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Contents...

Editorial…

Department of Electrical Engineering acknowledges that technological potential that can be harnessed to satisfy the needs of civil society. In other words, technology can be seen as a public good that can benefit all, through an open system exchange of ideas, with open data initiatives, open technologies, and open ecosystems designed for the collective good, as defined by respective communities that will be utilizing them. Electrotrends serves the purpose to select some well appreciated ideas to come in front through the light delightful magazine

Prof. Bhushan Save (HOD, Dept. of EE)

There is huge potential for Electrical Engineering to bring massive benefits to under-served populations, advancing equal access to public services such as health, education, social assistance, or public transportation, Electrical Engineering can also drive inequality, concentrating wealth, resources, and decision-making power in the hands of a few countries, companies, or citizens. Artificial intelligence for equity Electrical Engineering calls upon academics, Electrical Engineering developers, civil society, and government policy-makers to work collaboratively toward a technological transformation that increases the benefits to society, reduces inequality, and Electrotrends aims to highlight everything.

Prof. Piyali Mondal

Microgrid: Advantage to existing Power Sector

India's power consumption grows 41 per cent in April

PTI • Last Updated: May 01, 2021, 11:35 AM IST

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Synopsis
On the other hand, peak power demand met, which is the highest supply in a day, during the first half of this month remained well above the highest record of 132.20 GW in April 2020. During April this year, peak power demand met or the highest supply in a day touched the highest level of 182.55 GW and recorded a growth of nearly 38 per cent over 132.73 GW recorded in the same month in 2020.

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Power consumption in the country grew 41 per cent in April to 119.27 billion units (BU) in the same month last year, showing robust recovery in industrial and commercial demand of electricity, according to **power ministry** data.

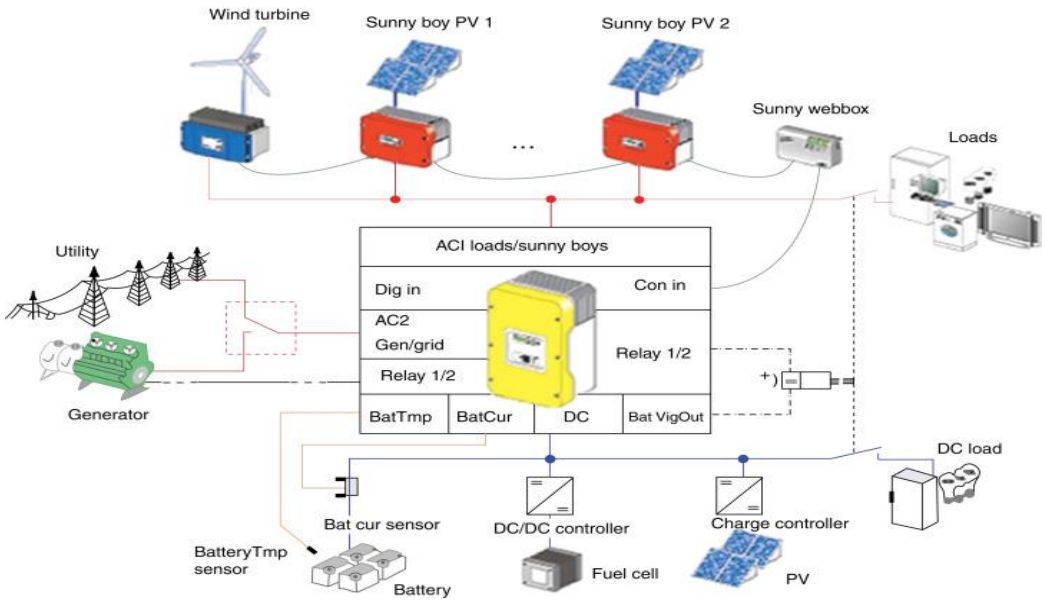
Power consumption in April last year was recorded at 84.55 BU.

Source: Economic Times

Day by day, power demand is going on increasing so there is a requirement for more power generation to be transmitted to the consumer. There is a requirement to upgrade both the generating sector and the Transmission & distribution sector. Generation can be increased by installing more conventional and non-conventional energy sources but there are more restrictions to upgrade the existing transmission and distribution system as it consists of up-gradation of transmission line, transmission towers, transformers and other devices in a substation this is a very costly process.

Along with these there is a need to increase security, reliability and quality of power supply translated to be consumer.

