

## SMART GRID - It's SCOPE AND FUTURE IN INDIA

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**Abstract:-** The present power grid using the technology of 1970, but are connected to increase with the progress in different concept of power generation, problems with the power outages and theft, and also due to the demand, we need a modernized grid to fit the needs of the customers even in the to take the situation in claim hype, what can be called "Smart Grid". The Smart Grid performs various functions, so that it increases network stability, reliability, efficiency and ultimately reduces the conduction losses. The Smart Grids are the two-way processing power of the consumers who may have distributed generation. Various technologies such as sensors and measurement, use of advanced components are used for the successful functioning of the network. Confronted in this paper, Smart Grid, its features, technologies in smart grid used, implementation and challenges of Smart Grid in India are discussed.

**Keywords:-** Scope and future in India, functions, challenges and implementation in India.

### I. INTRODUCTION TO SMART GRID

A smart grid delivers electricity from suppliers to consumers using two-way digital technology to control appliances at consumers homes to save energy, reduce cost and reliability and transparency. It is capable of assessing their health in real-time, the prediction of their behavior, predictive behavior, adaptation to new environments, handling of distributed resources,

stochastic demand and the optimal answer to the smart device. It is a tool, the power company to you by focusing on the changing real business drivers, cost containment, end-to-end power delivery control and a secure infrastructure. The grid is as observability node with data integration and analysis have the advances in system operation and control support. These include power delivery and the high integration of strategic planning utility functions. The existing distribution systems and use techniques and strategies that are old and there is limited use of digital communication and control technology. In order to achieve improved, reliable and economical power delivery flow of information and ensure integrated communication proposed. The smart grid with smart functions, it is expected to process self-correction, reconfiguration and recovery, and provide able loads and randomness of market participants in real time while creating complex interactive behavior with smart devices, communication protocols, standard and smart algorithms to achieve complex interaction with Smart communication and transport system.

#### A. Characteristics of Smart Grid

1. **Self-healing:-** A grid, which is able to rapidly detect, analyze, respond and restore from perturbations
2. **Empower and Incorporate the consumer:-** The ability to incorporate consumer equipment and behavior in the design and operation of the grid.
3. **Tolerant of Attack:-** A grid that mitigates and

stands resilient to physical and cyber security attacks.

**4. Provides power quality needed by 21<sup>st</sup> century users:-** A grid that provides a quality of power consistent with consumer and industry needs.

**5. Accommodates a wide variety of generation options:-** A grid that accommodates a wide variety of local and regional generation technologies (including green power).

**6. Fully enables maturing electricity markets:-** Provides competitive markets for those who want them.

A smart grid can be used as a coherent system of information and communication technologies and control systems for the automation and business processes across the entire power sector comprises electricity generation, transmission, distribution and consumers interact are defined. The idea of a smart grid is to make the existing network infrastructure as efficiently and reliably as possible, by the use of intelligence and automation. Secure communications, standard protocols, data management and efficient architecture that can facilitate the exchange of data, some of the most important questions for the implementations of the smart grid in India.

## II. INDIA TOWARDS SMART GRID

A "smart grid" is a concept for transforming a power grid, with the modern communication, automated checks and other forms of information technology. It integrates new, innovative tools and technologies of generation, transmission and distribution to home appliances and equipment. The urgency for Smart Grids in India arises from the challenges that the industry is currently in front. India operates the third largest transmission and distribution network in the world, still faces a number of challenges, such

as: inadequate access to electricity supply shortages (peak and energy), high network losses, poor quality and reliability and rampant theft. The development towards Smart Grid would address these issues and to transform the existing network in an efficient, reliable, safe and less restricted grid that would help, access to electricity for all. Smart Grid integrated energy infrastructure, processes, devices, information and markets a coordinated and collaborative process that generates energy, distributed and can be used effectively and efficiently. A smart grid delivers electricity from suppliers to consumers using two-way digital technology to control appliances at consumers homes to save energy, reduce costs and increase reliability and transparency. It overlays the electricity distribution grid with an information and net metering system. Power travels from the power plant to your house through an amazing system called the power grid. As a modernized electricity network is being promoted by many governments, including the Government of India as a way of addressing energy independence were, global warming and emergency resilience issues.

