ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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

Dear Members, Fellow Professionals, Friends and Well wishers,

SEASONS GREETINGS AND BEST WISHES!!

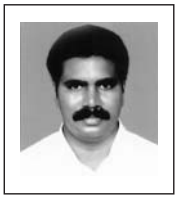
We have no words to THANK all those who made the RELEASE FUNCTION of the 100th ISSUE of this News Letter on the 21st of June, 2014, a Grand Success and made it a Memorable day. We take all the words of praise by many with HUMILITY and we will take all the words of suggestions seriously and implement in course of time. We are aware of the fact that there is lot of scope for improvement in serving the cause of our Professional Fraternity and Technology and Safety. We have taken a Pledge to strive our Best for continuous improvements. More suggestions and contributions are welcome from all our Members and all our Readers.

World Population Day is one of the Annual Days in the Month of July and as widely acknowledged by many, the sizable and young population of India is a Boon to us. The concepts of Preparedness for the future revolve around adequate and trained Man Power for various kinds of activities including Agriculture, Commerce and Trade and Manufacture, Communication, Controls and Arts and Culture and Technologies, all these and more. There is also another aspect of continuous training of Man Power for continuously improving performances. The concepts also include Sustainable Development, Technology Developments and 'On Going' Planning processes. All these mean enough and more of People and our Country is certainly blessed with not only the Numbers but also the Quality of people. The Quality of our People have been proved repeatedly all over the World and as told by an Eminent Person "….. it (the quality of people) seems to be the Result of over 5000 years of our Civilization……"

Another important aspect of Development and Technology and Conservation and Competitiveness is INNOVATION and this too should be aiming at Sustainable and Green Developments. As far as Engineering and Technologies are concerned, the INNOVATIONS could focus on Energy Efficiency, Renewable Energy, Water Energy and Water Efficiency. These again mean Training and Identification and Nurturing of People and Ideas and so on. There seems to be abundant scope for all these in our Country.

We are commencing a "Technology Series" from this issue mainly to focus on evolution and current status with regard to Technologies in various areas of Electrical Distribution Elements and Components and Installation Engineering and Design Practices etc. In this regard we appeal to specialists in the areas of Transformers, Switch Gears, Cables, Various Equipments for Protection and Controls etc. to send us materials and Articles for publication in the future issues of this News Letter. We have commenced in this issue with compilation some details on "Cables" by way of introduction and we look forward to publish interesting and valuable details in future for our readers.

We thank all those members who have helped us by participating in the advertisements appearing for the issue June 2014 – Emaar Electricals, Sivasakthi Electricals, Blue Sea Power Solutions Pvt. Ltd., Devee Electricals, Power Links, Krishna Bharathi Power Systems, Aruna Electricals, Galaxy Earthing Electrodes Pvt. Ltd., V-Guard Industries Ltd., Shree Abirami Enggineering Works, Elmeasure India Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., Universal Earthing Systems Pvt. Ltd., Cape Electric Pvt. Ltd., Supreme & Co Pvt. Ltd., Prayagaa Enterprises Pvt. Ltd., Magna Enterprises, Rathnam Enterprises, Jef Techno Solutions Pvt. Ltd., Prolite Autoglo Ltd., Power Care Enterprises, Ashlok Safe Earthing Electrode Ltd., Hopes Engineering, Switchwell Engineering, Sweess Service Centre, Vie Soleil Engineers Pvt. Ltd., Velohar Infra Pvt. Ltd., Sivasakthi Enterprises, Shree Engineers, Electrotherm (India) Ltd., Vasu Electrical, Power Cable Corporation, Faith Power Solutions, Saravanan Control System, Jayam Bros., A.M. Manickam, Turbo Electrical Engineers, Fomra & Fomra, Miccrotech Engineering Corporation, KEI Wires and Cables, C&S Electric Ltd., FLIR Systems India Pvt. Ltd., Tech-Up Engineering Pvt. Ltd., Heat Craft Engineers Pvt. Ltd., Intrans Electro Components Pvt. Ltd., Deekay Electricals, Subash Electrical, Sri Bhoomidurga Marketing Pvt. Ltd., Saidapet Electricals, Sakthi Electrical Traders, Kumaran Industries, Welwin Electricals, Max Electric Co., Power Electrical Works, Aim Electrical Controls India Pvt. Ltd., Alfa Switchgear (I) Pvt. Ltd., Electro-Tech Engineers, Bharat Enterprises, Tycoon Rubber Insulating Mats, Abirami Electricals, Balaji Electrical, EA Facilities Services Pvt. Ltd., Tandem Enterprises. EDITOR



OBITUARY

G. ELUMALAI

(10.12.1970 - 31.05.2014)

On behalf of The TamilNadu Electrical Installation Engineers Association 'A' Grade extends **Heartfelt Condolences** for the demise of our Member **Mr. G. ELUMALAI,** ***Propreitor, M/s. Power Care***, Chennai.

We pray the almighty to rest his soul in peace.

ELECTRICAL INSTALLATION ENGINEER

President : U. BASKARAN

Secretary : K. KANNAN

Treasurer : P. SUYAMBU

Editor :
G. VENKATESH

Printer :
M. VENKATARAMAN

Advisor :
S. MAHADEVAN

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MEMBERS DETAILS

S.No.	Company Name	License No.	Place	Contact No.
135.	Arma Engineers & Consultants	EA 2784	Coimbatore	0422-4379233, 98940 44688
136.	Base Electrical and Electronic Solutions Pvt Ltd	ESA 375	Coimbatore	0422-4354655, 98422 55004
137.	Chandra Electricals	EA 2353	Coimbatore	98422 26737, 93601 26737
138.	Circuit Engineering	EA 1701	Coimbatore	0422–2400438, 98430 16438
139.	CV Electric Company	EA 2403	Coimbatore	0422-4378279, 98946 59279
140.	Dakshin Electricals	EA 1905	Coimbatore	0422-2443868, 98422 44244
141.	Darshan Controlss Corporation	EA 2445	Coimbatore	0422-2317002, 98431 36626
142.	Del Star Engineers	EA 2309	Coimbatore	95851 34161, 98430 11641
143.	Devishree Electricals	ESA 117	Coimbatore	0422-2498187, 99401 87896
144.	DKD Engineers & Agencies	EA 1819	Coimbatore	0422-4392009, 98652 52528
145.	Electrical Installation Systems	EA 2046	Coimbatore	94422 27237, 81229 77569
146.	Energy Control Corporation	ESA 333	Coimbatore	0422-2321849, 98430 36626
147.	Essaar Electro Controls	EA 2277	Coimbatore	0422-2535407, 97888 53540
148.	Ever Rise Engineering	EA 2204	Coimbatore	0422-4378005, 98422 25896
149.	Geethanjali Electricals	EA 2660	Coimbatore	0422-2563415, 99655 56341

EVENTS

Renewable Energy India Expo
3-5 September 2014
India Expo Centre, Greater Noida

UBM
A UBM Event

Event Profile: Organised by UBM India, the Renewable Energy India Expo is an annual event that aims to accelerate growth of the Indian renewable energy sector by offering sustainable development opportunities to businesses in this industry.
Date &Time: 3rd - 5th September 2014
Venue: India Expo Centre, Greater Noida, India
Website: http://www.renewableenergyindiaexpo.com

WIRE & CABLE INDIA 2012

International Exhibition and Conference for the Wire & Cable Industry
Events Profile: The Confederation of Indian Industry (CII) and Messe Düsseldorf will jointly organize Wire & Cable India. Messe Düsseldorf is the organizer of wire Düsseldorf - the world's No. 1 Trade Fair for the wire and cable industries.
Date &Time: 28th - 30th October 2014
Venue: Mumbai, India
Website: http://www.mdna.com/trade-shows/details/wireindia

Events Profile: The construction industry is one of the largest economic activities contributing to India's development. India has been witnessing tremendous growth in building and construction sector for the past 5 years. With a modest beginning of 20,000 sq.ft of green footprint in the country in the year 2001, today over 2,007 Green Buildings with a Footprint of over 1.40 Billion sq.ft are being constructed all over India. To advance green building movement in the country, IGBC is organising India's flagship event on green buildings.
Date &Time: 4th - 6th September 2014
Venue: Hyderabad International Convention Centre (HICC), Near Hitec City, Hyderabad
Website: **http://www.greenbuildingcongress.com/site/gbc/index.jsp**

inter solar SUMMIT INDIA

Events Profile: This event will serve as an addition for the highly successful Intersolar India in geographical terms, thus the content-related focus will be on the southern parts of India and take place at the same time as the electronica / productronica exhibition in September.
Date &Time: 22nd September 2014
Venue: Vivanta By Taj, 2275, Tumkur Road, Yeswantpur, Bangalore, India
Website: **https://www.intersolarglobal.com/index.php?id=4956**

inter solar connecting solar business | INDIA

Events Profile: Intersolar India is India's largest exhibition and conference for the solar industry and, as a leading industry platform, focuses on the areas of photovoltaics, PV production technologies, energy storage and solar thermal technologies. In 2013, a total of 170 companies from 14 countries attended the exhibition.
Date &Time: 18th - 20th November 2014
Venue: Mumbai, India
Website: **http://www.intersolar.in/en/intersolar-india.html**

CONTRIBUTION TO NEWSLETTER (Rs.1,000/- per year)

68. Aiswarya Power Corporation, (2014-15)
69. Lasmi Chander Engineering Co. Pvt. Ltd, (2013-15)
70. K.G.S. Electricals, (2014-15)
71. Delhi Electrical Constructions, (2014-15)
72. Magna Enterprises, (2014-15)
73. Saidapet Electricals, (2014-15)
74. Mr. K. Muthukrishnan, (2014-15) ***Non Member***
75. Velohar Infra Pvt. Ltd, (2013-15)
76. Vennila Electricals, (2014-15)
77. Godrej & Boyce Manufacturing Co. Ltd, (2014-15) ***New Member***
78. Menaka Electricals, (2014-15) ***New Member***
79. RRS Electricals, (2014-15)
80. Royal Constructions, (2014-15) ***New Member***
81. Prakash Fabricators & Electricals, (2014-15) ***New Member***
82. Yesar Electricals, (2013-15)
83. Guru Engineers, (2014-15)
84. Seshasayee Papers & Boards Ltd, (2014-15)
85. Ganesh Electricals, (2014-15)
86. Bharath Enterprises, (2014-15) ***New Member***
87. J.R. Engineering, (2014-15)
88. Neutral Electricals, (2014-15) ***New Member***
89. Blue Sea Power Solution Pvt. Ltd, (2014-15)
90. SSE Enterprises, (2013-15)
91. D. Sudhakar Electricals, (2014-15) ***New Member***
92. Shree Sakthie Electrical & Engineering (Works), (2014-15)
93. Shanti Enterprises Electricals Pvt. Ltd, (2014-15)
94. Priya Enterprises Electricals, (2013-14)
95. Immanuel Electricals, (2014-15)
96. Prakash Power Planning Pvt. Ltd, (2014-15)
97. Sree Switchgears & Control, (2014-15)
98. R.S. Electrical Controls, (2013-15)
99. Henry & Farad Pvt. Ltd, (2014-15)
100. Voltech Manufactures Co. Pvt. Ltd, (2014-15)
101. Shri Sakthi Electricals, (2014-15)
102. Inel Power System Engineers Pvt. Ltd, (2014-15)
103. Sterling & Wilson Ltd, (2013-15)
104. MSC Enterprises, (2014-15)
105. SRP Electricals, (2014-15)
106. Eskay Enterprises, (2014-15)
107. Ganga Consultants Contractors, (2014-15)
108. Senthil Technocrafts, (2014-15)
109. Philson Electric Co. Pvt. Ltd, (2014-15)
110. Delta Engineers, (2013-15)
111. S.R and Co, (2014-15)
112. Sarayu Contractors and Consultants, (2014-15)
113. J.K. Engineering Associates, (2014-15)
114. Sundhar Electrical Engineers, (2014-15)
115. Volts Trans Engineers, (2014-15)
116. Kutsun Enterprises, (2013-15)
117. Delta Roto Tech Pvt. Ltd, (2013-15)
118. Shrishti Power Technologies Pvt. Ltd, (2014-15)
119. Mahesh Enterprises, (2013-15)
120. Essar Electricals, (2013-15)
121. Elsytech Engineers & Consultants (P) Ltd, (2014-15)
122. Kevin Electricals, (2014-15)
123. S.E. Consultancy Services, (2014-15)
124. Bestech Electrical Engineering, (2014-15)
125. Energy Control Corporation, (2013-15)
126. Chemin Control Instrumentation Pvt. Ltd, (2013-15)
127. Johnsons Electrical Trading, (2015-17)
128. Krishna Power and Control Pvt. Ltd, (2014-15)
129. Nanjil Power, (2014-15)
130. Win Power Engineering, (2013-15)
131. Sabari Electrical Enterprises, (2014-15)
132. Abirami Electricals, (2014-15)
133. M.M. Engineers, (2014-15)

We request other members also to send their contribution for NEWSLETTER early.

(***Please help us to serve you better***)

KNOW THY POWER NETWORK – CIRCUIT – 82

Let us restart our journey. We are now living in a modern world of distraction with Smart devices. Everywhere the term **"Smart"** resonates/reverberates. So, we should also make ourselves **"Smart Enough"** to connect seamlessly with this Smart world. As usual, let me add some more Smart devices/appliances for our discussion. Prior to this, let us make one point very clear. There lies an immediate/urgent need for all of us to free ourselves from the clutches of these Smart devices; otherwise we shall be enslavened by them. Not only we won't have time for an one to one talk or conversation with others.but also, we lose our "human touch"/human quality and become remote controlled machines. **Then imagine! What will happen to our lives!** So I fervently request all of you to brush aside the intrusion of the Smart Phones and try to meet/ contact your friends/relatives regularly so as to have a lively discussion or one-to-one conversation. I sincerely hope you will extend your hands for this "Smart phone-less" personal contact Suggestion Will you?

I Smart Television

As its name implies, it is really a very smart device and have good compatibilities with all Smart devices. Let it be a Smart Phone, Computer or another Smart TV. It has built in facilities for Wi-Fi Direct and other Smart UI facilities. It has an integration of all internet streaming devices and social network.

II Smart Refrigerator

These appliances have "Frost-free Operations" and provided with digital inverters. They keep stored foods a fresh for a minimum period of seven days and help to achieve maximum cooling with minimum electrical energy consumption. What else you want?