The microgrid is such a concept that can provide a solution to the above problem. Microgrid's primary concern is to provide power to the consumer that is security and reliability of power along with the quality power supply. As microgrids are installed towards the consumer side it provides enough time for distribution companies to upgrade existing transmission & distribution systems. It also provides the solution against losses in transmission & distribution systems as well as the peak demand management.



A microgrid is an electric power distribution system that consists of loads and the distributed generation that can be operated in a controlled and coordinated way while connected to the main power grid or while the island

Source: sciencedirect.com

How is microgrid an advantage?

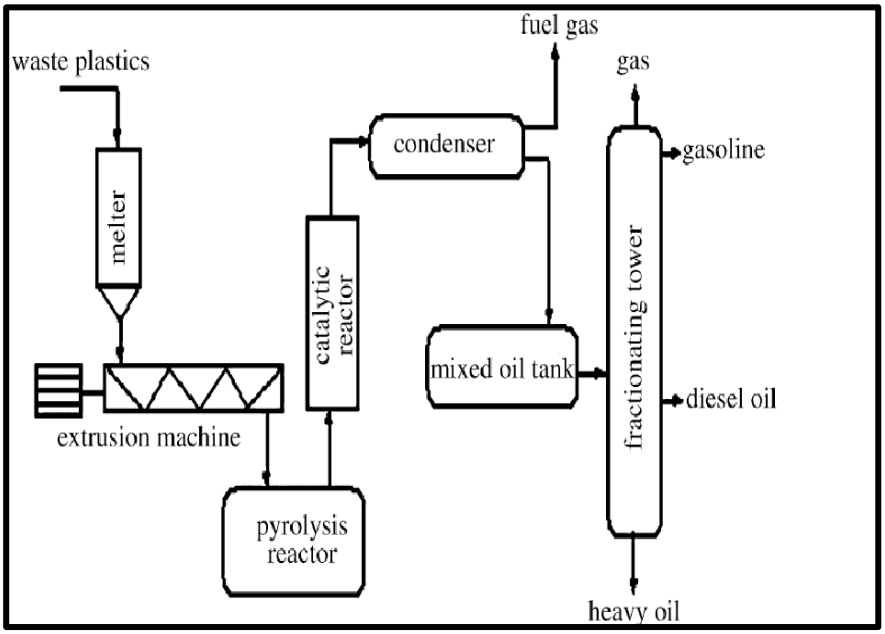
- If we see the electricity coverage of Indian power sector up to 2019 the total installed capacity is 383,373 MW. In total capacity share of fossil fuel is 79.8% and renewable is having a share of 17.3%. Total GHG emission as per the stats of 2017 is 2,194.74 MtCO2. As microgrids encourage the use of renewable energy sources, it can provide the solution to this problem by installing more renewable energy sources for power generation. It also helps in the reduction of greenhouse gases.

- If we see the Indian power sector from a consumption point of view, the industrial sector (41.16%) and residential sector (24.76%) uses more power as compared to other sectors such as agriculture (17.69%), commercial (8.24%) and traction (1.52%). In the concept of micro-grid renewable energy sources of some KW to some MW are installed in user's premises only. It reduces the burden on the existing transmission and distribution systems and also gives advantage of low transmission and distribution losses.

Prof. Anojkumar Yadav

Waste Plastic To Diesel

The pyrolysis process of plastic waste engenders fuel, offering an alternative to gas. But in general, the composition of pyrolysis liquid products may differ, depending on the composition of the feedstock and its process parameters. The results of pyrolysis products (liquid, gas and char) were obtained within the range of 500–650◦C. From the degradation of polypropylene (PP), Withal the product of distillation bubble cap column of each tray is presented. The quantity of gas and fuel oil yield has its conversion il-lustrating. There was incrimination in the conversion of PP plastic waste from 9% (at500◦C) to 99.87% (at650◦C).

