TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE

NEWSLETTER

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EDITORIAL

Dear Members, Fellow Professionals and Friends,

Greetings to all!

The coexistence of good and bad qualities is inherent in all human beings. Not all will ever be with either good or badalone. Lanka Sri Jeyaraj said in a discourse that a person is called righteous when his good qualities out number the bad ones, and vice versa, a person is called impious. We should not allow evil attributes to develop and dominate in us.

Dhritharashtra's wife, Gandhari, possessed all qualities and kept her eyes closed for her husband's sake. But on hearing the news of Kunthi Devi giving birth to a child, she became nervous and thought she could not give birth to a son yet. She became impatient and jealous.

Parimel Azhagar explains jealousy as a person who cannot tolerate seeing the progress, development, and prosperity of others.

Thiruvalluvar says the Goddess of good fortune (Mahalakshmi) cannot bear the sight of envious people, whom she will return over to her elder sister, the Goddess of misfortune (Moodevi) - (AvvithuAzhukkaru-Kural 167).

Karna was known for his charitable qualities. Duryodhana decided to plunge into war, relying only on Karna.But he refused to participate in the war as long as the grand sire Bhishma donned the role of general is simo, Duryodhana was known for all evil qualities.

We thank all those members who have helped us by participating in the advertisement appearing for the issue April 2024 – E Power Engineering, Velan Infra Projects Pvt Ltd., Supreme Power Equipment Ltd., Sinewaves Solutions India Pvt Ltd., Sakthi Transformers, Pentagon Switchgear (P) Ltd., MV Power Consultants & Engineers (P) Ltd., Global EPC India Pvt Ltd., Sastinadha EPC Solutions India Pvt Ltd., Value Engineers, Power Cable Corporation, Sri Bhoomidurga Marketing (P) Ltd., 3SI Eco Power LLP., Gravin Earthing & Lightning Protection System (P) Ltd., VSP Power Solutions, Indoswiss Electricals & Enterprises.

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TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE

NEWSLETTER

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CONTENTS

SUSTAINABLE ALTERNATIVES TO LITHIUM-ION BATTERIES

Sustainable alternatives to Lithium-ion Batteries

Powering everything from smartphones to electric cars, batteries are an important power source in our everyday lives. But batteries are not exactly friends of the planet, are they? That being the case, the race is on to find a more sustainable alternative to the traditional lithium-ion battery. Some of the Alternate Sources which seem to sustainable are discussed below:

Sodium-ion Batteries

First up are sodium-ion batteries. These are basically the same as lithium-ion batteries, but they replace the lithium ions (which carry the charge) with sodium ions.

The great thing about using sodium instead of lithium is that it's much easier to source. In fact, saltfrom the ocean can be used to extract sodium pretty much anywhere in the world.

The downside to sodium batteries, however, is that their sodium ions are larger than lithium ions. This means a lower energy density, which would mean a shorter battery life for cell phones, a smaller range for electric vehicles, etc.

Lithium-Sulphur Batteries

Next up are Lithium-Sulphur batteries, which replace cobalt (the difficult-to-source anodic material in a lithium-ion battery) with sulphur. The benefit of lithium-sulphur batteries, other than having raw materials that are easy to source, is that they have a high-energy density and low production costs.

The main drawback with this option currently is the fast degradation rate. It is for this reason that lithium-sulphur batteries are not yet viable for day-to-day electronics.

Solid-State Batteries

Perhaps the most hopeful contender in this race is solid-state batteries. These are like lithium-ion batteries, except they use a solid electrolyte medium, rather than a liquid one, to allow ions to flow between electrodes.The advantage of solid-state batteries over traditional lithium-ion batteries is that they have a much lower risk of ignition.

Solid-state batteries also have greater conductivity, which should mean better capacity and charging speeds from devices that use this technology.

Hydrogen Fuel Cells

Hydrogen fuel cells cannot really be described as a battery, but they have nonetheless emerged as a popular option when it comes to producing clean energy.

Hydrogen fuel cells work by combining hydrogen with oxygen in the air to produce electricity and water vapour. The process is fully environmentally friendly.

The downside to hydrogen fuel cells is that they need to be built. This is very costly and not many countries in the world have the infrastructure to support it.

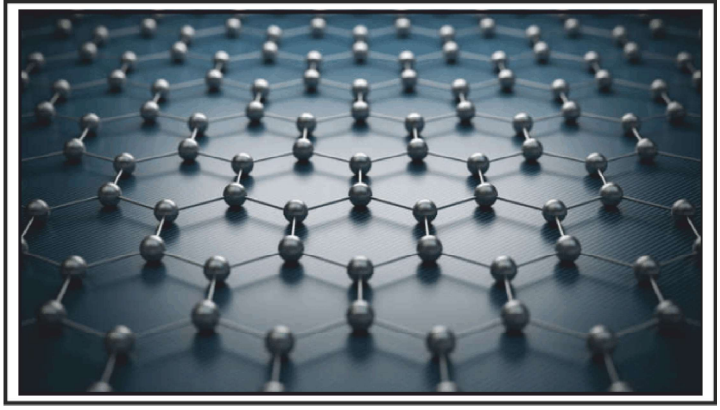
Hydrogen Fuel Cells

Magnesium Batteries

One alternative that is in the pilot stages of research is aqueous magnesium batteries, which use magnesium ions to carry the charge rather than lithium ions.The upside to this option is the abundant availability and higher iconic charge of magnesium. This means a higher energy density from the same-sized cell.There are still several unanswered questions with magnesium batteries, though, such as which cathode materials to use. The materials used in lithium-ion batteries will not work.

Graphene Batteries

Another promising material when it comes to making batteries is graphene, the world's thinnest material. It consists of a single layer of carbon atoms.



Graphene has many properties that make it a strong contender in the race to replace lithium: it is strong, light, and has excellent electrical conductivity. However, graphene is so expensive that, for now, it remains unviable for use in commercial products. It costs more than US$60,000 per metric ton.

Aluminium Batteries

Next up is aluminium, which is both a readily available resource and one of the most easily recycled materials.Aluminium also has the added benefit of being much cheaper than lithium. It is therefore a favourite of researchers working to develop alternative battery technologies. The Australian company Graphene Manufacturing Group, for example, claims that its aluminium batteries charge 60 times faster than their lithium counterparts.

Iron Batteries

Researchers are also experimenting with iron as an alternative to lithium. Iron reportedly has less of a tendency to lose efficiency than lithium.The problem with iron batteries currently is that they are too big to be used for the consumer goods we need them for, such as cell phones and electric cars.However, iron could still be a viable option for practical grid storage. Indeed, one Oregon-based company recently invested heavily in this technology.

Silicon

Silicon is another material of interest for battery researchers. It will never fully replace lithium, but it can be added to lithium batteries to make them last longer. Currently, lithium-ion batteries use graphite as one of their main components. However, the lithium slips through the gaps in the carbon layers, which results in a loss of storage over time.Using silicon instead of graphite would both reduce this leakage and make the batteries lighter.

Hemp

The last option on the list is hemp, a material that is already highly regarded for its growing speed, its ability to sequester carbon, and its versatility as a Fiber stock.

Texas-based start-up Bemp suggested using hemp to make alternative batteries and has already developed a boron carbon battery type using the material. Their battery still uses lithium and lithium-sulphur battery technology, but it is cheaper, lighter, and easier to recycle than traditional lithium-ion batteries.

Courtesy:https://www.msn.com/en-in/autos/news/sustainable-alternatives-to-lithium-ion-batteries/ss-BB1kBBxh?ocid=msedgntp&pc=LCTS&cvid=2f3ee4ebf503486e8d01c71b517a4dea&ei=62#image=1

ELECTRICAL, SAFETY AND COMMUNICATION REQUIREMENT IN HOSPITALS

Electrical Engineers some years back, needed to consider and worry about providing a Substation, Transformers, Power Distribution Boards, Power Points, cabling for all devices and earthing for an hospital. The electrical Engineers were very adept in their professional requirement.

The fire alarm system was installed by separate contractors.

Nurse call system was preliminary with a switch and an indication board bought off-the-shelf.

But now-a-days the situation has become integrated and complex and the power management, call management and tracking, ip-telephony, etc. have also have to be included by the Electrical Engineers in their scope as the hospital management expects a single contractor to carry out all the system requirements.

Also high-end hospitals are the cream for the electrical engineers and the high-end hospitals require more of such advanced systems.

Also, an electrical engineer goes for a hospital meeting considering that his expertise in electrical systems will get him the project. But is indicated that the electrical system will also include the nurse call system, fire alarm system, security system etc.

We present herewith some of the features / services of the Nurse Call, Fire Alarm, Patient Care systems etc. as a brief for the electrical Engineers for an understanding and also solicit some queries so that the client understands that the electrical engineer knows the system. The electrical engineer can then coordinate with companies like Schrack, Honeywell, Simplex and provide the system.

Additional / New features / systems to be provided in hospitals now-a-days:

- Nursecall communications system with a comprehensive range of signalling and speech connections between patients and nursing staff as well as among nursing staff members.
- IP telephony handsets conforming to standards H.323 and SIP built into the patient handsets.

- Smartcard system for processing and billing telephone, television and internet access charges in accordance with different charging models.
- Intranet and Internet access for patients.
- CCTV system provision
- Fire Alarm System provision.
- Fire protection system provision including providing details of the fire pump status in the BMS controllers.
- Medicine transportation system and its power and controls
- HVAC system – its management, power and controls
- Building Management System – Its power and controls
- Access Control System – Its power and controls, etc.
- Presence indicating visual lights for rooms where members of the nursing staff are present like Nurse Location – Green color, Service / staff locaton – yellow, doctor – blue color etc.
- Provision of various call systems like:
    1. Fire alarm to entire nursing staff
    2. Heart alarm (Code Blue) to code blue team
    3. Emergency (Help) call to nurses
    4. Bathroom or WC call to nurses
    5. Enhanced Patient call from his bed to Nurses
    6. Disconnection call to nurses (if the diagnostic connections are removed, then an alarm is given at the nurse station)
    7. Service call to Service staff
    8. Fault call to house technician
    9. Safety / Security Call to Security station
    10. Manual ward interconnection
    11. Automatic Call Forwarding etc.