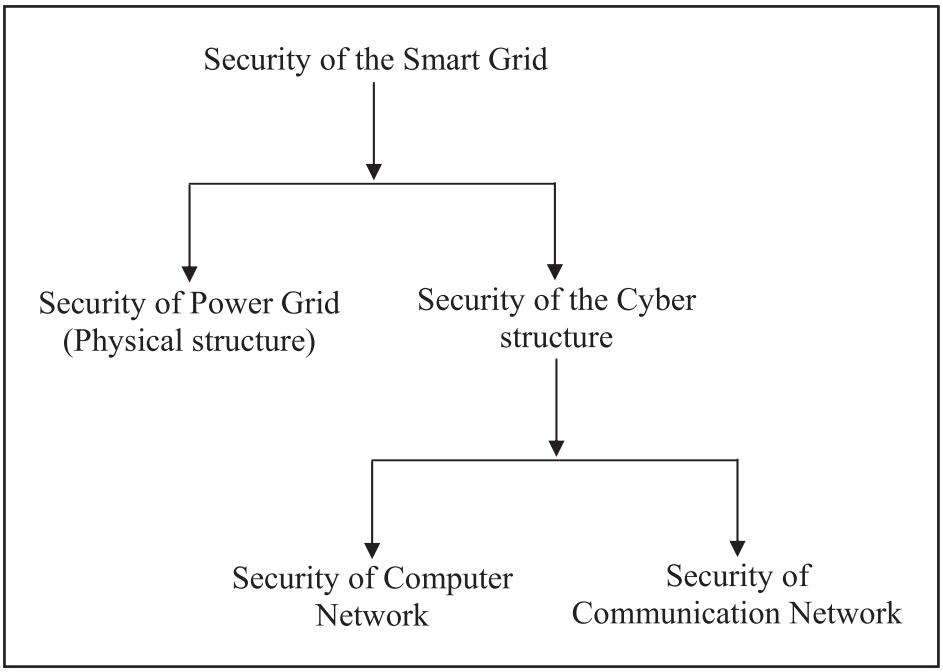
Now let us have a brief focus on the difference between Smart and Intelligent Equipment/ Devices. Smart devices are provided with "Sensors" which can sense the environmental conditions and other stimuli and act accordingly. [i.e. It can start working or stop working.] That is all for its job. It has no built-in intelligent controls for the operating systems i.e. It has no tuned controls for the external or environmental conditions. This brings the main difference between the Smart and intelligent devices. **The "Intelligent devices" on the other hand are provided with built-in controls that meet or adjust with the prevailing external conditions.** They can change the operating system of the devices in tune with the external conditions. They can sense but also react and swiftly respond to environmental conditions or other Stimulies just like human beings. These devices are provided with Sensors & Intelligent Operating Controls.

(Eg.) Smart Air Conditioners and Smart Refrigerators have "Thermostats with fixed settings only where as Intelligent Air Conditioners and Refrigerators have thermostats whose settings are automatically increased/ decreased in sync with the prevailing environmental conditions. *In brief, Smart devices have sensors only whereas intelligent devices have both sensosrs and operating controls.*

III "Smart Car – Driverless Self-driving Car"

These cars are now under design and testing only; but they may hit the roads in the near future. Toyota and Lexus cars are now used for this study. These cars operate autonomously and safely without any human intervention; no acceleration pedals nor brakes nor steering wheels are provided to them. Computer Softwares, several cameras and sensors and a spinning laser radar totally control their journey. Even with a Smart phone application, these cars can be commanded and controlled. Just based on our directions, in the form of control

signals, they can pick up passengers and automatically drive them to their selected destination while navigating the traffic automatically. These cars can focus a number of changing variables like the number of cars on the road and pedestrians crossings. Presently they cannot navigate under adverse weather conditions like water logging or snow on the road. In addition, they find it very difficult to identify and avoid hitting of small animals like squirrels. Now, they can move along a pre-determined way only even though they can find out humans and follow meticulously the traffic rules. Let me stop here the description of the modern Smart devices/equipment. In the next article, I would like to share with you some information relating to the capability of Smart Phones ie. what they (Smart Phones) can do for us. Probably some of us may not know them.It is time for us to return to our regular site viz. Smart Grid. A Smart system is one where cyber-physical systems are seamlessly functioning together.



In other words it can be stated that a Smart System is one where cyber and physical systems are coupled together and we get best out of them. So, also our "Smart Grid" makes our life better.

We have seen that the Smart Grid has two layers which are independent in operation, in contour and rhythm but interdependent. We need to protect/shield them separately from external and internal attacks. Thus there lies a need for the provision of separate security for the physical structure of the Smart grid (electricity grid) and also for its cyber structure which contains computer network and communication network. We have to provide necessary security for all these systems and also the systems of other organizations that have a foot hold in Smart Grid. In this context, it has to be noted that our country is a "hot spot" for the attacks on both the physical and cyber components of the Smart Grid.

In my next article, let us learn more about these security arrangements. Now, its time for me to "sign off".

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

If you want to Walk Fast, Walk Alone. But if you want to Walk Far, Walk Together. - RATAN TATA

A ROBUST SOURCE OF INFORMATION ON MARINE ENERGY, OFFSHORE WIND PROJECTS

Wondering what the impact on killer whales might be from a turbine installed under the sea? Curious whether crabs and other crustaceans might be attracted to underwater cables carrying electricity to homes and businesses on the mainland? Interested in which country is harvesting the most energy from the world's oceans?

The answers to these and many more lie with Tethys, a robust online resource available for free to anyone interested in ocean energy and offshore wind resources. Tethys—named after the goddess of the sea in Greek mythology—focuses on the environmental effects of energy projects that are proposed, underway or completed in the ocean and above it.

The database includes hundreds of scientific papers, technical reports, regulatory applications on file with federal and international bodies and clickable maps that show the locations of research studies and project sites under development around the world. A robust search function allows a user to filter results, for instance, to find all tidal energy projects in the U.S., offshore wind projects in Europe and so on.

The resource was created by marine scientists and IT specialists at the U.S. Dept. of Energy (DOE)'s Pacific Northwest National Laboratory, based in Richland, Wash. PNNL is the only DOE laboratory with an ocean research facility, the Marine Sciences Laboratory, which is located on Washington state's Olympic peninsula west of Seattle.

"There is enormous energy capacity within our oceans," said Andrea Copping, an oceanographer at PNNL who heads Tethys. "Can we develop this potential responsibly, to reduce our carbon footprint, without doing damage to the ocean? This is the question that Tethys is designed to explore."

Tethys is an important form of outreach for the DOE's Office of Energy Efficiency and Renewable Energy as it seeks to accelerate efforts to tap the vast energy potential of the oceans with minimal impact on the environment.

The Website also serves as a virtual community that gives users the opportunity to comment on new research, to seek advice, to let their peers know about regulatory developments or to find potential new collaborators. The site is aimed at project developers, regulators, scientists, students and anyone interested in the effects of marine energy projects on the environment.

The site encompasses hundreds of projects that harness energy by using devices that spin, bob, rise and fall, or sway back and forth in the ocean. Structures include buoys the size of buses that move up and down to capture energy from waves; turbines anchored to the sea floor that spin with the tides and offshore platforms that support floating wind turbines. Systems typically include a network of underwater power cables that funnel the energy between devices and a main cable that carries the energy to where it's needed on land.

Researchers are investigating potential environmental effects, including noise that might disturb marine mammals, power cables that might emit electromagnetic fields, mooring lines that might entangle wildlife and spinning blades that might injure marine animals. More subtle effects might include consequences to the shoreline when wave energy is removed from a particular spot of flowing water, or the impact on sea life from moving cold water from the bottom of the ocean to the surface and warm water to the depths.

Tethys draws heavily on data gathered through an international effort, Annex IV, which is a collaboration created by Ocean Energy Systems, a technical initiative under the International Energy Agency. Annex IV nations have agreed to pool their information on wave and tidal energy projects and make that collection freely available to the public through Tethys.

"We believe we have, in one form or another, environmental data on almost every wave and tidal device that has ever been placed in the water anywhere on the planet", said Copping.

Source: Pacific Northwest National Laboratory

TAMILNADU GOVERNMENT
GAZETTE NOTIFICATION NO: 108
CHENNAI, WEDNESDAY, MAY 28, 2014

(G.O. Ms. No.38, Energy (D2), 28th May 2014, Vaikasi 14, Jaya, Thiruvalluvar Andu – 2045)

Sl.No (1)	Electrical Inspector (2)	Headquarters (3)	Area (4)
1.	Electrical Inspector / Chennai-North and Assistant Electrical Inspector / Chennai-North	Chennai	1. Perambur, Purasaiwakkam and Ayanavaram Taluks 2. Tondiarpet Taluk, 3. Mylapore and Velachery Taluks of Chennai District
2.	Electrical Inspector / Chennai-South and Assistant Electrical Inspector / Chennai-South	Chennai	1. Mambalam and Guindy Taluks 2. Egmore, Amaindakarai Taluks of Chennai District
3.	Electrical Inspector / Ambattur and Assistant Electrical Inspector / Ambattur	Ambattur	1. Ambattur, Maduravayal Taluks 2. Madhavaram, Thiruvottriyur Taluks 3. Poonamallee Taluks of Thiruvallur District
4.	Electrical Inspector / Ponneri and Assistant Electrical Inspector / Ponneri	Ponneri	1. Thiruvallur Taluk 2. Gummidipoondi Taluk 3. Ponneri Taluk 4. Utthukottai Taluk 5. Tirutani Taluk 6. Pallipattu Taluk of Thiruvallur District
5.	Electrical Inspector / Chengalpattu and Assistant Electrical Inspector / Chengalpattu	Chengalpattu	1. Chengalpattu Taluk 2. Utiramerur Taluk 3. Kancheepuram Taluk of Kancheepuram District
6.	Electrical Inspector / Sriperumbudur and Assistant Electrical Inspector / Sriperumbudur	Sriperumbudur	1. Sriperumbudur Taluk of Kancheepuram District
7.	Electrical Inspector / Tambaram and Assistant Electrical Inspector / Tambaram	Tambaram	1. Tambaram Taluk 2. Tirupporur Taluk 3. Tirukazhukundram Taluk 4. Alandur Taluk 5. Sholinganallur Taluk 6. Cheyyur Taluk 7. Madurantagam Taluk of Kancheepuram District
8.	Electrical Inspector / Cuddalore and Assistant Electrical Inspector / Cuddalore	Cuddalore	1. Cuddalore District 2. Nagapattinam District 3. Villupuram District 4. Ariyalur District and 5. Perambalur District

Sl.No (1)	Electrical Inspector (2)	Headquarters (3)	Area (4)
9.	Electrical Inspector / Vellore and Assistant Electrical Inspector / Vellore	Vellore	1. Vellore District 2. Thiruvannamalai District
10.	Electrical Inspector / Trichy and Assistant Electrical Inspector / Trichy	Trichy	1. Trichy District 2. Thanjavur District 3. Pudukkotai District 4. Thiruvarur District
11.	Electrical Inspector / Krishnagiri and Assistant Electrical Inspector / Krishnagiri	Krishnagiri	1. Krishnagiri District 2. Dharmapuri District
12.	Electrical Inspector / Coimbatore (North) and Assistant Electrical Inspector / Coimbatore (North)	Coimbatore	1. Coimbatore (North) Taluk of Coimbatore District 2. Nilgiri District
13.	Electrical Inspector / Coimbatore (South) and Assistant Electrical Inspector / Coimbatore (South)	Coimbatore	1. Coimbatore (South) Perur, Madukkarai Taluks 2. Pollachi Taluk 3. Valparai Taluk 4. Kinathukadavu Taluk of Coimbatore District
14.	Electrical Inspector / Sulur and Assistant Electrical Inspector / Sulur	Sulur	1. Sulur Taluk 2. Annur Taluk 3. Mettupalayam Taluk of Coimbatore District
15.	Electrical Inspector / Tiruppur and Assistant Electrical Inspector / Tiruppur	Tiruppur	1. Tiruppur (North), Tiruppur (South) Taluks 2. Avinashi, Uthukkuli Taluks 3. Kangayam Taluk of Tiruppur District
16.	Electrical Inspector / Palladam	Palladam	1. Palladam Taluk 2. Dharapuram Taluk 3. Madathukulam Taluk 4. Udumalaipettai Taluk of Tiruppur District
17.	Electrical Inspector / Erode and Assistant Electrical Inspector / Erode	Erode	Erode District
18.	Electrical Inspector / Salem	Salem	Salem District
19.	Electrical Inspector / Namakkal and Assistant Electrical Inspector / Namakkal	Namakkal	1. Namakkal District 2. Karur District
20.	Electrical Inspector / Dindigul and Assistant Electrical Inspector / Dindigul	Dindigul	1. Dindigul District 2. Theni District
21.	Electrical Inspector / Madurai and Assistant Electrical Inspector / Madurai	Madurai	1. Madurai District 2. Sivaganga District
22.	Electrical Inspector / Virudhunagar and Assistant Electrical Inspector / Virudhunagar	Virudhunagar	1. Virudhunagar District 2. Ramanathapuram District
23.	Electrical Inspector / Tirunelveli and Assistant Electrical Inspector / Tirunelveli	Tirunelveli	1. Tuticorin District 2. Tirunelveli District 3. Kanyakumari District

Sl.No (1)	Electrical Inspector (2)	Headquarters (3)	Area (4)
24.	Electrical Inspector (Technical) and Government Standard Laboratory	Chennai	Attached with the Office of the Chief Electrical Inspector to Government
25.	Senior Electrical Inspector, Coimbatore	Coimbatore	Areas comprising the Jurisdiction of Electrical Inspectors of Coimbatore (North), Coimbatore (South), Tiruppur, Palladam, Sulur, Madurai, Virudhunagar, Tirunelveli, Dindigul, Erode, Salem, Namakkal.
26.	Senior Electrical Inspector/ Head quarters, Chennai	Chennai	Attached with the office of the Chief Electrical Inspector to Government.
27.	Chief Electrical Inspector to Government , Chennai	Chennai	Whole State of TamilNadu.

அரசு தலைமை மின் ஆய்வாளர், முதுநிலை மின் ஆய்வாளர் மற்றும் மின் ஆய்வாளர்களின் பணி மற்றும் பணி மாற்றங்களுடன் அதிகார எல்லை மாற்றம் - மின் ஆய்வாளர்களின் ஊர் மாற்றத்தின் விவரம்.

வ.எண்	அலுவலர் பெயர் மற்றும் தற்போது பணிபுரியும் இடம்	ஊர் மாற்றம் செய்யப்பட்ட இடம்	கூடுதல் பொறுப்பு வழங்கப்பட்ட இடம்
1	திரு. க. வீரமணி, கோவை (மத்தியம்).	சூலூர்	–
2	திரு. தே.அழ. தேனப்பன், காஞ்சிபுரம் (தெற்கு).	அம்பத்தூர்	–
3	திரு. து. செல்வராஜ், காஞ்சிபுரம் (கிழக்கு).	ஸ்ரீபெரும்புதூர்	–
4	திரு. ஞா. ஜோசப் ஆரோக்கியதாஸ், கிருஷ்ணகிரி.	பொன்னேரி	–
5	திரு. வீ. இராமகிருஷ்ணன், ஈரோடு (வடக்கு).	பல்லடம்	கோவை (தெற்கு)
6	திரு. தா. கார்திகேயன், சென்னை (மேற்கு).	தாம்பரம்	–
7	செல்வி. நா. மைதிலி, திருப்பூர்.	கடலூர்	–
8	திரு. பெ. பழனி, மதுரை.	திண்டுக்கல்	மதுரை, விருதுநகர் கோட்டங்கள்
9	திரு. கா. ஜெயகிருஷ்ணன், கடலூர்.	ஈரோடு	–
10	திரு. தே. செந்தில்குமார், கோவை (தெற்கு).	திருப்பூர்	கோவை (வடக்கு)
11	திருமதி. நா. ஹேமா, காஞ்சிபுரம் (வடக்கு).	செங்கல்பட்டு	–
12	திரு. ப. தினகர்பாபு, விருதுநகர்.	கிருஷ்ணகிரி	வேலூர்
13	திரு. செ. பாலமுருகன் உதவி மின்ஆய்வாளர். (மின் ஆய்வாளர் கூடுதல் பொறுப்பு / திருநெல்வேலி)	–	மின் ஆய்வாளர் கூடுதல் பொறுப்பு / திருநெல்வேலி

TAMIL NADU TO ADD 1,000 MW OF WIND ENERGY

With removal of restrictions and control on wind power evacuation in Tamil Nadu, where the installed capacity for wind power is the largest in the country, is expected to add another 1,000 MW this year.

