps, showing the area of supply as specified in the license to Exhibit I same for public inspection at all reasonable times at his hear office, his local offices, if any, and at the office of every local authority within the area of supply.
- (2) Every such licensee shall, within the aforesaid period of thirty days, supply free of charge one copy of the license along with the relevant maps to every local authority within the area of supply and shall also make necessary arrangement for the sale of printed copies of the license and maps to all persons applying for the same, at a price to be notified by the Appropriate Government from time to time.

### **IX. Plan for area of supply to be made and kept open for inspection –**

- (1) The licensee shall, after commencing to supply electricity, forthwith cause a plan, to be made in electronic form, of the area of supply and shall cause to be marked thereon the alignment and in the case of underground works, the approximate depth below the surface of all the existing electric supply lines, street distributing boxes and other works and shall once in every year cause that plan to be duly corrected so as to show the electric supply lines, street distributing boxes and other works for the time being in position and shall also, if so required by an Electrical Inspector, cause to be made sections showing the approximate level of all his existing underground works other than service lines.
- (2) Every plan shall be drawn to such horizontal and vertical scale as the Appropriate Commission may require. Provided that no scale shall be required unless maps of the locality on that scale are for the time being available to the public.
- (3) Every plan and section so made or corrected or a copy thereof, marked with the date when it was made or corrected, shall be kept by the licensee at his principal office or place of business within the area of supply, and shall at all reasonable times be open to the inspection of all applicants and copies thereof shall be supplied.  
Provided that existing and old plans and sections and underground distribution network shall be converted to electronic form within three years from the date of commencement of these regulations.
- (4) Global Positioning System (GPS) mapping or mapping through any other latest technology, of existing and old plans and sections shall be completed within five years from the date of commencement of these regulations and new plans and sections shall be compatible to the Global Positioning System mapping or mapping through any other latest technology.
- (5) The licensee shall, if required by an Electrical Inspector and where the licensee is not a local authority, by the local authority, if any, concerned, supply free of charge to such Electrical Inspector or local authority a duplicate copy of every such plan or section or a part of the same duly corrected.
- (6) The copies of plans and sections under this regulation shall be supplied by the licensee to every applicant on the payment of such fee as the Appropriate Commission may, by regulation, specify.

*(To be continued)*

*Courtesy: The Gazette of India: Extraordinary (Part III – Sec.4)*

***“If your actions don’t live up to your words, you have nothing to say.”  
— DASHANNE STOKES***

## KNOW THY POWER NETWORK - 168


Let us continue from last issue i.e. Monitoring and control of various energy flows including electrical energy in a premise.

S. No	System / Equipment / Device	Important Energy Related Parameters	Energy Saving Measure Required
I	II	III	IV
4.	(i) Motors used in pumps, compressors, Lifts and other Electrical Machineries / Devices	(i) Power Factor (ii) Voltage drop across the connection between the motor and the motor control centre. (iii) Unbalance in the applied voltage (iv) Power quality of infeed especially wave form (Harmonics) and Frequency (v) Nature of connected drives (Constant torque variable torque) and controls like manual, VFD soft starter, Delta – Starstarter (vi) Power transmission device and other components like belt drive, chain drive and fans coupling etc.	(i) Use energy efficient motors – EF 1 or EF 2 motors (ii) Try to run the motors at 70% of optimum level; low loads and idle running of motors are to be avoided. Similarly low voltage or under frequency / over frequency operations are to be avoided. (iii) Adopt fibre glass fans and flat belts where ever possible. (iv) Reduce voltage drop across the connection between motor control centre and the motor terminals; loose connections and hot joints are to be eliminated; adequate crimping is required, similarly adopt correct size of copper cables for the motor connection. (v) Avoid rewinding of failed motors to the maximum extent possible.
		Motor no load current and stator resistance per phase (comparison of no load current and stator resistance per phase before and after reminding will be helpful in assessing the efficiency of rewinding of a motor)	The main point that needs to be noted is that being the prime mover, the AC motor is always efficient and does not cause major losses. The problem lies in the “enduse mechanical drives connected to it. These are the equipment / the segments that cause major losses. So our focus should be fixed / pointed or connected drives, equipment and not on the motor.
		Good maintenance practice that include, (i) Regular inspection of motors for checking wear in bearings and housings, dust / dirt in motor ventilating ducts. (ii) Checking load conditions to assess motor loading (iii) Lubricating appropriately	

		<p>(iv) Checking for proper alignment / balancing of motor</p> <p>(v) Checking supply wiring fuses (protection conditions) and terminal box</p> <p>Key observations that are useful to indicate the healthiness of the motor and its connected drives are</p> <p>(i) Percentage loading as KW</p> <p>(ii) Voltage unbalance levels</p> <p>(iii) Voltage Current levels</p> <p>Frequency, Harmonics, Power factor</p> <p>(iv) Machine (Drive side conditions like</p> <ul style="list-style-type: none"> <li>➤ Load / Unload conditions</li> <li>➤ Pressure</li> <li>➤ Flow</li> <li>➤ Temperature</li> <li>➤ Damper / Throttle operation (pumps)</li> <li>➤ Rewound motor (no load current variations)</li> <li>➤ Metering provision especially in the neutral.</li> </ul>	
5.	Compressors (compressed air systems)	Condition of the air intake to the compressor	Intake air should not be warm, humid and dusty. Locate the compressors in a well ventilated area with a clean, dry, cold air source. Every 4°C rise in inlet air increases the power consumption by 1%; clean air filters regularly
		Compressor valve condition	It should be struded and in good condition worn out / leaking valves can reduce compressor efficiency by as much as 50 percent
		Pressure drop across the filters	Install manometers across the filers and monitor the pressure drop as a guide for the replacement of an element.
		Loading on the compressor system – low load operation – (air demand is 50% or less)	Avoid low load operation of compressors. If it is necessary then consider change over to a smaller compressor or reduce compressor speed (e.g) reduction of motor pulley size in case of belt arrive compressors
		Moisture of compressed air	Use regenerative air dryers

		Condition of inter coolers since the fouled inter coolers, reduce the compressor efficiency it needs attention	Periodic cleaning of inter coolers must be ensured.
		Operating capacity of compressors	Free air delivery last (FAD) will be of help if it is carried out periodically. It helps to find out the present operating capacity of compressor against its designed capacity.
		Systems having common headers to facilitate feedings from several compressors	Operate one small compressor to handle loop variations and the rest to operate at full level
		Heat recovery from hot compressed air to generate hot air or water for process application. An economical method in the case of large compressors.	It can be carried out wherever it is possible.
		Pressure requirements for process; it should not vary widely (e.g) 3 bar to 7 bar.	If the difference in the pressure requirements exceed this tolerance level. It is desirable to have two separate compressors air system.
		Power consumption level - for the air out put received	If it is more for the single stage compressor when compared to that in a multi stage compressor then it is preferable to go for two stage or multi stage compressor.
		Compressor delivery pressure (It should be reduced whenever possible)	This step results in energy savings.
		Unloaded running condition in case of large compressors (100KW or more). Range between load and unload pressure setting	To eliminate this condition variable speed drives can be attempted. It should be kept at minimum level
		When automatic timer controlled drain traps are in use, the compressed air is wasted. It happens whenever the valve operates.	To avoid this, limit the frequency of drainage operations or optimize.
		Motor current, cooling water flow and its temperature, inter stage and discharge pressure. Compressed air temperature and load cycle readings are to be monitored	When abnormal readings are noted immediate corrective steps are required.

		Compressed air leakage it should not exceed 40 – 50 percent.	Periodic leak tests may be carried out to estimate the quantity of leakage.
		Instead of using long delivery lines for a load point loaded at a far off place, a small dedicated compressor may be erected at load point. Compressed air ring mains may be used to provide desired pressures at all load points. Compressed air supply to a machine should be switched off when it is not in use.	To meet this situation interlocker solenoid cut off valves in the air system can be used.
		Energy wastage due to excessive energy consumption or leakage (wear of seals and other rubber parts caused by friction or causes	Lubrication of all pneumatic equipment / devices is required
		Energy wastage caused by the misuse of compressed air such as body cleaning, agitation, general floor cleaning and similar applications	Such activities should be discouraged / eliminated
		Wastage of energy caused by the operation of pneumatic equipment beyond its recommended operating pressure.	These operations should not be carried out. These should be avoided to the maximum extent as it will lead to the excessive wear of equipment components
		As the consumption of pneumatic transport system is very high (8 times more than normal mechanical system) it should be rarely adopted.	Higher energy savings can be got by reducing compressed air applications
		Pneumatic tools like drills and grinders consume about 20 times more energy than motor driven tools, they should be used efficiently and scarcely while going for pneumatic operations, it is desirable to go for welding rather than threaded connections	Electrically operated tools are generally preferred
		Higher pressure drop in globe valves	It is desirable to go for ball or plug or gate valves
6.	HVAC and refrigeration equipment	(i) Efficient cold insulation (ii) Optimization of air conditioning volumes	Insulations adopted should be appropriate to avoid heat gain In this regard false ceiling and segregation of critical areas with air contains will be of much use.

