TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE

NEWSLETTER

ISSUE NO. 198	VOL NO. 19/2024	MONTHLY ISSUE NO. 5	PRIVATE CIRCULATION ONLY	OCTOBER 2024

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
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ANNUAL GENERAL BODY MEETIONG WITH ELECTION - 2024-2026

On 28.09.2024 at Esthell Village Resort, Thirukazhukundram




Inauguration - Lighting the Traditional Lamp

President, Secretary, Treasurer Addressing the AGM

Members Gatherings in AGM

PRODUCT DISPLAY

M/s Sun Power Services, Chennai

M/s Great White Electricals, Chennai

M/s GM Modular Pvt. Ltd.,
Chennai

M/s Tekpower Energy Solutions,
Chennai

M/s Sree Nandhees Technologies Pvt. Ltd.
Chennai

M/s Havells India Ltd.
Chennai

Members Identity verified before voting

Members Casting their Votes

Election Committee handing over the
Winning Certificate to the
Mr. K. Ramesh, as New President

Election Committee handing over the
Winning Certificate to the
Mr. D. Santhanam, as New Secretary

Election Committee handing over the
Winning Certificate to the
Mr. C. Umamurugan, as New Treasurer

NEW TEAM - READY TO SERVE

Left to Right: M. P. B. Ravindranath, Mr. M. Arumugam, Mr. S. Gouthaman Mr. A. Murugavel Mr. C. Umamurugan, Mr. D. Santhanam, Mr. K. Ramesh, Mr. K. Nagarajan, Mr. S. Kovalan, Mr. S. Karthikeyan Mr. N. Senthilkumar, Mr. K. Vignesh,

EDITORIAL

To All Members,

!!Happy Deepawali!!

As we celebrate Deepavali this year in October, which usually falls in the month of October or November, depending on the lunar calendar. People decorate their homes with oil lamps, colourful rangoli, and lights irrespective of their religion. Fireworks, Sweets and Gifts are also integral to the celebration. This marks the celebration of 'Brightness' and Joy all over the country.

Deepavali is also marked by high degree of economic activities in the form of purchases of all kinds, investments and even commencement new businesses and accounts by many communities. Deepavali is a time for family gatherings, feasting, and community celebrations, strengthening social bonds. With the line-up of other festivals too around the corner we should be mindful in all our celebrations and lead a heathy lifestyle.

As we commemorate Gandhi Jayanthi also this month, a brief note on Gandhiji's philosophy is included in this issue.

All of Gandhi's endeavours, innovations, and changes were based on the four core principles of his life and philosophy: Truth, Nonviolence, Satyagraha, and Sarvodaya. With total transparency, openness, and simplicity, Gandhiji was able to unite the entirenation, giving it a strong voice and facilitating the successful advancement of the Freedom Struggle. When we became independent, the economy was at its lowest point and poverty was pervasive, but we had committed leaders who were intelligent, hardworking, and visionary, and we were able to progress with the aid of plentiful natural resources.

Gandhiji believed that the only people who could manage the wealth of society were the owners and directors of commercial companies. He viewed business to serve society. Gandhi advocated for businesses to contribute positively to their communities, prioritizing social welfare over mere profit-making. He believed that businesses should operate on ethical principles. He emphasized honesty, integrity, and fair dealings, arguing that profit should not come at the expense of ethics or social responsibility.

Gandhiji promoted the idea of self-sufficiency, particularly through the revival of local industries. He encouraged the use of khadi and other indigenous products, arguing that businesses should support local economies and empower communities.

Let us all pledge to purchase some Khadi products for this Deepavali and purchase oil lamps from local artisans and support local economy rather than just ordering them Online and celebrate the festival of lights in a safe way.

We extend our sincere gratitude to all those members who have helped us by participating in the advertisement appearing for the issue August 2024 – VSP Power Solutions, Indoswiss Electricals & Enterprises, Gravin Earthing & Lightning Protection System (P) Ltd., 3SI Eco Power LLP., Sri Bhoomidurga Marketing (P) Ltd., Power Cable Corporation, Sastinadha EPC Solutions India Pvt Ltd., C-Sec Technologies Pvt. Ltd., Dezerve Solar Panels, Global EPC India Pvt Ltd., Galaxy Earthing Electrodes (p) Ltd., MV Power Consultants & Engineers (P) Ltd., Pentagon Switchgear (P) Ltd., Sakthi Transformers, Sinewaves Solutions India Pvt Ltd., Velan Infra Projects Pvt Ltd., Supreme Power Equipment Ltd., E Power Engineering, Value Engineers.

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE

NEWSLETTER

President :
K. RAMESH
Secretary :
D. SANTHANAM
Treasurer :
C. UMAMURUGAN

Co-Editor : N. SOBAN BABU

Printer : M. VENKATARAMAN

CONTENTS

PARTICULARS	PAGE NO.
Editorial	5
Contents	6
MOM - AGM with Election 2024 - 26	7
Updated Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2023 – 7	8-12
Harmonic – Audible Noise & Over Heating of the Detuned Reactor – 8	13
Honeywell Commissions India's First On-Grid Battery Energy Storage System in Lakshadweep	14
A Brief about National and International Testing, Certifying and Insurance Bodies	15-16
Seminar Photos	23-26
Parallel Operation of Transformers	33-39
Five Power and Electric Trends that will Shift the Future	40-43
Home Festivals – 10 & 11	44

ADVERTISEMENTS	PAGE
3SI Eco Power LLP	46
Arrow Marketing	48
E Power Engineering	3
Elecxpo	1
Galaxy Earthing Electrodes (P) Ltd.	28
Gravin Earthing & Lightning Protection System (P) Ltd.	45
Global EPC India Private Limited	29
Indo Swiss	32
Kuber Electricals	20
MV Power Consultants & Engineers (P) Ltd.	17
Pentagon Switchgear (P) Ltd.	18
Power Cable Corporation - Medium Voltage Conductor Covers	27
Sakthi Transformers	22
Sastinadha EPC Solutions India (P) Ltd.	30
Sinewaves Solutions India (P) Ltd.	21
Sri Bhoomidurga Marketing (P) Ltd.	31
Supreme Power Equipment (P) Ltd.	2
Value Engineers	4
Velan Infra Projects Pvt. Ltd.	19
VSP Enterprises	47

MINUTES OF THE MEETING

ANNUAL GENERAL BODY MEETING WITH ELECTION 2024-2026

Date: 28.09.2022, Saturday Place: Esthell Village Resort, Thirukazhukundram

The Annual General Body Meeting started with a Welcome Note by President Mr. S.D. Poongundran

The Secretary Mr. V. Rengarajan, thanked his President, Treasurer & all the VPs & Committee members for their contribution to the TNEIEA association. He explained the progress during the tenure and appreciated the members involved in the activities.

The Treasurer Mr. Erode G. Kannan, submitted the Audited accounts 2023-2024 and circulated copies of audited accounts. All members gave their consent. The Audited accounts passed unanimously.

Election committee Members:

Mr. L. Wilson Susai Raj

Mr. S. Gopalakirshnan,

Mr. S. Ramasamy,

Mr. P. Thangaraj

The Election of Office Bearers for the years 2024-2026 was conducted

Nominations received for the Post President

1. **Mr. A.A. Murali** M/s Bestech Electrical, Madurai

2. Mr. K. Ramesh M/s Techno Engineering, Chennai

Nominations received for the Post Secretary

1. **Mr. G. Hariharan** M/s Gajendraa Electric Company, Chennai

2. Mr. D. Santhanam M/s Delta Engineers, Chennai

Nominations received for the Post Treasurer

1. **Mr. N. N. Bharanidharan** M/s Nataraja Electricals, Erode

2. Mr. C. Umamurugan M/s Paower Tech Engineers, Cuddalore

Election Details: Total members Voted: 375

For President Candidate

Mr. A.A. Murali Received	: 171 Votes
Mr. K. Ramesh Received	: 203 Votes
Not Valid Vote	: 1 Votes
	375 Votes

Mr. K. Ramesh, M/s Techno Engineering, Chennai was declared & elected as President for the year 2024-2026.

For Secretary Candidate

Mr. G. Hariharan Received	: 177 Votes
Mr. D. Santhanam Received	: 197 Votes
Not Valid Vote	: 1 Votes
	375 Votes

Mr. D. Santhanam, M/s Delta Engineers, Chennai was declared & elected as Secretary for the year 2024 – 2026.

For Treasurer Candidate

Mr. N. N. Bharanidharan Received	: 181 Votes
Mr. C. Umamurugan Received	: 194 Votes
	375 Votes

Mr. C. Umamurugan, M/s Paower Tech Engineers, Cuddalore was declared & elected as Treasurer for the year 2024 – 2026.

The following Vice Presidents, Joint Secretaries and Committee Members were elected by show of hands of Members. Members gave their concurrence for the same.