Some of the applicable standards for the Nurse Call and related systems:

Please note that International Standards are prevalent in the above applications and are mentioned below:

- DIN-VDE 0834 – Call systems in hospitals, care homes and similar establishments, valid from 1 April 2000
- DIN-VDE 0834 / Part 1 – Device specifications, installation and operation, valid from 1 April 2000
- DIN-VDE 0834 / Part 2 – Environmental conditions and electromagnetic compatibility, valid from 1 April 2000
- Provision of electricity in accordance with EN60950, EN61000-4-2 to -4-6 as well as EN61000-3-2 and EN55011 (Class B), Discharge current and isolation voltage in accordance with EN60601-1 (DIN750 part 1)
- NFPA 72 for the Fire Alarm and Communication Systems.
- National Institute of Standards and Technology standards like NISTIR 8161.
- IEC 62676-2-32 Video surveillance system for use in security applications, Open Network Video

Interface Forums, etc.

Some key features required in the systems:

- Superordinate and/or centralised controller devices are not permitted for safety reasons. In the event of a system component failing, all other system components and functions must remain available in their entirety.
- In the event that system extensions or modifications are made, the entire system must not need to be reconfigured in full, and software and firmware upgrades must be carried out in a centralised manner over the network.
- Fire Alarm systems shall be provided as per NFPA 72, IS-2189 standards and automatic forwarding of fire alarms using protocols like TCP/IP should be provided.

Some key queries to be solicited from the clients on the systems:

- How many wards need to be managed?
- How many room per ward need to be managed?
- How many beds per room need to be managed?
- How many system switches per cascade required?
- How many call button stations with locating and reassurance light are required?
- How many room and reading light controls are required?
- Whether self-ejecting plugs are required (which prevent damage to the plugs while removal)?
- How many connection module for connecting patient handsets, diagnostic devices, radio receivers or diagnostic adapters?
- How many communication terminals with optical and acoustic call forwarding for rooms of the ward in which a speech connection for the staff is required?
- How many Diagnostic adapters for integration of third-party products, e.g. pressure-sensitive care mats etc. is required?
- How many management centers, switches, servers are planned etc.?
- How many fire alarm panels (main, repeater panels) are required?
- How many security stations are planned for CCTV storage and viewing?
- Whether total building layout is available?
- Whether preliminary fire NOC is available?

Forwarding Note:

The electrical engineers are considered that they know and can do everything. The above article is a beginners guide to explore the above areas of business in a hospital and become successful.

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SUBSTATION DESIGN APPLICATION GUIDE – 16

8.4 Design of the Mechanically Switched capacitor (MSC) for 132kV East Claydon Substation

1. Performance

As a result of NGC's assessment of the harmonic conditions around the NG 132kV system, this design for 3 off mechanically switched capacitor banks (MSCs) with a nominal rating of 52.5 MVAr during Stage 1, increasing to 60 MVAr with the addition of a detuning reactor at Stage 2.

Stage 1 is the installation of a non-detuned MSC with a minimum rating of 52.3 MVAr at 132kV for frequencies between 49.5 Hz and 50.5 Hz. The MSC is complete with current limiting reactors and is designed for ease of convention to Stage 2. Stage 2 is the detuning of the capacitor to the third harmonic (nominally 140 Hz) by the addition of a reactor. The affect this addition is to increase the MSC rating to at least 60 MVAr. A harmonic study was performed using AREVA's (then GEC Alsthom) harmonic penetration programme (HARP) to ensure NGC's required performance was met. The study confirmed the suitability of the ratings parameters given in the aforementioned Amendment and hence the equipment offered is in full compliance with NGC's requirements and specifications.

The reactors for Stage 1 are mounted on top of each capacitor stack.

The reactors for Stage 2 are connected at the neutral end of the filter and thus are not exposed to short circuit currents. This simplifies the reactor designs and eliminates the need for expensive short circuit testing.

Only a small voltage is developed across the current limiting reactor of Stage 1 and hence no extra insulation for the capacitor above that which would otherwise be required for a plain capacitor bank is necessary. However, the HARP study highlighted the inadequacy of this insulation level when the capacitor is detuned. The voltage across the 133 mH reactor developed by the fundamental current would not, on its own, compel the capacitor insulation level to be increased. However, when harmonic voltages are considered, particularly third, IEC 71 (Insulation Co-ordination) gives an insulation level of up to 170kVp. The proposed capacitor LV to ground and the Stage 2 – 133mH reactors HV to LV and ground are thus rated for a BIL of 170kVp. The capacitor BIL for HV to LV and ground is 650kVp. All remaining BILs are 125kVp.

(a) Capacitors

The capacitor units are of the all film dielectric (non PCB) type. A number of windings are connected in series and parallel in order to meet the overall kVAr and voltage rating of the unit. They are then mounted in an insulated, hermetically sealed, stainless steel containers together with discharge resistors. The units are mounted in galvanised steel racks which form three stacks – one per phase. The units within each stack are connected in series and parallel in order to achieve the overall MSC rating.

(b) Reactors

The air-cored and air-natural cooled reactor coils are designed for outdoor installation. With an aluminium conductor, they are insulated with epoxy resin and cylindrical in construction.

During Stage 1 operation a small current limiting reactor is mounted on top of each stack. When converting to Stage 2 the MSC connections are removed and replaced with connections to the much larger ground mounted 133mH reactors.

2. Electrical Design

As shown on NGC drawings 29/6167 and 29/6168, the main capacitor bank is connected to 132kV busbar. Each phase of the bank is split into two halves with a current transformer for each half for capacitor unbalance split phase protection. The bank has an insulation level of 650kVp BIL for HV to LV and ground. The LV terminal of the bank has an assigned insulation level of 170kVp.

3. Layout

All the MSC equipment is mounted inside an interlocked safety compound for Stage 1. A plan of the equipment is shown on NGC drawing numbers 29/6167 and 29/6168. The capacitor banks consist of 1 stack per phase, each stack comprising 4 racks with each rack size 20. External devices such as discharge VT's are provided for rapid discharge of capacitor banks.

During Stage 1 operation the 300μH limiting reactor will be mounted on top of each stack. During Stage 2 when the capacitor bank is detuned at a later stage to 140 Hz, the MSC connections are removed and replaced with connection to the larger ground mounted reactors of 133mH to avoid resonance with the supply system impedance. Hence, sufficient space and access are allowed in the Stage 1 layout for the addition of the floor mounted reactors. Sufficient space for additional equipment's are allowed, i.e. surge arresters and current transformers for detuned 2.8 harmonic filter.

8.5 IED-ARS forcontrolling MSCDN'S, MSC's and reactor switching

The function of the IED-ARS is to switch MSCDN's, MSC's and Reactors in a realistic way to achieve the following objectives without the need for operator intervention:

a) Voltage control under normal system conditions

b) Voltage control under post fault conditions

c) Overvoltage protection of MSC's, achieved by MSC protection mode

Software

Data values are obtained from the SCS via a suitable communication media.

Communication

A bi-directional communication link is required between the ARS and SCS.

Plant to be controlled

The IED-ARS can control the following equipment where it exists at a site:

a) MSC's connected to the LV or transformer tertiaries

b) Reactors connected to the LV or transformer tertiaries

c) HV compensation plant MSC's or Reactors connected to the HV if fitted with a dedicated CB

d) The tap stagger facility on the ATCC

Up to 10 LV or tertiary connected MSC's or Reactors and up to 4 items of HV compensation plant can be controlled by the IED-ARS system

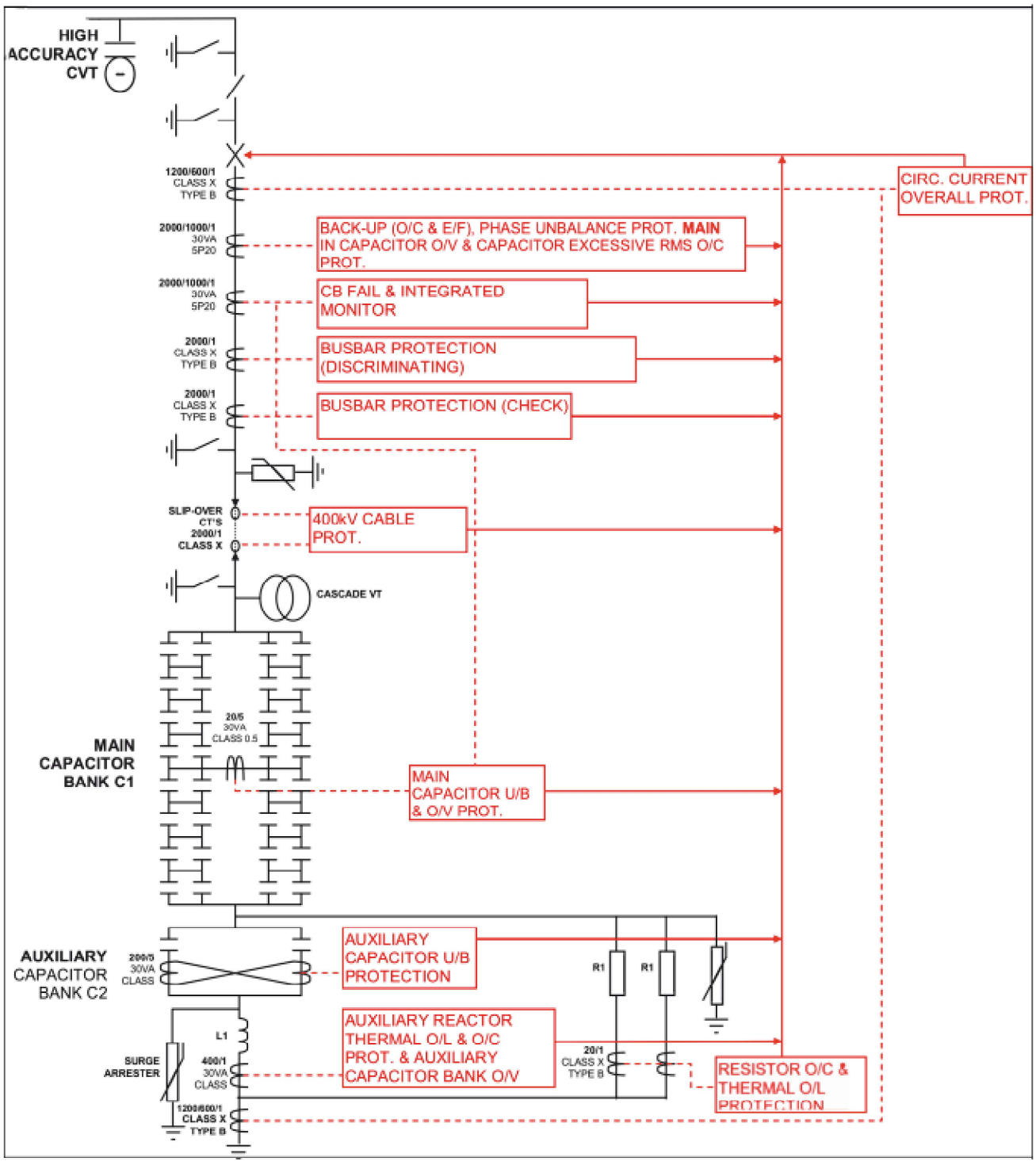
8.6 Magnetic field density (mT) contour plot for 400kV and 132kV MSCDN reactors