		<p>(iii) Minimization of heat load</p> <p>(iv) Minimization of heat flows in terms of TR capacity as well as refrigeration level.</p>	<p>Measures such as roof cooling, roof painting, efficient lighting, pre cooling of fresh air by using air-to-air heat exchangers, variable volume air system, optimal thermostat setting of temperature of air conditioned spaces and sun film applications are preferred in this regard.</p> <p>It can be achieved by way of</p> <ul style="list-style-type: none"> <li>➤ Flow optimization</li> <li>➤ Increase in heat transfer area by having higher temperature coolant</li> <li>➤ Avoid wastages like heat gains loss of chilled water, idle flows. Frequent cleaning / descaling of all heat exchangers may be allotted.</li> </ul>
		Bypass flows chilled water, part level operations	To achieve this, close the valves of all idle equipment; match the loads and plant capacity on line and adopt variable speed drives for varying process load.
		Optimization of condenser and evaporator parameters	This effort will help minimize specific energy consumption and maximization of capacity .
7.	FANS	<p>(i) Excess air level in combustion system – it should be minimized</p> <p>(ii) Minimization of cold air in leaks in - hot flue gas path in case of kiln boilers and furnace.</p> <p>(iii) In leaks / out leaks in AC system</p> <p>Other areas that will help improvement in fan performance.</p> <p>(i) Change of impeller by a high efficiency impeller</p> <p>(ii) Derating of impeller (by a smaller dia impeller)</p> <p>(iii) Use of GRP impeller</p> <p>(iv) Adoption of variable speed drive or two speed motors</p> <p>(v) Use of energy efficient flat belt</p> <p>(vi) Use of inlet guide vanes in place of discharge damper control</p> <p>(vii) Minimize system resistance and pressure drops by making improvement in duct system</p>	<p>This step will help reduce the loads in ID and FD fans</p> <p>It will help reduce the load in ID fans.</p> <p>As it has a major impact on fan power consumption and its efficient operation, it may be minimized.</p>
Let me sign off here.		(To be continued)	 <p>V. Sankaranarayanan, B.E., FIE, Former Addl. Chief Engineer/TNEB E-mail: vsn_4617@rediffmail.com Mobile: 98402 07703</p>



# SUBSTATION DESIGN APPLICATION GUIDE – 7

## 3.8 Line Traps

These are fitted on the circuits power line carrier communication. They are normally fitted on the line side of the line isolator to enable communication to continue when the isolator is open.

There may be one or two line traps depending upon whether the PLC system is phase-to-earth or phase-to-phase.

## 3.9 Surge Arresters

Surge arresters are provided to protect equipment from transient over voltages due to lightning strikes on overhead lines and other exposed connections, and sometimes at the higher system voltages from switching surges. It should be noted that the closer the surge diverter is to the equipment being protected, the better is the protection afforded.

They are normally provided close to the most important and costly items of equipment such as transformers when the earth terminal of the arrester is also directly connected to the transformer tank and when appropriate, to the transformer neutral.

They can also be provided at the entry of overhead lines to the substation at the line side of the line isolator where they will also protect against the flashover of the gap of the open isolator. When line traps are fitted the arresters are normally on the line side of the line traps since with lightning surges significant voltages can be produced at the relatively high surge impedance of the line trap. Such surge arresters are sometimes considered to give a sufficient protection to any transformers in the substation but it must be recognised that better protection is provided by surge arresters close to the transformers.

Surge arresters may also be at cabled entries to protect the cable against over voltages produced by the reflection of surges travelling down the cable when they reach the higher surge impedance of the open connections.

Sometimes it is specified that lightning arresters be fitted only to the bus-bars. This may provide a low cost but less effective solution.

### Surge Arrester Parameters

	400kV	275kV	132kV	33kV
Switching Impulse Withstand Voltage (kVp) =	1050	850		
Protection Level (kV) = (IEC)	$\frac{1050}{1.25} = 840$	$\frac{850}{1.25} = 680$	$\frac{550}{1.25} = 440$	$\frac{170}{1.25} = 136$
Lightning Impulse Withstand Voltage (kVp) =	1425	1050	650	170
Protection Level (kV) =(NGC)	$\frac{1425}{1.4} = 1020$	$\frac{1050}{1.4} = 750$	$\frac{650}{1.4} = 464$	$\frac{170}{1.4} = 121$
Maximum Continuous Voltage (kV) =	$\frac{400 \times 1.23}{\sqrt{3}} = 285$	$\frac{275 \times 1.23}{\sqrt{3}} = 195$	$\frac{132 \times 1.23}{\sqrt{3}} = 94$	$\frac{33 \times 1.23}{\sqrt{3}} = 23$
Rated Surge Arrester Voltage (kV) $\geq$ (NGC)	$\frac{400 \times 1.58}{\sqrt{3}} = 366$	$\frac{275 \times 1.58}{\sqrt{3}} = 250$	$\frac{132 \times 1.58}{\sqrt{3}} = 120$	$\frac{33 \times 2.2}{\sqrt{3}} = 42$
Energy Level Class $\geq$ Normally =	3 4	3 4	3 4	3 4
Nominal Discharge Current =	10-20kA	10-20kA	10kA	

## **4. Protection Equipment / Device**

### **4.1 Introduction**

The purpose of an electrical power system is to generate and supply electrical energy to consumers. The system should be designed and managed to deliver energy to the utilization points with both reliability and economy. Protection should be done to prevent the following:

- a) Prevent any disruption of supply
- b) Electrical equipment used is very expensive and we should prevent any damage to the equipment
- c) Power system should operate in a safe manner at all times
- d) How well we design the electrical equipment, fault will occur on power system
- e) Fault may represent a risk to life and property

### **4.2 Protection System**

- a) Protection System – complete arrangement of protection equipment (based on IEC60255-20)
- b) Protection equipment – collection of protection devices i.e. Relays fuse etc.
- c) Protection devices – CT's, VT's, CB's
- d) Protection scheme – a collection of protection equipment, providing a defined function and protection devices to make the scheme work (i.e. relays, CT's, VT's, CB's, batteries etc.)

### **4.3 Protection Equipment**

Relays may be classified as follows:

- a) Electromechanical Relays
- b) Static Relays
- c) Digital Relays
- d) Numerical Relays

### **4.4 Protection Devices**

Current Transformers CTs

Voltage Transformers T'

Circuit Breakers CB's etc.

### **4.5 Current Transformers**

Standard: IEC 185, BS3938, TPS 8/2 & NGTs

There are two types of design:

- a) Bar Primary Design
- b) Hair Pin Design

### **4.6 Specification of Class 5P and 10P Type CT's**

- a) CT Ratio: 2000/1000/1A
- b) Rated Primary Continuous

- c) System frequency 50Hz
- d) Class: 5P, Class 10P, Class I, Class 0.5
- e) Accuracy Limit Factor 10, 15, 20
- f) Burden 10VA, 15VA, 30VA
- g) Continuous overload

#### 4.7 Specification of Class X Type CT's

- a) CT turn ratio, e.g. 1/1000/2000
- b) Rated primary continuous current
- c) Knee point voltage
- d) Magnetising current
- e) Maximum secondary resistance

Definition of knee point Voltage  $V_k$

The 'knee-point' of the excitation curve is defined as 'that point at which a further increase of 10% of secondary emf would require an increment of exciting current of 50%'.

#### 4.8 420kV Current Transformers

##### (i) Class X Type A

Turn Ratio 1/1000/2000

$V_k \geq 300$  (RCT + 7.5) at 1/2000 tap

$I_{mag} = 60$  mA at  $V_k/2$

RCT = 3.0  $\Omega$  at 75°C

##### (ii) Class X Type B

Turn ratio 1/2000A

$V_k \geq 60$  (RCT + 5)

$I_{mag} = 40$  mA at  $V_k/2$

RCT = 5.0  $\Omega$  at 75°C

##### (iii) Class X Special CT Ratio

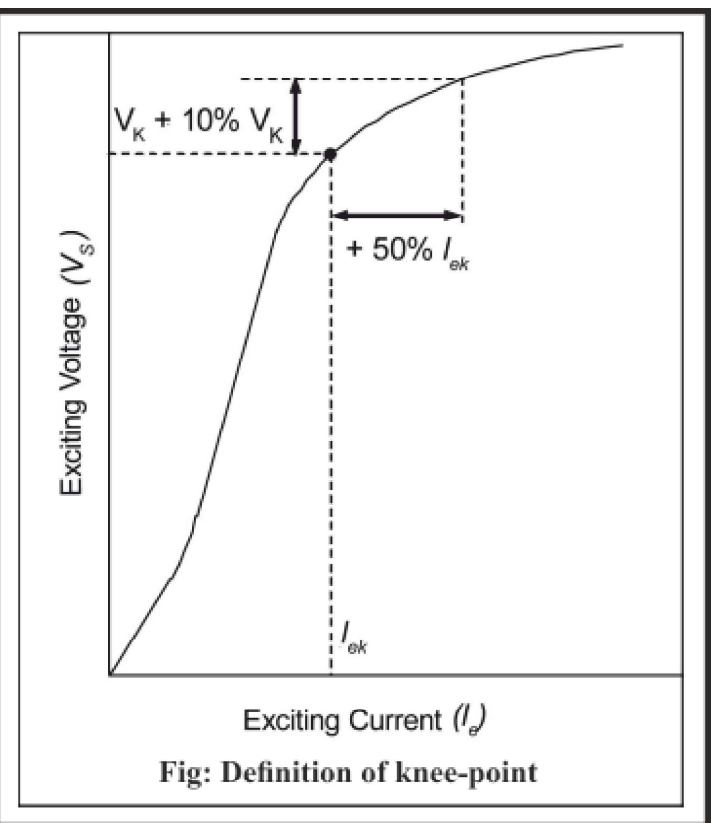
Turn ratio 1/600/1200

$V_k \geq 82$  (RCT + 3)

$I_{mag} = 60$  mA at  $V_k/2$

RCT = 2.4  $\Omega$  at 75°C

##### (iv) a) Type A CT's are used for – Distance Protection



HV Connection Protection

LV Connection Protection

b) Type B CT's are used for – Bus-bar Protection

Circulating Current Protection

Trans for Bias Differential

Mesh Corner Protection

HV & LV connections (if the distances are short)

#### 4.9300kV Current Transformers

a) Protection A 1/600/1200

$V_k \geq 160 (R_{CT} + 7.5)$

$I_{mag} = 60\text{mA}$  at  $V_k/2$

$R_{CT} \leq 2.5 \Omega$

at  $75^\circ\text{C}$  at 1200/1 ratio

b) Protection B 1/600/1200

$V_k \geq 82 (R_{CT} + 3)$

$I_{mag} = 60 \text{ mA}$  at

$V_k/2$   $R_{CT} \leq 2.5 \Omega$

at  $75^\circ\text{C}$  at 1200/1 ratio

c) Measurement/Protection 1200/600/1A

Class 5P/10 30VA (at 600/1)