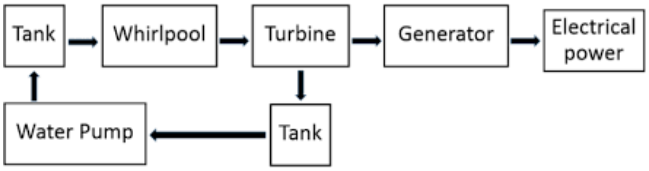


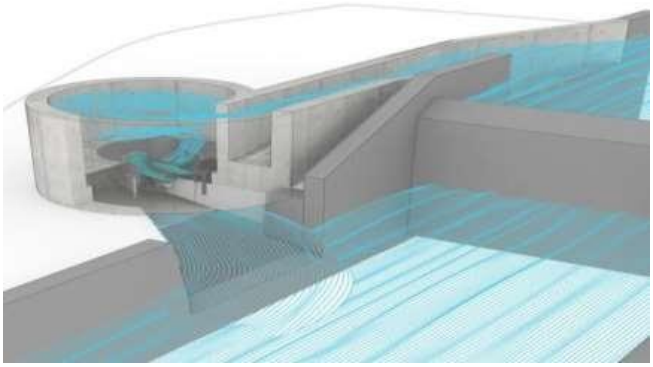
The oret-ically, the yield will increment alongside an incrimination in temperature due to the fact that the reaction rate is more expeditious at high temperatures viscous, which is a denouement that it requires to be recycled. The vapour permeates the 4-tray distillation bubble cap plate column by utilizing heat from the reactor, and this is due to the heat emanating from the reactor or vapour pressure which cans condensate in the tray at optimum conditions (580◦C). Whereas, at temperatures above the optimum conditions vapour can be condensate in-tray, but higher energy is required to obtain high ash and wax content which will then require a cost to disunite. In integration, sundry characteristics of the fuel obtained in accordance with the boiling point of each product are achieved. However, vapour which is left tun-condensate in-tray is processed utilizing H2O2 10% in gas washing bottles to absorb acidic gas and CO2 composed from pyrolysis afore being discharged into the environment.

Prof. Mukesh Kumar Mishra

Whirlpool turbine: Boom to renewable energy

Whirlpool turbine is a technology used as a part of hydro power plant. Its installation requires a 1.5 m height difference from the water level. It can be installed in rivers and canals. It also uses the flow in water to produce eddy current which generates electricity. Among all the renewable energy sources, water has been used for many years for the purpose of electricity generation, as the most important source. Currently world electricity has become one of the most basic necessities of life. Water when flows by the force of gravity, it can be used to turn turbines and generators to produce electricity. The whirlpool turbine can be used not only in river but also where there is drainage flowing from industries to dumping yard.





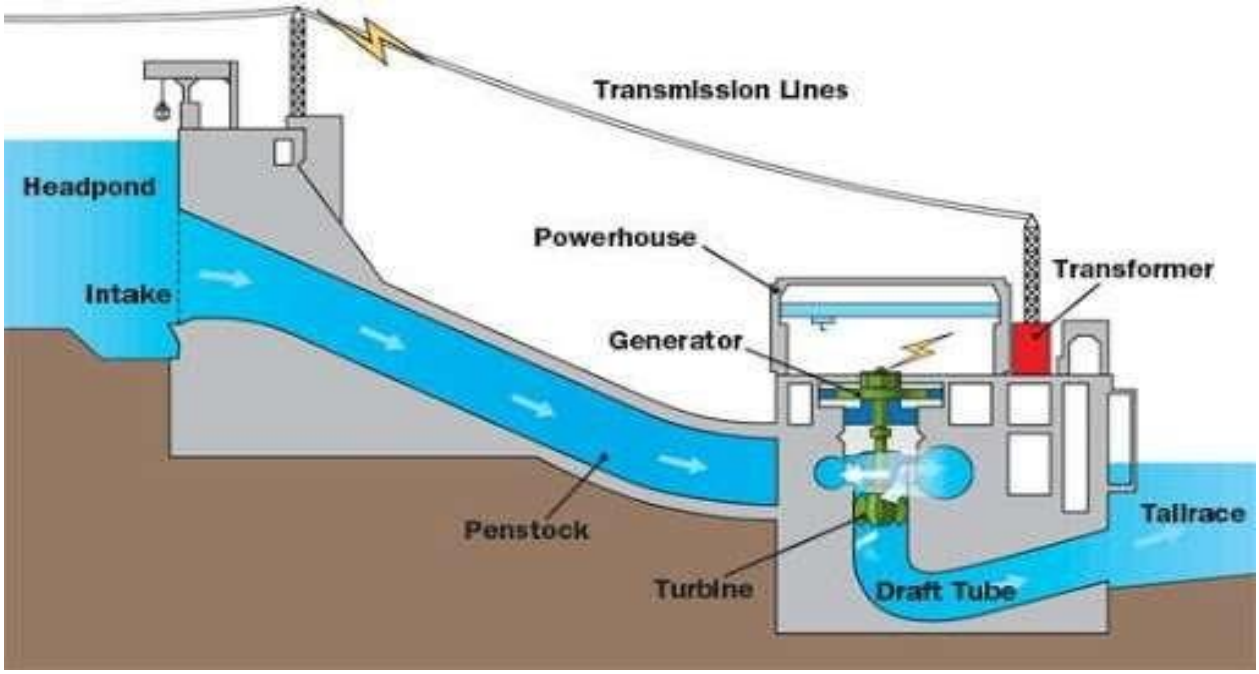
In whirlpool turbine, the flow of the water creates a vortex that turns the rotor, which eventually extracts the energy from the water and generates electricity by making use of a submersible generator. Whirlpool turbine is constructed in such a way that its design allows fish and other animal life to pass through the turbine unhurt. As we install nets at the end of the drainage system the waste can be collected together and there would not arise any water blockage or chokes.