According to industry sources to set up one mega watt of wind farm it would cost around Rs 6 crore.

The Tamil Nadu Government announced that from June 1 power cut will be withdrawn, mainly owing to the beginning of wind season, and removal of restrictions and control on wind power evacuation and withdrawal of all load shedding.

All these comes at a time when the wind power industry has been complaining infrastructure issues and payment delays from the State Electricity Board.

D V Giri, Secretary General, Indian Wind Turbine Manufacturers Association, said that the removal of restrictions and control on wind power evacuation and withdrawal of all load shedding will instill confidence in the minds of investors to invest more as Tamil Nadu has good winds.

Tamilnadu investment in the past is for captive consumption which will help existing investors and in future more IPPs (independent power Producers) will invest.

Total installed capacity of wind energy in Tamil Nadu is 7,248 MW. This is almost 40% of the total wind installed capacity in the country, according to Tamil Nadu Energy Development Agency. Almost full capacity is operating and connected to the Grid.

It may be noted, in 2012-13 addition of wind power in the state as only 175 MW as compared to 1,083.15 MW in 2011-12. The drop in the addition was attributed to withdrawal of the Accelerated Depreciation (AD) incentive for wind power projects w.e.f. April, 1 2012, infrastructure bottlenecks and payment delays.

Industry representatives says “considering two major issues - infrastructure and payment delay - are addressed and there are indication that AD might come back the industry will invest on new capacities in the State”.

During wind season the wind power contributes around 30-35% of the State power demand on a daily basis. On a yearly basis it is around 16-19%.

Besides infrastructure, one of the other challenge was payment from the State Electricity Board, which according to Giri, “delayed payments and evacuation are issues faced anywhere. There is improvement in payment now”.

Last year the industry has said the State Electricity Board owes around Rs 1,200 crore for the industry and the state government has cleared this till December, now the due is negligible to the tune of around Rs 100 crore, said a senior official from the industry.

On the infrastructure, he said commissioning of Kayathar 400 KV Substation by July and other Substations of Theppakundu, Kanarpatti, Anaikadavu and Rasipalayam can evacuate additional 4,000 to 5,000 MW.

Besides, the Green Corridor to evacuate power being funded through KFW- a German Fund, will greatly help the current situation, said Giri. Recently Tamil Nadu Chief Minister requested the Centre to provide a grant of Rs 2,250 crore for ‘Green Energy Corridor’ towards transmission schemes for evacuation of a portion of solar energy.

Courtesy: Business Standard

A JAPANESE STARTUP UNVEILS A LONG-LASTING AND SAFER BATTERY MADE FROM CARBON

A battery that lasts longer, is safer, charges faster and is less expensive than a standard lithium ion battery: That's the powerful idea behind a new type of battery under development by a young Japanese startup called Power Japan Plus, or PJP, which came out of stealth on Tuesday. The year-old company uses carbon for both the anode and the cathode portion of the battery and hopes to start producing it later this year.

A battery is made up of an anode on one side and a cathode on the other, with an electrolyte in between. In a lithium ion battery, lithium ions travel from the anode to the cathode through the electrolyte, creating a chemical reaction that allows electrons to be harvested along the way.

While lithium ion batteries are the dominant batteries these days for laptops, cell phones and early electric cars, they have some shortfalls. For example, the batteries degrade pretty quickly over time (which explains why your laptop battery dies every couple of years), and they can catch on fire under extreme impact. They're also relatively expensive if you need a bunch of them to power an electric car, which is why Tesla's cars are only really attainable by the wealthy right now.

An all-carbon battery

A battery that uses carbon for both the anode and the cathode could be safer than a lithium ion battery because it removes the highly flammable lithium oxide. While battery fires have been rare for electric car companies,

DO look up and look out for power lines before you climb a tree.
The electricity can go right through the tree branch - and right through you!

Tesla, GM and others have all seen a handful of cars with punctured batteries catch on fire, and have faced PR hiccups as a result. Thermal runaway — intense, long-lasting fires caused by lithium oxide catching on fire — has long been the Achilles' heel of lithium ion batteries.

A carbon battery also doesn't degrade as quickly as a lithium ion battery over time. While a standard lithium ion battery with a two-year lifetime could have around 500 cycles of charging and discharging, Power Japan Plus' dual-carbon battery could last for 3,000 cycles, the company's executives told me in a phone call. They also say that because of the carbon chemistry, their battery can charge 20 times faster than a standard lithium ion battery.

Because the battery only uses carbon for its main active material, it could cost less than standard lithium ion batteries, though executives declined to name its price. Lithium ion batteries have continued to drop in price and Tesla says it's reducing the cost by 30 percent with its planned battery factory.

Finally, an all-carbon battery could be more easily recycled at the end of life than a lithium ion battery because it doesn't contain rare earth materials and metals. Activated carbon can come from a variety of low cost, easily-available sources.

The idea for a dual carbon battery has been under development by Japanese researchers since the 1970s. Around six or seven years ago, scientists at Kyushu University started working on nanotechnology and material breakthroughs — in the laboratory of applied chemistry professor Tatsumi Ishihara — that could raise the capacity (how much electric charge can be delivered at a certain voltage) of those early dual carbon batteries.

Now Power Japan Plus — co-founded by Japanese tech entrepreneurs Dou Kani (the CEO and president) and Hiroaki Nishina (the COO) — is looking to commercialize the research done at Kyushu. While neither Kani or Nishina has a long background with battery chemistry (they hail from the telecom and software sectors), they've brought on Japanese battery cathode expert Kaname Takeya, who developed the cathode tech used today in the Toyota Prius and the Tesla Model S.

Takeya splits his time between San Francisco and Japan and is the company's CTO and CEO of its U.S. operations. He just finished a project for Argonne National Labs, and previously also worked on some battery startups including Quallion and EnerDel.

Other companies are looking at ways to engineer carbon to make batteries better. EnerG2 is one of those startups, and the company has developed carbon materials for a variety of battery applications. Because Power Japan Plus' innovation is in the development of the carbon material, the company is also looking into a side business of selling its carbon to third parties.

Early stage

While the tech has been under development for several years, the founders incorporated just a year ago, and now employ only eight people. To date they've been bootstrapping the company, but are hoping to raise funding to help them begin moving into early production later this year.

Funding, particularly in Silicon Valley, could prove to be difficult for an early stage battery manufacturer, given all of the battery startups that have struggled over the years. It's a difficult market because scaling up battery production can take a long time and, potentially, a lot of money. But big corporations that are interested in ultimately owning or licensing advanced battery tech might still be interested in providing early funding.

Power Japan Plus says it is less capital-intensive than other battery companies because its battery can be manufactured on existing battery production lines. Because the batteries don't use rare materials and have only one active material, execs say the supply chain is extremely simple, which also reduces costs. Additionally, executives told me that while they want to do some early pilot line production themselves, they know they need a large manufacturing partner if they want to scale up production to offer batteries to electric cars.

Power Japan Plus intends to first launch batteries for the medical device and satellite industries, which are hyper-focused on safety. Later down the road, they could try to tackle electric cars. An electric car with a battery pack of dual-carbon batteries could charge much faster and last much longer on the road, giving it a higher resale value. Currently the team is supplying batteries for a Go-Cart in a transportation proof-of-concept partnership.

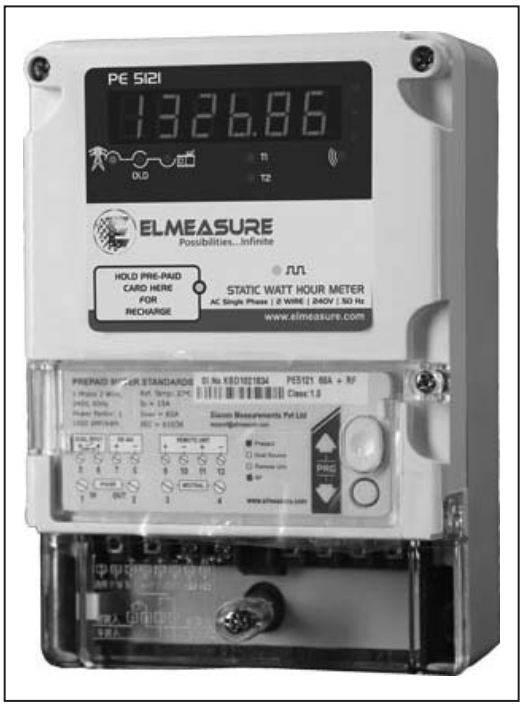
In the immediate future, electric cars — at least from dominant players Tesla and Nissan — are betting on lithium ion chemistry for batteries. But farther down the line, other types of chemistries will need to be investigated to provide power for the next generation of electric cars.

The use of solar energy offers huge potential for natural resource and climate protection and for the expansion of renewable energies on the road to a future-oriented energy supply. – MARGARETA WOLF

PRODUCT OF THE MONTH

ELMEASURE PREPAID METER

- **Accuracy :** Class 1 (Default) IEC 61036, CBIP 88
- **Sensing/Measurement :** True RMS, 1 Sec update time, 4 Quadrant Power & Energy RD Option
- **Input voltage:** 4 Voltage inputs (VR, VY, VB, VN); Programmable 110 or 415V LL Nominal (Range 80 to 550V LL), Primary Programmable up to 999 kV, Burden: 0.2VA Max. per phase.
- **CT operated input current :** Current inputs (AR, AY, AB) 50mA- 6A (Field configurable 1A or 5A), Primary Programmable up to 99 kA for CT operated one, Overload : 10A Max continous, 50A Max for 3 sec. for 5A or 10 times basic whichever is lower, Burden : 0.5VA Max. per phase
- **Whole current operated :** 10 - 40A or 15 - 60A or 20 - 80A
- **CT PT Ratio Max :** 2000 MVA Programmable
- **Display Resolution :** 1 row, 6 digits, (Integrated 6 digits) 10mm
- **Communication:** RS485 serial channel connection, Industry standard. Modbus RTU protocol (RS232 optional), Baud rate: 1200 bps to 19200 bps. (Preferred 9600 bps), Isolation: 2000 volts AC isolation for 1 minute between communication and other circuits.
- **Gas / water input option :** Factory configurable Digital input with Maximum Frequency 3 Hz OR Analog Input 4-20mA or 0-20mA programmable at field or 1-10DC voltage
- **Weight :** Unpacked: 1650 gms, Packed: 1850 gms
- **Mechanical Specification :** for 3phase prepaid meter, Dimension Bezel: 173 × 262 mm (Depth 82mm behind bezel)



ELSoft PPS:

The service provider will have PC, Charging unit and Elmeasure's ELSoft PPS. ELSoft PPS is a windows based Software to recharge RF Card. Initially ELSoft PPS software should be entered with all the meter serial numbers and the user name and address.

The action required by the service provider is just to install the meter and further activities involve only the consumer, which then is a very simple procedure to be followed. It is sufficient for the service provider to have only one man power to recharge the card as per the consumer's requirement.

The steps involved are the consumer would place a request to recharge the card. The service provider recharges using ELSoft PPS software and recharging unit. After the recharge consumer needs to display the card in front fascia of the meter or remote unit. This enables the meter to acquire the amount recharged now the content in the card is reset to zero until he recharges again. The intelligent microcontroller based Electronics inside the meter stores the number of units recharged by the concerned consumer and measures the energy consumption.

As soon as the consumer exceeds the recharged amount that is when the meter projects zero balance the meter disconnects the outgoing power supply to the consumer until the next recharge. It adopts advanced RF smart card techniques, the user buy electric power and transmit the data of purchased amount into the meter to use power. One household with one meter and one card, to use power by card, it can prepay for electric power, automatically meter-reading, and prevent power-stealing. When the purchased power is used up, it will power

cut automatically. Meanwhile, the information of the user is managed by the computer, computer can check, sum up the data and charge fees and print bills as needed.

Unique features of ELSoft PPS

- Password protected
- Works only with the Elmeasure Dongle
- Customer master – Add / Edit / View customer list to be serviced. This will be useful to keep the record and generate the bills with the meter serial no
- Cost – EB/ DG/ Gas and water per unit charges to be connected and the tax part of it
- Recharge – Option of deducting currency based on the fixed and maintanace charges and the tax
- Reports –
  a. Recharge slip provides the last recharge slip for the particular user.
  b. Consolidated recharge history for the particular user for the selected period
  c. Consolidated recharge history for all the users for the selected period to facilitate the service provider

CONSTRUCTION OF ICE WALL BEGINS AT FUKUSHIMA DAIICHI

Construction has begun on the "ice wall" at the shattered Fukushima Daiichi nuclear power plant, TEPCO announced today. This underground wall of frozen soil is intended to prevent groundwater from flowing into the reactor buildings, where it mixes with radioactive materials. Every day, about 400 tons of groundwater flows into the reactor basements.

Since the meltdowns of March 2011, TEPCO has been trying to capture this contaminated water, store it safely, and treat it to remove the radioactive materials. It's an understatement to say that the company has had some trouble with this process. Storage tanks have leaked, and it took a long time to get the water treatment systems working properly.

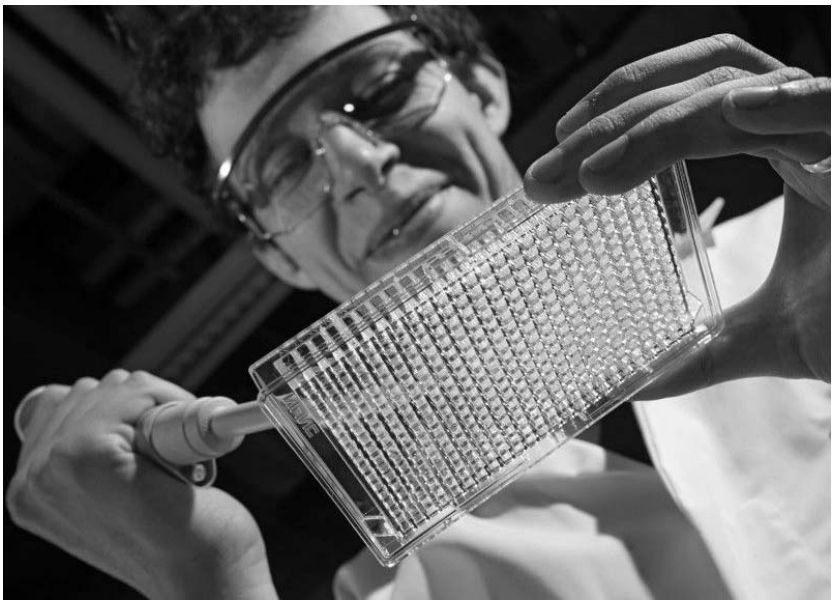
Stopping the contamination of groundwater is an important step in Fukushima Daiichi's 40-year decommissioning process. Right now, TEPCO is constantly building tanks to store the ever-accumulating water. Once the groundwater is kept out of the reactor buildings, TEPCO can focus on the radioactive water that's leaking out of the perforated reactors themselves.