#### 4.10 145kV Current Transformers

a) Protection A 1/600/1200

$V_k \geq 50 (R_{CT} + 17)$

1/500/1200

$V_k \geq 60 (R_{CT} + 12)$

$I_{mag} = 60\text{mA}$  at  $V_k/2$

$R_{CT} \leq 2.5 \Omega$  at  $75^\circ\text{C}$  at 1200/1 ratio

b) Protection B 1/500/1000

$V_k \geq 95 (R_{CT} + 2.5)$

$I_{mag} = 60\text{mA}$  at  $V_k/2$

$R_{CT} \leq 2.5 \Omega$  at  $75^\circ\text{C}$

at 1000/1 ratio

c) Measurement/Protection 1/600/1200

Class 1 30VA

Class 5P10 30VA (600/1A)

Class 5P20 30VA (1200/1A)

For tapped current transformers, the knee-point Voltage, magnetising current and secondary resistance are to be specified for the full winding (i.e. top tap)

*(To be Continued)*

*Courtesy: V. Ayadurai Bsc, C.Eng, FIEE*

*Engineering Expert*

# WHAT IS GANDHIAN IDEOLOGY?

## Gandhian Ideology

- Gandhian ideology is the set of religious and social ideas adopted and developed by Mahatma Gandhi, first during his period in South Africa from 1893 to 1914, and later in India.
- Gandhian philosophy is not only simultaneously political, moral and religious, it is also traditional and modern, simple and complex. It embodies numerous Western influences to which Gandhiji was exposed, but is **rooted in ancient Indian culture** harnessing universal moral & religious principles.
- The philosophy exists on several planes - the spiritual or religious, moral, political, economic, social, individual and collective.
  - The spiritual or religious element, and God, are at its core.
  - Human nature is regarded as fundamentally virtuous.
  - All individuals are believed to be capable of high moral development, and of reform.
- Gandhian ideology emphasises not on idealism, but on **practical idealism**.
- Gandhian philosophy is a **double-edged weapon**. Its objective is to transform the individual and society simultaneously, in accordance with the principles of truth and non-violence.
- Gandhiji developed these ideologies from various inspirational sources vis **BhagvadGeeta**, Jainism, Buddhism, Bible, Gopal Krishna Gokhale, Tolstoy, John Ruskin among others.
  - Tolstoy's book '**The Kingdom of God is within you**' had a deep influence on Mahatma Gandhi.
  - Gandhiji paraphrased Ruskin's book '**Unto this Last**' as '**Sarvodaya**'.
- These ideas have been further developed by later "Gandhians", most notably, in India by, VinobaBhave and Jayaprakash Narayan and outside of India by Martin Luther King Jr. and others.

## Major Gandhian Ideologies

- **Truth and nonviolence:** They are the twin cardinal principles of Gandhian thoughts.
  - For Gandhi ji, truth is the relative truth of truthfulness in word and deed, and the absolute truth - the ultimate reality. This **ultimate truth is God (as God is also Truth)** and **morality** - the moral laws and code - **its basis**.
  - **Nonviolence**, far from meaning mere peacefulness or the absence of overt violence, is understood by Mahatma Gandhi to **denote active love** - the pole opposite of violence, in every sense. Nonviolence or love is regarded as the highest law of humankind.
- **Satyagraha:** Gandhi ji called his overall method of nonviolent action Satyagraha. It means the exercise of the purest soul-force against all injustice, oppression and exploitation.
  - It is a method of securing rights by personal suffering and not inflicting injury on others.
  - The origin of Satyagraha can be found in the Upanishads, and in the teachings of Buddha, Mahavira and a number of other other greats including Tolstoy and Ruskin.
- **Sarvodaya-** Sarvodaya is a term meaning '**Universal Uplift**' or '**Progress of All**'. The term was first coined by Gandhi ji as the title of his translation of **John Ruskin's** tract on political economy, "**Unto This Last**".
- **Swaraj-** Although the word swaraj means self-rule, Gandhi ji gave it the content of an integral revolution that encompasses all spheres of life.
  - For Gandhi ji, swaraj of people meant the sum total of the swaraj (self-rule) of individuals and so he clarified that for him swaraj meant freedom for the meanest of his countrymen. And in its fullest sense,

swaraj is much more than freedom from all restraints, it is self-rule, self-restraint and could be equated with moksha or salvation.

- **Trusteeship-** Trusteeship is a **socio-economic philosophy** that was propounded by Gandhi ji.
  - It provides a means by which the wealthy people would be the trustees of trusts that looked after the welfare of the people in general.
  - This principle reflects Gandhi ji's spiritual development, which he owed partly to his deep involvement with and the study of theosophical literature and the Bhagavad Gita.
- **Swadeshi** The word swadeshi derives from Sanskrit and is a conjunction of two Sanskrit words. 'Swa' means self or own and 'desh' means country. So swadesh means one's own country. Swadeshi, the adjectival form, means of one's own country, but can be loosely translated in most contexts as self-sufficiency.
  - Swadeshi is the **focus on acting within and from one's own community**, both politically and economically.
  - It is the interdependence of community and self-sufficiency.
  - Gandhi ji believed this would lead to independence (swaraj), as British control of India was rooted in control of her indigenous industries. Swadeshi was the key to the independence of India, and was represented by the charkha or the spinning wheel, the "center of the solar system" of Mahatma Gandhi's **constructive program**.

### Relevance in Today's Context

- The ideals of truth and nonviolence, which underpin the whole philosophy, are relevant to all humankind, and are considered as universal by the Gandhians.
- More than ever before, Mahatma Gandhi's teachings are valid today, when people are trying to find solutions to the rampant greed, widespread violence, and runaway consumptive style of living.
- The Gandhian technique of mobilising people has been successfully employed by many oppressed societies around the world under the leadership of people like **Martin Luther King in the United States, Nelson Mandela in South Africa, and Aung San Suu Kyi in Myanmar**, which is an eloquent testimony to the continuing relevance of Mahatma Gandhi.
- **Dalai Lama said,** "We have a big war going on today between world peace and world war, between the force of mind and force of materialism, between democracy and totalitarianism." It is precisely to fight these big wars that the Gandhian philosophy needed in contemporary times.

*In my life, I have always looked to Mahatma Gandhi as an inspiration, because he embodies the kind of transformational change that can be made when ordinary people come together to do extraordinary things." -Barack Obama*

### Conclusion

- Gandhian ideologies shaped the creation of institutions and practices where the **voice and perspective of everyone can be articulated, tested and transformed**.
  - **According to him, democracy provided the weak with the same chance as the strong.**
- Functioning on the basis of voluntary cooperation and dignified & peaceful co-existence was replicated in several other modern democracies. Also, his emphasis on political tolerance and religious pluralism holds relevance in contemporary Indian politics.
- Truth, nonviolence, Sarvodaya and Satyagraha and their significance constitute Gandhian philosophy and are the four pillars of Gandhian thought.

# MAKING BEST USE OF ADDRESSABLE AND CONVENTIONAL FIRE ALARM SYSTEMS (PART – 1)

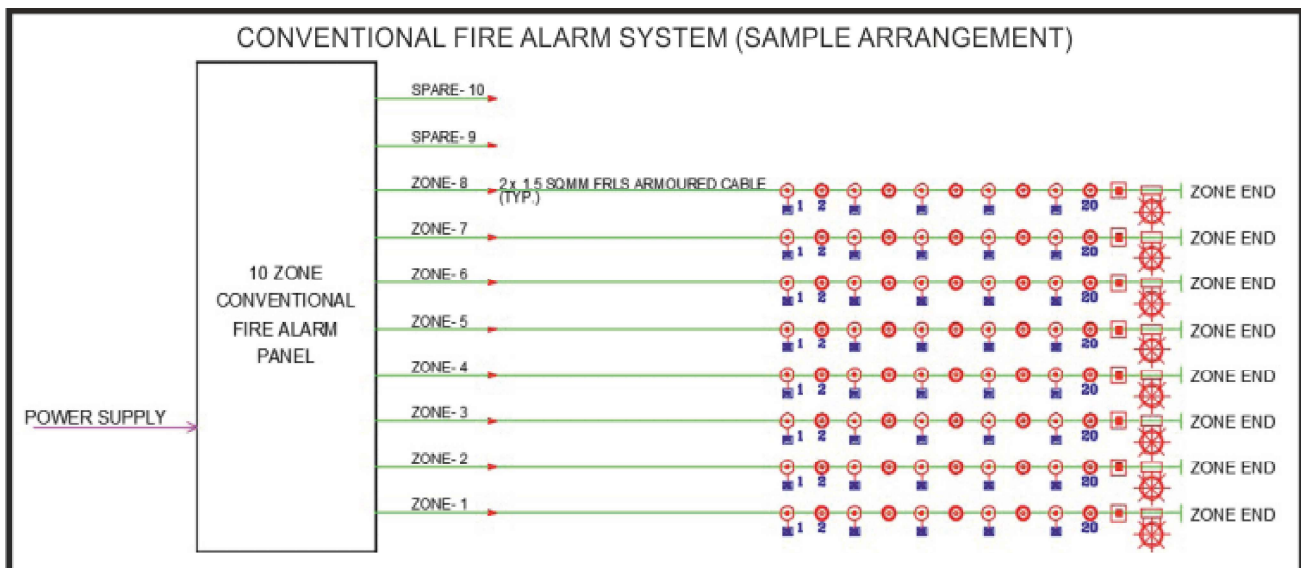
**Fire** is best prevented by planning a proper layout, making proper selection of systems and processes, providing proper training to personnel, segregation, separation, isolation, substitution of hazards etc.