Whirlpool turbine is a low-pressure turbine fitted with a submersible generator, which generates electricity that is sufficient to power up to 60 houses 24/7 without harming the environment. Whirlpool turbine installation requires a 1.5 m height difference in water level. Whirlpool turbine can be installed in most rivers and canals. It uses the flowing water to produce eddy current, which, in turn, generates electricity. Whirlpool turbine is also cheaper to install than conventional hydro plants. Construction of conventional hydro plants entails big dams or tunnels. These require significant investments.

This whirlpool turbine has been designed and fabricated for a low water head hydro system. The vortex turbine is extremely efficient for power generation in places where large dams and reservoirs are not feasible. Places like natural outflows of water such as small streams and naturally fast flow found in hilly areas or areas with spring waters. For a turbine of a given geometrical design, a smaller blade size translates into a higher rotational speed for the same flow speed. Installation of these systems on the sides of the prebuilt canals does not require any extensive changes and done with little effort.

The turbine we designed was an initial prototype. It had a diameter of 6 inches and the rest of the assembly constructed at escalator it respectively. As we install nets the flow of water will be continuous and no damage can be caused to turbines.

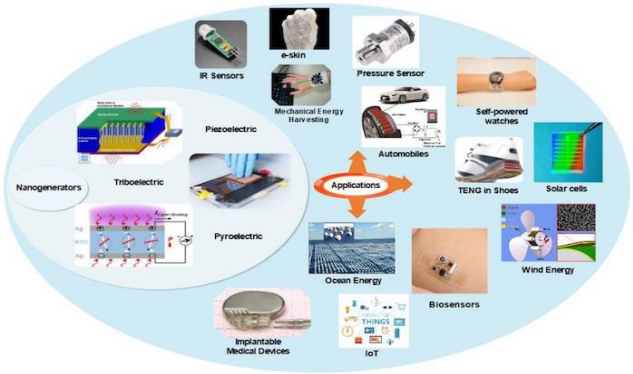
With a comparatively low-head difference of 0.8 - 2.0 m, these mini power plants have the potential to produce between 100 – 1000kW.

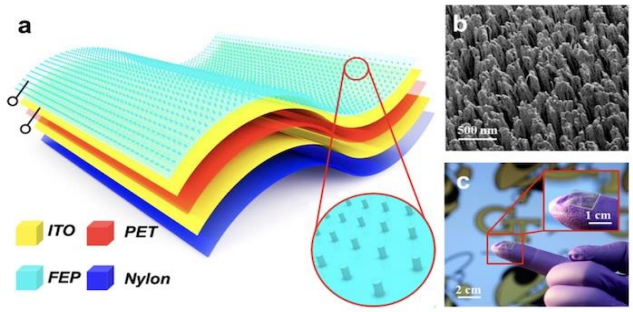


Prof. Chitralekha Vangala

Triboelectric sensors (TES)

While it seems like smart watches are just luxuries for construction workers, but in the electrical trades, these gadgets are actually used for saving lives. The Proxxi Smart watch, for instance, is a wearable that helps ensure the safety of electrical workers at the site by reducing risks of injuries and electrocution. The watch is equipped with triboelectric sensors (TES) that notify the user of any high-voltage electricity sensed nearby. It also has GPS sensors that send out location stamps so that electrical subcontractors are sure that their workers are at the site where they are assigned. Triboelectricity can be used to create self-powered sensors known as triboelectric sensors (TES). The architecture of the TES was sandwiched in several layers: at the top was a layer of fluorinated ethylene propylene (FEP) modified by polymer nanowires. Next came a three-layer structure—a layer of polyethylene terephthalate (PET) and two transparent indium tin oxide (ITO) layers. Finally, the bottom layer was made of a nylon film. The TES generated a corresponding 35 V when 20 mN of force was applied. Researchers also found that the output voltage could offset a siren alarm if the TES integrated with a signal processing circuit. Triboelectric nanogenerators (or "TENGs") aren't the newest technology on the block. However, global research indicates they may change energy-harvesting technology through the power of movement.