TEPCO explains that the ice wall technology is similar to that used in ice skating rinks. Pipes of coolant are inserted into the ground, which freeze the soil around them all the way down to the bedrock. The ice wall will redirect the groundwater around the damaged reactor buildings, letting it flow harmlessly to the sea. TEPCO plans to begin freezing the soil in March 2015.

All the breaks you need in life wait within your imagination, Imagination is the workshop of your mind, capable of turning mind energy into accomplishment and wealth - NAPOLEON HILL

THE SWEETEST CALCULATOR IN THE WORLD- SUGAR-BASED MOLECULAR COMPUTING

(*Nanowerk News*) In a chemistry lab at the Friedrich Schiller University Jena (Germany): Prof. Dr. Alexander Schiller works at a rectangular plastic board with 384 small wells. The chemist carefully pipets some drops of sugar solution into a row of the tiny reaction vessels. As soon as the fluid has mixed with the contents of the vessels, fluorescence starts in some of the wells. What the Junior Professor for Photonic Materials does here - with his own hands - could also be called in a very simplified way, the 'sweetest computer in the world'. The reason: the sugar molecules Schiller uses are part of a chemical sequence for information processing.



The chemist of Jena University and his two postgraduate students, Martin Elstner and Jörg Axthelm recently described in the new edition of the science journal *Angewandte Chemie International Edition* ("Sugar-based Molecular Computing by Material Implication") how they developed a molecular computer on the basis of sugar.

"The binary logic which makes a conventional computer chip work is based on simple yes/no-decisions", Professor Schiller explains. "There is either electricity flowing between both poles of an electric conductor or there isn't". These potential differences are being coded as "0" and "1" and can be linked via logic gates - the Boolean operators like AND, OR, NOT. In this way, a number of different starting signals and complex circuits are possible.

Chemical reactions linked with computer algorithms

These logic links however can also be realized with the help of chemical substances, as the Jena chemists were able to show. For their 'sugar computer' they use several components: One fluorescent dye and a so-called fluorescence quencher. "If there are both components involved, the colorant can't display its impact and we don't see a fluorescence signal", Schiller says. But if sugar molecules are involved, the fluorescence quencher reacts with the sugar and thus loses its capability to suppress the fluorescence signal, which makes the dye fluorescent. Depending on whether the dye, the fluorescence quencher and the sugar are on hand to give the signal, a fluorescent signal results - "1" - or no signal - "0".

"We link chemical reactions with computer algorithms in our system in order to process complex information", Martin Elstner explains. "If a fluorescence signal is registered, the algorithm determines what goes into the reaction vessel next". In this way signals are not translated and processed in a current flow, like in a computer but in a flow of matter. That their chemical processing platform works, Schiller and his staff demonstrated in the current study with the sample calculation 10 + 15. "It took our sugar computer about 40 minutes, but the result was correct", Prof. Schiller says smiling, and clarifies: "It is not our aim to develop a chemical competition to established computer chips". The chemist rather sees the field of application in medical diagnostics. So it is for instance conceivable to connect the chemical analysis of several parameters of blood and urine samples via the molecular logic platform for a final diagnosis and thus enable decisions for therapies.

Source: Friedrich Schiller University Jena

NEWSLETTER - 100th ISSUE CELEBRATION

21.06.2014 was a memorable day for the Association. The 100th issue of the Association NEWSLETTER was released on that day.

The grand event was held at RAMADA, Chennai, starting with registration of members, the function proceeded on a brisk note.

FLIR systems India Pvt. Ltd. and Larsen & Tourbo Ltd., put their latest products on display at the hall. After registration all the members had a hands on experience of new products offered by the two companies.

The Chief guest of the function, Mr. S. Appavoo, Chief Electrical Inspector, TamilNadu Govt. was warmly received with a bouquet by the President Mr. U. Baskaran, Secretary Mr. K. Kannan and Treasurer Mr. P. Suyambu. Mr. S. Appavoo, CEIG, then had a brief look of the products displayed. Soon, the other special guests including Mr. L.A. Srinivasan, Retd. CEIG arrived and were warmly received.

The function was inaugurated with Thamizh Thaivazhthu and Lighting of Kuthuvilakku by Mr. S. Appavoo, CEIG followed by Mr. L.A. Srinivasan, Mr. A.K. Venkatasamy past president, Mr. S. Sitaraman past treasurer and Mr. B. Rangarajan of Trichy.

The function started with a speech from Mr. G. Venkatesh, Joint Secretary gave a brief account about how the NEWSLETTER was initiated. Then he read out the messages of Mr. T.M. Bhikkaji and Mr. A.K. Venkatasamy in the first issue. They were instrumental in bringing out the NEWSLETTER.

Then Mr. U. Baskaran welcomed the Chief Guest Mr. S. Appavoo, CEIG and other invitees. He also thanked the former office bearers who were instrumental for initiating the publication of NEWSLETTER.

All special invitees were honoured on behalf of the Association. Mr. U. Baskaran, President presented a memorial shield to Chief Guest Mr. S. Appavoo, CEIG. Then the Chief Guest released the 100th issue of NEWSLETTER and Mr. L.A. Srinivasan received the first copy. Mr. A.K. Venkatasamy, Mr. S. Sitaraman, Mr. P. Shanmugam and Mr. M. Vedachalam also received copies of NEWSLETTER from the chief guest.

Then Chief Guest Mr. S. Appavoo, CEIG addressed the gathering. He expressed his happiness in releasing the 100th issue of the NEWSLETTER. He commended Mr. A.K. Venkatasamy, Mr. T.M. Bhikkaji and Mr. S. Sitaraman on their efforts to bring NEWSLETTER into existence and congratulated them. He also appreciated the contents of the NEWSLETTER and suggested inclusion of photos of those who contribute articles to the NEWSLETTER.

Mr. S. Appavoo CEIG expressed his satisfaction on the role played by the Association in bridging the gap between the Electrical Inspectorate and the end user. Further, he urged the Association to bring a revised version of Technical Guide Line Book at the earliest and he assured all assistance from his department for release of the book.

Then special invitees were honoured with mementos. Mr. A.K. Venkatasamy and Mr. S. Sitaraman were presented with mementos by Mr. U. Baskaran, President and Mr. K. Kannan, Secretary respectively. Mr. P. Suyambu, Treasurer presented a Memento to Mr. M. Mahadevan who was a pillar of strength for publication of Newsletter. Mr. V. Sankaranarayanan and Mr. M. Venkataraman, our Publisher were also honoured with mementos. Mementos were also presented to Mr. Kamal Basha (Retired CEIG), Mr. D. Karthikeyan (EI), Mr. M. Sakthivel (EI), Mr. B. Palanisamy (AEI) and key advertisers on behalf of the Association.

In the Technical Seminar Session, Mr. Bhaskar Lala, Sales Manager (South) FLIR Systems India Pvt. Ltd., explained the benefits of Thermography for Electrical Installations and maintenance.

Next in his Technical speech, Mr. Bharat Kumar, Business Development Manager L&T, explained the features of new products offered by Larsen & Tourbo Ltd.

Mr. K. Kannan, Secretary, before his Vote of Thanks, requested Mr. S. Appavoo, CEIG to present a memento to Mr. G. Venkatesh, Joint Secretary and Editor of NEWSLETTER on the special occasion.

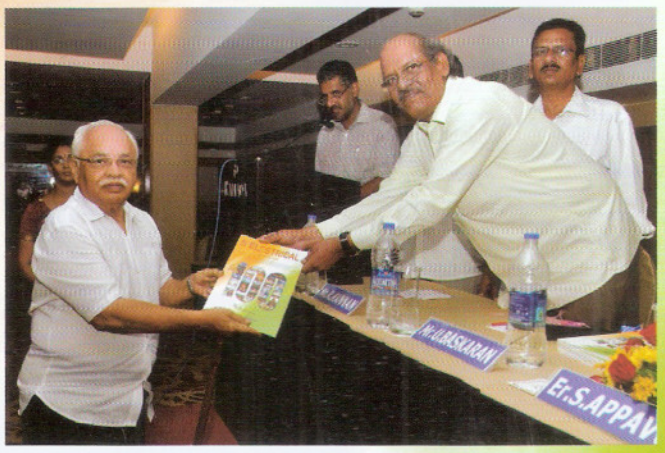
In his vote of thanks Mr. K. Kannan thanked the Chief Guest Mr. S. Appavoo, CEIG other officials of Electrical Inspectorate, officials from TNEB, sponsors and speakers in Technical Seminar, and all other Members who graced the occasion. He also thanked the past President, Secretary and Treasurer of the Association Mr. A.K. Venkatasamy, Mr. T.M. Bhikkaji and Mr. S. Sitaraman for their service to our Association.

NEWSLETTER - 100th ISSUE PHOTOS

Mr. G. Venkatesh, Joint Secretary *giving a brief account about how the* **NEWSLETTER** *was initiated.*

Mr. U. Baskaran, President *Welcomes the Chief Guest and Invitees*

The Chief Guest Mr. S. Appavoo, CEIG releasing the 100th issue of NEWSLETTER



Mr. L.A. Srinivasan, CEIG (Retd.) *receiving the first copy of the* **100th issue of NEWSLETTER**

Chief Guest Mr. S. Appavoo, CEIG *addressing the gathering*

Mr. U. Baskaran, President *honouring*
Mr. A.K. Venkatasamy, *Past President*

Mr. K. Kannan, Secretary *honouring*
Mr. S. Sitaraman, *Past Treasurer*

Mr. P. Suyambu, Treasurer *honouring*
Mr. S. Mahadevan, *Advisor*

Mr. U. Baskaran, President *honouring*
Mr. V. Sankaranarayanan, *Article Writer*

Mr. K. Kannan, Secretary *honouring*
Mr. M. Venkataraman, *Printer*

Mr. K. Kannan, Secretary
Presenting **Vote of Thanks**

OPTIMIZATION OF AIR INSULATION CLEARANCES FOR EHV/UHV TRANSMISSION LINES

This paper presents the results of the study conducted on 400 kV, 800 kV and 1200 kV transmission line insulator strings and conductor-tower window geometries with an aim to optimize air insulation clearances. Laboratory investigations were carried out to evolve the switching impulse performance of phase-to-earth and conductor-window configurations in addition to the reference rod plane air gap lengths in EHV/UHV range. Tests were conducted on 400 kV, 800 kV and 1200 kV line configurations of I, Vee, double Vee, etc., by simulating the tower windows. The paper also presents results of the study on optimization of conductor-tower air insulation clearances for adoption in 1200 kV AC transmission lines using 8 bersimis conductor bundle carried out for establishment of 1200 kV Test Station at BINA, Madhya Pradesh, by Power Grid Corporation of India. Results of the tests and the data presented in the paper will be useful for design of phase-to-ground air insulation for adoption in EHV/UHV Transmission lines.

1.0 INTRODUCTION

The evaluation of the switching impulse performance of large electrodes for UHV line design was carried out by many researchers [1-4]. These studies have pointed out the great importance of switching impulses of positive polarity and suggested that these are to be used for the design of external air gap insulation in the UHV range. While different line configurations are encountered in UHV line, the lowest breakdown voltage was yielded with rod-plane gaps and thus used as reference air gap. The breakdown voltage also depends on the shape of the impulse, i.e. on the front time for slow front impulses. For air insulation, it is typical that for each gap length, there is an impulse time to peak for which the breakdown voltage is least. The lowest voltage is called Critical Flashover Voltage (CFO) and the peak time corresponding to minimum value is called time to peak [T_{cr}]. In order to use the concept of gap factors, applied to other configuration normally encountered in the line, studies were conducted on the reference rod-plane gap for varying gap lengths in the UHV range. The CFO at various front times of positive switching impulse was determined for various gap lengths spanning the UHV range. It was proved in reference [4] that the spark over voltage of any electrode configuration subjected to switching impulses is proportional to that of a rod-plane gap of the same length. The coefficient of proportionality being called the gap factor (k) depends on the electrode configuration. The data obtained from the rod-plane configuration was applied to the actual line configuration at higher gap distances, for which the optimization is intended. The breakdown voltage of the tower simulation at smaller gap length in the 400 kV range is obtained and the gap factors were determined for a particular configuration for use at higher gap distances. These gap factors were used to preliminarily calculate the gap distances required for 800 kV and 1200 kV line configurations.

For the experimental work on the evaluation of critical flashover voltage of the rod-plane configurations, the mild steel (MS) rod of 400 mm^2 cross-section and a length of about 1 meter are hung between impulse voltage divider and the load capacitor. The load capacitor will additionally act as capacitive load and help in obtaining the proper switching impulse wave shape. The plane was simulated by 5 m x 5 m wide MS plates of 6 mm thickness properly earthed to a reference earth. Generator parameters were varied to obtain various peak times of the switching impulse voltage. Tests were conducted using up and down method as given in IEC 60060-1 [5] to determine the spark over voltages for various crest times.

For optimization test setup, the simulated tower windows are hung along with the insulator assembly and simulated bundle conductor between two anchor towers. The height of the bottom most conductor was at least 1.5 times the length of the insulator string or more so as to avoid any flashover to the ground. Figure 1 gives a view of a 5 MV/500 kJ Impulse Voltage Generator along with 5 MV Damped Capacitive Divider used in the studies. The laboratory procedure for optimization of window clearances is to simulate the required tower window based on the type of tower and conduct flashover voltage/withstand voltage tests keeping the gap at the estimated gap distance. The required gap is estimated from the concept of gap factor discussed in the next section. The study was conducted on the common window configurations by varying the gap distances in the range of 2.25-4 meters and common gap factor was obtained for tower

Fig.1: A view of 5000kV/500 kJ outdoor impulse voltage generator with damped capacitive divider

side and tower top. These gap factors were used to estimate the required clearances for 800 kV and 1200 kV line. After fixing this estimated clearances, the experimentations of determining the $U_{50\%}$ and conforming of $U_{10\%}$ was carried out in accordance with [5], to arrive at the rated basic switching impulse levels [BSL] as given in IEC 60071-1 [6]. The gaps can be increased or decreased from the estimated values by 0.1 m to arrive at the optimized clearance [7] to obtain the rated BSLs for the given system voltage.

2.0 REFERENCE ROD-PLANE AIR GAP CHARACTERISTICS

Test setup and the procedure described in section 1.0 are used to obtain the so-called U-curves. Only the positive polarity was attempted based on the experience and the literature [3,4]. The gap lengths varied from 2.5 m to 15 m to cover the EHV/UHV range air gap clearances. The $U_{50\%}$ flashover voltages were obtained for various peak times. Figure 2 shows a view of rod-plane gap flashover. Figure 3 gives the variation of $U_{50\%}$ breakdown voltage as a function of peak time T_p of the switching impulse with gap length as a parameter for gap lengths up to 15 m.