However, all the above do not preclude the possibility that fire will never happen. Hence detection of the fires become very important so that either by manual or automatic interventional the fire damages can be reduced.

For this purpose, the fire alarm system is a very commonly used right from single house dwellings to complex nuclear power plants.

The conventional fire alarm systems have been in vogue for several years but for the past few years, there is almost a mad rush to adopt addressable fire alarm systems without understanding the implications of risk, installation ease, budget, technical competence, maintenance, reliability, flexibility, scalability, operation convenience, vendor independence etc.

I would say that personally I visited seven similar factories of a client recently. Four of them had addressable fire alarm systems and three of them had addressable fire alarm systems. It was shocking to note that while all the three conventional fire alarm systems were operating well and there was no fault in the panels, none of the four addressable fire alarm systems were working properly.

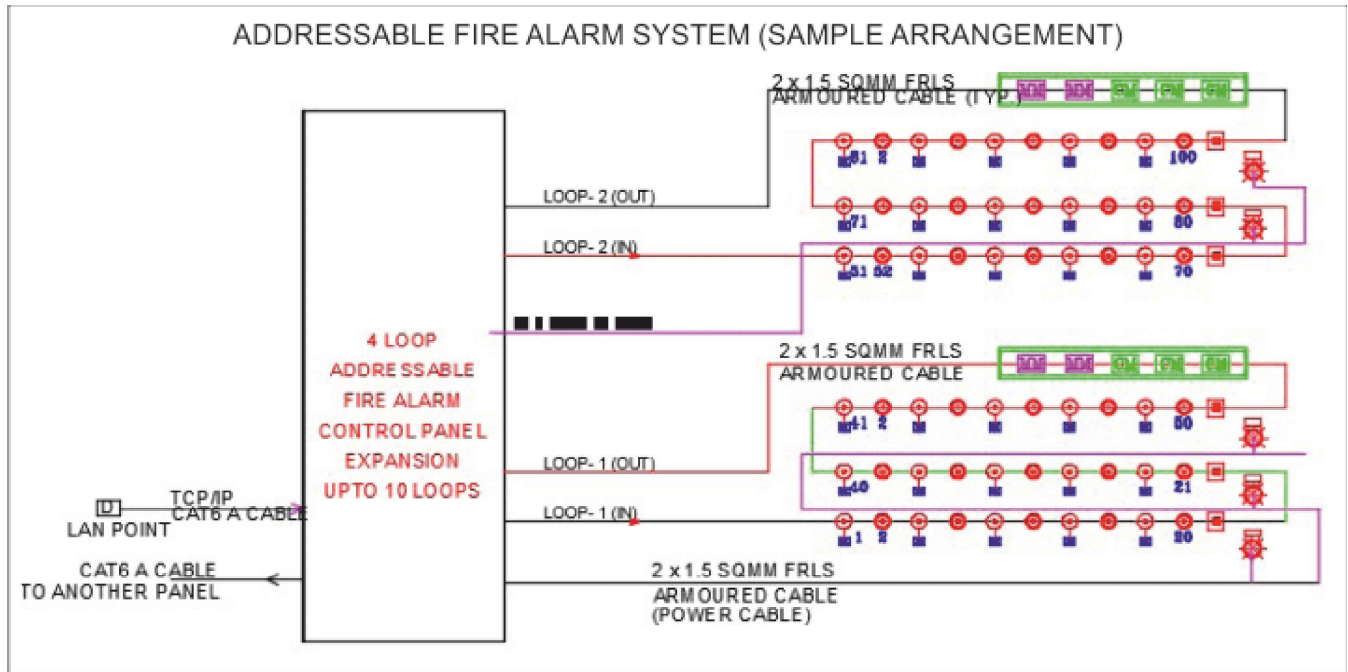


When I asked them the reason for the non-performance of the addressable fire alarm systems, their feedback sadly were:

1. The contractor installed the system but the software programming is not happening properly.
2. We installed additional detectors, but programming not carried out.
3. Our factory is in a remote area. In the earlier conventional system, we did not have issue in installing flame-proof MCP etc. easily, but for the addressable fire alarm we are still awaiting the receipt of the monitor modules etc.
4. The budget was quickly used up.

***“Being all talk speaks volumes about you.” — FRANK SONNENBERG***

5. We should not have removed the earlier conventional Fire Alarm System before installing the new addressable fire alarm system. We were told the same cable will work, all the hooters will operate, but they are not working.
6. We have three technological suppliers who supplied their own addressable fire alarm panels – they are not communicating with each other etc.



Hence overall in this part, we will see a few points of how to select conventional or addressable fire alarm system. In the next part we will see which are the major parameters of addressable fire alarm systems as per International Standard like NFPA and how to make them work.

#### A. How to select or upgrade conventional to addressable fire alarm system:

1. Implications of risk – If the number of detectors is limited, if the zoning required is limited, if the security is able to quickly identify the areas, then conventional fire alarm system is still fine. Else look to upgrade to addressable fire alarm system.
2. If the existing conventional fire alarm system is working well, then if there is a need to provide more outputs like HVAC tripping etc., then let the conventional system continue to work as already fund allocation already done for the same.
3. Many PRELIMINARY FIRE NOCs solicit for separate Manual Call Point System. The conventional fire alarm system can easily be adopted for the same.
4. Budget allocation and economics – Every item in an addressable system is costlier than an conventional system. The cost economics of cable reduction and operational advantage of pinpointed fire location etc. needs to be reviewed in detail. **Any vendor who comes to your premises or project, ask them to make the cost calculation and furnish to you. Review the same please for a more valued judgement.**

***“If you talk about it, it’s a dream, if you envision it,  
it’s possible, but if you schedule it, it’s real.”***

***— Anthony Robbins***



5. Verify whether the addressable system supplier has an office in India, what is his spare parts base, how close is their local installation and commissioning office close to your site, how many projects have been completed by them etc. prior to accepting any brand of addressable fire alarm system. Only some manufacturers and some products have longstanding in the Indian market to serve you.
6. Verify whether the “CAUSE AND EFFECT”, “LOOP LOADING CALCULATIONS”, “BATTERY LOADING CALCULATIONS” etc. are understood, explained well and demonstrated with prior documentation by the prospective vendor.
7. Ask them specifically for your type of project, what I/O can be provided. (Basically make them to sweat to understand your project requirement and quote for the project accordingly).
8. **It should be understood that the fire alarm system products and system design are somewhat vendor and product dependent. For example – number of detectors per loop can be different, number of hooters that can be catered by a loop can be different, panel limitations about the number and amount of power supply etc.**

**The consultant cannot make a design which fits all type of automatic system design. Also, in addition, the vendors without a proper understanding of the system or to cut corners, do not for example provide proper supervised power supply to addressable hooters etc. Hence, obtain specific confirmation of the boq and design from the vendor prior to placing order.**

9. Verify whether the HVAC system, electrical system has potential free contacts. This will enable data to be mined from the system or trip them. Else, the purpose and benefit of the addressable fire alarm system is not accrued.
10. Many project sites have expert automation specialists operating their PLC systems. Provide them the authority and responsibility to also manage the fire alarm system. They will do a wonderful job.
11. Adopt a formal procedure of selecting a fire alarm system – do not do commercial negotiation first and technical later.

### **CLOSING NOTE:**

There was a earlier thought process that ‘**technology supports change**’. Now the thought process is ‘**technology drives change**’. Understand technology, your requirement and you will make the best benefit of the same.

Wishing all our fellow members and their families a very happy, prosperous and safe New Year 2023.



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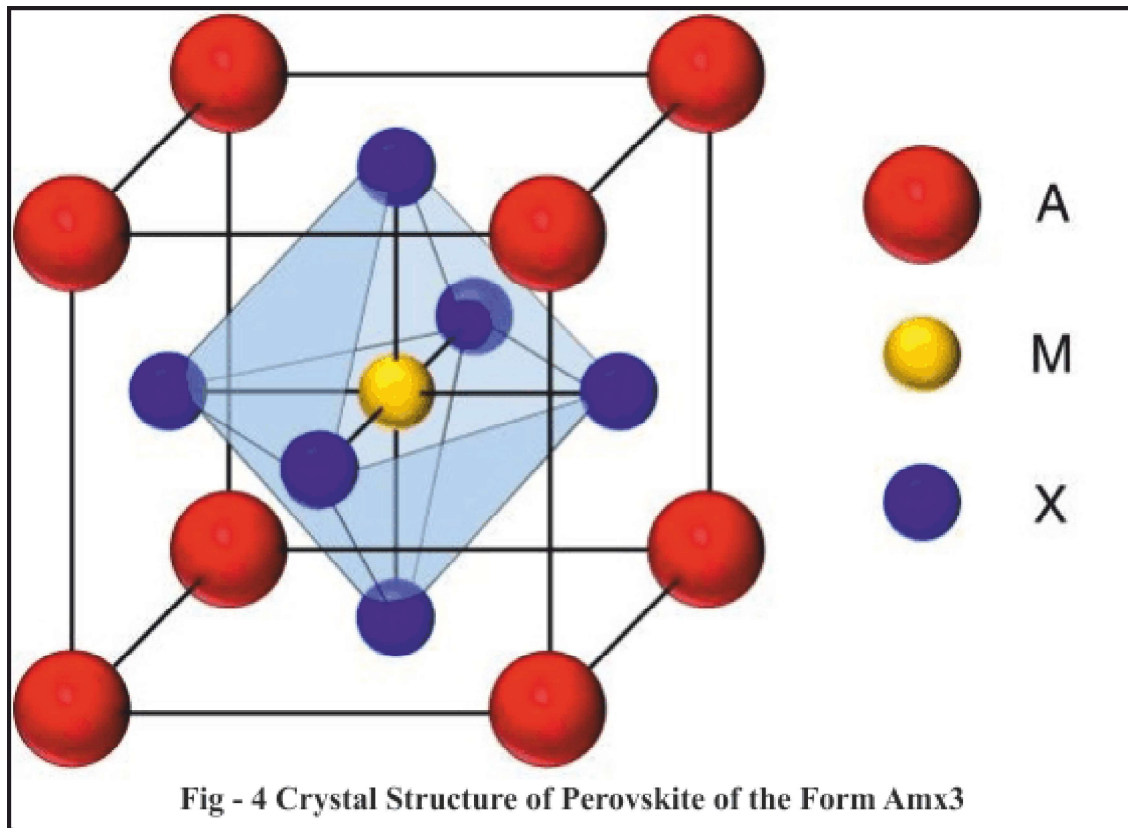
***(Son of Mr. H.Kalyanasundaram – Ex. Best and Crompton Engineering Limited)***

***“Actions speak louder than words.  
 And sometimes inaction speaks louder than both of them.”  
 — Matthew Good***

## PEROVSKITE SOLAR CELLS – THE FUTURE OF SOLAR POWER GENERATION - 2

### Crystal structure

The cubic crystal structure of 3D perovskite system with generic formula of  $AMX_3$  is shown in Fig - 4. The blue shaded region shows the  $IMX_6$  4-octahedron



As with many structures in crystallography, it can be represented in multiple ways. The simplest way to think about a perovskite is as a large atomic or molecular cation (positively charged) of type M in the centre of the cube. The corners of the cube are then occupied by atoms A (also positively charged cations) and the faces of the cube are occupied by smaller atom X with negative charge (anion).