1. The reference levels for magnetic field (B) as given in NRPB GS11 are expressed as $B = 80{,}000 / f\ (\mu T)$ where f is the frequency. Thus for 50 Hz fields the limit is 1.6 mT and for 150 Hz the limit is 0.53 mT. As indicated in the magnetic field plots at 50 Hz the 1.6 mT contour lies within the MSCDN compound fence. Similarly, for the 150 Hz field component, where the reactor current is considerably lower, typically < 10% of the 50 Hz component the 0.53 mT contour will also lie within the compound fence.

Information from the reactor supplier indicates that the 0.1 mT contour will occur at the following distances from the reactor surface

For 400kV MSCDN distance = 7.4 m

For 132kV MSCDN distance = 5.8 m



225 MVAr Fuse-less Mechanically Switched Capacitor Damping Network
SLD Fleet 400kV Substation

2. 400kV MSCDN's

a) Compound Fence Distance of the compound fence from the surface of the nearest reactor for the MSCDN = 3.1 m

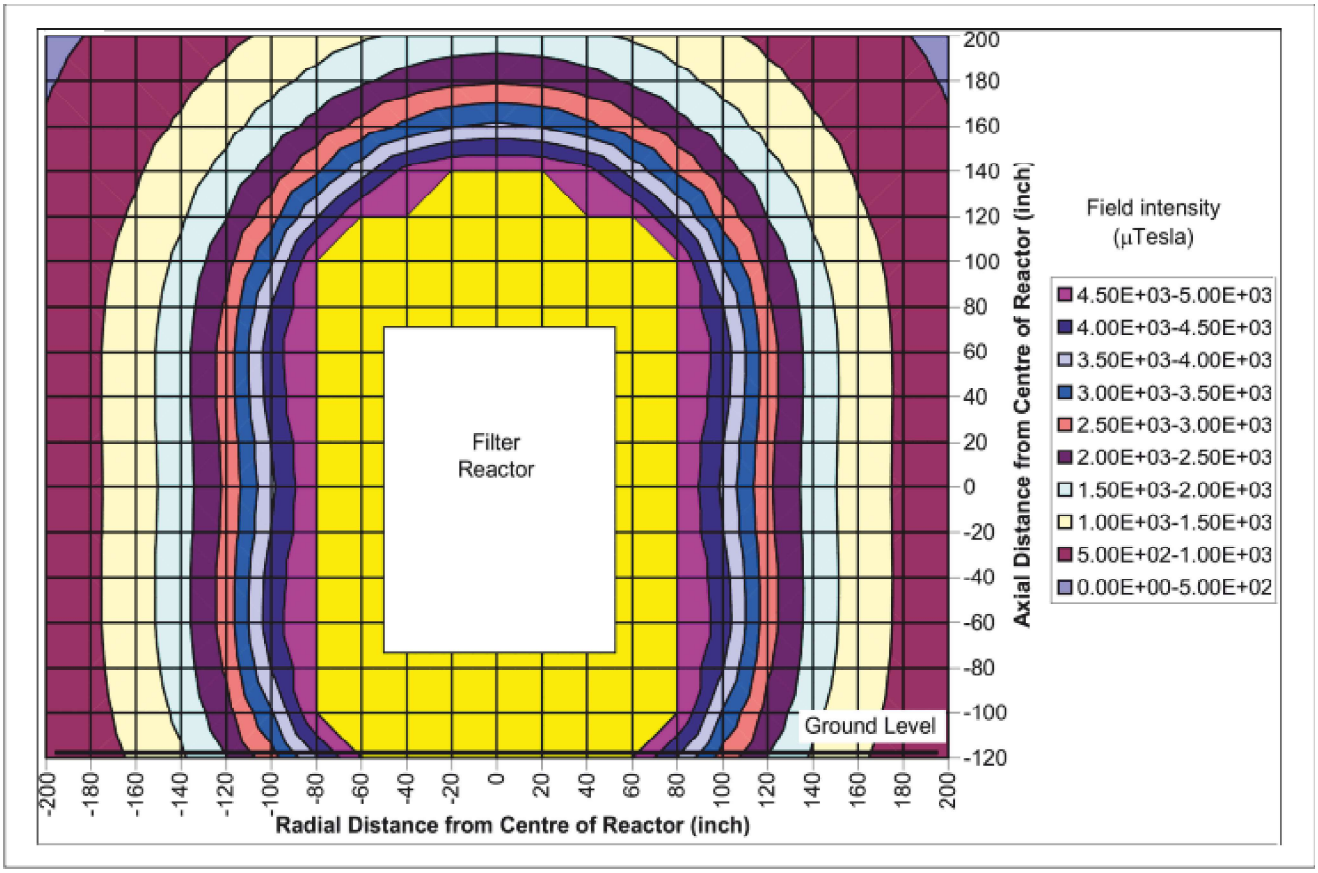
b) Radius of the reactor coil = 1.23 m

c) Distance between two adjacent reactor coils as shown on the site layout = 11.7 m

d) Distance of the magnetic field density of 1.0 mT (refer to Haefely Trench magnetic field contour plot) from the surface of the reactor coil = 2.9 m

e) Distance of the NRPB recommended magnetic field density of 1.6 mT (as calculated) from the surface of the reactor coil = 2.4 m (falls within the MSCDN compound)

f) Based on the information provided by Haefely Trench the distance of the magnetic field density of | 0.1 mT from the surface of reactor coil = 7.4 m



3. 132kV MSCDN's

a) Compound Fence Distance of the compound fence from the surface of the nearest reactor for the MSCDN = 3.1 m

b) Radius of the reactor coil = 1.1 m

c) Distance between two adjacent reactor coils as shown on the site layout = 4.3 m

d) Distance of the magnetic field density of 1.5 mT (refer to Haefely Trench magnetic field contour plot) from the surface of the reactor coil = 1.9 m

e) Distance of the NRPB recommended magnetic field density of 1.6 mT (as calculated) from the surface of the reactor coil = 1.8 m (falls within the MSCDN compound)

f) Based on the information provided by Haefely Trench the distance of the magnetic field density of 0.1 mT from the surface of reactor coil = 5.8 m

(to be Continued)

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

Engineering Expert

CURRENT TRANSFORMERS' MARKET SIZE TO EXPAND

The current transformer market size is expected to grow by USD 422.01 million till 2027. However, the growth momentum of the market will progress at a CAGR of 8% during the forecast period...

According to Technavio's latest market research report titled Global Current Transformer Market 2023-2027, the burgeoning demand for electricity in emerging economies is fuelling market expansion. Urbanization, propelled by industrial development, is catalysing residential and commercial construction activities. India, boasting one of the globe's swiftest urbanization rates due to its burgeoning populace and rising incomes, stands as a prime example.

Furthermore, the manufacturing sector in these regions holds immense growth prospects, bolstering electricity demand. Anticipated to emerge as major manufacturing hubs, these nations are driving substantial market growth. This trend has spurred both public and private entities within the electricity industry to embark on planned network capacity expansion initiatives, indicative of the burgeoning demand. These endeavours underscore the significant market growth forecasted for the forthcoming period.

The Emerging Market Trend

The very sophisticated manufacturing processes result in the production of high-quality electrical equipment like ABB instrument transformers, which are the next generation. Similarly, the APG process is subject to multiple casting parameters, such as temperature, pressure, and curing time. Such a variable is posed by epoxy producers as a challenge for optimizing the production process in order to obtain a better product.

The Key Segment

The oil-immersed segment is significant during the forecast period. These transformers are meant to be immersed into insulating oil for better insulation and cooling and are widely applied in high voltage applications, e.g., to generate electricity, transmission, and distribution systems.

The Market Overview

The Current Transformer (CT) market is experiencing a surge, driven by heightened demands in energy distribution and the modernization of power networks. As power usage increases and electric vehicles become more prevalent,

the need for efficient energy consumption rises. CTs play a pivotal role in power distribution, accurately measuring and monitoring current flow.

With the modernization of power distribution infrastructure, CTs are evolving to meet the demands of smart grids and renewable energy integration. Their reliability and accuracy make them indispensable in ensuring stable and efficient electricity delivery. As the push for sustainable energy intensifies, the CT market is poised for sustained growth, catering to the evolving needs of the energy landscape.