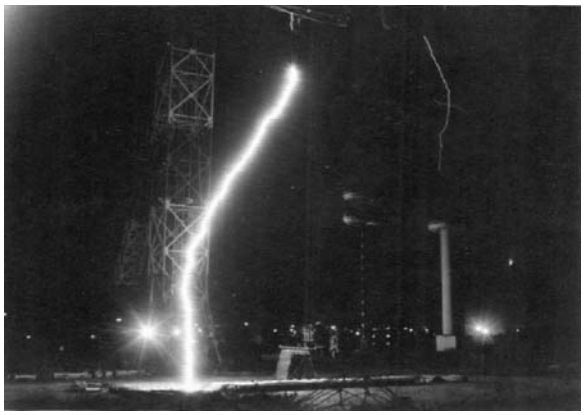


Fig.2: A view of Rod-plane gap flashover

It can be observed from Figure 3 that the critical flashover voltage increases with the gap distance and the critical front times is around 200 μs for gap distance of about 4 m. The critical flashover voltages (CFOs) obtained from this study were plotted as a function of the gap distances and is as shown in Figure 4. The data obtained were fitted into the curves results in expression of type

$$U_{CFO} = 3750/ (1 + 8/D) \text{ for } D<15 \quad (1)$$

The results obtained were compared with the formula suggested by Gallet and Leroy [4] and it was found that the estimated CFO was well within ±3% of the experimental results obtained in this study and thus validating our results. For gap lengths in the range 2.5 m to 5.5 m, the variations of CFO with gap distance was found to fit the straight line fit and for the data it can be given as

$$U_{CFO} = 140 + 254\ D \quad (2)$$

for $2.5 < D < 5.5$ m

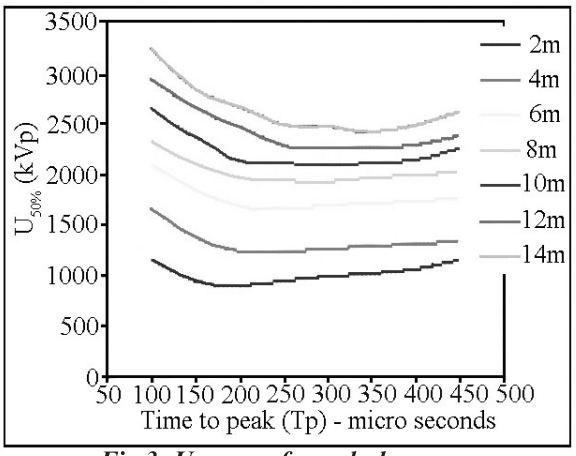


Fig.3: U-curves for rod-plane gap

The variation of critical time as a function of gap distance is plotted in Figure 5. The data fits the straight line equation and is as

$$T_{cr} = 21\ D + 80 \quad (3)$$

for $4 < D < 15$

For the rod-plane gap, the $U_{50\%}$ for the standard switching impulse, i.e. 250 μs/2500 μs, was obtained for gap distances 2.5 m to 5 m and the data was best fit to the curve given by the expression.

$$U_{50\%} = 564\ D^{0.56} \quad (4)$$

The results of the test were compared with empirical formula suggested by [2] for the $U_{50\%}$ voltages with the gap length for standard 250 μs/2500 μs wave shape and it was observed that the mean deviation of the two results is less than 2 %.

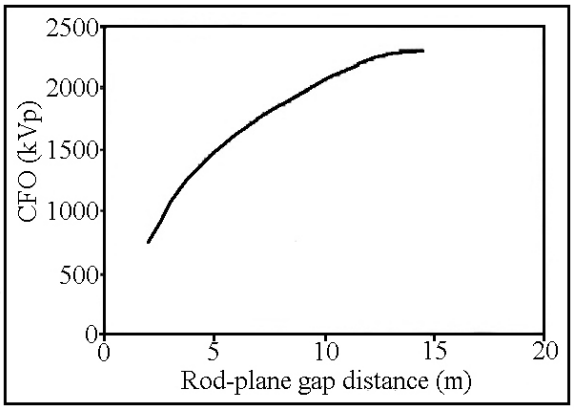


Fig.4: CFO as a function of Rod-plane gap length

3.0 DETERMINATION OF GAP FACTOR FOR TOWER SIDE

Experimental study was conducted on 400 kV 'I' string by simulating the side tower and is as shown in Figure 6. $U_{50\%}$ for the standard switching impulse voltages was obtained. The gap distances were varied and the results were tabulated. Rod-plane gap data obtained from equations 3 was also tabulated for gap distance 2.25 m to 4.5 m in steps of 0.25 m. The average gap factor was found as 1.25. Table 1 gives the results as obtained for the side tower and from the expression as obtained from the rod-plane configuration study.

TABLE 1:- DETERMINATION OF GAP FACTOR

Gap Distance (m)	$U_{50\%}$ (kV)		Gap factor (kW)
	Grading ring-tower side	Rod plane	
2.75	1135	907	1.251
3.00	1185	960	1.234
3.25	1278	1027	1.244
3.50	1350	1066	1.266
3.75	1410	1122	1.256
4.00	1450	1134	1.278
4.25	1482	1177	1.259
4.50	1489	1227	1.213
		Average k	1.25

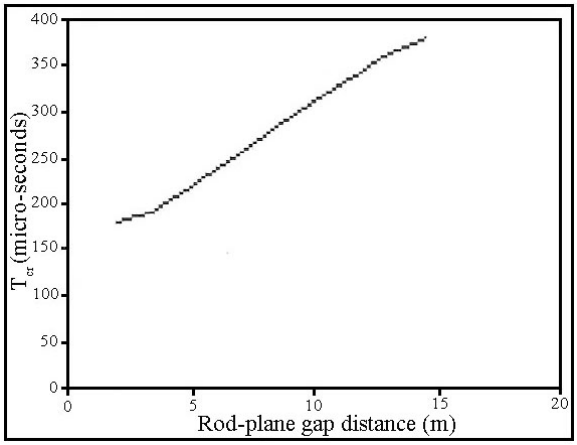


Fig.5: Critical front time as a function of rod-plane gap length

Fig.6: A view of 400 kV string with tower side simulation for gap factor determination

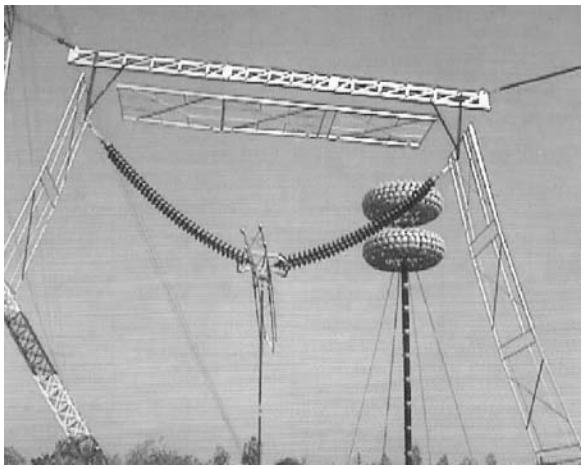


Fig.7: A view of 800 kV insulator string with simulated tower

4.0 OPTIMIZATION OF TOWER WINDOW CLEARANCES FOR INSULATOR STRINGS

Estimation of the window clearances was made with the BSL considerations and with the use of equation U_{CFO} =3400/(1 +8/D) making the first approximation of BSL as the critical flashover voltage of the rod-plane gap. Using the gap factor, the gap distance required for the BSL will be approximately obtained. The BSL considered will be $U_{10\%}$ i.e. the withstand voltage with 10% flashover probability obtained from the $U_{50\%}$ as:

$$U_{10\%} = U_{50\%} / (1\text{-}1.3\sigma) \quad (5)$$

where σ is the conventional standard deviation.

For statistical calculations of the expected performance in the field, the value of σ considered is 3 %. This $U_{50\%}$ will be considered as CFO and the required gap distance considering the gap factor will be estimated as

$$U_{50\%} = k \times 3400/(1 + 8/d_e) \quad (6)$$

where k is the gap factor and d_e is gap distance estimate.

For a given geometry and the gap distance estimate, the tower window was simulated and the determination of $U_{50\%}$ was carried out. The tower window, top and side, and conductor configuration and the hardware used were according to the current practice for 400 kV and 765 kV transmission lines and extrapolated dimensions for 1200 kV transmission line hardware. Figures 7 and 8 show the 800 kV and the 1200 kV tower window optimization study view of the test setup. The number of impulses applied corresponding to the $U_{10\%}$ or BSL are 40 for an estimated gap distance. If the initial test results in number of flashover more than 4, the gap distance in experimental test setup would be increased by 0.1 m and again 40 numbers of SI positive polarity impulses of standard wave shape were applied. If the number of flashovers were less than 4, the gap distance was reduced by 0.1 m and the experiment repeated. This way the optimized clearance for number of flashover ≤4 out of 40 was obtained. Additional tests with negative polarity SI and positive and negative polarity lightning impulse test on the same optimized setup were carried out. The test program was specifically conceived to generate UHV tower design data.

Results in Table 2 show the tower window electrical clearances obtained experimentally based on the rated BSL of the line insulation. However, it is generally agreed that the line to ground switching surge over voltage, for

typical 400 kV lines do not exceed 1.7 pu [8]. This finding is corroborated by the results of the EMTP calculations on typical 400 kV, 800 kV and 1200 kV lines [9], wherein, it was found that the case of double line ground fault gave 1.69 pu as 2 % probability switching over voltage.

Hence, for all the three different voltage class transmission lines under consideration, it could be confidently assumed that the maximum line to ground SI would not exceed 1.75 pu. Hence, it is inferred that the electrical clearances corresponding to 1.75 pu could be used in the window size determination rather than the clearance required for BSL, which proves to be very large and uneconomical. Table 2 also shows the experimentally optimized electrical clearances considering 1.75 pu as the $U_{10\%}$ voltage and the overall electrical clearances taking into account the mechanical swing of the insulator strings.

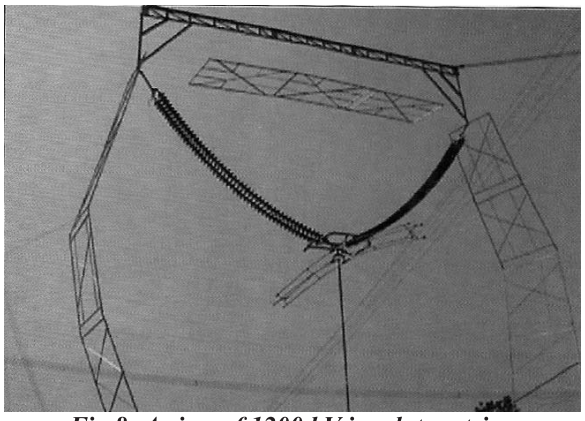


Fig.8: A view of 1200 kV insulator string with simulated tower

TABLE 2:- WINDOW CLEARANCES FOR 400 kV 800 kV AND 1200 kV LINES

System voltage (kV)	Type of string	BSL (kV)	1.75 pu voltage (kV)	Window electrical clearances in meters		Reduced overall clearances taking into account mechanical swing	
				Based on BSL	Based on 1.75 pu	With BSL	Based on 1.75 pu
400	I	1050	600	2.75	1.44	2.75+1.6= 4.3	1.44+1.6=3.04
	V	1050	600	3.0	1.91	3.0	2.0*
800	I	1550	1143	4.9	3.44	5.3 (7.2 to 7.8)	3.44+2.3=5.74
	V	1550	1143	6.75	4.75	6.75	4.75*
1200	V	1800	1550	7.25	5.1	8.75	5.1*

*Mechanical swing considered as zero.

These clearances were found to withstand 1.75 pu SI at respective critical fronts obtained from Figure 4 when simulated and tested. Hence, the system designer has the option of using the window clearances based on the system BSL or based on 1.75 maximum line to ground switching impulse voltage. Additional clearances are required for line maintenance and other contingencies for V strings, such as 1 pu power frequency voltage withstand capability of the window at a maximum swing angle of 55° mechanical corresponding to contingency of one arm of the V snapping (55° being half the V angle).

An exercise was made to calculate the tower clearance required for the contingencies mentioned above. Table 3 shows all the three estimates namely estimate for the 1.75 pu over voltage, BSL as over voltage and contingency of one arm snapping for V strings. In case of one arm snapping of V string, the final healthy string position from central arm is obtained by multiplying the minimum tower top clearance by sin 55°. Total clearance under such contingency is obtained by adding to this clearances required for withstanding 1 pu voltage at 300 kV per meter. A swing angle of 20° mechanical is considered for 400 kV-I string, 23° mechanical swing for 800 kV-I string, 5° swing for V string of 400 kV and no swing for 800 kV and 1200 kV strings. It is evident that a minimum of 3.3 m, 5.90 m and 7.92 m are required for 400 kV, 800 kV and 1200 kV line towers, respectively, to meet the contingency of one arm snapping. These clearances are, in general, higher than the estimated electrical tower side clearances from 1.75 pu SI over voltage point of view. The minimum dimensions of tower windows for 400 kV, 800 kV and 1200 kV lines presented in a concise manner in Table 3 and variation in this could occur only due to the changes in lengths of insulator strings required to meet the pollution performance.

Therefore, even with 1.75 pu as over voltage tower, top clearance is determined from BSL considerations only. It also has dependency on the pollution performance of insulator string.

(To be continued...)

Courtesy: Pradeep M Nirgude, Gunasekaran B and Shivakumara Aradhya R S, CPRI Journal

The release of atomic energy has not created a new problem. It has merely made more urgent the necessity of solving an existing one - ALBERT EINSTEIN

SOUTHERN GRID SYNCHRONOUSLY CONNECTED WITH THE NATIONAL POWER GRID INDIAN POWER SYSTEM BECOMES ONE OF THE LARGEST OPERATING SYNCHRONOUS GRIDS IN THE WORLD

The Southern Grid has been synchronously connected to the rest of the Grid in the country. With this, the mission of 'One Nation – One Grid – One Frequency' has been successfully accomplished. The southern grid connectivity was achieved on the evening of December 31, 2013 through commissioning of Raichur-Solapur 765 kV single circuit transmission line by Power Grid Corporation of **India** Limited, the Central Transmission Utility of the country, interconnecting the Southern grid synchronously with the rest of the national power grid facilitating bulk transfer of power across regional boundaries. This line of 208 circuit kilometers (ckm) and 765/400 kV substations at Raichur and Sholapur has been commissioned five months ahead of its contractual schedule i.e. 31st May, 2014 at a cost of approximately Rs.815 crores. With this interconnection, **India**n power system has entered into a new era and become one of the largest operating synchronous grids in the world with about 232GW of installed power generation capacity.

Synchronous integration of Southern Grid with rest of the national power Grid shall not only augment the inter-regional power transfer capacity of Southern region but also relieve the congestion being experienced in few transmission corridors. This will be a great boost for further economic growth of the country. It is likely to take a few months before power flow over this line is stabilized.**India**n Power System is operating through five Regional Grids and a Pan **India** synchronous grid was envisaged for optimal utilization of the generation resources in the country. Till now, four regional grids namely Northern, Eastern, Western and North-eastern regions (NEW grid) were connected synchronously and Southern Region (SR) was connected to this NEW grid through HVDC links. Synchronous interconnection of SR with NEW grid was envisaged through high capacity 765 kV Raichur – Sholapur lines, as an ultimate step towards establishment of an "All **India** Synchronous National Grid" facilitating bulk transfer of power across regional boundaries.