Depending on which atoms / molecules are used in the structure perovskites can have an impressive interesting properties, including superconductivity, giant magnetoresistance, spin-dependent transport (spintronics), photoelectricity, and also can be used as a catalyst.

$MAPbX_3$  (MA is methylammonium, i.e.  $CH_3NH_3$ ) based hybrid halide perovskite has recently emerged as a new class of low cost material for photovoltaic application, where they have achieved a remarkable increase in solar efficiency from 9% in 2012 to 21% in 2017. Despite this high efficiency further research work is necessary to explore its physics and stability. The most successful hybrid organometallic halide perovskite is  $CH_3NH_3PbX_3$  (X is Cl, Br, I) or its variations. Its crystal structure is shown in Fig - 5.

$MAPbX_3$  - based perovskites have been found to exhibit multiple phases as a function of temperature and composition. These different phases possess dramatically different electrical and optical properties as well as stability. In general beta phase  $MAPb_1_3$  is used as solar cell absorber, because of its thermodynamically stable nature at room temperature and its increased absorption coefficient ( $>26\text{mm}^{-1}$ ) and conductivity.

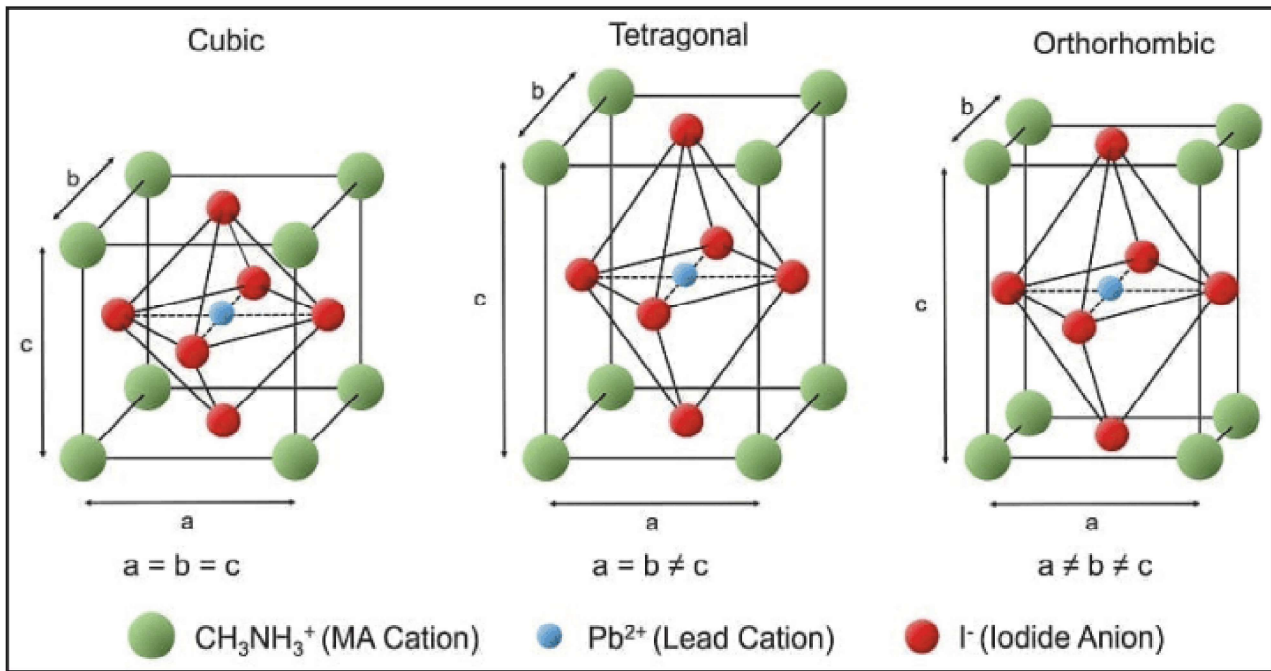


Fig - 5 crystal structure of organometallic halide perovskite

## Properties

The materials with such a structure have the following features when used in photovoltaics:

- 1) The materials possess excellent photoelectric properties, lower exciton binding energy and high optical absorption coefficients.
- 2) Perovskites if used as a light absorbing layer are, capable of absorbing solar energy efficiently due to s-p antibonding coupling.
- 3) Electrons and holes can be transmitted simultaneously and the transmission distance can be as high as 1 micrometre. This means high electron and hole mobilities and diffusion length.
- 4) It possess a large dielectric constant and electrons and holes can be effectively transmitted and collected.
- 5) Using proper manufacturing techniques solar cells can be made with shallow point defects and with superior structural defect tolerance.
- 6) Low surface recombination velocity and benign grain boundary effects.

These features lead to a high open circuit voltage and a short circuit current density, if it is used in solar cells.

## Advantages

Compared to existing solar cell technologies, perovskite devices have the following advantages:

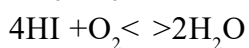
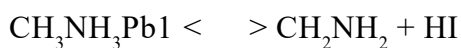
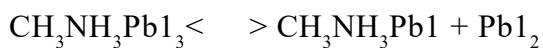
1. It has excellent comprehensive performance. It can efficiently perform the absorption of incident light, the excitation, transport and separation of photo generated carriers at the same time. It has broad absorption range from visible (400 - 700 nm) to near infrared spectrum (800 nm).
2. High extinction coefficient and appropriate band gap width.  
The perovskite material has a good energy bandwidth of about 1.5 eV and a very high extinction coefficient. Its light absorption capacity is more than 10 times higher than organic dyes.
3. Methylamine lead halide perovskite is an ideal material for developing high efficiency low cost solar cells.

4. It has excellent bipolar carrier transport properties and can transport efficiently electrons and holes. The electron / hole transport length is more than 1 micrometre and the carrier lifetime is much longer than other solar cells.
5. The biggest advantage is that it can produce a high open circuit voltage under full illumination and has reached 1.3 V. which is close to that of GaAs cells indicating that its energy loss under full sunlight is very low and the conversion efficiency has further scope of improvement.
6. The solar device can be made into a P - I - N type planer structure, which is advantageous for scale production.
7. The core material of the cells - the composite perovskite material can be prepared by simple preparation methods e.g coating, vapour deposition and mixing process. It has low manufacturing cost and consumes less energy.

### Disadvantages

There are several key factors that limit the development of perovskite solar cells:

1. Although perovskite material shows outstanding performances in photovoltaics, it suffers from poor chemical stability under ambient conditions. When perovskite crystals are exposed to oxygen or moisture, the crystallinity of perovskite rapidly loses its phase and ultimately deteriorates the optoelectronic properties due to decomposition as shown in the following reactions :



During de-crystallization process, intermediate complexes shown above are formed and they increase the defect states or the number of grains with low optoelectronic properties. Therefore, single crystal perovskites, which have very low defect states and grain boundaries, can increase chemical stability. Single crystal MAPbBr<sub>3</sub> perovskite solar cells exhibits high stability while maintaining 93% of initial photo conversion efficiency (PCE) after aging for 1000 hours in ambient condition.

2. Achieving light and thermal stability of perovskite are also challenging issues which can influence PV performance. Photo induced migration of MA<sup>+</sup> or Pb<sup>+</sup> which is accelerated by the presence of light, can damage the octahedron structure of perovskite or penetrate into adjacent layers such as hole-transport layer (HTL) and metal electrode.  
Since all the inorganic single crystal perovskites e.g CsPbBr<sub>3</sub> have shown for high thermal stability upto 580°C, the single crystal perovskite is attractive in the near future for commercial PV application.
3. They are very sensitive to changes in conditions during the preparation process. So it has poor reproducibility that would affect large scale applications.
4. At present the most common method for making these cells is spin coating which is not conducive to the preparation of large area, continuous perovskite films.
5. The absorption layer of the commonly used perovskite cell contains soluble heavy metal lead. Also toxic organic solvents may be used during device preparation that may cause environmental pollution. To counter the pollution from lead, tin may be used. But with tin the cell efficiency, at present, is limited to 10%.
6. Spiro-OMeTAD that is used as a whole transporting material is very expensive, being 10 times the price of gold and its synthesis process is complex. Hence there is a necessity to find out a cheaper alternative.

