4th International Conference on New Frontiers of Engineering, Management, Social Science and Humanities
(IEI, Chandigarh) Institution of Engineers, India, Chandigarh
12th-13th May 2019 www.conferenceworld.in ISBN : 978-93-87793-88-0

IOT & ITS FACINATING APPLICATION IN SMART GRIDE TECHNOLOGY

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Abstract:

A smart grid is an electrical grid which include the variety of operational and energy measures including smart meters, smart appliances, renewable energy resources and energy efficient resources. Electronic power conditioning and controlling of production and distribution of electricity are important aspect of smart grids it mainly include smart generation, smart transmission , smart distribution & smart utilization.. Nowadays, the main communication form on the Internet is human-human..The Internet will become to the Internet of Things. This technology can be used in development of smart grids. Research and development in smart grid come up with new technology to make human life easier. This paper gives a strong idea about various technologies and standards for smart grid. This paper represent the clear idea about smart grid and new concept like, electric vehicle, automatic electric vehicle charging on roads.

Keyword: ***RFID, AMI, Smart Meter, Communication Topology, IoT, EMS***

Introduction: The smart grid has emerged in the last decades as a promising area of research and evaluation, ranging from futuristic academic concepts to short-term deployable functionality and associated business models. A new concept of next generation electric power system that will feature innovative advanced configurability, reactiveness, and self-management. The smart grid is a modern electric power grid infrastructure for improved efficiency, reliability and safety, with smooth integration of renewable and alternative energy sources, through automated control and modern communications technologies [1], [2].

In India electric utilities are planning to deployed smart meters on the pilot basis. There are seven ongoing pilot projects and various working group like ISGF,BIS (Bureau of Indian Standard) are

working and giving information about protocol and technologies. Smart Metering Architecture (SMA)/Advance metering infrastructure (AMI) [3] is a key task in the smart Grid [4],[5]. In such a system, each power user is equipped with a smart meter enabling two-way communications back to the utility company, as well as variable tariffs, outage monitoring, prepayment and remote disconnect.

This paper will provide detailed survey on smart metering communication and standards, energy management system, home area network and IOT technologies. Radio frequency identification (RFID) has been labeled as a replacement of bar code, but RFIO system can do much more than that. RFID has already had some valuable applications in retail ,health-care, facilities management and provides a strong support for the Internet of Things. [6],

In recent years, Smart Grids (SGs) have gained increasing attention not only from the research community but also from the public at large. What makes a grid "*smart*" is the added intelligence including two-way communication, sensing, and advanced control and management capabilities. This allows a grid to not only detect and react to changes timely and autonomously but also be able to maintain high level of efficiency, reliability, and quality of service. In this context, the **Internet of Things (IoT)** is considered as the key technology to enable the transformation of a traditional grid to an Smart Grid [7], [8], [9].

IOT Technology:

The IoT has the prospective to alter the methods of various innovative services and applications, such as observing real-time things, search engine for things *etc.*, and also work with their communication and interaction.

The Internet of Things is a vision that includes several technologies like Information Technology, Nanotechnology, Biotechnology and Cognitive Sciences. The rapid increase in the storage capacity and processing power of the devices, global connectivity, miniaturization and self-determining behavior and the capability of devices to connect and to sense.

Functions of Smart Grid Components:

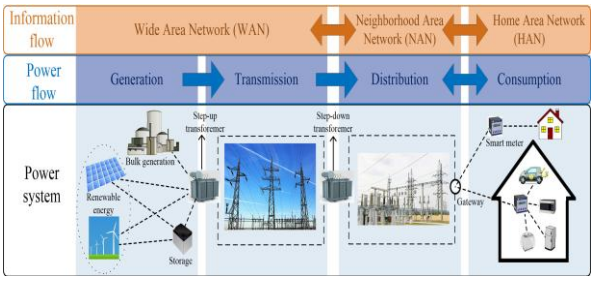


Fig.1. Smart grid architecture presenting power systems, power flow and information flow

Smart Generation: It involves the energy production, automatic voltage maintenance, automatic power factor standards based on feedback from the multiple points in the grid. It also involves the low carbon power generation like wind turbine, concentrating solar power system, photovoltaic panels.

Storage Component: The smart grid system involves the renewable as well as non-renewable power generation system so that it is important to find the way to store the generated energy for lateral

ISBN : 978-93-87793-88-0

use. The smart grid storage technology includes pumped hydro, advance batteries, flow batteries, compressed air, super conducting magnetic energy storage, super capacitors and flywheels.

Transmission Subsystem Components : The transmission system involves the different types of the sensors, communication technology, real time monitoring, microprocessor based relay, automatic circuit breakers, for developing the smart transmission functionality.

Smart Metering Technology: Smart meter is known as an advance energy meter which determines the energy used by the end-consumer and provides information to the utility company .Smart metering system is considered as an efficient method used for improvement in efficiency of energy consumers and power consumption patterns and helps in reduction of financial burden of electricity. It is developed by combining power system, telecommunication and other technologies

Intelligent Grid Distribution Subsystem Components: The distribution system is the final stage in the transmission of power to end users. It involves the automation using the smart meters, communication links between the consumers, and utility control, energy management component.

Demand Side Management Components: The DSM provides the reduced emission in fuel production. It involve the delivery with two information, smart energy billing and smart homes, demand side meters, customer interface for better energy efficiency. It involves the integrated communication equipments, intelligent electronic devices for controlling the home appliances and their control system.