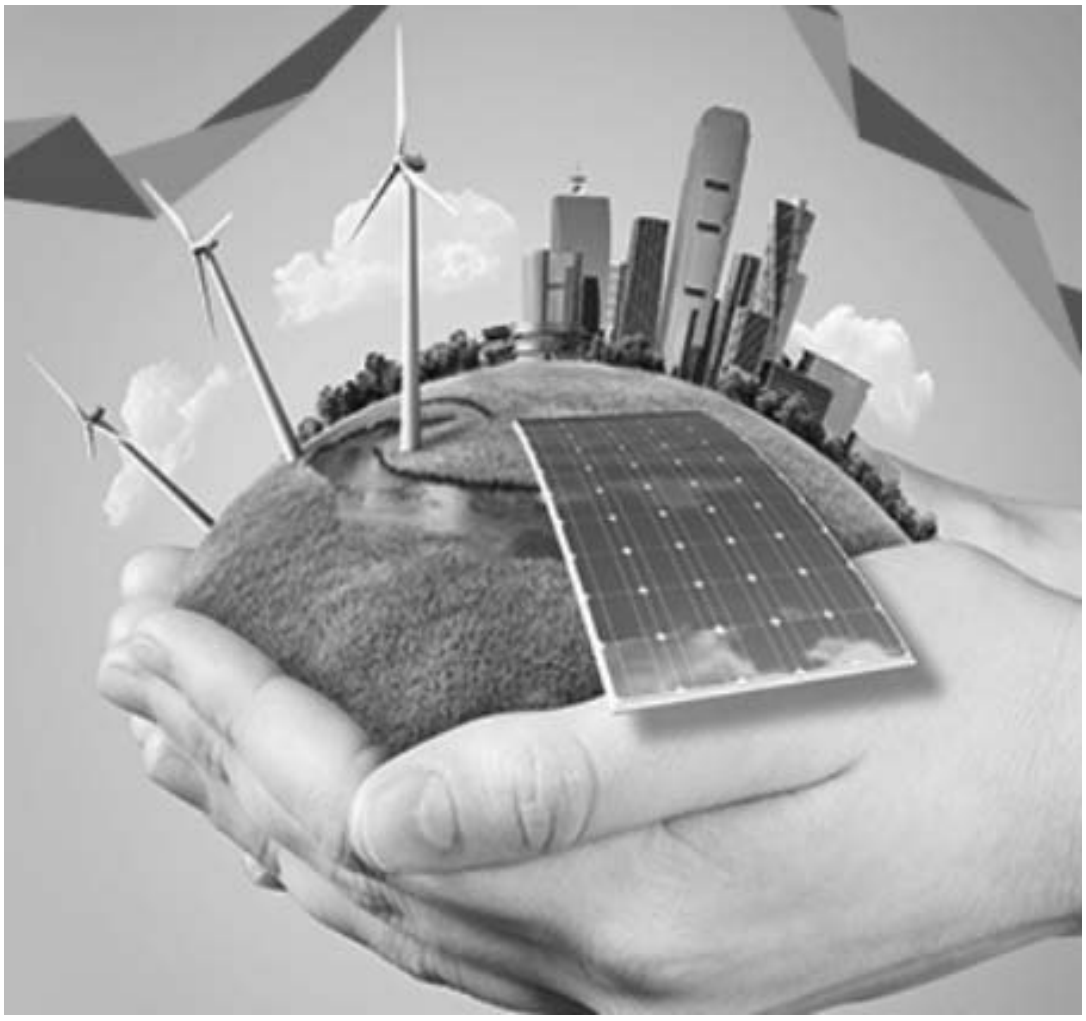
Courtesy: Eq Mag Live

Science does not know its debt to imagination. - RALPH WALDO EMERSON

WELSPUN RENEWABLES COMMISSIONS KARNATAKA'S LARGEST 19 MW (DC) SOLAR CAPACITY

- **Project with tracker technology will annually supply 30,724,000 units of clean energy**
- **WREPL's 11 MW (DC) project commissioned in less than three months from PPA signing, nearly 10 months ahead of schedule. 8 MW (DC) was commissioned last year about 2 months ahead of schedule**
- **Project achieved full load WITHIN A WEEK of commissioning, touched high CUF% of 27% in a day**
- **For next 25 years 23,043 tons of CO_2 emissions will be mitigated on a yearly basis.**

Mumbai, May 16, 2014 Welspun Renewables Energy Private Limited (WREPL), India's leading renewable energy generator commissions Karanataka state's largest solar project with a capacity of 19 MW (DC) implemented as two projects of 8 MW (DC) and 11 MW (DC). Based in Chitradurga district the project was awarded in phase 1 and phase 2 bidding based on Karnataka solar policy. The 8 MW (DC) capacity was commissioned last year – about two months ahead of schedule, while the balance 11 MW (DC) capacity has now been commissioned in less than three months from signing of PPA in January 20th 2014 and about 10 months ahead of schedule.



Out of 80 MW awarded in phase 1 of bidding, only two developers have commissioned their projects and is considered as a significant achievement by the Industry. While, in the 2nd phase of bids, out of 13 developers to whom the state had issued an LOI - WREPL's 11 MW (DC) project is first to be commissioned! . The performance of these two projects is currently among the top performing plants in the country.

Speaking on the occasion **Mr. Vineet Mittal, Vice Chairman, Welspun Renewables Energy Pvt. Ltd.** said "We are committed to Karnataka's energy security targets. WREPL would like to work with the state in strengthening its green energy revolution by commissioning mega capacities. As with our projects before, we have commissioned our 19 MW (DC) capacity much ahead of scheduled date; thereby fulfilling on our commitment to deliver environment friendly & efficient energy in the shortest possible time into the Karnataka state grid".

The projects achieved full load within a week and performing exceedingly well. It is already touching high performance standard (CUF%) of 27%. A statement of implementation of solar projects in the last 2 rounds would have helped to project us way ahead compared to others.

Karnataka is an energy deficit state and has been reeling under power cuts constantly. With this project in Chitradurga we will be able to help the state overcome its summer power requirement. For the next 25 years, the project will be annually feeding 30,724,000 units of clean emission free energy into the state grid. This is equivalent to powering 48,000 homes and mitigating 23,043 tons of CO_2 emissions.

The tracking system deployed at the site would track the path of the sun from morning till evening. This system is expected to give a significant boost to power generation percentage in comparison to the fixed tilt system.

The solar installation has been developed by Welspun Renewables Energy's step down subsidiary Welspun Solar Kannada Pvt. Ltd. under the Karnataka Solar policy 2011-16. As per the PPA signed with Mangalore Electric Supply Company (MESCOM), the power plant was scheduled to begin commercial operations only by March 2014. 11 MW (DC) was to be commissioned before 20-Jan-2015.

Welspun Renewables Energy has commissioned 328 MW (DC) and over 723.5 MW capacity is under construction. The organization envisions developing power projects pan India, with existing projects located in high radiation zones like Gujarat, Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu and Punjab.

About Welspun Renewables Energy Pvt. Ltd.: (www.welspunenergy.com)

Welspun Renewables Energy Pvt. Ltd. (WREPL) is a leading independent developer of renewable energy projects with a vision of commissioning 1.75 GW of solar & wind projects. Within a short span, the clean energy generator has pioneered solar power solutions, both in terms of plant size and total installed capacity. Its power plants are among the highest generating projects in the country and have been built ahead of committed timelines, thereby helping the country meet its renewable energy targets. WREPL holds the distinction of winning and operating one of the world's largest solar projects of 151 MW (DC). Through its strong commitment to triple bottom line, WREPL is working for underserved communities in area of education, empowerment & healthcare. It is presently mitigating over 445,464 tons of CO_2 emissions annually.

TELENGANA HARVESTS SOLAR ENERGY

The Telangana Government has zeroed in on the backward district of Mahbubnagar to set up an integrated 1,000 MW solar power generation park.

The project will to be taken up by Telangana Industrial Infrastructure Corporation in partnership with Solar Energy Corporation of India. The SECI has given in-principle approval for the park, K. Pradeep Chandra, Principal Chief Secretary, Industries, Government of Telangana, said.

Speaking on the sidelines of CII PaperTech conference, he said that typically one MW requires an investment of about Rs. 6 crore. The developers of projects will bring in these investments. The Government role will be limited to facilitation and creation of necessary support infrastructure.

Industrial policy

He said that the Government will soon come out with a new industrial policy for the period for the next five years outlining the areas of thrust and incentives. The industrial policy of the unified State is valid between 2010-2015.

Pradeep Chandra said that the Government is also in the process of encouraging companies engaged in renewable energy sector, green technologies and waste management to set up their projects in the State as a cluster.

Earlier, during the year Solar Energy Corporation of India Limited had announced its decision to set up a mega solar park in the State and five more such parks in other parts of the country.

Referring to the State Government moves to set up a National Institute of Packaging, the official wanted the paper sector players to partner in this initiative of the Government.

Courtesy : Business Line

It takes as much energy to wish as it does to plan - ELEANOR ROOSEVELT

NEW CONCEPT TO IMPROVE POWER PRODUCTION OF WIND TURBINES

Wind energy is one of the most promising renewable energy resources in the world today. Dr. Hui Hu and his group at Iowa State University studied the effects of the relative rotation directions of two tandem wind turbines on the power production performance, the flow characteristics in the turbine wake flows, and the resultant wind loads acting on the turbines. The experimental study was performed in a large-scale Aerodynamics/Atmospheric Boundary Layer (AABL) Wind Tunnel available at Aerospace Engineering Department of Iowa State University. Their work, entitled "An experimental study on the effects of relative rotation direction on the wake interferences among tandem wind turbines", was published recently in *SCIENCE CHINA Physics*, Mechanics & Astronomy, 2014, Vol 57(5).

In a typical wind farm, the wind turbine located in the wakes of upstream turbines would experience a significantly different surface wind compared to the ones located upwind due to the wake interferences of the upwind turbines. Depending on the wind turbine array spacing and layout, the power losses of downstream turbines due to the wake interferences were found to be up to 40%. Therefore, how to improve the power production of downstream wind turbines in a wind farm is one of the most significant research topics in recent years. Extensive experimental and numerical studies have been conducted recently to examine wind turbine aeromechanics and wake interferences among multiple wind turbines in order to gain insight into the underlying physics for higher total power yield and better durability of the wind turbines.

While most of the wind turbines in modern wind farms are Single Rotor Wind Turbine (SRWT) systems, the concept of Counter-Rotating Wind Turbine (CRWT) systems has been suggested in recent years. Since azimuthal velocity would be induced in the wake flow behind a wind turbine with its rotation direction in the opposite direction to the upstream rotor, the downstream rotor should rotate in the same direction as the swirling wake flow for a CRWT system in order to extract wind energy in the wake flow more efficiently. So far, since the distance between the two rotors in a CRWT system is always very small (i.e., less than 1D, and D is the rotor diameters), the attempts of CRWT to improve wind energy utilization are focused on near wake characteristics. On the other hand, most of the previous studies on the wake interferences among multiple turbines are limited to SRWT systems with all the turbines rotating in the same direction. The wake interferences among SRWT systems with different rotation directions in a wind farm have never been investigated before. With this in mind, Dr. Hu

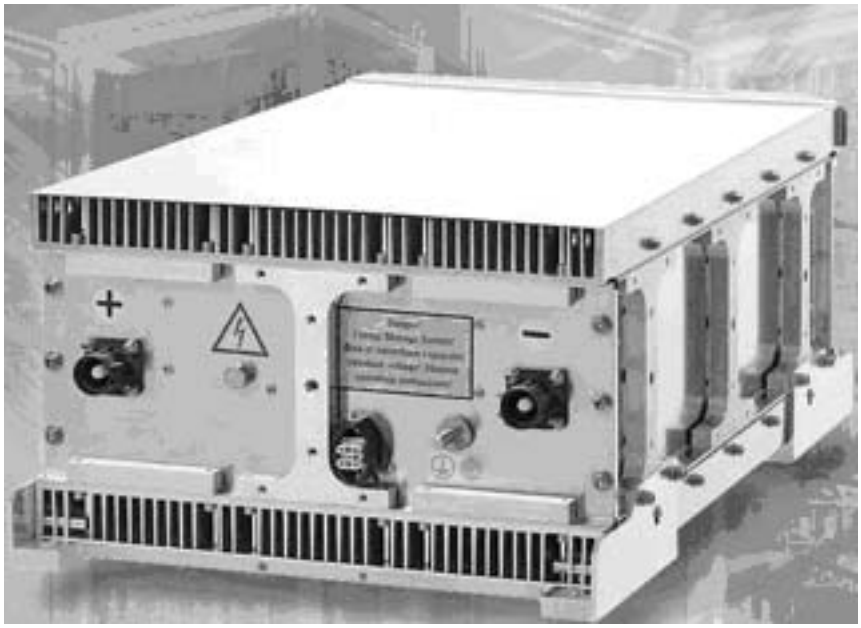
and his group conducted a comprehensive experimental study to quantify the effects of the relative rotation direction of two tandem wind turbines on the wake interferences among the turbines. While the oncoming flow was kept constant during the experiments, the model turbines were set to operate in either co-rotating (i.e., the downstream turbine has the same rotation direction as the upstream turbine) or counter-rotating (i.e., the downstream turbine has an opposite rotation direction in relation to the upstream turbine) configuration. The turbine power outputs, the static and dynamic wind loads (i.e., aerodynamic forces and bending moments) acting on the turbines, and the turbulence characteristics in the wake flows behind the turbines were measured and compared quantitatively.

It was found that the turbines in counter-rotating would harvest more wind energy from the same oncoming wind, compared with the co-rotating case. While the recovery of the streamwise velocity deficits in the wake flows was found to be almost identical with the turbines operated in either co-rotating or counter-rotating, the significant azimuthal velocity generated in the wake flow behind the upstream turbine is believed to be the reason why the counter-rotating turbines would have a better power production performance. Since the azimuthal velocity in the wake flow was found to decrease monotonically with the increasing downstream distance, the benefit of the counter-rotating configuration was found to decrease gradually as the spacing between the turbines increases. While the counter-rotating downstream turbine was found to be able to produce up to 20% more power compared with the co-rotating downstream turbine when the spacing between the turbines was 0.7 rotor diameters (i.e., 0.7D), the advantage of the counter-rotating configuration was found to be reduced to only about 4.0% when the spacing between the turbines was increased to about 5.0D. Since the azimuthal flow velocity in the wake flow was found to become almost negligible in the further downstream region, the benefits of the counter-rotating configuration were found to die away (i.e., <1.0%) when the spacing between the turbines becomes greater than 6.5D. It suggests that, on the practical relevance of wind farm design, counter-rotating configuration would be more beneficial to onshore wind farms, compared with offshore wind farms, due to the much smaller spacing between the turbines (i.e., ~3 rotor diameters for onshore wind farms vs. 6~10 rotor diameters for offshore wind farms), especially for those turbines sited over the mountains/hills with the spacing between the turbines only about 1~2 rotor diameters.