Analyst Review

In the realm of energy distribution and power networks, Current Transformers (CTs) play a pivotal role in monitoring power usage and ensuring efficient energy distribution. As the world moves towards modernizing power distribution infrastructure, the demand for CTs is experiencing a significant upsurge. This surge is fuelled by various factors ranging from the integration of renewable energy sources to the proliferation of electric vehicles.

One of the primary drivers stimulating the current transformer market is the global push towards energy efficiency. With mounting environmental concerns, there's an urgent need to minimize transmission losses and enhance energy efficiency throughout transmission and distribution networks. Energy-efficient transformers equipped with smart sensors have emerged as a solution to mitigate energy wastage and optimize power usage.

However, the modernization of power distribution infrastructure comes with its challenges, notably the high initial costs associated with upgrading aging systems. Despite the long-term benefits, the upfront investment can be a deterrent for many stakeholders. Nonetheless, the promise of reduced transmission losses and enhanced energy efficiency acts as a compelling incentive for investment.

In the context of environmental sustainability, the prevalence of oil-based insulation in traditional transformers raises concerns regarding environmental impact and safety. This has led to a growing emphasis on adopting eco-friendly alternatives and exploring innovative insulation materials to mitigate environmental risks.

Moreover, the advent of electric vehicles has reshaped the energy landscape, necessitating robust power networks capable of supporting widespread adoption. Current transformers play a crucial role in monitoring and managing the power flow required for charging infrastructure, contributing to the seamless integration of electric vehicles into the grid.

Furthermore, the digitalization of power systems has revolutionized the way energy is monitored and managed. Advanced CTs equipped with digital technology offer real-time data monitoring and analysis, enabling proactive maintenance and optimizing energy distribution.

In parallel, the shift towards renewable energy sources such as solar and wind necessitates adaptable CT solutions capable of accommodating fluctuating power generation. Transformer and circuit breaker bushing advancements cater to this need, ensuring seamless integration of renewable energy into existing grids.

In conclusion, the current transformer market is witnessing dynamic growth driven by the imperative for energy efficiency, the adoption of renewable energy sources, the proliferation of electric vehicles, and the digitalization of power systems. With innovation at its core, the industry is poised to address the challenges of modernizing power distribution infrastructure while advancing towards a sustainable energy future.

However, the high cost of upgrading electricity distribution networks hampers market growth.

Courtesy: Electrical India, dt. 02.05.2024

GOVT TWEAKS RULES FOR SPEEDY ELECTRICITY CONNECTION, ROOFTOP INSTALLATION

Now getting new electricity connections will be as fast as three days in metropolitan areas, seven days in municipal areas and 15 days in rural areas, according to the latest amendments in the existing norms.

The government has approved amendments to the Electricity (Rights of consumers) Rules, 2020, the power ministry said in a statement on Friday.

The amendments also simplified the process of rooftop solar installations and empower consumers living in multi-storied flats to choose connection type and ensure separate billing for common areas and back-up generators in residential societies, thus enhancing transparency, the ministry said.

The revised rule provides for checking meters installed by distribution companies in case of consumer complaints to verify electricity consumption.

According to the statement, the period for obtaining a new electricity connection under the rules has been reduced from seven days to three days in metropolitan areas, from fifteen days to seven days in other municipal areas, and from thirty days to fifteen days in rural areas.

However, in rural areas with hilly terrain, the period for new connections or for modifications in existing connections will remain 30 days, it stated.

The amendments have also made installing rooftop solar systems easier and faster.

The statement also said that the revised rules will facilitate faster installation and enhance the ease of setting up rooftop solar PV systems at the premises of "prosumers" (referring to consumers who would also produce electricity through rooftop solar system).

An exemption has been provided for the requirement of technical feasibility study for systems up to a capacity of 10 kW, it stated. For systems of capacity higher than 10 kW, the timeline for completing the feasibility study

has been reduced from 20 days to 15 days. Further, in case the study is not completed within the stipulated time, the approval will be deemed to have been given. Additionally, it has now been mandated that the distribution system strengthening necessary for rooftop solar PV systems up to 5 kW capacity will be done by the distribution company at its own cost. Also, the timeline for the distribution licensee to commission rooftop solar PV systems has been reduced from 30 days to 15 days. Consumers can now obtain separate electricity connections for charging their electric vehicles (EVs).

This aligns with the country's goal of reducing carbon emissions and reaching net zero by 2070, it stated.

It stated that provisions have been introduced to enhance consumer choice and promote greater transparency in metering and billing.

Owners residing in co-operative group housing societies, multi-storied buildings, residential colonies, etc., will now have the option to choose from the distribution licensee either individual connections for everyone or a single-point connection for the whole premises.

The exercise of the option will be based on a transparent ballot to be conducted by the distribution company.

A parity has also been brought in the tariff charged to consumers who get electricity supplied through the common single-point connection and to those who avail of individual connections.

Metering, billing, and collection will be done separately for individual electricity consumption sourced from the distribution licensee; individual consumption of backup power supplied by the residential association, and electricity consumption for common areas of such residential associations, which is sourced from the distribution licensee.

In cases where consumers raise complaints about meter reading not aligning with their actual electricity consumption, the distribution licensee is now required to install an additional meter within five days from the date of receipt of the complaint, it stated.

This additional meter will be used to verify the consumption for a minimum period of three months, thus reassuring consumers and ensuring accuracy in billing.

Union Power Minister R K Singh said in the statement that the interest of consumers is paramount for the government.

It is for this purpose that the government issued the Electricity (Rights of Consumers) Rules, 2020 on 31st December, 2020, thus setting standards for services provided by electricity distribution companies all over India.

These rules cover aspects such as billing, complaints, compensation, and timelines for new connections. They also offer support for renewable energy generation by "prosumers".

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.).

Courtesy: Business Standard, dt. 02.05.2024

GO SOLAR

- Open your new savings accounts on your roof top.
- Your roof top is your bank, go solar and save money.
- Harvesting is sun, everyday eats heavy bills away.

HARMONICS IN POWER SYSTEM & MITIGATION – 6

Reason for High Voltage THD

Most Variable Speed Drivers have an AC to DC rectification stage followed by DC to AC inversion stage at variable frequency & variable voltage. The inversion is brought about by VOLTAGE SOURCE INVERTER (VSI) that are based on PWM (Pulse Width Modulation) technique. Since we use PWM technique it means that output voltage is highly pulsed & hence richer harmonics, thereby exhibiting a higher THD.

The pulse width in the output voltage are made to a vary in sinusoidal fashion (sinusoidal PWM) and motor reactance often fulfils all filtering requirements so as to make the current drawn by the motor appear sinusoidal

Reason for Even Harmonics

When power converters are working normally even harmonics are very minimal & whenever there is any problem in firing pulse to power electronic components it generates even order harmonic

A UPS system is drawing different waveform patterns in both positive &negative half cycle. That is positive half cycle current wave shape does not match the negative half cycle current wave shape. This due to improper firing of the rectifier unit in UPS system & results in the presence of EVEN HARMONICS.

Even harmonics created by firing time irregularities are defined into three types

Type-1 -Pulse Deviation

One of the six pulses does not occur in the correct time or manner results in an "ACROSS THE BOARD" increase in harmonic currents with poor cancellation of ODD harmonics & production of even harmonic current due to half wave dissymmetry to Zero.

Type -2

Pulses 1,3&5 are displaced an equal amount from 2,4&6. This results in the generation of even harmonics that is multiples of 3+/- 1

Type -3

The interphase transformers are typically designed to absorb only a small amount of imbalance between the rectifier halves & can quickly go into saturation when the rectifier system is not well balanced,the output current of two 3pulse group flowing in the opposite direction in the inter phase produce significant DC magnetization of core. As it goes into saturation & become ineffective the rectifier operates as two separate 3pulse group with star point connected & semi-conductors only conducting over half of the normal 120Ú. The resulting 60Ú conduction angle results in about 17% increase in semi-conductor power(watts) loss results in heating of Thyristor, fuses & secondary of Transformer.

This unbalance also results in an effective DC current that the transformer secondary must carry. The transformer goes into saturation increasing losses & creating larger amount of heat & disproportionate amount of 3rd harmonic current.

(to be continued)

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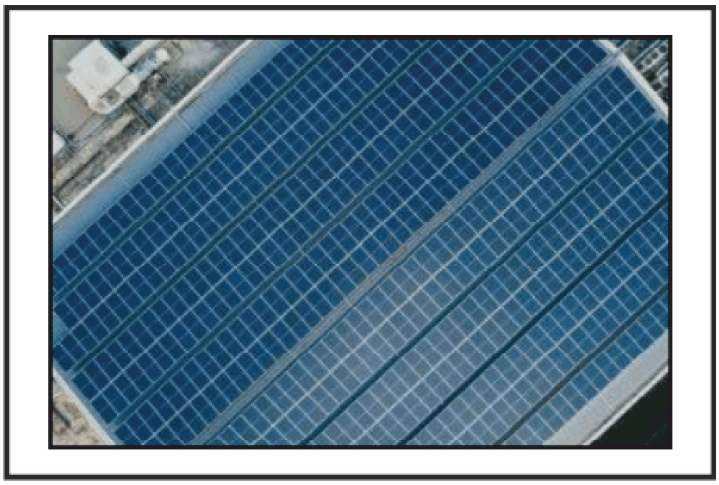
AS WE NAVIGATE THE CHALLENGES OF CLIMATE CHANGE AND SEEK ALTERNATIVES TO FOSSIL FUELS, SOLAR ENERGY CONTINUES TO EMERGE AS A KEY PLAYER IN THE GLOBAL ENERGY LANDSCAPE

Solar Energy in 2024

In 2024, the world finds itself at a pivotal moment in the quest for sustainable energy solutions. Among the array of renewable resources, solar power stands out as a beacon of hope for a greener future.