Vice Presidents:

Mr. S. Karthikeyapandian, M/s. Jaisakthi Enterprises Pvt. Ltd., Chennai

Mr. M. Arumugam, M/s Del Star Engineers, Coimbatore

Mr. A. Murugavel, M/s Venus Electric Works, Cuddalore

Mr. S. Karthikeyan, M/s Ohms Engineering, Madurai

Mr. N. Senthilkumar, M/s Shree Sakthie Electrical & Engineering, Salem

Mr. K. Vignesh, M/s V Best Engineers, Trichy

Mr. K. Nagarajan, M/s Dhanya Electricals, Thirunelveli

Mr. S. Kovalan M/s Devipriya Electricals, Vellore

Joint Secretary:

Mr. P.B. Ravindranath, M/s Ryaan Electrical Enterprises, Chennai

Mr. S. Gouthaman, M/s Electrical Installation Systems, Coimbatore

The Elected New Secretary Mr. D. Santhanam, M/s Delta Engineers delivered the Vote of Thanks

UPDATED CENTRAL ELECTRICITY AUTHORITY (MEASURES RELATING TO SAFETY AND ELECTRIC SUPPLY) REGULATIONS, 2023 – 7

(3) The minimum clearances specified in Schedule VI shall be maintained for bare conductors or live parts of any high voltage direct current apparatus in outdoor substations, excluding high voltage direct current overhead lines.

(4) There shall not be tapping of another transmission line from the main line for 66 kV and above class of lines:

Provided that during natural calamities, tapping may be allowed to ensure emergency power supply to affected areas till normalcy is restored.

Inter-locks and protection for use of electricity at voltage exceeding 650 V

(1) The owner shall ensure the following, namely:

(i) isolators and the controlling circuit breakers shall be inter-locked so that the isolators cannot be operated unless the corresponding breaker is in open position;

(ii) isolators and the corresponding earthing switches shall be inter-locked so that no earthing switch can be closed unless and until the corresponding isolator is in open position;

(iii) where two or more supplies are not intended to be operated in parallel, the respective circuit breakers or linked switches controlling the supplies shall be inter-locked to prevent possibility of any inadvertent paralleling or back feed;

(iv) when two or more transformers are operated in parallel, the system shall be so arranged as to trip the secondary breaker of the transformer in case the primary breaker of that transformer trips;

(v) all gates or doors which provide access to live parts of an installation shall be inter-locked in such a way that these cannot be opened unless the live parts are made dead and proper discharging and earthing of these parts shall be ensured before any person comes in close proximity of such parts; and

(vi) where two or more generators operate in parallel and neutral switching is adopted, inter-lock shall be provided to ensure that the generator breaker cannot be closed unless one of the neutrals is connected to the earthing system.

(2) The following protection shall be provided in all systems and circuits to automatically disconnect the supply under abnormal conditions, namely:

(i) Over current protection to disconnect the supply automatically if the rated current of the equipment, cable or supply line is exceeded for a time which the equipment, cable or supply line is not designed to withstand;

(ii) earth fault or earth leakage protection to disconnect the supply automatically, if the earth fault current exceeds the limit of current for keeping the contact potential within the reasonable values;

(iii) buchholz relay, pressure relief device and winding and oil temperature protection with alarm and trip contacts shall be provided on all transformers of ratings 1000kVA and above;

(iv) transformers of capacity 10 MVA and above shall be protected against incipient faults by differential protection;

(v) all generators with rating of 100 kVA and above shall be protected against earth fault or leakage;

(vi) All generators of rating 10001 kVA and above shall be protected against faults within the generator winding using restricted earth fault protection or differential protection or by both;

(vii) high speed bus bar differential protection along with local breaker back up protection shall be commissioned and shall always be available at all 132 kV and above voltage substations and switching stations and generating stations connected with the grid:

Provided that in respect of existing 132 kV substations and switching stations having more than one incoming feeders, the high speed busbar differential protection along with local breaker back up protection, shall be commissioned and shall always be available; and

(viii) in addition to above, all electrical protection system for generating stations, substations and transmission lines shall be as per the regulations notified by the Authority under clause (c) of sub-section (2) of section 177 of the Act.

Testing, Operation and Maintenance

(1) Before the approval is accorded by the Electrical Inspector under regulation 45, the manufacturer's test certificates shall. If required, be produced for all the type, acceptance and routine tests as required under the relevant standards.

(2) No new apparatus, cable or supply line of voltage exceeding 650 V shall be commissioned unless such apparatus, cable or supply line are subjected to site tests as per relevant standards.

(3) No apparatus, cable or supply line of voltage exceeding 650 V which has been kept disconnected for a period of six months or more from the system for alterations or repair, shall be connected to the system until such apparatus, cable or supply line are subjected to the site tests as per relevant standards.

(4) Not withstanding the provisions of this regulation, the Electrical Inspector may require certain tests to be carried out before or after charging the installations.

(5) All apparatus, cables and supply lines shall be maintained in healthy conditions and tests shall be carried out periodically as per the relevant standards.

(6) Records of all tests, trippings, maintenance works and repairs of all apparatus, cables and supply lines shall be duly kept in such a way that these records can be compared with the past records.

(7) It shall be the responsibility of the owner of all installations of voltage exceeding 650 V to maintain and operate the installations in a condition free from danger and as recommended by the manufacturer or by the relevant standards.

(8) Failures of any 220 kV and above voltage level transformer, reactor and transmission line towers shall be reported by the owner of electrical installation, within forty eight hours of the occurrence of the failure, to the authority and the reasons for failure and measures to be taken to avoid recurrence of failure shall be sent to the authority within one month of the occurrence in the forms provided in Schedule VII:

Provided that in case of mines and oil-fields, the failure of 10 MVA or above transformers shall be reported to Electrical Inspector of mines.

Precautions to be taken against excess leakage in case of metal sheathed electric supply lines

The following precautions shall be taken in case of electric supply lines other than overhead lines, for use at voltage exceeding 650 V, namely:

(i) The conductors of the cable except the cable with thermoplastic or cross linked polyethylene, insulation without any metallic screen or armour shall be enclosed in metal sheathing which shall be electrically continuous and connected with earth and the conductivity of the metal sheathing shall be maintained and reasonable precautions shall be taken where necessary to avoid corrosion of the sheathing;

(ii) The resistance of the earth connection with metallic sheath shall be kept low enough to permit the controlling circuit breaker or cut-out to operate in the event of any failure of insulation between the metallic sheath and the conductor.

Explanation – For the purposes of this regulation;

(a) In the case of thermoplastic insulated and sheathed cables with metallic armour, the metallic wire or tape armour shall be considered as metal sheathing; and

(b) Where an electric supply line as aforesaid has concentric cables and the external conductor is insulated from an outer metal sheathing and connected with earth, the external conductor may be regarded as the metal sheathing for the purposes of this regulation provided that the foregoing provisions as to conductivity are complied with.

Connection with earth for apparatus exceeding 650 V

(1) The entire switchyard or substation equipment and buildings including all non-current carrying metal parts associated with an installation shall be effectively earthed to an earthing system or mat which shall,

(i) Limit the touch and step potential to tolerable values as per relevant standards;

(ii) Limit the earth potential rise to tolerable values mas per relevant standards, so as to prevent danger due to transfer of potential through ground, earth wires, cable sheath, fences, pipe lines or other such equipment; and

(iii) Maintain the resistance of the earth connection to such a value as to make operation of the protective device effective.

(2) In the case of star connected system with earthed neutrals or delta connected system with earthed artificial neutral point,

(i) The neutral point of every generator and transformer shall be earthed by connecting it to the earthing system not by less than two separate and distinct connections:

Provided that the neutral point of a generator may be connected to the earthing system through an impedance limit the fault current:

Provided further that in the case of multi-machine systems, neutral switching may be resorted to, for limiting the injurious effect of harmonic current circulation in the system;

(ii) The generator or transformer neutral shall be earthed through a suitable impedance where an appreciable harmonic current flowing in the neutral connection causes interference with the communication circuits; and

(iii) In case of the delta connected system, the neutral point shall be obtained by the insertion of an earthing transformer and current limiting resistance or impedance wherever considered necessary at the commencement of such a system.

(3) In case of generating stations, substations and other installations of voltage exceeding 33 kV, he system neutral earthing and protective frame earthing may be, if system design so warrants, integrated into common earthing grid provided the resistance to earth of combined mat does not cause the step and touch potential to exceed the values as per relevant standards.

(4) Single phase systems of voltage exceeding 650 V shall be effectively earthed.

(5) In the case of a system comprising electric supply lines having concentric cables, the external conductor shall be connected with the earth.

(6) Where a supplier proposes to connect with earth an existing system for use at voltage exceeding 650 V which has not hitherto been so connected with earth, he shall give not less than fourteen days' notice in writing together with particulars of the proposed connection with earth to the telegraph authority established under the Indian Telegraph Act, 1885 (13 of 1885).

(7) Where the earthing lead and earth connection are used only in connection with earthing guards laid under overheadlines of voltage exceeding 650 V but not exceeding 33 kV where they cross a telecommunication line or a railway line, and where such lines are equipped with earth leakage protective device, the earth resistance shall not exceed twenty five ohms and the project authorities shall obtain no objection certificate from Railway Authorities and Power and Telecommunication Co-ordination Committee before energisation of the facilities.

(8) Every earthing system belonging to either the supplier or the consumer shall be tested for its resistance to earth on a dry day during dry season not less than once in a year and records of such tests shall be maintained and produced, if so required, before the Electrical Inspector.