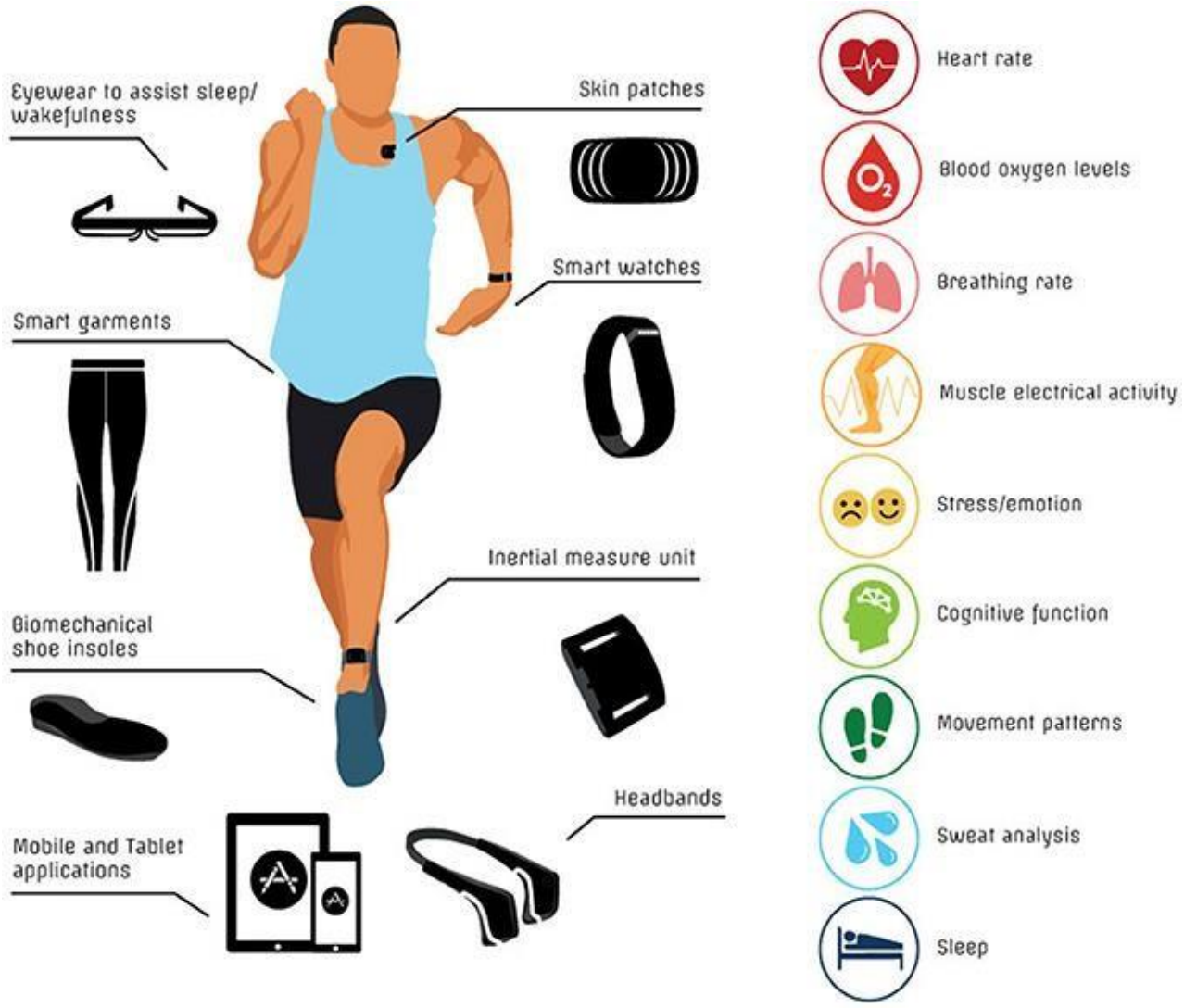


This device hinges on the principle of electrostatic induction, converting various mechanical energies to electricity. TENGs can harvest energy for electrification from walking, vibration, human motion, wind, rotating tires, and flowing water. The performance of TENGs depends on the material used to develop them; different materials have different triboelectric charges. The superposition principle of electric potential implies that output voltage and current are affected by the density of triboelectric charges. Materials used to develop TENGs must produce triboelectric charges easily and have different triboelectric polarization. TENGs are often created from are polytetrafluoroethylene (PTFE), polyamide, polyvinylidene fluoride (PVDF), and silk materials.