The Rise of Solar Technology

Advancements in solar technology have been nothing short of remarkable. In 2024, solar panels are more efficient and affordable than ever before. Breakthroughs in materials science and engineering have led to thinner, lighter, and more durable solar cells, making them easier to install and integrate into both urban and rural environments.

Solar Energy Goes Mainstream

One of the most significant developments in recent years is the mainstream adoption of solar energy. Governments, businesses, and homeowners alike are increasingly turning to solar power to meet their energy needs. In many parts of the world, solar installations have become a common sight, adorning rooftops and sprawling across fields. The plummeting cost of solar panels, coupled with incentives and subsidies, has made solar energy an attractive investment for individuals and corporations alike.

Solar Power: A Key Player in the Energy Transition

The transition to solar energy is not just about reducing carbon emissions; it's also about creating a more resilient and decentralized energy system. By generating electricity at the point of consumption, solar power reduces the need for costly and inefficient transmission infrastructure, while also increasing energy security and independence.

Challenges and Opportunities

Of course, the widespread adoption of solar energy is not without its challenges. Issues such as intermittency, energy storage, and grid integration must be addressed to fully unlock the potential of solar power. However, these challenges also present opportunities for innovation and collaboration. From advanced battery technologies to smart grid solutions, researchers and entrepreneurs are hard at work finding ways to overcome these obstacles and build a more sustainable energy future.

Looking Ahead

As we look to the future, the potential of solar energy is boundless. With continued investment in research, development, and infrastructure, solar power has the capacity to transform the way we produce and consume energy. By harnessing the boundless energy of the sun, we can create a cleaner, brighter, and more sustainable world for generations to come.

In 2024, solar energy isn't just an alternative; it's a necessity. As we strive to combat climate change and build a more resilient energy system, the sun shines as a beacon of hope, illuminating the path towards a brighter tomorrow.

Courtesy: nium.com/2024/05/02/harnessing-the-power-of-the-sun-solar-energy-in-2024/

TOP 10 ELECTRIFICATION TRENDS

1. Battery Technologies

Battery technologies optimize the energy-power trade off and maximize energy density through advanced materials and designs. With the increasing demand for customized battery packs, start-ups further apply engineering analytics to cut development costs. Further, sustainability requirements allow innovators to leverage battery chemistries that eliminate heavy metals like cobalt and cadmium. Otherwise, start-ups recycle or dispose of batteries to ensure a minimal impact on the environment. All of these make innovations in battery technology a critical trend for widespread electrification.

TexPower develops Cobalt-free Batteries

US-based startup **TexPower** combines its patented cobalt-free Nickel Manganese Aluminium (NMA) cathodes, high-energy anodes, and electrolytes to produce ultra-high energy cell systems. They are reliable, safe, and cost-efficient, supporting applications for electric vehicles (EVs) and electrified aircraft propulsion systems. The start-up's proprietary battery elements deliver higher energy density than commercial nickel cobalt aluminium (NCA) / nickel manganese cobalt (NMC) batteries in any form factor and system.

Evolectric offers Modular Battery Systems

US-based start-up **Evolectric** specializes in electrified transportation and battery technologies. The start-up's customized battery hardware and software solutions enable the realization of both one-off products and scalable solutions for e-powertrains. The customization process involves rapid prototyping, engineering analysis, modeling, and simulation that facilitates application-based battery sizing. Additionally, Evolectric's battery management system allows for the seamless integration of battery packs with the e-powertrains. This way, the start-up reduces development costs and provides optimized powertrains for EV manufacturers.

2. EV Charging Infrastructure

Improvements in charging time, affordability, and convenience greatly affect the adoption of electric vehicles. Charging infrastructures that offer high-wattage and ultra-fast chargers extend a vehicle's range in only a few minutes. Additionally, technologies, like DC fast charging, reduce the crowding of charging points installed along heavy traffic corridors. Further, inductive charging equipment enables wireless charging, improving the flexibility of EV charging. Wireless energy transfer also aids the integration of vehicle-to-grid (V2G) technology at charging stations. Sensors and smart devices track charging activities to further ensure safety and optimize operational costs.

Meredot makes a Wireless Charging System

Latvian start-up **Meredot** provides a wireless charging system that allows for charging at contact and over the air. Predominantly catering to electric scooters, the start-up's charging pads do not require precise positioning and allow power transfer over a distance of 15 cm. The technology allows power transfer through asphalt, cement, snow, rain, or ice, enabling installations on the surface or underground. Meredot's solution thus provides a single platform for the charging of shared and private mobility companies.

Carbon-Ion enables Fast Charging

US-based start-up **Carbon-Ion** develops an ultrafast, high-power charging system that offers improvements over commercially available super capacitors. The system stores energy with a combination of lithium-based batteries and super capacitors to deliver high performance. It offers high, specific power that extends the lifetime of lithium-based batteries while enabling fast charging. The start-up's technology upgrades the power output of recharging stations where the grid infrastructure is limited.

3. Grid-scale Storage

Grid-scale storage plays an important role in electrification as it improves the operating capabilities of the grid and lowers costs. It also ensures high reliability and reduces infrastructure investments. Innovations in grid storage technologies, such as pumped hydro, compressed air energy, thermal energy, and flywheel storage, offer more flexibility with variable power sources and higher energy demands. These advances accelerate the integration of renewable energy sources like wind and solar into the grid, maximizing the output of renewable assets. This electrification trend ultimately alleviates the need for mining traditional power generation sources like coal and natural gas.

Mine Storage provides Low-Carbon Energy Storage

Swedish start-up **Mine Storage** develops a flexible grid-scale energy storage solution for bulk storage and ancillary services. The start-up sets up pumped hydropower storage solutions in abandoned mines. Utilizing the existing infrastructure lowers construction costs and the environmental impact of new greenfield storage infrastructure. Mine Storage's operational model optimizes revenues based on the conditions of the local energy market. This allows grid operators to adjust for production gaps and fluctuations in supply and consumption.

TasmanIon offers Grid-scale Battery Storage

TasmanIon is a New Zealand-based start-up that makes aluminium-ion batteries suited for grid storage and portable applications. The start-up's technology leverages aluminium cells with non-flammable electrolytes and safety-regulated design. The combination of materials also enables higher energy density compared to other batteries used in stationary storage such as lead-acid and redox flow. The start-up's battery solution serves as a cost-effective and scalable solution to balance surges during periods of high energy demand.

4. Energy Intelligence

Modern mechatronic vehicles feature electronic sensors, controls, and actuators along with software for data processing and computations. These capabilities allow vehicle manufacturers to leverage to optimize vehicle performance, EV charging, and maintenance infrastructure. Data analysis techniques like machine learning and predictive modelling manage large volumes of data and enable high-throughput data generation, gathering, and processing. Start-ups offering predictive analytics solutions for EVs and their supporting systems analyze driver and passenger behaviour to alter vehicle settings. Big data analytics also drives better decision-making in planning for new EV infrastructure development and integrations.

VoltSmart enables Automated Charging

Estonian start-up **VoltSmart** offers data-driven software for remote energy consumption management for EVs. The start-up's machine learning (ML) algorithms predict the required energy and departure time of EV drivers. It then automatically charges the EVs during periods of lower energy rates and cleaner power production. VoltSmart's automated charging solution lowers operational costs and makes electrification accessible and sustainable.

EVE Mobility facilitates Fleet Electrification

Irish start-up **EVE Mobility** develops an e-mobility intelligence platform. It utilizes ML to facilitate corporate fleet electrification. The platform combines vehicle and grid data to analyze costs associated with running EV fleets. EVE Mobility's other software tools monitor the current fleet operation state to create a comprehensive sustainability report. This way, the start-up allows fleet owners to electrify their assets faster and at lower costs.

5. Thermal Management Systems

Efficient thermal management is crucial for electric devices to ensure their optimal performance and efficiency. This electrification trend includes all innovative heat management solutions that maintain batteries, power electronics, and electric motors at optimal temperatures. Such cooling systems dissipate excess heat from electrical components and devices using air-cooled, liquid-cooled, or thermoelectric cooling systems. Start-ups utilize innovative designs and technologies like phase change materials, microchannel cooling, microfluidic cooling, and Nano fluidic cooling systems. Apart from the performance improvements, advanced thermal management systems further ensure safe and reliable operations of electric systems.

Synano develops Nanofluid Coolants

Dutch start-up **Synano** offers Nano fluid coolants for electronics. The start-up's cooling system ensures proper and uniform heat dissipation. For electromagnetic machines, like linear motors, this enables more efficient cooling. The start-up's solution increases productivity, reduces downtime, and improves the resilience of electric machines.

CoolestDC provides Liquid Cooling systems

Singaporean start-up **CoolestDC** designs and develops cooling solutions for power electronics, EV batteries, and high-powered electronic devices. The start-up's proprietary oblique-fin liquid and two-phase cold cooling solutions are customizable to fit unique requirements. CoolestDC's cold-plate designs cater to tight space constraints that are essential for EV applications to create energy-efficient systems.

6. Internet of Things

IoT is a key enabler of asset digitization, data collection, and computational capabilities in electrification efforts to better manage interconnected assets. It enables the real-time transfer of information and allows EV manufacturers to stay competitive and keep up with global challenges. Therefore, start-ups offer IoT solutions that deliver insights into charging times, weather conditions, cable position, etc. IoT also enables features like remote monitoring that aid in early fault detection and diagnosis, reducing infrastructure and machinery maintenance costs.

EMO Energy simplifies Battery Failure Prediction

Indian start-up **EMO Energy** develops *ZEN PAC*, a battery pack equipped with a platform that enables adaptable operations. The platform's AI model, *Sense AI*, utilizes multiple sensors to capture cell parameters. It predicts patterns and prevents potential incidents by controlling power with the start-up's other product, *ZEN Ctrl*. The sensors also detect cell punctures and trigger the thermal management system that rapidly extracts the heat from the affected cell, ensuring battery pack safety.