An experimental study on the effects of relative rotation direction on the wake interferences among tandem wind turbines

Source: Science China Press

ENERGY STORAGE SYSTEM

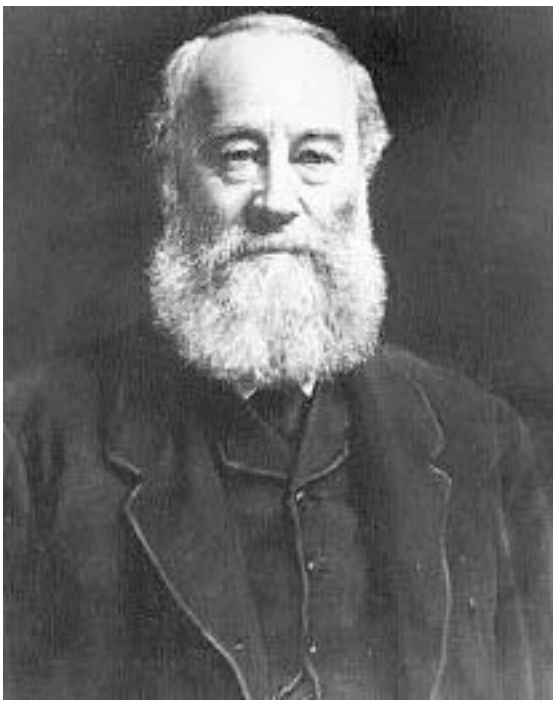


Schaefer Inc. has announced the new SCS family of air- or liquid-cooled energy storage solutions for mission critical or remote location requirements that need to perform under extreme environmental conditions in alternative energy, military defense and rail operations.

The SCS has a maintenance-free design that offers the ability to provide highly reliable energy storage as a standalone solution or to extend the battery life of an existing storage solution. They are resistant to intense shock, vibration and high temperatures while operating up to 1200 VDC and up to megawatts when configured in a system solution. Standard features include active balancing, real-time measurement of cell, modules, system voltages and temperatures, detection of cell over-temperature and over-voltage, passive balancing of cells, data transmit over RS485 and communication via CAN-Bus. Options include current monitoring and collection of all system data. The SCS modules can be assembled in a cabinet or case.

Schaefer Power Inc.

JAMES PRESCOTT JOULE (1818 - 1889)



The son of Benjamin Joule (1784–1858), a wealthy brewer, and Alice Prescott Joule, James Prescott Joule was born in the house adjoining the Joule Brewery in New Bailey Street, Salford 24 December 1818. James was tutored at the family home 'Broomhill', Pendlebury, near Salford, until 1834 when he was sent with his elder brother Benjamin, to study with John Dalton at the Manchester Literary and Philosophical Society. Fascinated by electricity, he and his brother experimented by giving electric shocks to each other and to the family's servants. Joule became a manager of the brewery and took an active role until the sale of the business in 1854. Science was a hobby but he soon started to investigate the feasibility of replacing the brewery's steam engines with the newly invented electric motor. In 1838, his first scientific papers on electricity were contributed to *Annals of Electricity*, the scientific journal founded and operated by Davies's colleague William Sturgeon. He formulated Joule's laws in 1840 and hoped to impress the Royal Society but found, not for the last time, that he was perceived as a mere provincial dilettante. When Sturgeon moved to Manchester in 1840, Joule and he became the nucleus of a circle of the city's intellectuals. The pair shared similar sympathies that science and theology could and should be integrated. Joule went on to lecture at Sturgeon's Royal Victoria Gallery of Practical Science.

He went on to realise that burning a pound of coal in a steam engine produced five times as much duty as a pound of zinc consumed in a Grove cell, an early electric battery. Joule's common standard of "economical duty" was the ability to raise one pound by a height of one foot, the foot-pound. Joule was influenced by the thinking of Franz Aepinus and tried to explain the phenomena of electricity and magnetism in terms of atoms surrounded by a "calorific ether in a state of vibration". In 1843 he published results of experiments showing that the heating effect he had quantified in 1841 was due to generation of heat in the conductor and not its transfer from another part of the equipment. This was a direct challenge to the caloric theory which held that heat could neither be created nor destroyed. Caloric theory had dominated thinking in the science of heat since it was introduced by Antoine Lavoisier in 1783. Lavoisier's prestige and the practical success of Sadi Carnot's caloric theory of the heat engine since 1824 ensured that the young Joule, working outside either academia or the engineering profession, had a difficult road ahead. Supporters of the caloric theory readily pointed to the symmetry of the Peltier-Seebeck effect to claim that heat and current were convertible, at least approximately, by a reversible process.

The mechanical equivalent of heat

Joule wrote in his 1845 paper:

... the mechanical power exerted in turning a magneto-electric machine is *converted into the heat* evolved by the passage of the currents of induction through its coils; and, on the other hand, that the motive power of the electro-magnetic engine is obtained at the expense of the heat due to the chemical reactions of the battery by which it is worked. Joule here adopts the language of *vis viva* (energy), possibly because Hodgkinson had read a review of Ewart's *On the measure of moving force* to the Literary and Philosophical Society in April 1844. Further experiments and measurements by Joule led him to estimate the *mechanical equivalent of heat* as 838 ft·lbf of work to raise the temperature of a pound of water by one degree Fahrenheit. He announced his results at a meeting of the chemical section of the British Association for the Advancement of Science in Cork in 1843 and was met by silence. Joule was undaunted and started to seek a purely mechanical demonstration of the conversion of work into heat. By forcing water through a perforated cylinder, he was able to measure the slight viscous heating of the fluid. He obtained a mechanical equivalent of 770 ft·lbf/Btu (4.14 J/cal). The fact that the values obtained both by electrical and purely mechanical means were in agreement to at least one order of magnitude was, to Joule, compelling evidence of the reality of the convertibility of work into heat. Joule now tried a third route. He measured the heat generated against the work done in compressing a gas. He obtained

a mechanical equivalent of 823 ft·lbf/Btu (4.43 J/cal). In many ways, this experiment offered the easiest target for Joule's critics but Joule disposed of the anticipated objections by clever experimentation. However, his paper was rejected by the Royal Society and he had to be content with publishing in the *Philosophical Magazine*. In the paper he was forthright in his rejection of the caloric reasoning of Carnot and Émile Clapeyron, but his theological motivations also became evident:

I conceive that this theory ... is opposed to the recognised principles of philosophy because it leads to the conclusion that *vis viva* may be destroyed by an improper disposition of the apparatus: Thus Mr Clapeyron draws the inference that 'the temperature of the fire being 1000 °C to 2000 °C higher than that of the boiler there is an enormous loss of *vis viva* in the passage of the heat from the furnace to the boiler.' Believing that the power to destroy belongs to the Creator alone I affirm ... that any theory which, when carried out, demands the annihilation of force, is necessarily erroneous.

In 1845, Joule read his paper *On the mechanical equivalent of heat* to the British Association meeting in Cambridge. In this work, he reported his best-known experiment, involving the use of a falling weight, in which gravity does the mechanical work, to spin a paddle-wheel in an insulated barrel of water which increased the temperature. He now estimated a mechanical equivalent of 819 ft·lbf/Btu (4.41 J/cal). In 1850, Joule published a refined measurement of 772.692 ft·lbf/Btu (4.159 J/cal), closer to twentieth century estimates.

Kinetic theory

Kinetics is the science of motion. Joule was a pupil of Dalton and it is no surprise that he had learned a firm belief in the atomic theory, even though there were many scientists of his time who were still skeptical. He had also been one of the few people receptive to the neglected work of John Herapath on the kinetic theory of gases. He was further profoundly influenced by Peter Ewart's 1813 paper *On the measure of moving force*. Joule perceived the relationship between his discoveries and the kinetic theory of heat. His laboratory notebooks reveal that he believed heat to be a form of rotational, rather than translational motion.

Joule could not resist finding antecedents of his views in Francis Bacon, Sir Isaac Newton, John Locke, Benjamin Thompson (Count Rumford) and Sir Humphry Davy. Though such views are justified, Joule went on to estimate a value for the mechanical equivalent of heat of 1034 foot-pound from Rumford's publications. Joule contends that Mayer's measurement was no more accurate than Rumford's, perhaps in the hope that Mayer had not anticipated his own work. Joule is attributed with explaining the Green Flash phenomenon in a letter to the Manchester Literary and Philosophical Society in 1869.

Honours

Joule died at home in sale and is buried in Brooklands cemetery there. The gravestone is inscribed with the number "772.55", his climacteric 1878 measurement of the mechanical equivalent of heat, in which he found that this amount of foot-pounds of work must be expended at sea level to raise the temperature of one pound of water from 60 to 61 F.

Honorary degrees:

LL.D., Trinity College Dublin, (1857);

DCL, University of Oxford, (1860);

LL.D., University of Edinburgh, (1871).

He received a civil list pension of £200 *per annum* in 1878 for services to science;

Albert Medal of the Royal Society of Arts, (1880).

There is a memorial to Joule in the north choir aisle of Westminster Abbey, though he is not buried there, contrary to what some biographies state.

A statue by Alfred Gilbert, stands in Manchester Town Hall, opposite that of Dalton.

Fellow of the Royal Society, (1850);

Royal Medal, (1852);

Copley Medal (1870);

President of Manchester Literary and Philosophical Society, (1860);

President of the British Association for the Advancement of Science, (1872, 1887);

Honorary Membership of the Institution of Engineers and Shipbuilders in Scotland, (1857)

SHE IS THE OLDEST YOGA WOMAN MASTER

Bending it like Beckham, doing delicate manoeuvres with the body turning and twisting as if she is a boneless creature and performing a headstand! These may well sound like a daily routine for a top class gymnast from China or Russia.

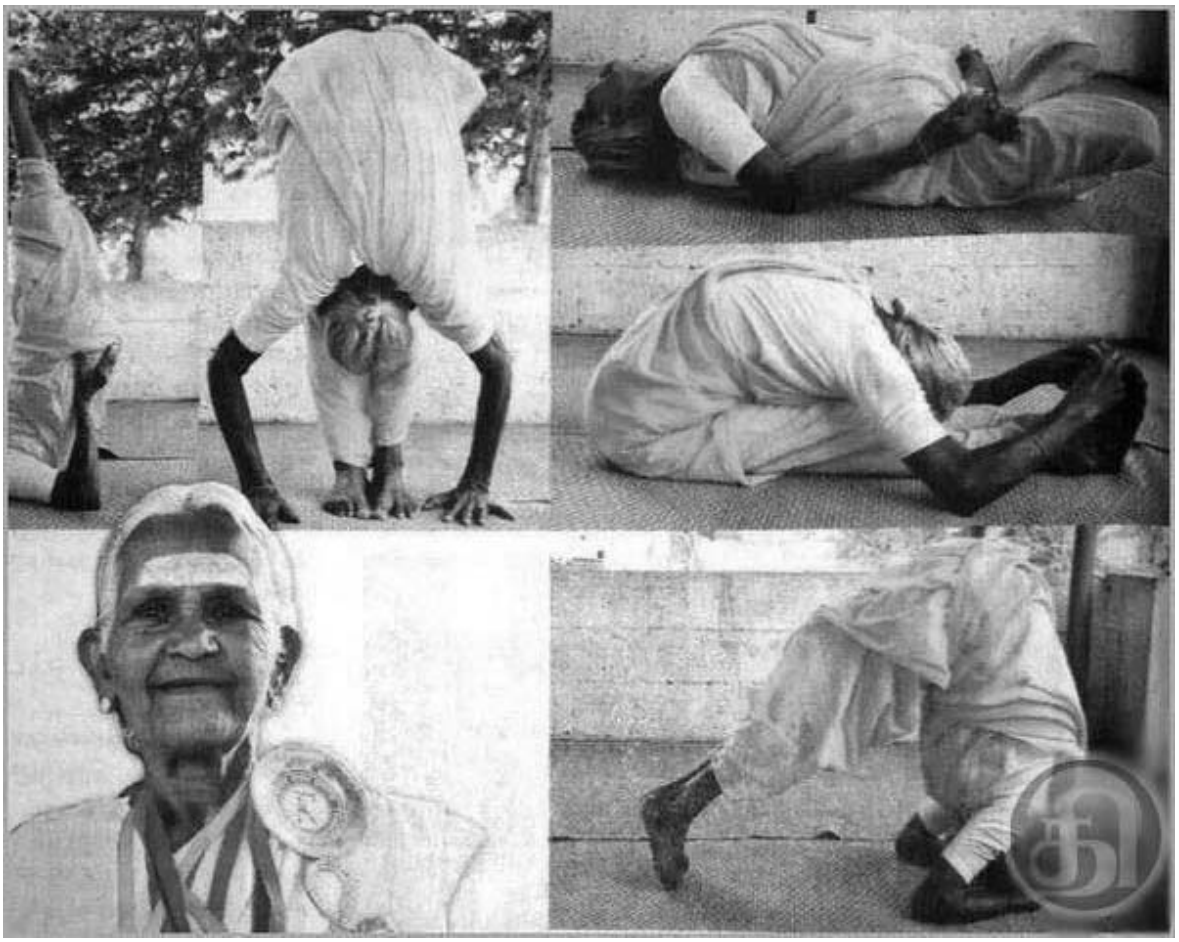
Wait and take a breath as these astounding feats are done by a 93-year-old **V NANAMMAL** *of Coimbatore in Tamil Nadu, a yoga instructor*.

The yoga instructor is vibrant as ever and proves that age really is just a number. Nanammal considers her hundreds of yoga students to be her own children. The nonagenarian has been practising yoga since she was 10 years and could be perhaps the country's oldest woman yoga teacher.

Born in a middle-class agricultural family at Coimbatore at Jaminkaliyapuram, Nanammal won a contest for the **"Silambattam"** (*a weapon-based Indian martial art from Tamil Nadu*) at district level when she was just 14.

After that she started learning yoga from her grandfather at her home town Coimbatore after seeing some boys and girls learning the ancient Indian exercise and was hooked on ever since. "I also learnt yoga even from my father- in-law after getting married to a Sidha doctor. Those days yoga was considered only as the village exercise," she says.

The Coimbatore-based great-grandmother also credits yoga for her good health. She does not take medication or had no health problems till now. "I still live strong and healthy due to my love for the exercise and I neither visited a hospital nor used any medicine till now," Nanammal said.



The woman, who has two sons and three daughters, teaches yoga every day for at least 100 students at her house. She claims her students "feel great" after the yoga sessions. Her students, usually a lot younger than her, also include two women in their 70s, some 60 year olds and the youngest is a girl of six.

The yoga instructor has even developed a legion of admiring students that consistently attend her classes. They've even taken to calling themselves "paethees," (granddaughters in Tamil) after their inspiring teacher who, they say, can still do asanas that they struggle with. "I'm 55, she calls me a youngster.

I aspire to achieve her fitness," said student Meenakshi. "She can do things we still struggle to do even after several years," said another student.

What makes her truly amazing is that she can support her whole body on her hands. She begins each class with about a dozen asanas and ends with a guided relaxation exercises accompanied by meditation. "I'm inspired to bring yoga into others' lives along with helping people unearth new talents," the nonagenarian said.

"My mother can do all the difficult asanas, including the painful **"peacock"** asana where the body is held in a horizontal position by the strength of the arms alone," Nanammal's son V Balakrishnan, who is also a yoga instructor, said.