General conditions for transformation and control of electricity

Where electricity of voltage exceeding 650 V is transformed, converted, regulated or otherwise controlled in substations or switching stations including outdoor substations and outdoor switching stations or in street boxes constructed underground, the following provisions shall be ensured, namely:

(i) Substations and switching stations shall preferably be erected above ground, but where necessarily constructed underground due provisions for ventilation and drainage shall be made and any space housing switchgear shall not be used for storage of any materials especially inflammable and combustible materials or refuse; and

(ii) (a) outdoor substations except pole type substations and outdoor switching stations shall, unless the apparatus is completely enclosed in a metal coveringconnected with earth, and said apparatus also being connected with the system by armoured cables, be protected by fencing not less than 1.8 metre in height or other means so as to prevent access to the electric supply lines and apparatus therein by an unauthorised person and the fencing of such area shall be earthed efficiently; and

(b) Transformer mounting structure shall be as per the regulations notified by the Authority under clause (e) of sub-section (2) of section 177 of the Act.

Pole type substations

Where platform type construction is used for a pole type substation and sufficient space for a person to stand on the platform is provided, a proper hand rail shall be built around the platform and if the hand rail is of metal, it shall be connected with the earth:

Provided that in the case of pole type substation on wooden supports and wooden platform, the metal hand rail shall not be connected with the earth.

Condensers

Suitable arrangement shall be made for immediate and automatic or manual discharge of every static condenser on disconnection of supply.

Supply to luminous tube sign installations of voltage exceeding 650 V but not exceeding 33kV.

(1) Any person who proposes to use or who is using electricity for the purpose of operating a luminous tube sign installation, or who proposes to transform or is transforming electricity to a voltage exceeding 650 V but not exceeding 33 kV for any such purpose shall comply with the following conditions, namely:

(i) All live parts of the installation, including all apparatus and live conductors in the secondary circuit, but excluding the tubes except in the neighbourhood of their terminals, shall be inaccessible to undesignated persons and such parts shall be effectively screened;

(ii) Irrespective of the method of obtaining the voltage of the circuit which feeds the luminous discharge tube sign, no part of any conductor of such circuit shall be in metallic connection, except of its connection with earth, with any conductor of the supply system or with the primary winding of the transformer;

(iii) All live parts of an exterior installation shall be so disposed as to protect them against the effects of the weather and such installation shall be so arranged and separated from the surroundings as to limit, as far as possible, the spreading of fire;

(iv) The secondary circuit shall be permanently earthed at the transformer and the core of every transformer shall be earthed;

(v) Where the conductors of the primary circuit are not in metallic connection with the supply conductors, one phase of such primary circuit shall be permanently earthed at the motor generator or convertor, or at the transformer and an earth leakage circuit breaker of sufficient rating shall be provided on the side of voltage not exceeding 250 V to detect the leakage in such luminous tube sign installations;

(vi) A sub-circuit which forms the primary circuit of a fixed luminous discharge tubesign installation shall be reserved solely for such purpose;

(vii) a separate primary final sub-circuit shall be provided for such transformer or eachgroup of transformers having an aggregate input not exceeding 1000 Volt-amperes of a fixed luminous discharge tube sign installation;

(viii) An interior installation shall be provided with suitable adjacent means for disconnecting all phases of the supply except the "neutral"in a three-phase, four-wire circuit;

(ix) For installations on the exterior of a building a suitable emergency fire-proof linked switch to operate on all phases except the neutral in a three-phase, four-wire circuit shall be provided and fixed in a conspicuous position at not more than 1.70 metre above the ground;

(x) A special "caution" notice shall be affixed in a conspicuous place on the door of every enclosure of voltage exceeding 650 V but not exceeding 33 kV to the effect that the supply must be cut off before the enclosure is opened;

(xi) Where static condensers are used, they shall be installed on the load side of the fuses and the primary side of the transformers where the voltage does not exceed 250 V;

(xii) Where static condensers are used on primary side, provision shall be made for automatic or manual discharging of the condensers when the supply is cut off; and

(xiii) Before using the static condensers or any interrupting device on the voltage exceeding 650 V, the executing agencies shall test and ensure that automatic discharging device is functional thereon.

(2) The owner or user of any luminous tube sign or similar installation of voltage exceeding 650 V but not exceeding 33 kV shall not bring the same into use without giving to the Electrical Inspector not less than fourteen days' notice in writing of his intention so to do.

(to be continued)

Courtesy: https://cea.nic.in/

HARMONIC – AUDIBLE NOISE & OVER HEATING OF THE DETUNED REACTOR – 8

The audible noise & overheating of the Detuned reactors are caused by FERRO RESONANCE

The level of voltage harmonics distortion on the low voltage busbars effects the occurrence of Ferro resonance.

FERRO RESONANCE or NON LINEAR RESONANCE in Electric circuits which occurs

1) When a circuit containing non-linear inductance is fed from a source that has series capacitance.

2) The circuit is subject to a disturbance such as opening of switch.

In case of Ferro resonance, it is characterized by a sudden jump of voltage & current from one stable operating state to another one

When the harmonic content on the low voltage side is high,the switching on capacitor stage causes the Ferro resonance at the Detuned reactor supported by the medium voltage system

During Ferro resonance the harmonic distortion of the voltage & current on low voltage & medium voltage busbars are high and Detuned reactors & PF correction capacitors exhibit over voltage & over current.

In Ferro resonance energy oscillated back & forth between the capacitive element and the non - linear inductive element which alternatively saturated

As a result, large over current & over voltages occur with abnormal wave forms and high harmonic content

When Ferro resonance occurs the harmonic spectrum of the Detuned reactor current & Voltage become very rich with 5th harmonic having the highest value.

When the 5th voltage harmonic on low voltage busbar is high the Detuned reactor can be overloaded with high current harmonics

Increased voltage harmonic distortion on the low voltage bus bar at some operating points where the percentage of non-linear load is increased, switching on the capacitor stage at these operating points triggered the Ferro resonance and stages that were already switched on, the high harmonic distortion caused the Detuned reactors to be over loaded & generates heat and audible noise.

(To be continued)

A. Srinivasan B.E.,MIE, CE(I), FIV, PE(I)

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HONEYWELL COMMISSIONS INDIA'S FIRST ON-GRID BATTERY ENERGY STORAGE SYSTEM IN LAKSHADWEEP

This marks India's first on-grid solar initiative using BESS to manage the supply of renewable power.

New Delhi: Honeywell Automation India Limited (HAIL) has successfully delivered and commissioned a micro grid Batter Energy and Storage System (BESS) for Solar Energy Corporation of India's (SECI) Lakshadweep Islands project. This marks India's first on-grid solar initiative using BESS to manage the supply of renewable power.

The 1.7 MWp solar and 1.4 MWh BESS enabled project is part of SECI's strategic decarbonisation plan for the Lakshadweep Islands, where Honeywell's BESS technology is being integrated into the micro-grid of Kavaratti, the largest island. The project is expected to save Rs. 2500 million over its lifetime, reduce diesel consumption by 19.8 million litres, and offset 58000 tonnes of carbon emissions, according to the Ministry of New and Renewable Energy.

Currently, the islands rely heavily on diesel generators, which contribute to high carbon emissions and dependence on mainland fuel supplies. Honeywell's BESS system includes an end-to-end energy management solution that will allow renewable energy to be stored and distributed efficiently, reducing reliance on diesel. "We are committed to supporting India's energy transition and energy self-reliance initiative by driving constant technology and software innovation". Said Ashish Gaikwad, Vice President and General Manager, Honeywell Industrial India.

Sun Source Energy, a leading solar company in India, collaborated with Honeywell to implement the system. "We are happy to play a pivotal role in this land mark project that supports the energy transition efforts of the Union Territory of Lakshadweep," said santanuGuha, CEO of SunSource Energy.

The project, inaugurated by Prime Minister Narendra Modi, represents the first non- containerized BESS approved by SECI and is seen as a critical step toward achieving India's net zero emissions by 2070.

Courtesy: SauravAnand,

ETEnergyWorld

A BRIEF ABOUT NATIONAL AND INTERNATIONAL TESTING, CERTIFYING AND INSURANCE BODIES

PART-1 – INTRODUCTION TO STANDARDIZATION AND STANDARDIZATION BODIES

1.0 An introduction to this article:

1.1 As we are all kindly aware, Testing, Certifying and Insurance Bodies serve the following purposes:

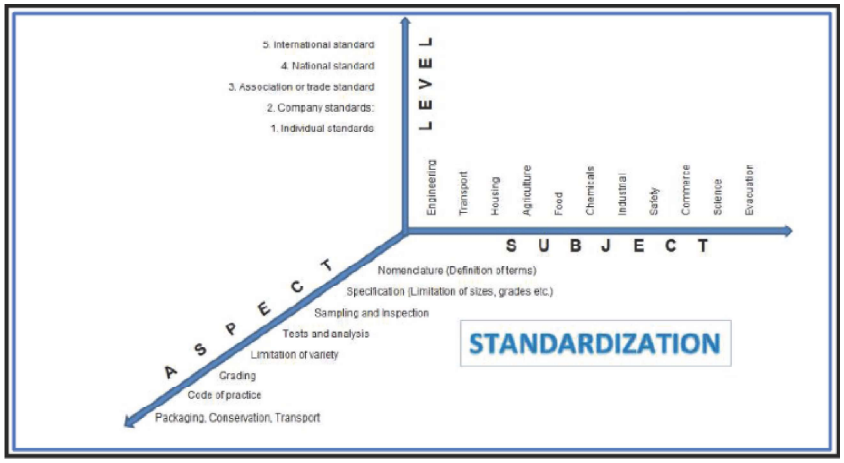
1 Method improvement for Manufacturing
2 Work measurement
3 Safety improvement
4 Technic improvement
5 Man power control
6 Record Maintenance
7 Inventory control
8 Scheduling
9 Getting repetitively same good results
10 Accident control
11 Ideas for improvement to existing standard
12 Customer Complaint Management
13 Time and motion study (Ergonomics)
13 Reduction of costs
14 Better perfomance
15 Define duties for personnel
16 Quality control
17 Improves efficiency
18 Better staff relationship
19 Management participation
20 Interchangeability
21 Rationalization and variety reduction
22 Import substitution
23 Utilization of local materials
24 Conservation of scarce materials
25 Use of waste materials
26 Optimization of quality
27 Assists transfer of technology
28 Provides consumer protection, etc.