Prof.Kavita Mhaskar

Wireless Wearable Tech

Last year, at the recent Apple event, Tim Cook shared a couple of videos he had received from several apple watch users. These customers appreciated how the apple watch had detected their health conditions (such as Atrial Fibrillation) and encouraged them to visit a doctor ultimately saving their lives.



Last year, at the recent Apple event, Tim Cook shared a couple of videos he had received from several apple watch users. These customers appreciated how the apple watch had detected their health conditions (such as Atrial Fibrillation) and encouraged them to visit a doctor ultimately saving their lives.

They typically rely on wireless, miniature sensors enclosed in patches or bandages, or in items that can be worn, such as a ring or a shirt. They take advantage of hand-held units to temporarily store physiological data and then periodically upload that data to a database server via a wireless LAN or a cradle that allow Internet connection. The data sets recorded using these systems are then processed to detect events predictive of possible worsening of the patient's

Well, this is the same case with wearable's in electrical engineering: they are literally lifesavers as well. An excellent example is Proxxi bracelets (known as Voltage) for electrical engineers with a sensor that vibrates if it gets too close to high-voltage electricity. Voltage is a wrist-worn voltage sensor that detects energized equipment and notifies the user of danger.

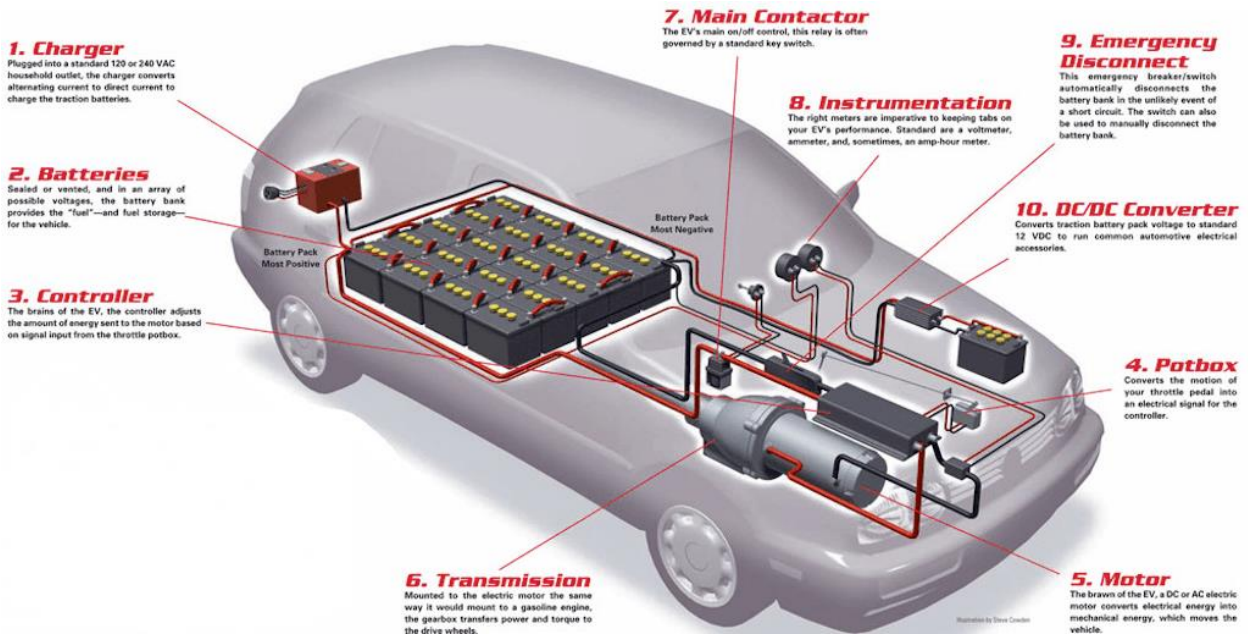
Data is sent to the cloud and projected on a dashboard. Furthermore, wearable devices are being developed to authenticate access to electrical machinery, provide communications information use of mobile phones.

Prof. Rahul Abhyankar

Working of Battery Electric Vehicle

Battery electric vehicles, or BEVs, use electricity stored in a battery pack to power an electric motor and turn the wheels.