*(To be Continued)*

*Courtesy: Ieema Journal, February 2022*

# ENERGY – GLOBAL MISSION AND INITIATIVES INDIA’S COMMITMENTS AND STRATEGIES – 8

## Sustainable Growth, Sustainable Energy, Emission reduction and Renewable Energy.

Conference of Parties COP 27 was held in Egypt from 6<sup>th</sup> to 18<sup>th</sup> November and India declared its Plans for emission reduction and march towards Net '0', with mention of specific areas and activities apart from overall targets with regard to Renewable Energy and Energy Efficiency and mindful consumption focus.

**India Submitted its Long-Term Low Emission Development Strategy to UNFCCC With this release, India joins the select list of less than 60 parties that have submitted their LT LEDS to UNFCCC.**

Posted On: 14 NOV 2022 4:46PM by PIB Delhi

India submitted its Long-Term Low Emission Development Strategy to the United Nations Framework Convention on Climate Change (UNFCCC), during the 27<sup>th</sup> Conference of Parties (COP27) today. The Long-Term Low Emission Development Strategy was launched by the Union Minister for Environment, Forest and Climate Change, Shri Bhupender Yadav, who is leading the Indian delegation to COP 27, being held at Sharm-el-Sheikh, Egypt from 6-18 November, 2022.



The salient features of the strategy are –

1. The focus will be on the rational utilization of national resources with due regard to energy security. The transitions from fossil fuels will be undertaken in a just, smooth, sustainable and all-inclusive manner.

The National Hydrogen Mission launched in 2021 aims to make India a green hydrogen hub. The rapid expansion of green hydrogen production, increasing electrolyser manufacturing capacity in the country, and three-fold increase in nuclear capacity by 2032 are some of the other milestones that are envisaged alongside overall development of the power sector.

2. Increased use of biofuels, especially ethanol blending in petrol, the drive to increase electric vehicle penetration, and the increased use of green hydrogen fuel are expected to drive the low carbon

development of the transport sector. India aspires to maximize the use of electric vehicles, ethanol blending to reach 20% by 2025, and a strong modal shift to public transport for passenger and freight.

3. While urbanization will continue as a strong trend from our current relatively low base, future sustainable and climate resilient urban development will be driven by smart city initiatives, integrated planning of cities for mainstreaming adaptation and enhancing energy and resource efficiency, effective green building codes and rapid developments in innovative solid and liquid waste management.
4. India's industrial sector will continue on a strong growth path, in the perspective of '*Aatmanirbhar Bharat*' and '*Make in India*'. Low carbon development transitions in the sector should not impact energy security, energy access and employment. The focus will be on improving energy efficiency by the Perform, Achieve and Trade (PAT) scheme, National Hydrogen Mission, high level of electrification in all relevant processes and activities, enhancing material efficiency and recycling leading to expansion of circular economy, and exploring options for hard-to-abate sectors, such as steel, cement, aluminium and others.
5. India has a strong record of enhancing forest and tree cover in the last three decades alongside high economic growth. India's forest fire incidence is well below global levels, while its forest and tree cover are a net sink absorbing 15% of CO<sub>2</sub> emissions in 2016. India is on track to fulfilling its NDC commitment of 2.5 to 3 billion tons of additional carbon sequestration in forest and tree cover by 2030.
6. The transition to low carbon development pathway will entail several costs pertaining to the development of new technologies, new infrastructure, and other transaction costs. While several estimates exist, varying across studies, they all fall generally in the range of trillions of dollars by 2050. Provision of climate finance by developed countries will play a very significant role and needs to be considerably enhanced, in the form of grants and concessional loans, ensuring scale, scope and speed, predominantly from public sources, in accordance with the principles of the UNFCCC.

The Paris Agreement in Article 4, paragraph 19, states, "All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."

Further, COP 26 at Glasgow in November 2021, in Decision 1/CP.26, inter alia, (i) urged Parties that have not yet done so to communicate their LT-LEDS by COP 27 (November 2022).

The document has been prepared after extensive consultations held by Ministry of Environment, Forest and Climate Change with all relevant Ministries and Departments, State Governments, research institutions, and civil society organizations.

India's approach is based on the following four key considerations that underpin its long-term low-carbon development strategy:

1. India has contributed little to global warming, its historical contribution to cumulative global GHG emissions being minuscule despite having a share of ~17% of the world's population.
2. India has significant energy needs for development.
3. India is committed to pursuing low-carbon strategies for development and is actively pursuing them, as per national circumstances
4. India needs to build climate resilience.

The two themes of "climate justice" and "sustainable lifestyles", alongside the principles of Equity and Common, but Differentiated Responsibilities and Respective Capabilities (CBDR-RC), in the light of national circumstances, that India had emphasized at Paris, are at the heart of a low-carbon, low-emissions future.

Similarly, the LT-LEDS has been prepared in the framework of India's right to an equitable and fair share of the global carbon budget, which is the practical implementation of India's call for "climate justice." This is essential to ensure that there are no constraints on realizing India's vision of rapid growth and economic transformation, while protecting the environment.

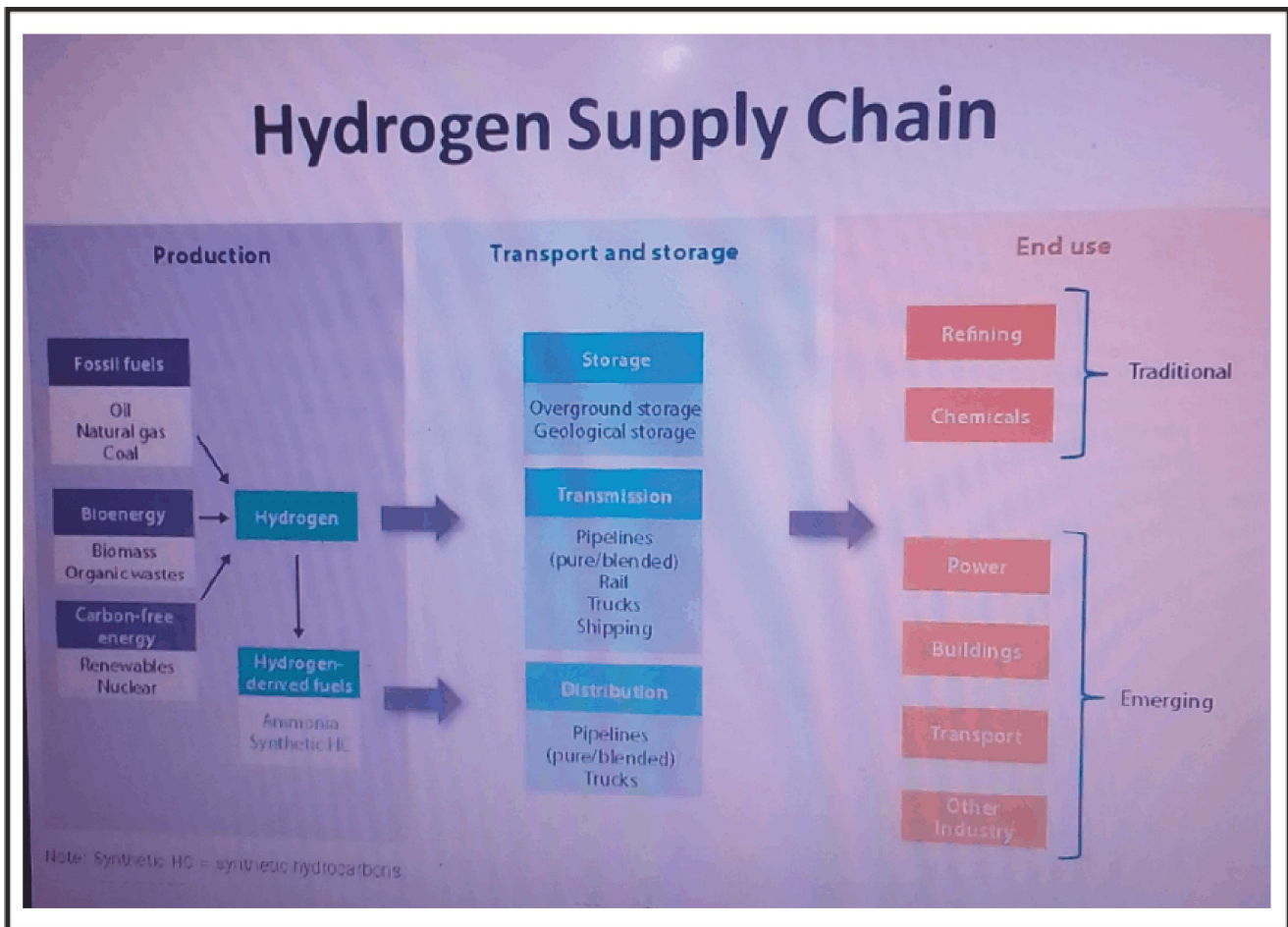
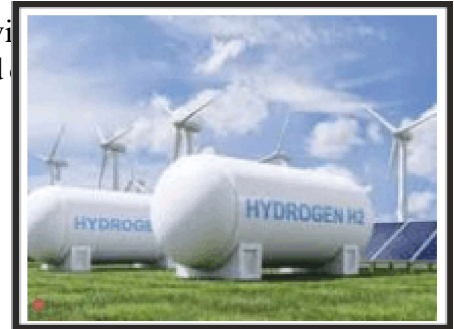
The LT-LEDS is also informed by the vision of LiFE, Lifestyle for the Environment (paradigm shift from mindless and destructive consumption to mindful and sustainable consumption)

### Hydrogen and Green Hydrogen

The first point taken up in the Strategy Presentation is Hydrogen Energy and lot of works are undertaken both by Government and the Industries in the past 2/3 years.

Hydrogen has always been in use as a product and by product in industries and processes and the new developments are pertaining to use of Hydrogen as clean source of energy to help towards achievement Net '0'.

The picture below will illustrate the status and development of Hydrogen and applications.