1.2 The Standard documents define the following aspects for the user's benefits:

1. Nomenclature (Definition of terms)
2. Specification (Limitation of sizes, grades etc.)

3. Sampling and Inspection
4. Tests and analysis
5. Limitation of variety
6. Grading
7. Code of practice
8. Packaging, Conservation, Transport, etc.

2.0 Type of Standardization and Certifying Bodies:



2.1 There are various:

1 International Standards
2 National standard
3 Association or trade standard
4 Company standards:
5 Individual standards

3.0 The interesting history and purpose of Standardization and Certifying Bodies:

3.1 The National and International Standards have some very interesting and important histories which one should be aware of. Further, they deliver important technical information as well.

3.2 We all look to their certification for our products and our procedures.

3.3 Many such Standards bodies also provide very valuable technical information for free as well.

3.4 The international standardization and certifying bodies include:

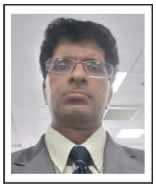
- International Standards Organization
- Factory Mutual
- Baseefa
- Atex, etc.

3.5 The National standardization and certifying bodies include:

- Bureau of Indian Standards
- Chief Controller of Explosives
- Petroleum, Explosive and Safety Organization, etc.

4.0 Going Forward:

4.1 In the next part, we will see some aspects about some of these standards and Insurance Organizations and what they have to offer.



Mr. Muthukrishnan Kalyanasundaram, M.E.
Proprietor – M/s HKM ENGINEERS AND CONSULTANTS
Services – Fire and Life Safety Consultancy
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PARALLEL OPERATION OF TRANSFORMERS

Introduction

- Parallel operation of transformer means HV and LV of two (or more) transformers are connected to the source busbars and load busbars respectively.
- According to IEC 60076 – 8, parallel operation means direct terminal-to-terminal connection between transformers in the same installations.

Need for Parallel Operation of Transformers:

The need for parallel operation of transformers arises to cater additional load when the transformer rating is exceeded and to maximize the availability, reliability, and flexibility of the power system during design

Availability: When any of the transformers is taken out for maintenance purposes, other transformer connected in parallel operation will meet the demand of the load without any service interruption.

Reliability: If any of the transformer running in parallel has tripped due to afault, then the remaining transformer will share the load. So the power supply won't get interrupted if load demand in this scenario does not make the transformer to operate in overload condition.

Flexibility: If the power demand gets increased in the future, there must be a provision of connecting transformers in the system in parallel to fulfil the extra demand, again if future demand is decreased, transformers running in parallel can be removed from the system to balance the capital investment and its return.

Conditions for Parallel Operation of Transformers:

- *Same Voltage Ratio/Turns Ratio*
- *Same Vector Group*

Same Voltage Ratio:

If the transformers connected in parallel have **slightly different voltage ratios**, then due to the **inequality of induced emf in the secondary windings**, a **circulating current** will flow in the loop formed by the secondary windings **under the no-load condition**. The **current** will be **quite high** as the **leakage impedance is low**. When the secondary windings are loaded, this circulating current will tend to produce **unequal loading on to the transformers**, and it may not be possible to operate the **full load from this group of two parallel transformers** (one of the transformers may get overloaded).

Circulating current, $I_c = \frac{E_A - E_B}{Z_A + Z_B}$ assuming $E_A > E_B$

Ea = Induced EMF of Transformer 1

Eb = Induced EMF of Transformer 2

Za = Actual Impedance of Transformer 1

Zb = Actual Impedance of Transformer 2

Case 1: Different Voltage Ratio

*Let us consider 2 No's of 25 MVA, transformers are connected in parallel, where the Transformer 1 has a voltage ratio of **66/11 kV** and Transformer 2 has the voltage ratio of **66/11.5 kV** and the load is given as 40 MW at unity p.f., and both transformers impedance are assumed as 10% according to IEC 60076-5.*

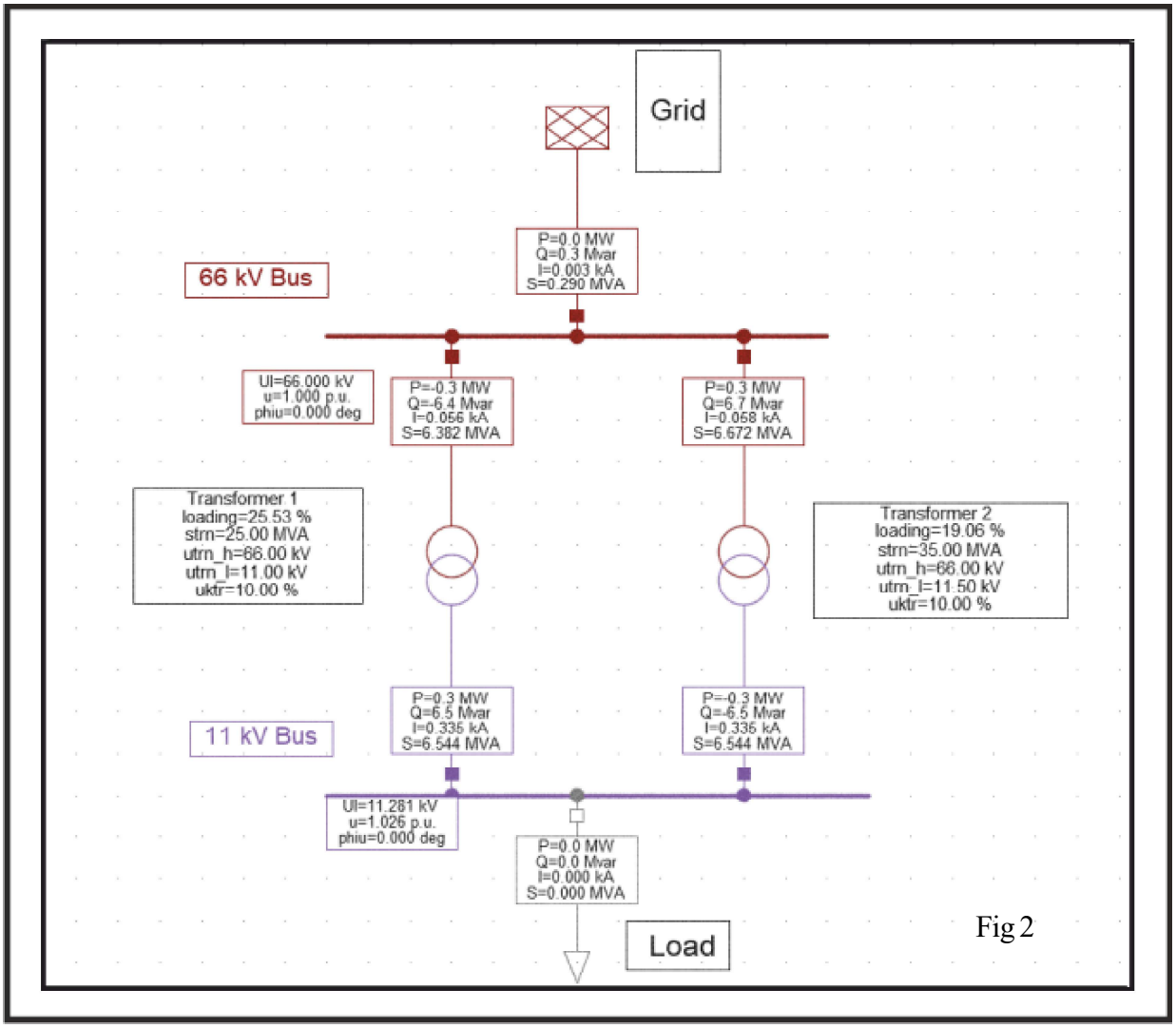


Fig 2

Inference: Due to different voltage ratios, the circulating current of 335 Amps flowing in between the secondary side of transformers (Transformer 2, LV side voltage (11.5kV) is slightly higher than Transformer 1 LV side voltage(11kV), so circulating current is flowing from Transformer 2 to Transformer 1). Hence at 11 kV bus, voltage is raised to 11.281 kV and also reflected circulating current of 56 Amps flowing in between the primary side of transformers.