When depleted, the batteries are recharged using grid electricity, either from a wall socket or a dedicated charging unit. Since they don't run on gasoline or diesel and are powered entirely by electricity, battery electric cars and trucks are considered "all-electric" vehicles. When driven, BEVs don't produce tailpipe pollution-they don't even have a tailpipe. However, the electricity they use may produce heat-trapping gases and other pollution at the source of its generation or in the extraction of fossil fuels. The amount of pollution produced depends on how the electricity is made. In the United States, battery electric cars charged off the dirtiest coal-dominated grid still produce less pollution than their gasoline-powered counterparts. BEVs powered by renewable energy sources like wind or solar are virtually emission-free. Not using gasoline or diesel also means that battery electric cars are significantly cheaper to fuel than conventional vehicles. Exact comparisons depend on the vehicle model and fuel prices, but driving a BEV can save drivers over $1,000 dollars in gasoline money.

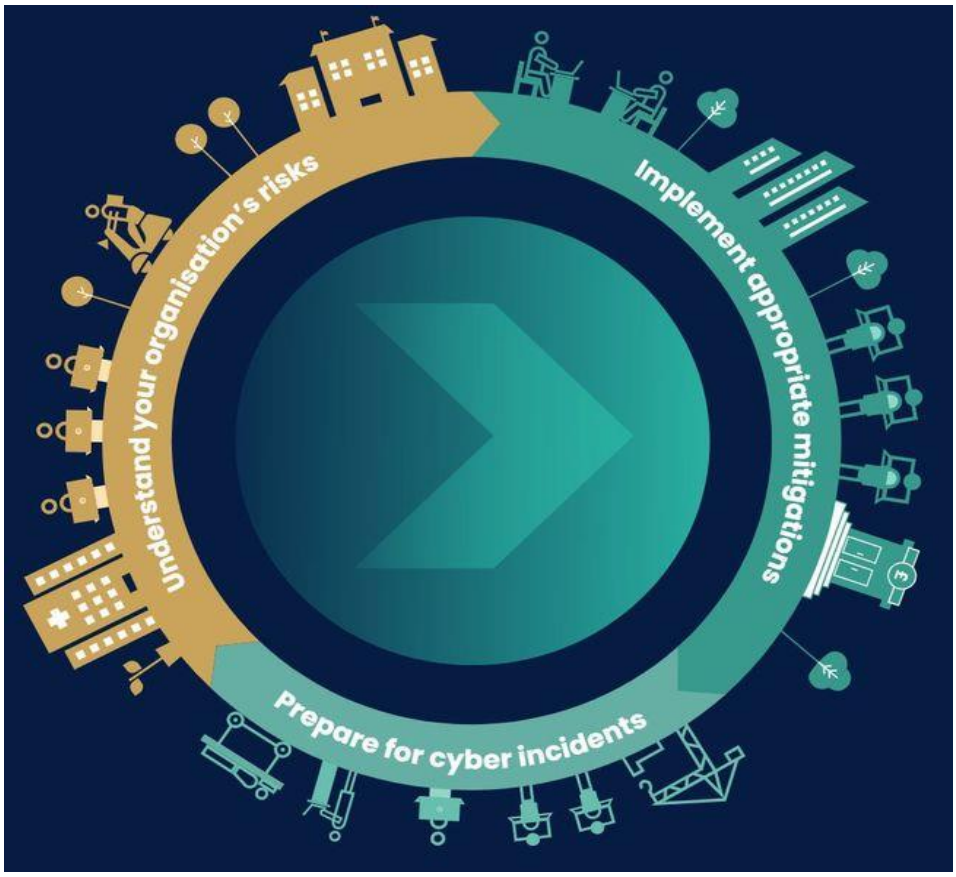


Prof. Sunil Suknale

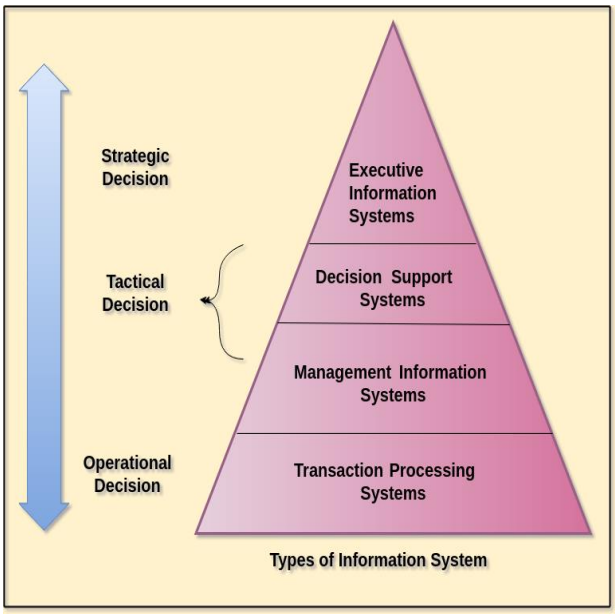
Cyber security

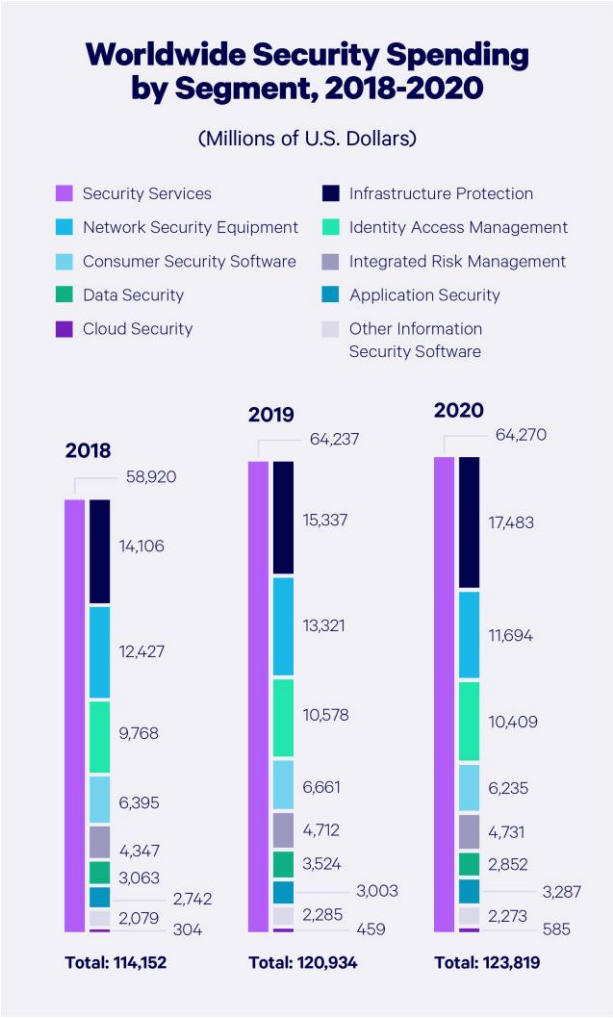
The protection of essential infrastructure is a major responsibility for every country, and the power sector is no exception. The security of industrial control systems has become highly significant as a result of the convergence of electrical, information, and operational technologies in a smart grid. The reliability of the power system infrastructure is directly determined by the security of the information infrastructure. Availability, confidentiality, integrity, and accountability are all important aspects of smart grid security. By preventing denial of service (DoS), falsified data injection, spoofing, and privilege escalation, these goals can be met.