CodeSmith offers Real-time Battery Monitoring

UK-based start-up **CodeSmith** provides IoT solutions to enable real-time battery monitoring. The start-up's IoT platform, *Battery Passport*, captures information on battery usage securely and in real-time, reporting problems affecting performance and battery life. Its intelligent reporting feature offers detailed information and alerts that facilitate battery health monitoring and fault response in real-time. The solution also stores verified battery maintenance data that provides transparency to second-hand users when the batteries are no longer useful.

7. Off-grid Energy Generation

In remote locations, off-grid energy solutions offer a more cost-effective alternative to extending existing grids. These solutions allow end users to easily move away from grids that utilize fossil-powered generation and adopt non-polluting energy sources. Current developments include photovoltaic (PV) panels, modular wind

turbines, and small hydropower or wave systems, separately or as hybrid generation systems. Further innovations include charge controllers, power conditioning equipment, safety equipment, meters, and instrumentation. This aids in realizing reliable power, cost reduction, and sustainable electrification.

Sol-Go provides Off-grid Solar Solutions

US-based start-up **Sol-Go** manufactures lightweight, flexible plastic solar panels for off-grid power generation. The start-up's solar panels combine high-efficiency monocrystalline silicon solar cells with its proprietary flexible no-line grid design. They are corrosion-resistant and waterproof, making them suitable for off-grid applications and recreational vehicles both on land and sea.

Kynetic provides Hybrid Off-grid Power

Canadian start-up **Kynetic** makes a hybrid off-grid energy solution that combines vertical wind turbines, solar products, lithium battery energy storage, and controllers to ensure optimized energy production. The start-up's clean, renewable power offsets operational costs involved with military mobility operations, telecommunications towers, mining camps, and electrifying remote indigenous communities. This way, Kynetic reduces diesel fuel demand and greenhouse gas (GHG) emissions in off-grid, generator-dependent requirements.

8. Microgrids

Microgrid technology supports the development of a flexible and efficient electric grid by integrating distributed energy resources (DERs), such as solar and geothermal energy. Microgrids strengthen grid resilience and mitigate grid disturbances as well as ensure faster system response and recovery. Additionally, the use of local energy sources shaves off peak loads and reduces energy losses in transmission and distribution. As a result, this increases the efficiency of electric delivery systems. Further, innovative software-driven solutions improve the agility of microgrids and allow for easy upgrades and increased control.

Tigon develops Decentralized Renewable Microgrids

Spanish start-up **Tigon** offers modular DC microgrids that integrate solar power, energy storage systems, EV charging points, and other DC load systems. The start-up's software and hardware solutions include solid-state transformers, DC/DC converters, energy management systems, and a decision support system that speeds up hybrid microgrid rollout. These solutions enhance the reliability and resilience of decentralized renewable-based power systems by simplifying energy transition for grid operators.

Solarize offers a Microgrid Operating System (OS)

German start-up **Solarize** creates a microgrid operating system that manages on-site energy production, distribution, and billing in commercial microgrids. It features an intuitive user interface, smart automation, and monitoring tools in a single app to track microgrid operations. The OS aids utility companies, microgrid operators, and owners of electricity production units to sell electricity on-site. This accelerates electrification through the better integration of on-site renewable assets.

9. Lightweight Technology

Using lightweight solutions in electric vehicles offsets the weight of power systems, improves efficiency, and increases range. Advances in lightweighting include developing new composite materials and innovative structural designs. They improve the performance-to-weight ratio, on-road handling, and EV stability. Apart from EVs, start-ups also focus on reducing the weight of batteries and inverter systems. This improves the portability of electric components and accelerates the replacement of fossil-powered power backups like diesel generators. Moreover, lightweight technologies translate to compact and power-saving solutions that reduce the total cost of EV ownership, while improving their performance.

Turncircles makes an Axial Flux Lightweight Motor

Czech start-up **Turncircles** manufactures an ultra-light custom electric motor for aerospace and mobility applications. It offers higher power-to-weight performance compared to conventional radial flux motors. The parametric motor model design is scalable and stackable, enabling short development lead times. Its design also makes assembly and repair easy. This way, the lightweight motor lowers power consumption and maintenance requirements of electric solutions for aerospace and mobility companies.

MOOV Drive Technology provides Lightweight Battery Storage

Norwegian start-up **MOOV Drive Technology** offers a compact, environmentally-friendly, and lightweight energy storage solution. It provides safe, quick, and easy access to energy at home and on the go. This replaces conventional lead acid batteries that are bulky and avoids the need for fossil fuel-powered backup generators. This facilitates the electrification of auxiliary power units utilized for domestic purposes.

10. Sector Coupling

Energy storage technologies, power-to-X (P2X) applications, and demand-response solutions interlink the power-producing sector with power-demanding sectors. They include buildings (heating and cooling), transport, and industrial operations. Start-ups and scale-ups develop innovative power generation and chemical processes that produce stable output under varying energy inputs. These sector coupling solutions improve the flexibility of electric power systems while aiding variable renewable energy source integration. This tackles the challenges in power-consuming sectors associated with securing reliable electrification and achieving decarbonization goals.

enaDyne provides Plasma Catalysis-based Reactors

German start-up **enaDyne** develops plasma catalysis-based reactors. The start-up's reactors selectively utilize renewable energy to convert CO2, green hydrogen, or green methane into green chemicals and e-fuels. enaDyne's catalysis technology also mitigates the intermediate step to produce syngas, saving resources and time. The start-up's power-to-X solution enables mobility and transportation providers to leverage carbon-neutral e-fuels to accelerate the transition to e-mobility.

Rondo advances Power-to-Heat Conversion

US-based start-up **Rondo** offers a power-to-heat solution to run industrial processes. The start-up's heat battery turns low-cost, intermittent electricity from sources like solar and wind energy into heat and stores it using refractory bricks. It delivers this stored heat as either superheated air or superheated steam, acting as a drop-in replacement for fossil-powered boilers. Rondo's solution offers the chemical and heavy industries a low-cost pathway to electrification and reduces operating costs.

Discover all Electrification Trends, Technologies & Start-ups

The electrification trends advance the progress toward carbon neutrality with the integration of AI and IoT. They enable data-driven monitoring of electrified assets and facilitate faster decision-making. This simplifies the electrification plan and optimizes assets according to demand forecasts. Start-ups also work to improve the efficiency and reliability of electrical systems and devices to accelerate the transition from fossil-powered energy.

The Electrification Trends & Start-ups outlined in this report only scratch the surface of trends that we identified during our data-driven innovation & start-up scouting process. Among others, transaction energy, V2X, and novel power electronics will transform the sector as we know it today. Identifying new opportunities & emerging technologies to implement into your business goes a long way in gaining a competitive advantage. Get in touch to easily & exhaustively scout start-ups, technologies & trends that matter to you!

Courtesy: https://www.startus-insights.com/innovators-guide/electrification-trends/

MEETING PEAK POWER DEMAND THROUGH GAS-BASED PLANTS REQUIRES DYNAMIC DOMESTIC RESOURCE ALLOCATION

Although resorting to natural gas is not ideal, our analysis finds that allocating more domestic gas to the power sector during the summer can make the plan economically advantageous for the country.

With the summer sun blazing in all glory, the annual concern of meeting India's peak power demand has emerged again. Rapid urbanisation, increasing industrial activity and erratic weather patterns are raising the peak power demand each year. This year, it is expected to touch 260 gigawatts (GW), 7% more than the 243GW recorded in the summer of 2023. By 2030, peak power demand could touch 350GW.

For ensuring uninterrupted supply, the central government is taking all measures possible. This year, the government has asked all gas-based power plants to remain fully operational during the crunch period of 1 May to 30 June 2024 by invoking Section 11 of the Electricity Act, 2023. Although resorting to natural gas is not ideal, our analysis finds that allocating more domestic gas to the power sector during the summer can make the plan economically advantageous for the country.

Meeting Peak Power Demand

The Institute for Energy Economics and Financial Analysis (IEEFA) firmly believes that increasing renewable energy capacity, enhancing energy efficiency and developing energy storage are key to meeting the peak power demand using sustainable means. While policy makers continue to take steps on all three fronts, they are also resorting to imported fossil fuels to tackle immediate demand spikes.

Highlighting the government's early action to prevent a supply crisis was its October 2023 decision to direct coal-fired plants to undertake a 6% blending of imported coal to meet the domestic coal shortage. The government also asked all imported coal-based power plants to remain operational and make full capacity available for generation till June 2024, later extended to October 2024.

Learnings from Past Procurement of Gas-Based Power

This year is not the first time the government has depended on gas-based power to meet peak demand. Last year, the government floated minimum offtake guarantee tenders for procuring 4GW of gas-based power for the 21-day crunch period from April to May 2023 and the 20-day crunch period from October to November 2023. This was apart from the 5GW power supply sought from NTPC's gas-based power plants.

For the April 2023 tender, the lowest bid was by Torrent Power to supply electricity at Rs. 13.7 per unit for 920 megawatts (MW) with a minimum guaranteed offtake of 278 million units (MUs). However, Torrent ended up supplying 1,038MUs from its plants in Dahej and Surat, potentially costing Rs. 14.22 billion.

Before invoking Section 11 for gas-based power plants in April 2024, the government had floated a similar tender for 16 March to 30 October 2024. Torrent was again the lowest bidder, committing 770 megawatts (MW) with a minimum guaranteed offtake of 388MUs until June 2024. Torrent's expected minimum revenue of Rs. 4.4 billion translates to a per unit electricity cost of Rs. 11.34.

While the discovered prices from these tenders were high, gas-based electricity tariffs can come down with tweaks to the current policy on domestic gas allocation. Our calculations find that tariffs can come down to Rs. 5.83 per unit by increasing the allocation of domestic gas (currently costing US$6.5 per million metric British thermal units (mmBTu)) to the power sector, such as to allow 50% blending with LNG (ongoing spot price of US$10.225 per mmBtu).