Case 2: LTC Operation in Transformer Parallel Operation

Let's consider 2 No's of 25 MVA, +- 10% tap range transformer *are connected in parallel, where the Transformer 1 has a voltage ratio of 66/11 kV operating at 1% min tap and Transformer 2 has the voltage ratio of 66/11 kV operating at 2% min tap and load is given as 40 MW at unity p.f., and both transformers impedance is assumed at 10% according to IEC 60076-5.*

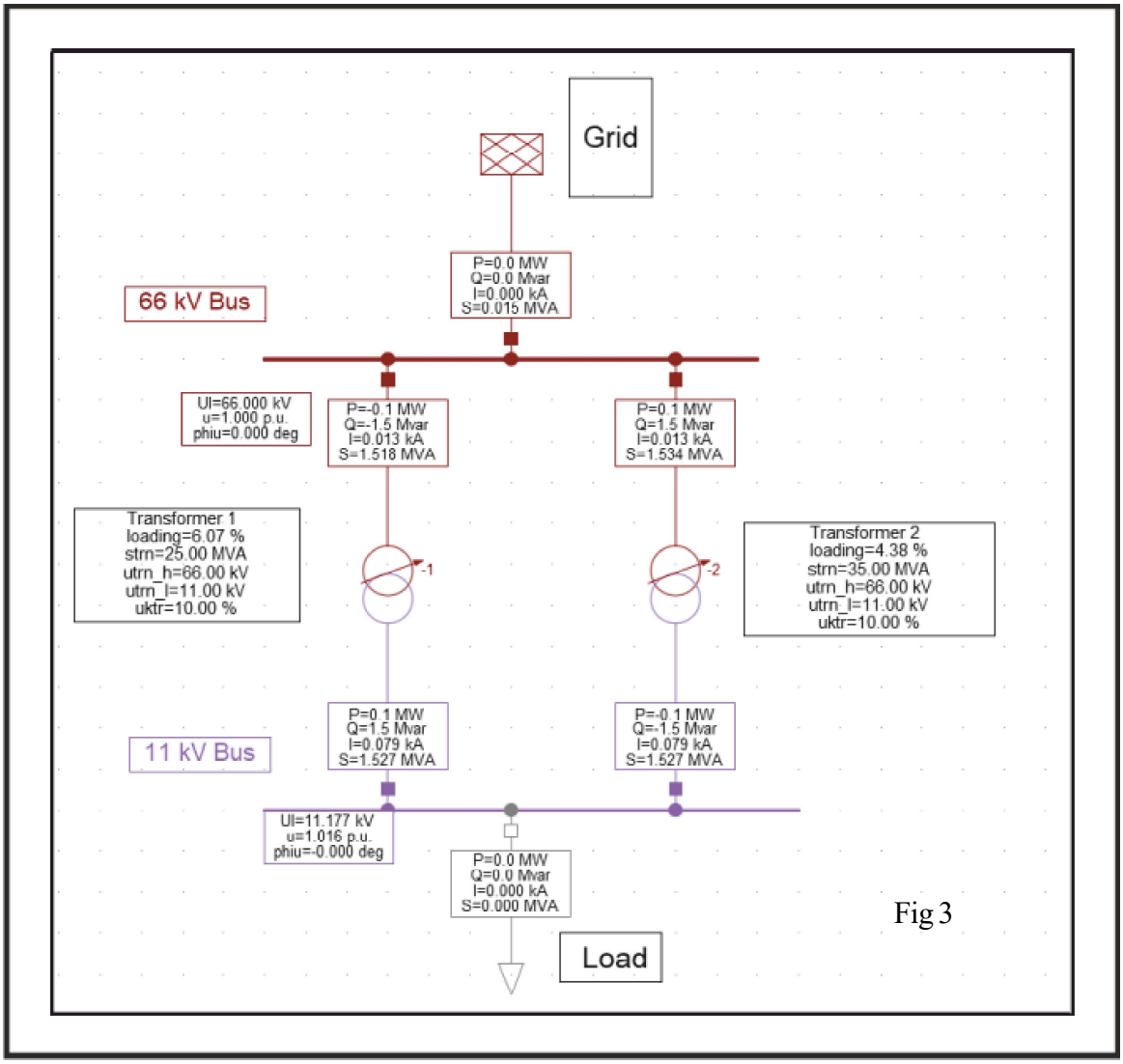


Fig 3

Inference: Due to maloperation of LTC, transformer 1 LV side voltage is 11.11 kV and transformer 2 LV side voltage is 11.22 kV. So 79 Amps of circulating current flows in the secondary side of both the transformers. In reality, there will be a Master-Follower methodology for LTC operation using auxiliary relays to avoid circulating current.

Master – Follower Method:

- The master–follower/master-slave method is just what the name says. This method's sole intent is to bring the tap changer on the follower transformer to the same tap position as for the master.
- By keeping the transformers on the same tap, there is no circulating current and there will be no significant losses except for the few seconds while the tap change is being accomplished.
- This method requires the transformers to be identical with equal no of taps and tap-step size. As each action of the master is duplicated by the follower, and unequal turn ratios of the transformers would lead to continuing circulating current.

- The method is usually implemented **using auxiliary relays** which command the follower to follow an action of the master and then will not permit a subsequent action of the master until a feedback signal is received from the follower confirming that it has operated and is ready to receive another command from the master.

Same Vector Group:

The phase sequence of line voltages of both the transformers must be identical for the parallel operation of three-phase transformers. If the phase sequence is incorrect, in every cycle each pair of phases will get short-circuited. This condition must be strictly followed for the parallel operation of transformers.

Example: *Let's consider 2 Nos. of 25 MVA, 66/11 kV transformers that are connected in parallel, where the impedance of both transformers are assumed at 10% according to IEC 60076-5. Vector group of T1 is Dyn1 and the Vector group of T2 is Dyn7.*

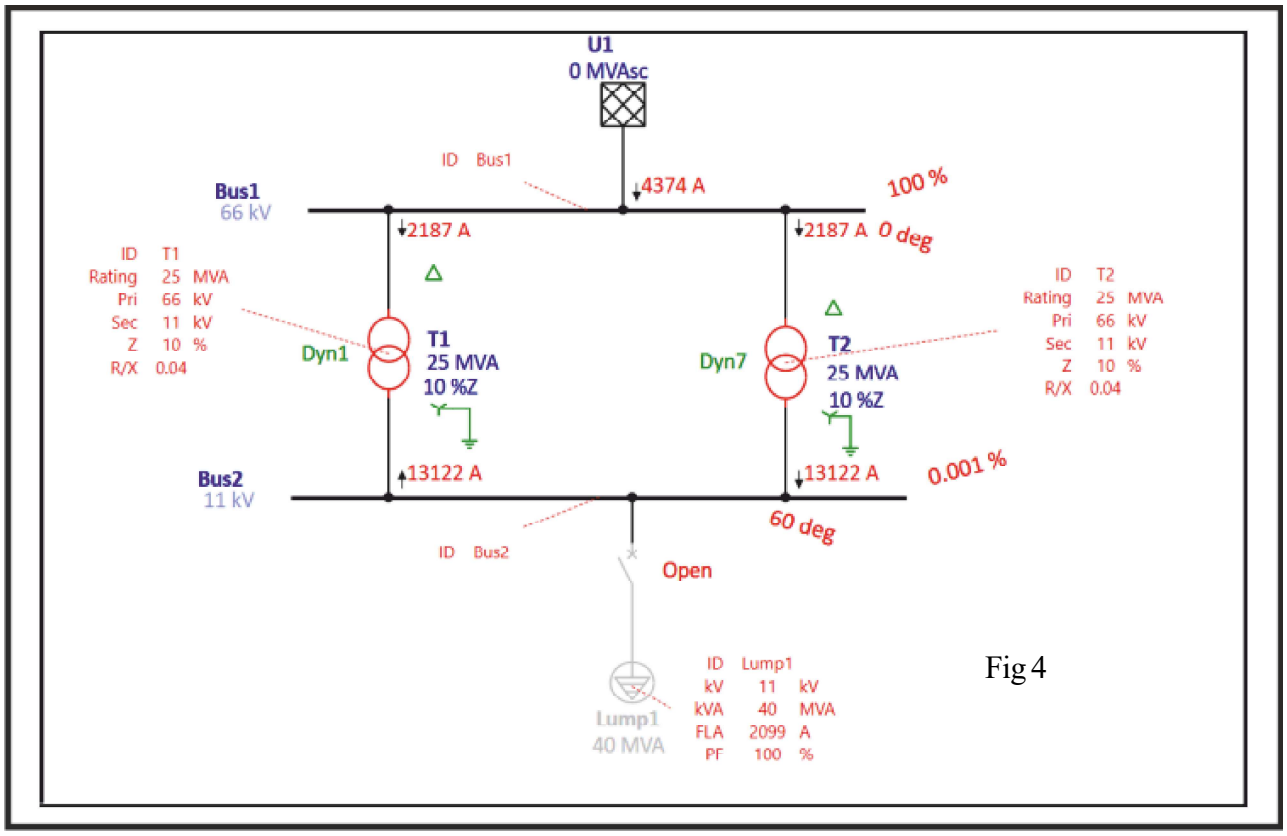


Fig 4

Inference: Only transformer having the same phase displacement between primary and secondary can operate in parallel. In the above example, due to different phase displacement there is a flow of circulating current in the network.

Calculation for determining circulating current:

$kV_{base} = 11\ kV$ $\quad MVA_{base} := 25MVA$

$Z_{pu} := 0.1$ $\quad Z_{base} := \frac{kV_{base}}{MVA_{base}} = 4.84\ \Omega$

$Z_{act} := Z_{pu}.Z_{base} = 0.484\ \Omega$

$Voltage_{diff} := 6350.853\ V\angle 150\ deg - 6350.853\ V\angle 30\ deg = (12.702\angle 150^{o})\ kV$

$$I_{cir} := \frac{Voltage_{diff}}{2.(0.484 \angle 90\ deg)ohm} = (163.1216 \angle 60^{o})\ kA$$

Strategic Conditions for Parallel Operation of Transformer:

- *Same Impedance*

Same Impedance:

The current shared by two transformers running in parallel should be proportional to their MVA ratings.