He said his mother can also demonstrate a complicated raised **"lotus", "bridge"** and a headstand with ease. Now, she is waiting for another accolade to add to her list as her name was sent to the Indian Yoga Federation to declare her the country's oldest yoga teacher.

According to him, Tao Porchon-Lynch, 93, from the United States is at present the world's oldest Yoga teacher. Nanammal never wears pants or special yoga dresses for classes or demonstration.

"I wear only our tradition sari. Still I can do more than 50 asanas," she claimed. The effects of aging have not crept on Nanammal. She said she can even read tiny letters from magazines and has a positive attitude towards life. The woman, who practises daily for an hour in the morning, said: "As far as my body is concerned, it keeps me flexible. I will stiffen up terribly if I didn't do it."

"I do yoga before I go to bed and I do yoga with my students when I get up in the morning,"she said. "I'm up every morning at 4.30 and I usually go to bed early in the night," she added.

Her diet includes only pulses and cereals and she avoids rice and non-vegetarian food items. Nanammal's technique even caught the attention of the Indian Yoga Master Federation whose chairman invited the yogi to lead classes at various colleges in the region. "She is not only instructing, she is practising," said Federation Chairman S Krupakar Murali.

Murali, who frequently travels to several countries, said though he has several years of yoga experience, he has never seen a person doing the difficult halasana likes Nanammal.

The woman has won several gold medals and trophies at national level, including the first prize for the national event for yoga in Andaman and Nicobar Islands. She feels that lack of financial support by the government is one of the major reasons for not many not coming forward to promote and learn this age-old art form.

"She had rejected offers from several yoga federations across the world as she does not know English" said Nanammal's younger son V Ellusami. Recently, Nanammal attempted world record by teaching a few yoga moves to more than 20,000 students at Coimbatore.

She said that her latest move was to create awareness among women, mainly girl students, about yoga techniques by going to various educational institutions to solve several health-related problems especially after marriage.

Courtesy: Deccan Herald, May 26th 2014

HUMOUR

SPANISH Teacher was explaining to her class that in Spanish, unlike English, nouns are designated as either masculine or feminine.

'House' for instance, is feminine: 'la casa.'

'Pencil,' however, is masculine: 'el lapiz.'

A student asked, 'What gender is 'computer'?'

Instead of giving the answer, the teacher split the class into two groups, male and female, and asked them to decide for themselves whether computer should be a masculine or a feminine noun. Each group was asked to give four reasons for its recommendation.

The men's group decided that 'computer' should definitely be of the feminine gender ('laf computadora'), because:

1. No one but their creator understands their internal logic;
2. The native language they use to communicate with other computers is incomprehensible to everyone else;
3. Even the smallest mistakes are stored in long term memory for possible later retrieval; and
4. As soon as you make a commitment to one, you find yourself spending half your paycheck on accessories for it. (THIS GETS BETTER!)

The women's group, however, concluded that computers should be Masculine ('el computador'), because:

1. In order to do anything with them, you have to turn them on;
2. They have a lot of data but still can't think for themselves;
3. They are supposed to help you solve problems, but half the time they ARE the problem; and
4. As soon as you commit to one, you realize that if you had waited a little longer, you could have gotten a better model.

The women won.

SOME WHITE TRUTHS

As the summer gets hotter, some easy ways to cool down homes

The sun glares down and seems set on keeping its fiery glance focussed on us. At times, the sweltering heat makes us sweat even in ventilated indoor spaces. To beat the heat, many of us turn to air-conditioners, which guzzle electricity, making our hearts skip a beat when it's time to pay the energy bills. It makes sense to shield our buildings from heat gain rather than negate it later. So, is there a heat shield for buildings?

Well, as simple a decision as your colour choice in exterior paints can make a big difference. White wins this battle, hands down. Though, of course, you can take a little leeway and try off-white, ivory, and other shades of white. Opting for a house bathed in white ensures maximum reflection of the heat rays that hit the house. On the other hand, the darker the shade of paint on exterior surfaces, the more is the absorption of heat.

In fact, the White Roof Project (WRP) taken up in cities like New York has shown that heat reflective white roofs can make a world of difference to both short-term and long-term climate change concerns. This project was started as a go-green endeavour to reduce carbon emissions caused by indoor air-cooling, reduce stress on the power grid and save on electricity usage for cooling. Volunteers undertook the task of white-painting roofs of buildings in New York City neighbourhoods like Manhattan. "This ended up making substantial money savings for end users too, prompting many building owners to pay up for white-painting their roofs," points out S. Aarthy, energy consultant.

The White Roof Project estimates that a roof covered with solar-reflective white paint could also reduce ambient heat in urban outdoor spaces by a few degrees and partly mitigate the 'heat island' effect. "In fact, it is estimated that 5–10 per cent of summer electricity is used just to negate heat gained by buildings because of the heat Island effect", remarks R. Saravana Perumal, hybrid green home consultant.

Add to this the electricity used for further cooling of indoor spaces, and the importance of going in for white roofs becomes self-evident. No wonder, WRP has now grown into a global network with chapters in various cities. "White surfaces absorb just 35 to 50 per cent of heat falling on it, and retain less than 7 per cent of the absorbed heat. And over 90 per cent of the little heat that's absorbed is reflected back into the atmosphere. On the other hand, black surfaces absorb about 90 per cent of heat, and also retain 50-60 per cent of this absorbed heat. That is the reason cricketers playing in the sun dress in white flannels, and doctors advise wearing light coloured clothes in summer," points out R. Saravana Perumal. Remember, our traditional village huts did manage to stay cool even without fans, leave alone air conditioners, thanks to their white, lime-washed walls and thatched roofs. By white painting, we can make 25 per cent energy savings on air conditioning, and 10-15 per cent on fan usage. White paint causes much less carbon emissions too compared to coloured paint.

"Simple exterior white emulsion paints and even inexpensive whitewashing or lime-washing works quite well, though, of course, there are special paints with higher solar reflectance index (SRI), and white-hued insulating tiles in the market. But again, special paints may have added chemicals which are perhaps better avoided. Keep the ceilings white too," says Perumal. By preventing heat gain into the building structure, we also get to prevent cracks erupting on walls because of heat-triggered expansion of cement.

Keep your cool

Moving inside, LED lights generate just 5-10 per cent of the heat generated by CFL bulbs and tube lights. So, it takes less electricity to cool an LED-lit room.

Ensure that doors can be shut air-tight, so that warm air doesn't leak into the room.

Growing plants on the terrace helps prevent solar heat from seeping into the building. This can be in the form of potted plants, terrace gardens, or creepers trailing over overhead pandals on the terrace.

Structural options like hollow block construction that insulates indoor spaces from heat and closeable air vents near the ceiling that let the lighter hot air move up and move out of the house, can help keep indoor spaces cool, despite the solar onslaught.

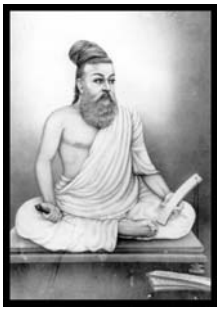
Courtesy: Hema Vijay, Habitat, The Hindu dt: 31.05.2014

HOME FESTIVALS - 8

AVANI (August/September)

This is a busy month, with two major festivals celebrated both at home and at the temple. Krishna Jayanthi, the birth of Lord Krishna, comes first. In the painting at right is the rescue of the baby Krishna, who was born in a prison. His father carries him across a swollen stream while the seven-headed serpent, AdiSeshan, protects the incarnation of Lord Vishnu from the storm. In the Home, offerings of butter and yoghurt are made to Krishna's image, and footprints made with red powder reveal his path from the home's front door to the shrine room, suggesting that Krishna has come to participate. Ganesha Chathurthi is a mammoth festival across all of India, ten days in celebration of His manifestation. Shown in the center of the painting is a statue of Lord Ganesha and a devotee offering obeisance by pulling his ears and bobbing up and down, a practice called *thopukarnam* in Tamil, done only for Ganesha – one explanation being that it is to make the Baby Ganesha laugh. The icon of Ganesha is made by the devotees from river clay and painted and decorated. At festival's end is the Visarjana or departure, when the clay icon is placed into the river the Deity is bid farewell. In North India Visarjana is celebrated by millions of people. At far right in the art is depicted the story of Ganesha consuming so many sweet offerings that He had to tie a snake around his belly to keep it from bursting. Ganesha chastised the Moon for laughing at His predicament, and as penance the Moon has ever since waxed and waned through the month instead of remaining constantly bright. *(To be continued)*

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 15



In the last Part we had selected some of the Kurals that can direct the New Government with the Basics of Good Rule.

Tiruvalluvar has devoted a set of Ten Kurals to illustrate 'How a Ministry should function for ensuring the Welfare and Safety of a Country. In a few Kurals selected and detailed below, it can be seen how he stresses importance of Righteous Actions, Timely Planning and Execution as well as Dealing with the neighbouring Countries for ensuring Peace and Welfare.

Karuviyum Kalamum Seigayum Seyyum
Aruvinayum Mandathu Amaichchu Kural 631

கருவியும் காலமும் செய்கையும் செய்யும்
அருவினையும் மாண்டது அமைச்சு. குறள் 631

"Behold the Man who can Judge aright the ways and means of achieving Great Enterprises and the proper Season to commence them; he is the proper man for the Council."

Aranarinthu Aanruamaintha Sollaneng Gnandrum
Thiranarinthan Therchith Thunai Kural 635

அறன்அறிந்து ஆன்றுஅமைந்த சொல்லான்எஞ் ஞான்றும்
திறன்அறிந்தான் தேர்ச்சித் துணை. குறள் 635

"Behold the man who knoweth the Law and aboundeth in Instruction, is deliberate in his Speech and always understandeth what is fit for each occasion; he is the Minister right."

Piriththalum Penik kolalum Pirintharp
Poruththalum Vallathu Amaichchu Kural 633

பிரித்தலும் பேணிக் கொளலும் பிரிந்தார்ப்
பொருத்தலும் வல்லது அமைச்சு குறள் 633

"He is the able Minister who posseseth the Capacity to Disunite allies, to cherish and keep up existing Friendship, and reunite those who have become enemies."

ITC GRAND CHOLA, CHENNAI

The hotel is built in **South Indian temple architecture** and has four entrances similar to the temples in South India, accordingly named as 'Vallavan', 'Sembiyan', 'Killi', and 'Chola'. Vallavan, Sembiyan, and Killi faces the north, the east, and the west, respectively. 'Vallavan' is the drop-off point for the guests for the grand presidential suite, the Raja Raja Chola Suite, the Presidential Suite, Karikalan Suite and for the ITC One category of rooms. 'Sembiyan' is the drop-off point for the retail wing. Killi is the drop-off point for the hotel's serviced apartments of which there are 78. There are 43 single bed room, 33 double bed room, and 2 two bed room apartments. Other features similar to the temples include tall pillars, grand columns, and sweeping staircases.

Sangam, the grand lobby in the front, accessed through the Chola entrance opens out into the various wings of the hotel commanding a full view of the arena. The grandest marble staircase of the hotel, with pastel-coloured hued marbles and hand-carved balustrade running over a series of symmetrical pillars and opening out into a huge stucco landing, is located outside the Killi doorway.

The white and soft-cream floral motifs in close clusters in the hotel, found on the walls, ceilings, and pillars, such as the sunflower motif in the portico and the kolam-inspired motifs in the food and beverage areas, are themed after the Chola empire, which ruled parts of South India and South-East Asia from 300 BC to 1250 AD. The bronze horse in front of the lobby is based on the one that was yoked to the chariots of the Chola kings. The marble walls are interspersed with panels of carvings of the wheel of life, the four-petalled flower, and are echoed in the etchings on the glass doors leading to the rooms and lounge area.

The architectural theme is reinforced with 462 pillars, most of them with hand-carved design work inspired by the Brihadeeshwara temple of Tanjore. The hotel has over 1 million square feet of marble with 57 varieties of the stone, for which the company bought a marble quarry in whole in Italy and shipped several tonnes of the stone to Chennai for the construction. The hotel has 7 lounges, and the average room size is 625 sq ft. The intricate stonework in the building were created by 4,000 artisans from Mamallapuram who worked on site. The overall construction of the hotel took five years to complete.

The hotel has 600 rooms and features 1,600,000-square-foot (150,000 m^2) of built area, 75,000-square-foot (7,000 m^2) of retail space and 100,000 square feet (9,300 m^2) of conference and exhibition facilities, which includes a pillar-less main ballroom of 26,540 sq ft named the Rajendra Hall, which can accommodate 5,000 guests. The ballroom is a stand-alone structure gently sloping into a carpeted area. The total area of the ballroom, including the pillar-less portion, is 55,000 sq ft. The hotel also has a 48-seater preview theater. The hotel covers 1.5 million square foot area on an eight-acre plot. Of the 8 acres, about 10 percent has been given to the Chennai Metropolitan Development Authority (CMDA) as part of the Open Space Reservation that has been taken over by the Chennai Corporation. The hotel has been designed by the Singapore-based SRSS Architects and the local architects is CRN.

Here is a list of some of the key eco measures that have been taken at ITC Grand Chola.

Energy & Carbon

- Self-owned wind farm of 12.6 MW capacity to cater to 100% electrical energy demand of the hotel
- The envelope materials comprising composite wall assembly, multi-glazed windows, and roof top insulation, well exceeds the standards of ASHRAE (www.ashrae.org) / ECBC (Energy Conservation Building Code)
- A programmable HVAC (Heating Ventilation and Air Conditioning) control called the Hartman loop has been installed to increase the efficiency of the system by 20%, for the first time in the country
- CO_2 Sensor based fresh air handling units operated by IBMS (Integrated Building Management System) leads to optimum guest comfort, while saving energy
- Digital Valet System ensures customized room climate controls and prevents wastage of energy
- Fully automated energy efficient boilers with O_2 trimming for enhanced efficiency and low fuel consumption
- 25% of the domestic hot water requirement is met by Solar Concentrators
- Programmable computerised lighting controls to provide for the mood lighting in the public areas and the restaurants. Hence, saving electrical energy
- Water cooled refrigerants in kitchen refrigeration equipment in place of air cooled equipment to save energy
- The CO monitoring based jet fan ventilation system of the basements compared to a conventional ducted system will save energy

Water

- External previous areas and green roofs along with water harvesting structures will retain 100% of storm water catchment onsite
- 100% of the irrigation, flushing, and cooling tower requirements is met through treated effluent
- Use of water efficient fixtures will reduce the building water use by 35% compared to conventional benchmarks
- The landscape area has carefully chosen native, adaptive and low maintenance vegetation species to minimize water requirement. Further, shading of ground covers by trees helps reduce evaporation losses thus reducing water consumption
- Drip irrigation and timer based controls for operating the irrigation valves further eliminates the wastage of water
- In laundry, the water from last wash is used for the pre-wash of the subsequent cycle. Further, use of low alkaline environmental friendly washing liquids helps reduce run time and saves water

Education & Training

Basic Environment Awareness Training is mandatory for all. New joinees are taken through a two day session and retraining is done for all existing employees once a year. Annual increments are subject to an employees successful completion of the same. Specialised training on subjects like energy, water, pollution control and prevention, environmental legislation and beyond, LEED standards, etc. are imparted to focus groups.

ITC GRAND CHOLA, CHENNAI

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