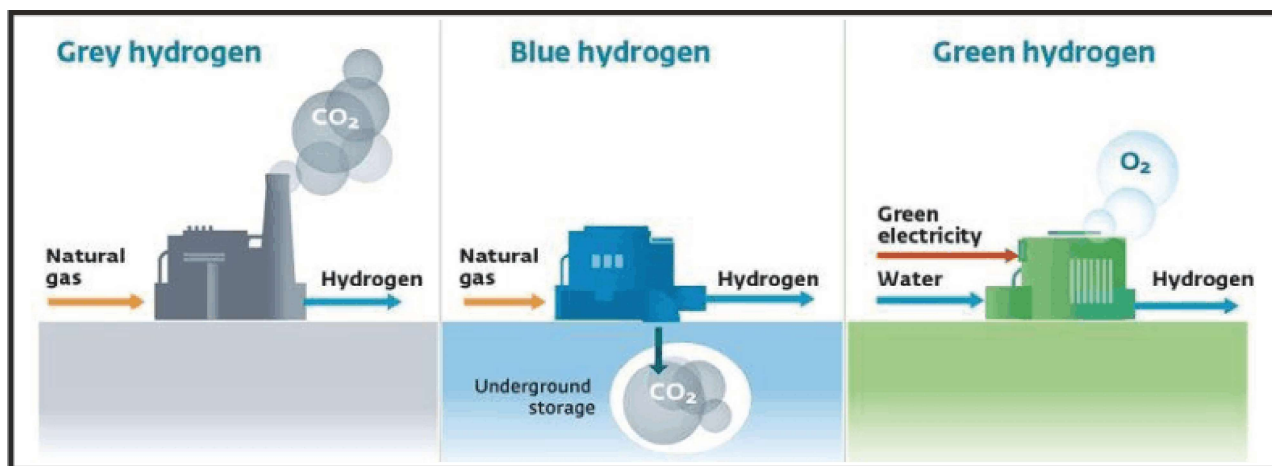
In the area of Energy and Power, one of the early areas of work and development pertains to "Fuel Cells" and Hydrogen. In the past as well as in the present scheme of things, FUEL CELLS play very important role in many applications, and before proceeding to discuss more about them, let us look at some basics of Hydrogen and Green Hydrogen.

Hydrogen, like electricity, is an energy carrier that must be produced from another substance. Hydrogen can be produced — separated — from a variety of sources including water, fossil fuels, or biomass and used as a source of energy or fuel. Hydrogen has the highest energy content of any common fuel by weight (about three times more than gasoline), but it has the lowest energy content by volume (about four times less than gasoline). As per International Renewable Energy Agency (IRENA), **Hydrogen shall make up six percent of total energy consumption by 2050.**

The current global demand for hydrogen is 70 million metric tons per year, more than 76 percent of which is being produced from natural gas, 23 per cent comes from coal and the remaining is produced from electrolysis of water.

Colors designated for Hydrogen - Grey Hydrogen, Blue Hydrogen, and Green Hydrogen:

Hydrogen is primarily used in petro chemicals and fertilizer industry and is produced largely from natural gas, there by emitting enormous amounts of carbondioxide. **Depending on the nature of the method of its extraction, hydrogen is categorized into three categories, namely, grey, blue and green.** There is a growing focus on increasing production of green and blue hydrogen due to its no carbon emission and use of carbon off set technology, respectively. Additionally, several leading organizations are exploring technologies which can convert bio and plastic waste into hydrogen, thereby providing a huge scope for investment in this technology which can combat India's twin problems of waste management and energy security.



Where the hydrogen comes from is important. At the moment, it's mainly produced industrially from natural gas, which generates significant carbon emissions. That type is known as “grey” hydrogen. A cleaner version is “blue” hydrogen, for which the carbon emissions are captured and stored, or reused. The cleanest one of all is “green” hydrogen, which is generated by renewable energy sources without producing carbon emissions in the first place.

Various uses of Hydrogen

- ❑ Hydrogen use today is dominated by **industry**, namely: oil refining, ammonia production, methanol production and steel production. Virtually all of this hydrogen is supplied using fossil fuels, so there is significant potential for emissions reductions from clean hydrogen.
- ❑ In **transport**, the competitiveness of hydrogen fuel cell cars depends on fuel cell costs and refueling stations while for trucks the priority is to reduce the delivered price of hydrogen. Shipping and aviation have limited low-carbon fuel options available and represent an opportunity for hydrogen-based fuels.

***“The superior man acts before he speaks, and afterward speaks according to his actions.”***

**— CONFUCIUS**



- In **buildings**, hydrogen could be blended into existing natural gas networks, with the highest potential in multi family and commercial buildings, particularly in dense cities while longer-term prospects could include the direct use of hydrogen in hydrogen boilers or fuel cells.
- In **power generation**, hydrogen is one of the leading options for storing renewable energy, and hydrogen and ammonia can be used in gas turbines to increase power system flexibility. Ammonia could also be used in coal-fired power plants to reduce emissions.

**Hydrogen is available from numerous sources including:**

- Renewable hydrogen generation from wind, solar or biomass installations
- Hydrogen production via hydrocarbon reformation at refineries and other industrial sites
- By-products from other industrial processes e.g. Chlor-alkali plants
- Hydrogen delivery is available world-wide from industrial gas providers

**How is hydrogen produced?**

**Steam methane reforming (SMR)**

- Most large scale hydrogen production is through steam methane reforming (SMR), in which high temperature steam is used to produce hydrogen from natural gas. Oil refineries are existing high volume SMR hydrogen producers, as hydrogen is a key enabler allowing refinery products to comply with the latest environmental fuel production standards. SMR is a mature and well understood process where the capital cost of distributed on-site hydrogen production continues to reduce, year on year for smaller (100kg/day) facilities.

**Electrolysis using renewable energy sources**

- Electrolysis is the process of using electricity to split water into hydrogen and oxygen. The reaction takes place in a device called an electrolyser. Electrolysers are commercially available and can range in size from low volume distributed hydrogen production units to grid-scale units that can be used directly with renewable energy sources such as wind and solar power arrays.
- For a low CO<sub>2</sub> society, hydrogen is an energy carrier and grid-scale storage provider that can enable renewable integration into the existing energy infrastructure and can be produced from renewable electricity using proven grid scale electrolysis.

**Biomass**

- Hydrogen is produced in biomass systems using bacteria to break down organic matter. Research is underway to improve the yield and speed of hydrogen production using this fermentation process. Biomass is an attractive technology as it has the ability to produce hydrogen from resources that are not currently used for fuel production, including waste water.

**How Hydrogen is supplied for use with distributed fuel cell systems?**

**Hydrogen supply and storage**

Hydrogen for distributed fuel cell systems is supplied in standard storage cylinders containing approximately 260ft<sup>3</sup> (7.36m<sup>3</sup>) of compressed gas. Hydrogen is typically delivered as clusters of 6, 12 or 18 cylinders for direct site deployment. This ensures a long run time for the fuel cell system.

Hydrogen can be transported from centralized production facilities via pipeline or as a compressed or liquefied gas, using tube trailers for road delivery to refill hydrogen tanks and cylinders local to the point of use. High volume road distribution helps to deliver a low cost molecule for use with distributed fuel cell systems.

Hydrogen gas cylinders and cluster packs are widely available from global gas providers.

## How can Hydrogen be used for electricity storage?

### Power-to-Gas

The need for electrical energy storage is regarded as a global strategic imperative, but unfortunately there are few available options to provide grid-scale electricity storage for days and weeks in duration.

Large scale storage can only be addressed by pumped hydro and compressed air (CAES) – both having limitations in capacity and flexibility, or chemical storage media like hydrogen and methane. Hydrogen is the only option to implement energy capacities over 10GWh. Batteries by comparison can only provide kW to MW grid storage in the seconds to hours energy storage range.

Intermittent renewable energy sources like wind and solar power require energy storage to be efficiently integrated into the existing electricity grid.

Hydrogen produced by electrolysis from renewable energy sources could be co-mingled and stored in existing gas pipelines (up to approx. 15% hydrogen) where it can be transported and used as part of the fuel stream for power plants to generate electricity at peak times. Researches are currently underway in many countries to examine this approach.

Leading gas turbine manufactures for the power industry, such as ALSTOM, GE and Siemens are developing turbines that can operate using a wide variety of hydrogen-rich fuels, delivering high performance and flexible operability.

### India Advancing Towards a Cleaner Future: The Role of Hydrogen Energy

- ❑ India has a huge edge in green hydrogen production owing to its favorable geographic conditions and the presence of abundant natural elements.
- ❑ The Government has given impetus in scaling up the gas pipeline infrastructure across the length and breadth of the country and has introduced reforms for the power grid, including the introduction of smart grids. Such steps are being taken to effectively integrate renewable energy into the present energy mix.
- ❑ With appropriate capacity addition to renewable power generation, storage and transmission, producing green hydrogen in India can become cost-effective which will not only guarantee energy security but also ensure self-sufficiency gradually.
- ❑ Setting the right priorities for hydrogen use will be essential for its rapid scale-up and long-term contribution to decarbonization efforts. Hydrogen is part of a much bigger energy transition picture, and its development and deployment strategies should not be considered in isolation.
- ❑ A shift to large-scale use of hydrogen fuel can help bolster India's geopolitical heft and support energy security. More than 30 countries and regions have hydrogen strategies that include import or export plans, indicating that cross-border hydrogen trade is set to grow considerably.



*(To be continued)*

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Mobile: 98401 55209*

**“...with words...You write it with actions. What you think is not important. It is only important what you do.”**

**– PATRICK NESS**

# NATIONAL ENERGY CONSERVATION DAY 2022

## National Energy Conservation Day - 14<sup>TH</sup> December 2022

National energy conservation day is celebrated every year by the people all over the India on 14<sup>th</sup> of December. The Energy Conservation Act in India was executed by the Bureau of Energy Efficiency (BEE) in the year 2001. The Bureau of Energy Efficiency is a constitutional body which comes under Government of India and helps in the development of policies and strategies in order to reduce the energy use.

What is the Energy Conservation?