The current carried by these transformers are inversely proportional to their internal impedance.

- From the above two statements, it can be said that the impedance of transformers running in parallel are inversely proportional to their MVA ratings. In other words, percentage impedance or per unit values of impedance should be identical for all the transformers to run in parallel.
- Clearly, if the transformers are matching, especially for this point of discussion that they exhibit the same impedance, there will be an equal division of load current in them when the tap changers are operating on the same tap position. If the condition is not met, the transformer will not share the equal load according to its MVA rating.

Example: *Let's consider* ***2 Nos. of 25 MVA, 66/11 kV transformer*** *are connected in parallel, where the* ***impedance of both transformers*** *are assumed at* ***10%*** *according to* ***IEC 60076-5*** *in* ***Case 1.***

Case 1:

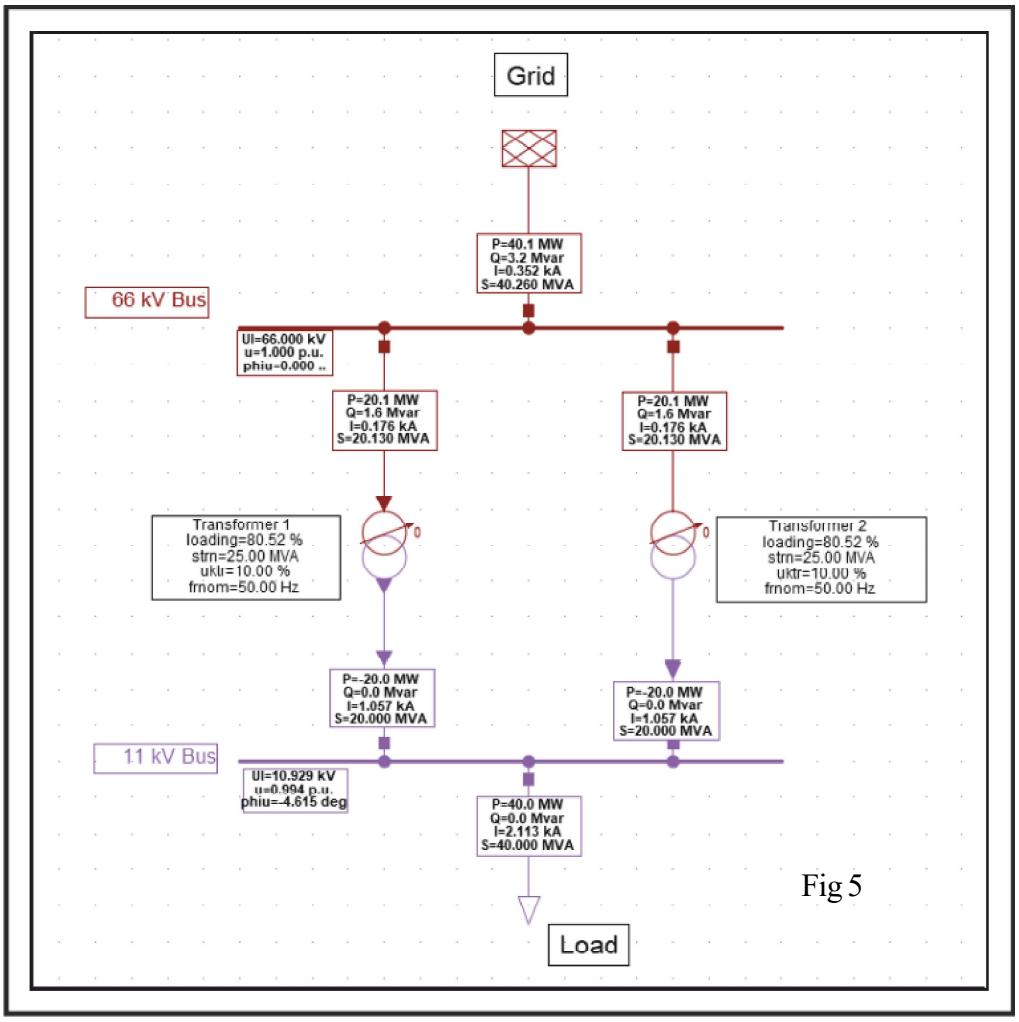


Fig 5

Inference: *From the above network, we can clearly say that connecting the transformers in parallel with the same parameters results in equal load sharing (percent impedance of both transformers are identical on their own MVA base rating).*

Practically, manufacturing two similar rated transformers with the same value of impedance on their own MVA base rating is quite difficult to do it.

According to **IEC 60076-1**, the tolerance on specified short-circuit reactance for a new transformer at the **principal tapping** is **7.5 % to 10 % of the declared value**.

Case 2:

Impedance of Transformer 1 *is assumed as* ***9%*** *and* ***Impedance of Transformer 2*** *is assumed as* ***11%****. Connected load demand is 40 MW, at unity power factor.*

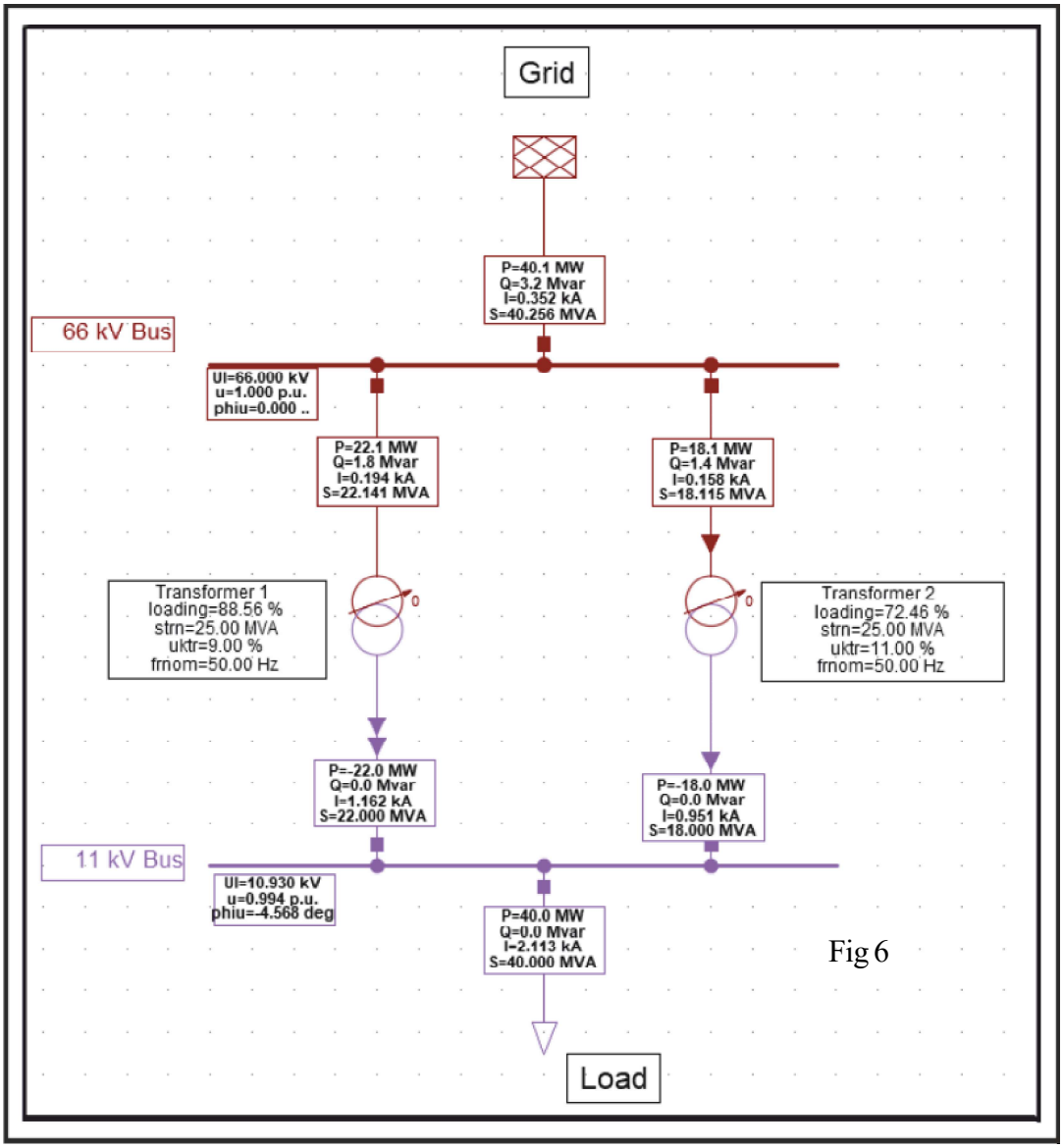


Fig 6

Inference: From the case 2 results, it is clearly stated that impedance mismatch can cause significant load unbalance among transformers. Transformer 1 with 9% impedance is loaded (88.56%) heavily than Transformer 2 (72.46%) with 11% impedance.

For parallel operation, transformer MVA rating not necessarily has to be the same. Let see what happens when transformers rating is not identical.

The current shared by two transformers running in parallel should be proportional to their MVA ratings.