Diminishing Role of Gas

To facilitate the uptake of expensive imported coal and gas-based power, the government initiated the high-price day ahead market (HP-DAM) in March 2023, which allowed for a high tariff of Rs. 20 per unit. An analysis of the HP-DAM activity during the April-May 2023 crunch period shows that the market clearing price (MCP) was lower than the tendered gas-based power price on which minimum offtake was provided on almost all days, apart from 17 April 2023 (MCP touched Rs. 20 per unit) and 13 May 2023 (MCP was Rs. 13.77 per unit). Similarly, for the October to November period, trade only occurred for a ten-day period from 10thOctober 2024 with total volume at 15.8MUs and an average price of Rs. 16.95 per unit.

Gas is also fast losing competitiveness to renewable energy. Firm and dispatchable renewable energy (FDRE) tenders, to ensure 24x7 supply, are helping overcome the variable nature of solar and wind power.

The latest discovered tariff for FDRE is already down to Rs. 4.64 per unit, as quoted by ABC Cleantech in the most recent tender floated by NTPC. Commendably, policymakers are accelerating the issuance of such tenders. As a result, gas-based power plants seem to have a limited role in meeting peak demand, even in the short term.

For the short-term, providing gas-based power plants with more domestic gas and reducing their dependence on costly LNG can not only bring down power tariffs but also be financially beneficial to all stakeholders. Going forward, even if gas-based power is required for short periods as peaking power, it would be better to allocate higher domestic gas for them during such times to ensure not just continuous power supply but also affordability.

Courtesy: Energyworld.com

One of the most exciting opportunities created by Renewable Energy technologies like Solar is the ability to help the World's poorest develop faster-but more sustainably too.

– Brainy Quotes

UPDATED CENTRAL ELECTRICITY AUTHORITY (MEASURES RELATING TO SAFETY AND ELECTRIC SUPPLY) REGULATIONS, 2023 – 5

41. Precautions against failure of supply and notice of failures

(1) The layout of the electric supply lines of the supplier for the supply of electricity throughout his area of supply shall under normal working conditions be sectionalised and so arranged, and provided with switchgear or circuit-breakers, so located, as to restrict within reasonable limits the extent of the portion of the system affected by any failure of supply.

(2) The supplier shall take all reasonable precautions to avoid any accidental interruptions of supply, and also to avoid danger to the public or to any employee or designated person when engaged on any operation during and in connection with the installation, extension, replacement, repair and maintenance of any works.

(3) The supplier shall send to the Electrical Inspector a notice of failure of supply of such kind as the Electrical Inspector may from time to time require to be notified to him, and such notice shall be sent by the earliest mode of communication after the failure occurs or after the failure becomes known to the supplier and shall be in the Form given in Schedule IV.

(4) For the purpose of testing or for any other purpose connected with the efficient working of the supplier's installations, the supply of electricity may be discontinued by the supplier for such period as may be necessary, subject to not less than 24 hours' notice being given by the supplier to all consumers likely to be affected by such discontinuance:

Provided that no such notice shall be given in cases of emergency

Chapter V - Safety provisions for electrical installations and apparatus of voltage not exceeding 650V

42. Test of insulation resistance

Where any electric supply line for use at voltages not exceeding 650 V has been disconnected from a system for the purpose of addition, alteration or repair, such electric supply line shall not be reconnected to the system until the supplier or the owner has carried out the test.

43. Connection with earth

The following conditions shall apply to the connection with earth of systems at voltage exceeding 50 V but not exceeding 650 V, namely: –

(i) neutral conductor of a three phase, four-wire system and the middle conductor of a two-phase, three-wire system shall be earthed as per the relevant standards;

(ii) neutral conductor shall also be earthed at one or more points along the distribution system or service line in addition to any connection with earth which shall be at the consumer's premises;

(iii) in the case of a system comprising electric supply lines having concentric cables, the external conductor or armour of such cables shall be earthed by two separate and distinct connections with earthing system;

(iv) in a direct current system, earthing and safety measures shall be as per the relevant standards;

(v) every building shall have protective equipotential bonding by interconnecting the exposed and extraneous conductive parts as per the relevant standards;

(vi) the alternating current systems which are connected with the earth as provided in this regulation shall be electrically interconnected:

Provided that each connection with the earth is bonded to the metal sheathing and metallic armouring, if any, of the electric supply lines;

(vii) the frame of every generator, stationary motor, portable motor, and the metallic parts, not intended as conductors, all transformers and any other apparatus used for regulating or controlling electricity, and all electricity consuming apparatus, of voltage exceeding 250 V but not exceeding 650 V shall be earthed by two separate and distinct connections with earth by the owner as specified in the relevant standards;

(viii) all metal casing or metallic coverings containing or protecting any electric supply line or apparatus shall be connected with the earth and shall be so joined and connected across all junction boxes and other openings as to provide good mechanical and electrical connection throughout the length:

Provided that the conditions mentioned in this regulation shall not apply, where the supply voltage does not exceed 250 V and the apparatus consists of wall tubes or brackets, electroliers, switches, ceiling fans or other fittings, other than portable hand lamps and portable and transportable apparatus, unless provided with the earth terminal and to class-II apparatus and appliances of the relevant standards:

Provided further that where the supply voltage is not exceeding 250 V and where the installations are either new or renovated, all plug sockets shall be of the three pin type, and the third pin shall be permanently and effectively earthed;

(ix) All earthing systems shall

(a) consist of equipotential bonding conductors capable of carrying the prospective earth fault current without exceeding the allowable temperature limits as per relevant standards in order to maintain all non-current carrying metal works reasonably at earth potential and to avoid dangerous contact potentials being developed on such metal works;

(b) have earth fault loop impedance sufficiently low to permit adequate fault current for the operation of protective device within the time stipulated in the relevant standards; and

(c) be mechanically strong, withstand corrosion and retain electrical continuity during the life of the installation and all earthing systems shall be tested to ensure effective earth bonding as per the relevant standards, before the electric supply lines or apparatus are energised;

(x) all earthing systems belonging to the supplier shall in addition, be tested for resistance on dry day during the dry season at least once in a year;

(xi) earth fault loop impedance shall be tested to ensure the automatic operation of the protective device and a record of every earth test made and the result thereof shall be kept by the supplier for a period of not less than two years after the day of testing and shall be available to the Electrical Inspector when required;

(xii) earth fault loop impedance of each circuit shall be limited to a value determined by the type and current rating of the protective device used such that, on the occurrence of an earth fault, disconnection of the supply shall occur before the prospective touch voltage reaches a harmful value; and

(xiii) 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.

44. Residual Current Device

The use of electricity to electrical installation, shall be controlled by a residual current device to disconnect the supply having rated residual current and duration as per the relevant standards:

Provided that in domestic installation, residual current device having residual operating current not exceeding 30 milli-ampere shall be used:

Provided further that such protective device shall not be required for supply lines having protective devices which are effectively bonded to the neutral of supply transformers and conforming to regulation 76.

(To be continued)

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

WHAT EXACTLY IS A HYBRID VEHICLE?

Most of us are aware of the emergence of electric vehicles (EVs). But do you know the difference between gasoline-electric hybrids and battery-electric vehicles? Can you tell a plug-in from a mild hybrid? Confusingly, there are four different types of hybrid car currently on the market, and understanding which is which is often a challenge for all but the most passionate of car fans. But if you're thinking about purchasing a EV anytime soon, it's best to brush up on your automotive vocabulary beforehand. So, are you ready to take charge of your electric vehicle knowledge?

Hybrid Electric Vehicle (HEV)

Hybrid electric vehicles (HEVs), also referred to as conventional hybrids, are powered by an internal combustion engine in combination with one or more electric motors that use energy stored in batteries. Pictured here is the Toyota Prius, the world's best-selling hybrid car.

A hybrid electric vehicle cannot be plugged in to charge the battery. Instead, the battery is charged through regenerative braking and by the internal combustion engine. HEV batteries are far smaller than those in fully electric cars. The extra power provided by the electric motor can potentially allow for a smaller engine.The battery can also power auxiliary loads and reduce engine idling. These features result in better fuel economy without sacrificing performance.

However, the downside of owning a HEV is that the battery can only typically provide a handful of miles of range when exclusively running on electric power.

Plug-in Hybrid Electric Vehicle (PHEV)

Plug-in hybrid electric vehicles (PHEVs) also use batteries to power an electric motor, as well as another fuel, such as gasoline or, more rarely, diesel. But the biggest difference to an HEV is that they also have charging equipment.

PHEVs are charged by being plugged into a power outlet via the grid, domestic Wallbox, or public charging device. Like HEVs, PHEVs also feature regenerative braking systems that feed energy back into the hybrid or electric system to help replenish a little bit of range. PHEVs generally have larger battery packs than hybrid electric vehicles. This means that plug-in hybrids can be driven on electric power alone, albeit for moderate distances only, perhaps up to 60 miles (96 km). For longer journeys, the vehicle will become reliant on the gasoline/diesel engine. However, consistently charging a PHEV is the best way to maximize the electricbenefits. Pictured is the Mini Cooper S E Countryman.

Mild Hybrid Electric Vehicle (MHEV)

A mild hybrid electric vehicle (MHEV) represents the middle ground between a gasoline/diesel car and a HEV. Mild hybrids feature a battery and a small electrical motor that works in conjunction with the engine to add torque and can also recapture energy under braking.

The motor-generator effectively supplements the combustion engine under the hood. However, at no time does the battery and motor provide all-electric propulsion. The configuration does allow the engine to shut off when the vehicle stops, at traffic lights for example, or in annoying stop-go-stop traffic, further improving fuel economy. Some MHEVs also use the generator to enable the car's engine to be turned off for up to 40 seconds when coasting—another appealing fuel-saving feature. Pictured is the Kia Proceed.

MHEVs generally cost less than full hybrids, but also provide less fuel economy benefit than full hybrids.