National energy conservation day in India is celebrated to aware people about the importance of energy as well as saving or conserving the more energy by using less energy. The exact means of energy conservation is using less energy by avoiding the unnecessary uses of energy. Using energy efficiently is very necessary to save it for the future usage. Energy conservation should be rooted in the behavior of every human being to get more effect towards the plan of energy conservation.

Objectives of National Energy Conservation Day

- National energy conservation day is celebrated every year using particular theme of the year by keeping in mind some goals and objectives to make more effective all over the country among people. Some of the important goals are:
- It is celebrated to send the message of importance of conserving energy in the every walk of life among people.
- Promoting the way of process of energy conservation by organizing a lot of events such as discussions, conferences, debates, workshops, competitions and etc all through the country.
- Promote people for less energy usage by neglecting the excessive and wasteful uses.
- Encourage people for efficient energy use in order to decrease the energy consumption and prevent the energy loss.



***"A job well done is better than well said."***

**— BENJAMIN FRANKLIN**



தமிழ்நாடு அரசு

மக்கள் நல்வாழ்வு மற்றும் குடும்பநலத்துறை

இந்திய மருத்துவம் மற்றும் ஹோமியோபதி ஆணையரகம்

# நிலவேம்பு குடிநீர்

இவற்றில் சேரும் மருந்துகள்



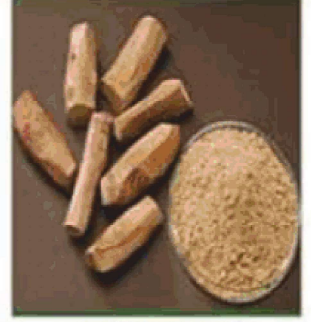
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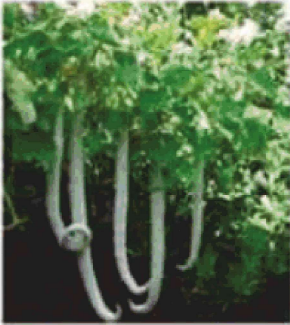
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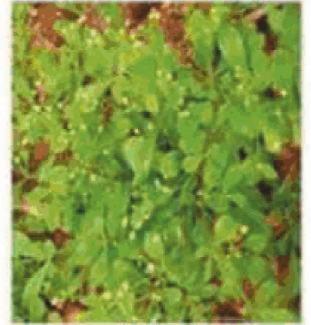
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சுக்கு, மிளகு



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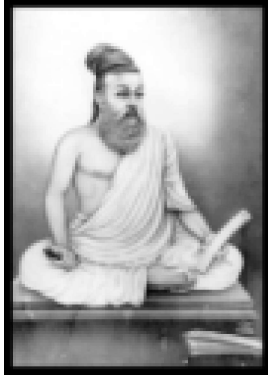
குடிநீர் அளவு

5 வயது முதல் 12 வயது வரை உள்ள குழந்தைகளுக்கு 10 மி.லி. தினமும் 2 வேளை அருந்தவும்.

பெரியவர்களுக்கு 50மி.லி. தினமும் 2 வேளை அருந்தவும்.

எல்லா வகை காய்ச்சலும் குணமாகும்

## TIRUKKURAL ON 'ACTION' & 'ACTIVITY' – 1



'Act', 'Action' and 'Activity' form the most important components of Life or Business or Management or anything we do to accomplish and excel.

Tiruvalluvar deals with this, which is known as "Seyal" or "Seydal" in a large number of Kurals, focusing on various aspects of life and deeds and performance and fulfilment. If words are not backed up by action, they are useless. Actions always speak louder than words. However, words and action are often used

simultaneously to make the difference in the outcome of any specific endeavor. The words serve as the inspiration, but the action is where things really happen.

In this first presentation, the 2 Kurals chosen deal with 'Good Deeds' and 'Charity' and we can understand the clear prescription by Tiruvalluvar.

*Ollum Vagaiyan Aravinai Oovaadhe  
Sellumvaai Ellaagn Seyal Kural 33*

*ஒல்லும் வகையான் அறவினை ஓவாதே  
செல்லும்வாய் எல்லாஞ் செயல் குறள் 33*

**"Be thou unremitting in the doing of good deeds:  
do them with all thy might and by every means"**

*Arkkaa Iyalpitruuch Selvam; Athupetraal  
Arkkupa Aange Seyal Kural 333*

*அற்கா இயல்பிற்றுச் செயல்வம் அதுபெற்றால்  
அற்குப ஆங்கே செயல் குறள் 333*

**"Prosperity is transient: if thou have come by it,  
delay not to do things that are of lasting Good"**

## HUMOUR

### CONTRACTORS

Three contractors are bidding to fix a broken fence at the White House in Washington D.C. One from Bangladesh, another from India and the third, from China.

They go with a White House office to examine the fence.

The Bangladesh contractor takes out a tape measure and does some measuring, then works some figures with a pencil. "Well", he says, "I figure the job will run about \$900. (\$400 for materials, \$400 for my team and \$100 profit for me)".

The Chinese contractor also does some measuring and figuring, then says, "I can do this job for \$700. (\$300 for materials, \$300 for my team and \$100 profit for me)".

The Indian contractor doesn't measure or figure, but leans over to the White House official and whispers, "\$2,700."

The official, outraged says, "You didn't even measure like the other guys! How did you come up with such a high figure?"

The Indian contractor whispers back, "\$1000 for me, \$1000 for you, and we hire the guy from China to fix the fence."

"Done!" replies the government official.

### TUNNEL CONTRACT

An underground tunnel was to be built between France and England for which a global tender was floated.

US based world leader quoted the highest- Some 100 million dollars.

A technology leader from Germany quoted 90 million dollars while a Chinese company quoted half of the US company-50 million dollars.

Santa and Banta Corporation from India shocked everyone by asking for just 50,000 rupees!

When called to explain as to how they would be successfully managing such a feat at such a low cost, they said:

Santa: *I will start digging from the French end of the tunnel while Banta will start digging from the English end with our shovels. And where we will meet and shake hands your tunnel will be completed.*

European Engineer: *What if you fail to meet and fail to shake hands?*

Santa: *Good for you. In that case you will have two tunnels for the cost of one!*

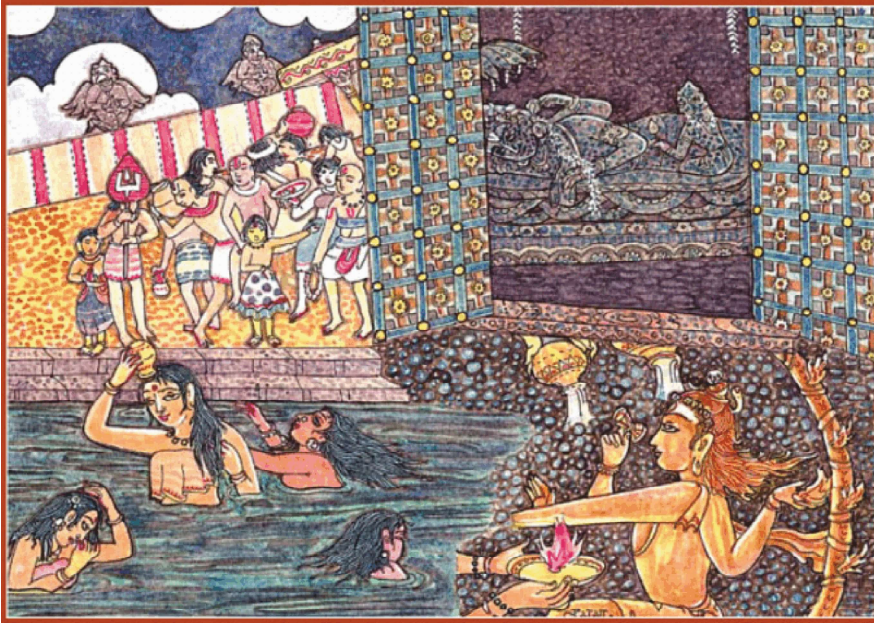
### MARRIAGE

In India, Women wear Mangalsutra / Sindoor to show they're married..

Men carry Tupperware lunch boxes into office to show they are married.....

## HOME FESTIVALS - 12

### Markazhi (December/January)



During Tirupavai (below, in upper left of painting), people bathe (lower left) and gather in the early morning to go on procession singing devotional Vaishnava songs (upper left). Especially popular are those of the 9<sup>th</sup> century lady saint Andal, venerated as one of South India's greatest devotional poets. On **Vaikunth Ekadasi**, the 11<sup>th</sup> day of the lunar month, the doors of the huge temple of

Srirangam are opened to devotees from morning to night for darshan of Rangam, an aspect of Lord Vishnu, sleeping on Adishani, the serpent king (upper right). Another famed festival is **Ardra Darshana**, when Siva Nataraja is decorated and taken from the temple in procession throughout the community (lower right). Especially the ill and those of old age seek to have a glimpse of Nataraj. A renowned sweet, **aurudra kalli**, is made with vegetables on this day.

*“All of these festivals are earnestly conducted. People wait for the day with their mind on God. The purpose is to gather in the home and worship for the prosperity of the family and of all mankind.”*

## HOME FESTIVALS - 1

### Thai (Mid-January/Mid-February)



At left the Sun god, Surya, is being worshipped with the outdoor cooking of a large pot of rice from the recent harvest. The overflowing of the dish

is called “**pongalo-pongal**”, and thus this festival is known as **Thai Pongal**. Other crops, like sugarcane, bananas and turmeric, are also offered. *Kolams* (hand-made rice flour patterns) are drawn in the form of the chariot, with the Sun and Moon in the centre. On this day cows and other animals are decorated and fed special foods, and their owners prostrate to them. Crows and other birds are offered food on leaves of turmeric. Sisters pray for the welfare of brothers, and elders bless the children. **Thai Pongal is celebrated by the poorest farmers and the wealthiest householders.**

*(To be continued)*



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