If two or more transformers are connected in parallel, then the load sharing percentage between them is according to their rating. If all are of the same rating, they will share equal loads. Transformers of unequal MVA ratings will share a load practically in proportion to their ratings, providing that the voltage ratios are identical and the percentage impedances (at their own MVA rating) are identical, or very nearly.

Example: Let's consider transformer 1 rating is 25 MVA and transformer 2 rating is 35 MVA. Both transformers having the same impedance and same voltage ratio of 10% and 66/11kV respectively.

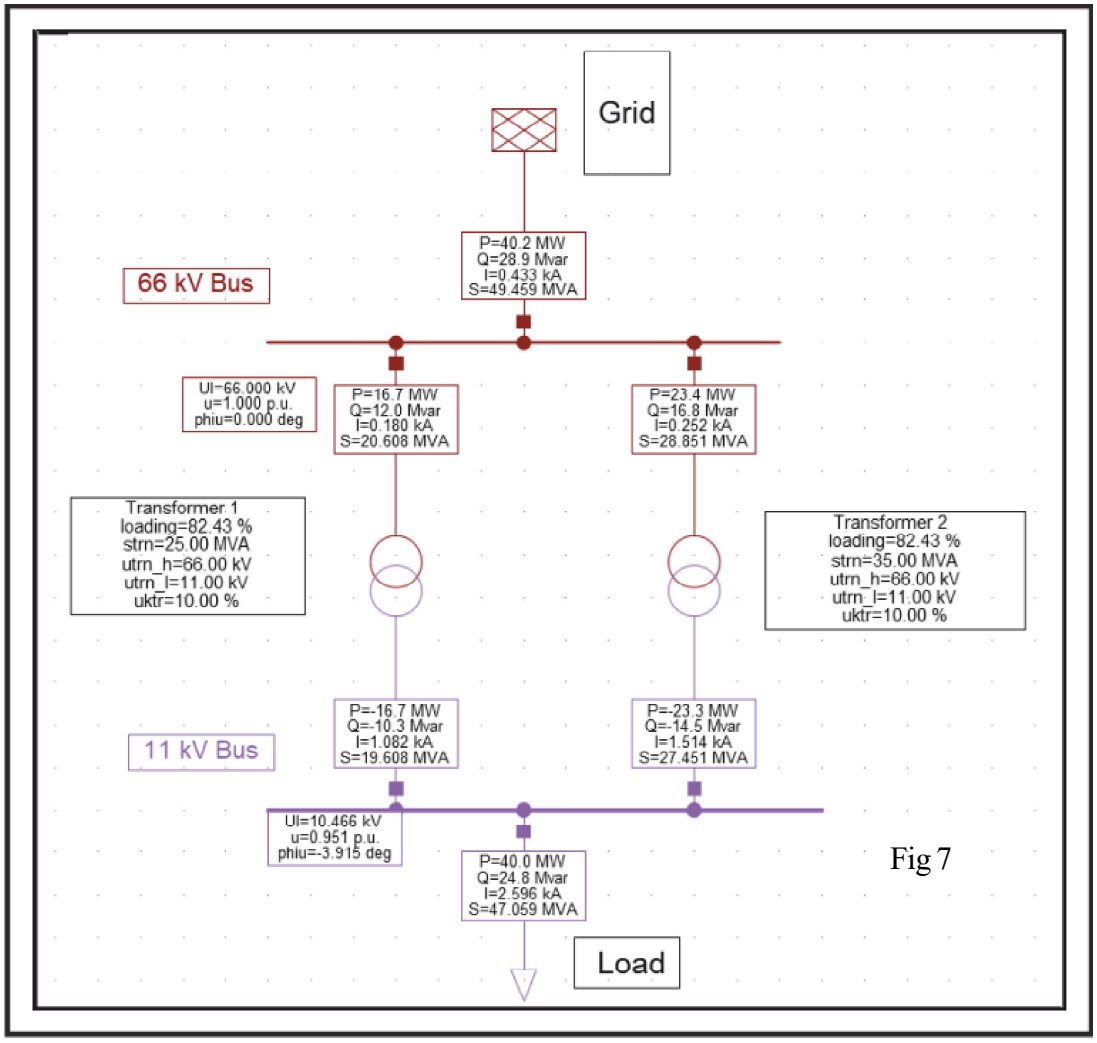


Fig 7

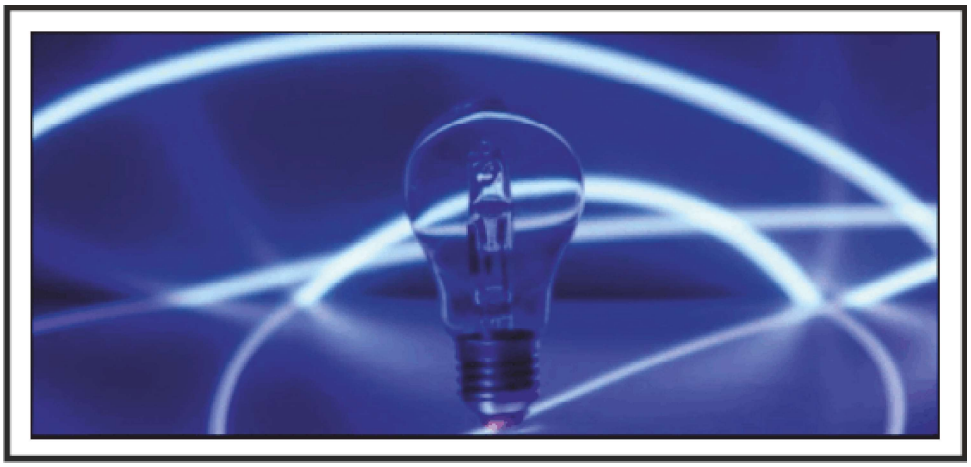
Inference: In the above case, both transformers are loaded equally (i.e.) loading percentage is similar for the transformers because p.u. impedance is equal in both transformers. Since the actual impedance of both transformers are not identical because transformer MVA ratings are different (Transformer 1 has 0.484 ohms on 25 MVA base and Transformer 2 has 0.345 ohms on 35 MVA base), hence 35 MVA rated transformer 2 shares 58.34% of load (27.451 MVA) compared to 25 MVA rated transformer 1 which shares 41.67% of load (19.6 MVA).

Conclusion: As an overall conclusion, the important conditions that are mandatory and that should be followed when going for the parallel operation of two (or more than two) transformers. Whereas, the favourable conditions are not met, still parallel operation is possible, but not optimal.

Courtesy: Mr. Selvakumar S.
Business Head
Power Projects India

FIVE POWER AND ELECTRIC TRENDS THAT WILL SHIFT THE FUTURE

Engineers must endeavour to remain ahead of electrical engineering trends as technology continues to innovate and update at a rapid pace. Why? Because the future of electronics affects many industries, including automotive, healthcare, manufacturing, telecommunications, banking and finance, retail, education, energy, aerospace, and security, engineers will be responsible for pioneering and developing new ways to interact with technology.



1. Wireless Power Transfer

Did you ever worry about forgetting to carry your charger while leaving on a trip? Maybe you forgot about it. This recent development in electrical engineering eliminates all causes for anxiety and discomfort.

Wireless power transmission is a promising invention for the future of electronics, even if it is still in the early phases of development and manufacturing.

The transmission of electrical energy from a power source to a receiver without the need of connecting wires is known as wireless power transfer (WPT), also known as wireless energy transfer.

Time-varying electromagnetic fields are used by WPT systems to transfer energy. Similar fields and waves are used by these systems and wireless communication equipment. In essence, a device's receiver detects power, enabling contactless data transfer, charging, and powering.

Developed by MIT physicists, wireless power transfer eliminates the need for chasing chargers or untangling dozens of cords and cables. This technology transfers power to devices through plastic, granite, wood, and even the air.

Innovative Uses

If you think wireless power transfer is limited to your phone or computer, think again. Electric vehicle charging docks, security software, and heart pumps have all been discussed as potential use cases for wireless power transfer. In short, wireless power transfer has transformed or will transform several aspects of our lives.

- **Smart Homes:** Wireless power transfer can be used to power a range of smart home devices such as lighting, climate control, security systems, and more.
- **Automotive**: WPT can enable contactless charging of electric vehicles, providing a more efficient and convenient way of powering them up.
- **Industrial**: WPT can be used to power industrial machinery and equipment, reducing the need for wires and cables and increasing safety.
- **Wearables**: WPT could be used to power and charge wearables such as fitness trackers, smartwatches, and medical devices.
- **Remote Areas**: WPT can be used to provide energy in remote areas where it is difficult to connect to the grid.

2. Wearable Tech

While wearable technology is nothing new, its constant innovation and new iterations require the industry to think on its feet (literally) to meet consumer demand and to stay ahead of electrical engineering trends.

Heart Monitors for the People

Some would argue **that the original wearable tech piece was the first pair of eyeglasses**. But we'd suggest something along the lines of a step counter with a digital display or a Garmin sports watch. What began, then, as an activity-tracking device has spurred a whole range of wearable pieces that send and receive texts, make calls, and alert wearers of possible health conditions.