Range Extender Electric Vehicle (REX)

Regarded as the fourth different type of hybrid, the range extender electric vehicle is not as popular as conventional or plug-in hybrids, and many models have been discontinued. Pictured is the Suzuki Swift from 2012.

While it does use a 'hybrid' of battery-plus-electric-motor and combustion engine, unlike self-charging and plug-in hybrids, the range extender does not power the car's wheels directly, it only charges the battery. In a range extended car, when the battery charge is low the range extender starts automatically and charges it up.

These days, a REX on the road is a rare sight. However, the new INEOS Fusilier is set to debut in 2027 and will be available either as a full-blown electric vehicle or a REX.

Courtesy: https://www.msn.com/en-in/autos/news/what-exactly-is-a-hybrid-vehicle/ss-BB1lnw9j?ocid=msedgntp&pc=LCTS&cvid=2f3ee4ebf503486e8d01c71b517a4dea&ei=62#image=1

POWERING AHEAD: THE ROLE OF RENEWABLE ENERGY IN ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

Electric Vehicles (EVs) are acquiring thrust as an environment-friendly transportation solution in India, directed by ecological concerns and technological progressions. Nonetheless, the extensive acceptance of EVs is subject to the expansion of a strong charging infrastructure throughout the nation. India's **EV Charging Infrastructure** Market was valued at USD 913 Million in 2023 and is expected to flourish with a CAGR of 22.04% in the predicted period i.e. 2024-2029. In turn, the sphere looks at the significant function of **renewable energy** in running **EV charging** stations in **India** for **sustainable** EV charging infrastructure.

Introduction to EV Charging Infrastructure

The **BEE** (Bureau of Energy Efficiency) looks forwards to the country introducing 46,397 EV **charging stations** within 9 Indian cities by 2030, out of which India at present merely has 5,234 EV stations. This reveals that the development of EVs in India is not restricted to the scope of being a short-term trend; rather it's a transformation that assures an unpolluted and sustainable future. Despite this, for this transformation to be a force, a solidly built and pervasive charging infrastructure is necessary.

Importance of Charging Infrastructure for EV Adoption

As per the overall situation, 1 charging station can accommodate the charging requirements of 6 to 20 EVs. In contrast, India has 1 charging station for approximately 135 EVs, intensifying the possibility of the country accomplishing 40% less than its EV 2030 objectives. In turn, for EVs to develop into majority-purchased vehicles, a completely developed charging infrastructure is imperative. Convenient access to charging stations not only lightens the nervousness of EV possessors but also inspires more individuals to switch to electric vehicles. It's similar to possessing a fuel station at every single nook and corner but with cleaned energy and a depleted carbon footprint.

Current Challenges and Opportunities

Among many, one of the major challenges is the insufficient charging infrastructure. With sparse charging stations, EV holders may find themselves in a tight spot as soon as their battery depletes. Furthermore, incorporating these charging stations with the electric grid presents its unique pool of challenges, demanding smart solutions to guarantee a steady and consistent power source for EVs? Insufficient Charging Infrastructure – The deficiency of charging infrastructure in India is an obstacle that must be overcome to speed up the implementation of EVs.? Grid Integration Challenges – Incorporating EV charging compels thorough planning and investment to ensure a stable and resilient energy supply, Smart grid solutions and innovative technologies hold the key to overcoming these challenges and making the transition to electric mobility smoother.

Importance of Renewable Energy

When it comes to charging EVs, the source of energy matters just as much as the vehicle itself. Integrating renewable energy sources like solar and wind power into EV charging stations offers a sustainable solution that not only reduces carbon emissions but also lowers operating costs in the long run.

Advantages of Renewable Energy

By harnessing the power of the sun, wind or other **renewable sources** to charge Evs, we not only reduce our dependence on fossil fuels but also contribute to a healthier and greener planet. In addition, with renewable energy becoming more affordable and accessible, powering up your EV with **clean energy** is a win-win for both the wallet and the environment in alignment with **policy and regulatory framework.**

Policy and Regulatory Framework

While the inclination is turning towards a more sustainable future, the role of policies and regulations cannot be overlooked. The Indian government has been steering the renewable energy and EV sectors in the right

dire4ction, with initiatives and incentives aimed at promoting the integration of clean energy in EV charging infrastructure. In addition, The government of India is seeking electric vehicle promotion in a way that their sale account for at least 30% of the entire four-wheeler sales by the year 2030. **Government Initiatives** from financial incentives to policy reforms, the government's initiatives are encouraging the renewable energy sector. Schemes like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) and the National Electric Mobility Mission Plan (NEMMP) aim to spur investments in EVs and renewable energy, creating a conducive environment for their growth and development.

In conclusion, the Indian government has been making constant efforts to increase renewable energy generation. It wishes to be able to produce up to 500 GW by 2030, which accounts for almost 50% of the entire energy requirements. The role of renewable energy in electric vehicle charging infrastructure in India is not just an innovative idea but a practical and necessary step towards a cleaner, greener future. With innovative technologies and future-focused recommendations, India can lead the charge toward a sustainable transportation ecosystem powered by the sun, wind and a sprinkle of innovation. Let's drive towards a brighter, renewable energy powered tomorrow!

Courtesy: Mr. Amit Raj Singh
Economic Times, dt. 09.05.2024

STAY AHEAD IN 2024 WITH MODERN ELECTRICAL TECHNOLOGY

HERE'S YOUR FAST-TRACK GUIDE TO TOMORROW'S MOST BUSINESS-FRIENDLY BREAKTHROUGHS

Key Takeaways:

- AI, smart grids, and the IoT are shaking up how energy is produced, distributed, and stored
- Renewable energy sources continue to gather steam as the future's primary source of power
- Tomorrow's electrical grids will get smarter and smaller to improve performance

Staying current with electrical developments can challenge businesses. Make informed, selective choices about which of the latest developments will reward boost productivity and cost effectiveness, then commit to adopting them. To do so, read this guide to learn more the future of electrical power, and which technologies could enhance your business operations most effectively!

Introduction to Modern Electrical Technologies

The future dictates businesses assume more learning curves and expensive investments to manage advancing technologies and customer expectations. Fortunately, the biggest power evolutions will recoup any upfront costs businesses may incur in implementing them.

Think faster, more reliable power, increased productivity, and lower utility bills. Add greater security against threats natural and human-caused, such as harsh weather or hackers? It's all part of the next power revolution, so let's look at how your business may run in the suture.

Emerging Trends in Electrical Technology

One critical trends in electricity is the growing dominance of smart grids. These faster, cooler and safer successors to traditional, outmoded grids that become more vulnerable and likely to fail with every passing year.

The past year has brought further worldwide investment in global electrical infrastructure increasingly composed of automated monitoring, sensors and surveillance protecting systems and making them more resilient. This is the Internet of Things (IoT): the wireless web of hardware and software that gives smart grids their data.

The coming years will present stronger grids more resistant to isolated electrical incidents by identifying, reporting and even repairing issues before they become system-wide problems. Smart Grids will provide:

- Reduced management and operational costs
- Lower rates through reduced peak demand
- Tighter security
- Better integration of renewable energy

The last benefit is vital because renewable energy solutions are integral to tomorrow's business tech. It's also the area where businesses still have significant autonomy of adoption (smart grids and the IoT are happening regardless). There are several good reasons to strongly consider going green in 2024.

Renewable Energy Solutions

Technically, every energy resources is renewable if more exists. The problem is that coal, oil and gas are more finite than the elements (which will be around as long as the planet is). That's why fossil fuels *non*-renewable, while wind, solar and hydro constitute renewable energy. Your business can stay ahead in the future by accessing planetary power. Water and wind power are beyond most small-to-medium business' means, but installing solar panels can be a cost-effective way to harness energy and cut long-term utility bills.

The price of power regularly increases, which is much less desirable than a steady and financially predictable solar energy. There are still money-saving steps you can take today eve if solar isn't yet possible for you, such as installing energy – efficient lighting and proactive maintenance.

To create a more energy efficient future, learn how much power your business is using today. That's simple when you know *how to measure energy efficiency*. This trend is revolutionizing business operations and energy management and making businesses more productive and cost-efficient while safe guarding them against the unpredictability of grid failure and utility rates. Of course, you can also combat that first one by installing the right commercial generator.

The impact of AI and Automation on Electrical Systems

Artificial Intelligence (AI) and automation are rapidly optimizing electrical system management. AI alone has been dubbed "the new electricity" and pairs with the IoT to make smart grids possible with machine learning and predictive analytics. These help AI combine past electrical patterns with real-time data to anticipate issues and fix potential problems before they start.

Adopting sustainable electricity benefits everyone. When sensibly installed, businesses reduce operating costs while giving the planet a much needed breather. Not to mention the competitive edge of proactively adopting new technologies!

What's nest in Electrical Technologies?

The electrical world continually presents exciting developments. Two of the most interesting advancements coming soon are:

- **Microgrids**

Imagine your neighbourhood having its own electrical grid, not sharing the same one as an entire county or state. Microgrids are smart grids that decentralize how energy is generated, distributed, and stored much closer to home. This plan should free each communities from the risks of wider grid failure.

- **Virtual power plants (VPPs)**

Yesterday's concrete behemoth power plants belched water vapour that sat fixed in one position. In the future, they'll exist virtually as networks of interconnected energy sources like solar panels, wind turbines, and batteries. VPP operators will constantly monitor electrical supply and demand using widely distributed power resources to optimize grid consumption.

Courtesy: https://yourpowerpro.com/modern-electrical-technologies-for-2024/

HOME FESTIVALS - 6

ஆனி - Aani (June/July)

This is the one month of the year when there are no home festivals — coinciding not uncoincidentally with an intense month of agricultural effort. However, during Aani, major temple festivals are held for Lord Siva as Nataraja, King of Dance (left), and for Siva and Parvati.

HOME FESTIVALS - 7

ஆடி - Aadi (July/August)

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

(To be continued)

"It is health that is the real wealth, and not pieces of gold and silver."

– MAHATMA GANDHI

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