Internet of Things: The IoT is defined as a network that can connect any object with the Internet based on a protocol for exchanging information and communication among various smart devices in order to achieve monitoring, tracking, management and location identification objectives.IoT also enables the integration of information flow, power flow and distribution flow in a SG.IoT sensing devices are generally comprised of wireless sensors, RFIDs, M2M (machine-to-machine) devices, cameras, infrared sensors, laser scanners, GPSs and various data collection devices. The information sensing in an SG can be highly supported and improved by IoT technology. TheIoT technology also plays an essential role in the infrastructure deployment of data sensing and transmission for the SG, assisting in network construction, operation, safety management, maintenance, security monitoring, information collection, measurement, user interaction etc.

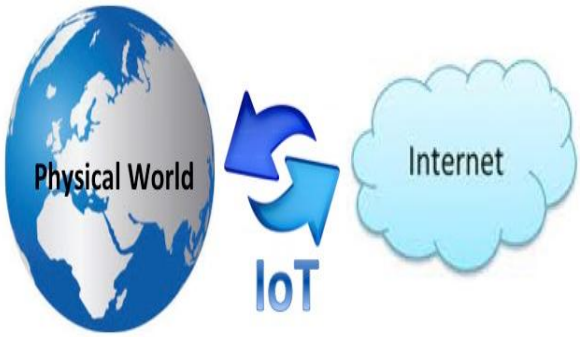


Fig.2 IoT For Power And Energy Systems:

ISBN : 978-93-87793-88-0

Power and energy systems are the major drivers of economic development. Providing access to clean and affordable energy has become a global priority and countries around the world are working towards achieving this goal.Internet of Things Energy (IoT-E) can revolutionize the current power and energy systems to meet the global energy demands. This is vital when it comes to energy conservation and costreduction. IoT improves the security and reliability of the power systems by communicating their health continuously , its helps prevent power outages as it communicates any irregularities in the power systems.

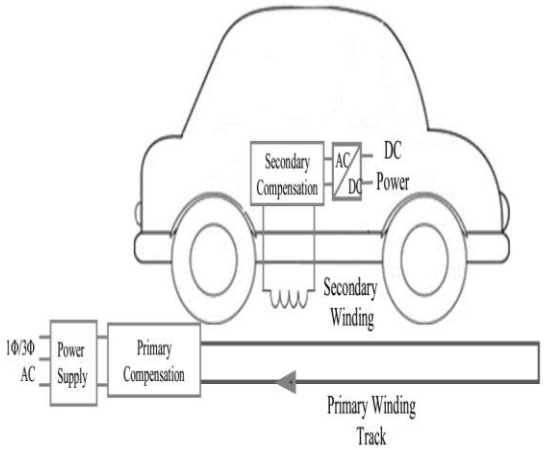
An Overview of Main Driving Factors for Smart Grids:

Technology Advancement	1) Smart Grid can be seen as the convergence of IT, telecom, and energy markets 2) New products and solutions through technology advancement 3) Significant amounts of venture capital investment in Smart Grid technologies and solutions
Higher Efficiency With the Help of Grid Optimization	1)Multiple integration points for intelligent grid hardware & software from transmission to consumption 2) Embedded sensors and monitoring capabilities 3) Deployment of advanced two-way communications networks 4) Growing Supply of Renewable and Distributed Power Generation and Storage 5) Network architecture to provide many forms of distributed generation and storage 6) Intelligent support is provided for various forms of renewable power sources
Advanced Customer Services	1) Robust, simple consumer energy management platforms 2) Networked devices within the "smart home" 3) New, efficient pricing models for electricity usage
21st Century Power Quality	1) Delivering power that is free from disturbances , interruptions and spikes

Concept of electric vehicle charging on roads

A Contactless Power Transfer System (CPT) refers to a system where power can be transferred electro-magnetically with no physical contact. The system consists basically of an air-core transformer with two windings. An electric vehicle can be charged via Contactless Power Transfer System, if it has pick-up winding installed below the chassis and is aligned with a primary winding connected to a power source. CPT systems can be used for charging EVs while being on idle state e.g. parked or at a traffic light. Moreover, an EV could be powered wirelessly while driving in case CPT systems are installed on the

roadway. This paper is focused only on charging while driving. The CPT system for on road charging consists mainly of long primary windings installed under the road and the secondary pick-up windings which are installed below the chassis of each electric vehicle. While the car is driving on top of the CPT system and the secondary becomes electromagnetically coupled with the primary, power is transferred to the EV.



On-road charging system for charging-while-driving Today's EVs consist mainly of an energy source system to provide the input power, an electric motor which converts the electric power to mechanical power sent to the wheels and the

controller which controls the power supplied to the motor and hence the speed [8]. When Contactless Power Transfer systems are used, additional power is induced to the EV system that can supply the EV motor and/or charge the EV battery. As a result, additional control is required in order to manage the power flow from the CPT system as well. Power from cpt system as well.

Conclusion:

This paper has been addressed an overview of IoT technology and its various uses in the smart grid technology. The 21st century has brought the great discoveries and advancement in the field of electrical engineering technology. This advancement also brought many challenges and required approaches to handle the challenges. The smart grid system based on IoT is one such approach. In this paper, we explain the concept and basic architecture of the smart metering system. It is also useful in the smart city technology which is going to be developed in India in future.

Acknowledgment:

Feeling great pleasure to present the paper presentation entitled as **"IOT and its fascinating application in smart grid technology",** but it would be unfair on our part if we do not acknowledge efforts of the people without the support of whom this work would not have been a success. Very first I am greatly thankful to my respected paper work coauthors, HoD **Prof. S. S. Dawange , of Electrical Engineering Department** for permitting me to use the all available facilities for successful work of paper. I would like to express my sincere gratitude to respected **Prof. A. R. Mirikar, Principal of Sanjivani K. B. P. Polytechnic, Kopargaon** for finding out time and helping us in this paper

presentation work. Last but not least I wish to express my gratitude to **my loving parents, friends** and all well-wishers for their moral support during completion of this work.

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