Forward-Thinking Fashion

But wearable tech is far more than just a watch or an electrical engineering trend. It can become a life-saving device. Electrical engineers have been hard at work developing wearable pieces that prevent injury and workplace accidents. For example, **SolePower boots** are specifically designed to eliminate on-the-job injuries. The boots contain technology that monitor the smart clothing is another form of wearable technology that incorporates sensors and other electronics into fabric, tracking physiological signals (heart rate, body temperature, and respiration) and providing feedback to the user. Some brands, such as **Sensoria**, track user performance and activity metrics, such as heart rate, steps taken, calories burned, and distance travelled. Others, like **Spire Health**, are designed to send ongoing, real-time health statistics to medical professionals to monitor health conditions. Smart clothing can also be used to connect to other devices such as smartphones, tablets, and laptops. And there are other potential applications of smart clothing as well, such as tracking location, helping wearers find help when they are lost or in danger, detecting injuries and falls, and alerting emergency contacts.

3. Electric Power Distribution and Supply

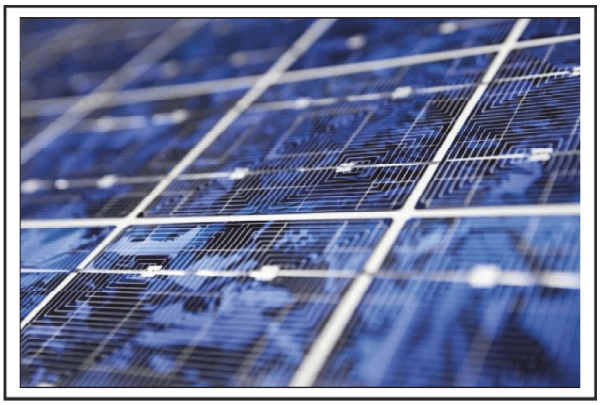
Almost gone are the days of customer reliance on power from a single, localized power company. Today's power generation industry trends dictate a better, more efficient way to generate power with smart grids and micro-grids.

Smart Grids

An advanced power grid, or "smart grid," is one that makes use of digital technology to monitor and control the flow of electricity, enhancing the supply's dependability and efficiency. Through two-way communication between the utility and the customer, smart grids can better manage the distribution of power and adapt to fluctuating

demand. A more sustainable energy supply is also made possible by this trend in electrical engineering, which also makes use of storage technology and renewable energy sources.

Microgrids



"A single controllable entity with respect to the grid" is what a microgrid is made up of—interconnected loads and dispersed energy supplies. In simpler terms, microgrids are independent power plants that supply energy to smaller, localized communities.

Depending on the needs and power consumption of a community, this grid can function in either of two modes: linked or island. Based on the location of a community, there are five different types of microgrids that may be used: commercial, military installation, remote off-grid, academic environment, and community. Microgrids provide several benefits.

- **Reliability**: They can provide a source of power in the event of an outage. They can also help reduce the frequency and duration of outages.
- **Cost**: Their small size and decentralized nature makes them more cost-effective than traditional grid infrastructure.
- **Sustainability**: Renewable energy sources can be incorporated into microgrids, reducing dependence on fossil fuels.
- **Efficiency**: They provide local power that is tailored to the specific needs of the area.
- **Scalability**: They are easy to expand and adjust to changing energy needs.

Power in the Hands of the Customer

This trend in power generation has the potential to change the current infrastructure for the supply of energy. Microgrids and smart grids give customers real control over their power supply while also improving communication between technology and power companies. Customers can generate their own electricity and sell any excess current they have through smart grids. Communities can generate their own electricity on-site, as needed, with the help of microgrids.

4. Electric Vehicles

Electric cars are still a trend in electrical engineering that is becoming more and more popular with consumers even after years of mass manufacturing. Electric vehicles are starting to be widely available. Many owners of electric vehicles may locate easily accessible charging stations in several areas, even if the infrastructure for charging is still in need of development. Customers who buy electric vehicles may potentially be eligible for tax breaks or credits.

National governments worldwide are also accelerating the future of electric vehicles by setting specific benchmarks. For instance, in U.S. Government wants half of all vehicles sold in 2030 to be electric. Furthermore, the Inflation Reduction Act encourages companies to install EV chargers at their properties. Those who do so can receive a 30% tax credit.

Record-Breaking Popularity

With electric vehicle manufacturer Tesla continuing to break records for production and market value, it's clear the future of electronics is in cars. As consumers become more conscious of sustainability and emissions, the popularity of electric vehicles will only grow. Several major automotive companies are also deeply invested in electrification: Ford, General Motors, Honda, Toyota, and are few of them.

Multiple Vehicle Options

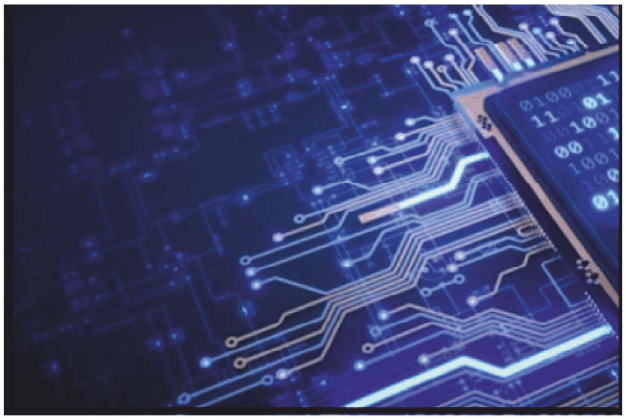
Despite the name, electric vehicles offer more models than solely battery-operated cars. These models operate entirely on battery power, with no engine parts able to use gasoline.

Plug-in hybrid electric vehicles: Plug-in vehicles offer gasoline and battery-powered fuelling options and can operate in an all-electric mode.

Hybrid electric vehicles: Hybrid models run entirely off gasoline but use an electric motor to lower fuel transmissions.

Rising consumer demand will expand the need for innovative updates and production of electric vehicles. Experts predict over 125 million electric vehicles by 2030,meaning there's not only potential for investment but also plenty of room for electrical engineering trends to influence future advancements.

5. The Internet of Things



If there's one subject matter knowledge critical to the success of an electrical engineer, it's the Internet of Things. The Internet of Things (IoT) is a network of connected devices that can communicate with each other and with other devices. These devices can be anything from phones and computers to sensors, actuators, and other electronic components. Through the IoT, data can be collected, analysed, and used to control and automate processes.

Room for Innovation

Aside from IoT knowledge for routine maintenance and updates, this trend in electrical engineering continues to have immense potential for innovation. Some of the more notable companies who employ engineers with IoT experience include Amazon, IBM, Microsoft, Intel, Cisco, and Samsung. These companies, which offer a range of IoT services and devices, require engineers to design, develop, maintain, and support them.

Room for Improvement

While there are standard connections that consumers have come to expect, there's always room for improvement. Consider the upgrade from 4G to 5G. 5G networks, which are faster and more reliable than 4G networks, provided faster download and upload speeds, greater bandwidth, and lower latency. This upgrade allowed more devices to be connected to the internet at once, and for these devices to communicate more quickly and efficiently. 5G also improved more advanced applications, such as augmented and virtual reality.

Still, the IoT creates room for more innovation in electrical engineering, such as in the following:

- smart homes
- smart cities
- industrial automation
- smart meters
- home energy storage systems

As the future of electronics increasingly requires an internet connection, the IoT is an electrical engineering trend that won't be going away any time soon.

Courtesy: https://www.mtu.edu/globalcampus/5-power-electrical-engineering-trends/

HOME FESTIVALS - 10

Aippasi (October/November)

Skanda shasti is the first festival of this month (right), commemorating the victory of Lord Murugan over the demon Sura, of the higher, spiritual self over the lower nature. **Deepavali is the major event of Aippasi**, celebrated everywhere Hindus live and by Buddhists and Jains, too. In one story of its origins, Vamana, the dwarf avatar of Lord Vishnu, requests the amount of land from King Bali that he can cover in three steps. Granted the request, Vamana covers with his first step all of the Earth, with the second all of the sky, and then asks the king where to take the third step. The king offers his own head (lower left), and in commemoration of the king's humility, the day was established. In another story, Lord Vishnu (center) kills the demon Naragasvaran with His discus. The various observances (lower right) of Dipavali include an oil bath, gifts of new clothes, fireworks (sufficiently indulged in Chennai to rattle dishes off the kitchen shelves), oil lamps for display and abundant pots of delicious food. The early morning bath is always considered to be in the Ganga itself, so one greeting of the day is, "Did you have the Ganga bath?"

HOME FESTIVALS - 11

Karttikai (November/December)

Krittika Dipa (right) is a joyous festival held on the Kritttika nakshatra (when the moon is in Pleiades constellation). Also called Sivalaya Dipa, it is celebrated most famously at Tiruvannamalai (upper left in the painting), on top of Arunachala Hill, home of saint Ramana Maharishi. A bonfire is lit on top that can be seen for miles around. Karthigai Purnima, the full- moon day, honours Lord Murugan. In one traditional story, six sparks from Siva's third eye became six babies (lower left), later gathered into one six-headed Arumugam (centre) by Parvati. Celebrations include lighting hundreds of oil lamps especially the standing lamp (right) of the home. On this day in Orissa, devotees make banana leaf boats and float them in the river with oil lamps.

(To be continued)

Courtesy: What is Hinduism?

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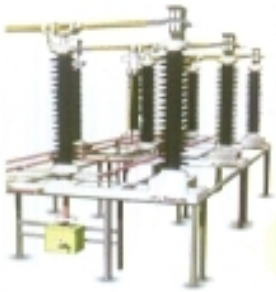

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