Prior to the introduction of micro grids, industrial control system security was restricted to the mitigation of cyber security risks. However, today's reality necessitates the security of important cyber assets, which include but are not limited to electric utility substations and control centres, as well as load dispatch centres. As a result, the term "cyber-physical security" perfectly encapsulates the present situation.



Cyber assets, physical assets, and human resources comprise up the electric power grid. Failures might arise from cyber attacks, physical attacks, or discontent human resources in such a cyber physical-human environment.





Aurora Vulnerability (2007), Stuxnet (2010), and Shamoon (2012) attacks have demonstrated the weakness of industrial control systems to cyber attacks, demonstrating that they are neither resilient nor robust. The electricity system is also more vulnerable to attacks due to the use of standard IT components and IP-based connectivity.

Cyber-attacks could be the consequence of human error or deliberate attempts to breach a microgrid's large number of attack routes. If one system component or communication line is compromised, others may be affected as well. A hijacked vendor with access to system breakers may open and close the microgrid, connect to it, or isolate it from the distribution substation and broader grid. Despite the fact that such vulnerability had been reported for several weeks, only a few suppliers have revealed any remedy plans. Cyber-attacks can range from the disruptive and damaging, such as distributed denial of service (DDOS), defacing bill-payer websites, causing damage to automated modules, or causing 'bricked' meters, to life-threatening events. Because of their lower protection, entry gates through non-critical loads are usually simpler targets for malicious attacks. Because of their lower load criticality and cost concerns, smart household devices have fewer protective controls, making them easier to attack.

Prof. Ritesh Chavan