Demand Side Management (DSM) is essential for an optimized and efficient use of electricity. Given limited resources, the main problem DSM is in the Indian system, where the demand is the identifies of the available generation, leading to reductions inevitably invite. DSM is the implementation of measures that effectively electricity to help the customers by using their peak load pattern. DSM can be achieved by:

1. Development and promotion of energy efficient technologies.
2. Improving the efficiency of various end use through increased energy utility correction leaks, system conversion. losses, etc.
3. Demand management through the introduction of soft options like higher prices during peak periods, at preferential rates during off-peak

season rates, interruptible tariffs, etc. Advent of smart grid are performed for Indian markets for future;

- 1.Data management system that includes data standards and data management.
- 2.Secure Communications and standard protocols.
- 3.Retail player rising priorities and introduction to the services on the basis of network quality.

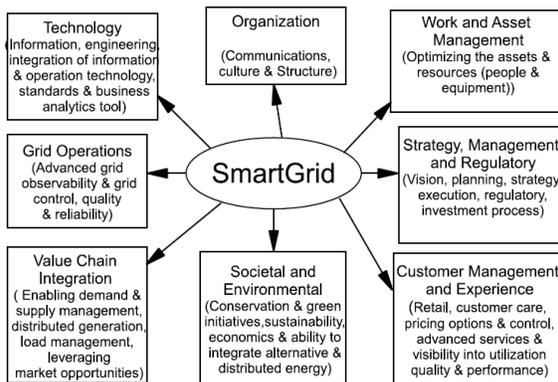


Figure 2: - Logical Domains and important elements of the Smart Grid

There are several companies who take the initiatives for smart grid in India:

- a).Crompton Greaves smart grid initiatives.
- b).North Delhi Power Limited (NDPL) Smart Grid initiatives.
- c).Bangalore Electricity Supply Company.

### III. TECHNOLOGY IN SMART GRID USED

*1.Integrated communication:* - Some messages are up to date, but are not uniform because they developed in an incremental fashion and not fully integrated. In most cases, data via modem instead of direct network connection to be collected. To enable integrated communication for real-time control, information and data exchange to optimize system reliability, asset utilization and security.

*2.Smart meter:-* A smart grid replaces analog mechanical meters with digital meters that record usage in real time. Smart meters are similar to Advanced Metering Infrastructure meters and a communication path extending from generation plants to the power grid (smart socket) and other smart grid-enabled devices.

Technology	Spectrum	Data Rate	Coverage Range	Applications	Limitations
GSM	900 - 1800 MHz	Up to 14.4 Kbps	1-10 km	AMI, Demand Response, HAN	Low data rates
GPRS	900 - 1800 MHz	Up to 170 kbps	1-10 km	AMI, Demand Response, HAN	Low data rates
3G	1.92-1.98 GHz 2.11-2.17 GHz (licensed)	384 Kbps-2 Mbps	1-10 km	AMI, Demand Response, HAN	Costly spectrum fees
WiMAX	2.5 GHz, 3.5 GHz, 5.8 GHz	Up to 75 Mbps	10-50 km (LOS) 1-5 km (NLOS)	AMI, Demand Response	Not widespread
PLC	1-30 MHz	2-3 Mbps	1-3 km	AMI, Fraud Detection	Harsh, noisy channel environment
ZigBee	2.4 GHz- 868 - 915 MHz	250 Kbps	30-50 m	AMI, HAN	Low data rate, short range

Table 1:- Communication technologies of Smart Grid

*3.Advanced components:-* Technologies within these broad R & D categories include: flexible alternating current transmission system devices, high voltage direct current, first and second generation superconducting wire, high temperature superconducting cable, distributed energy generation and storage devices, composite conductors, and "intelligent" devices.

*4.Reduced transmission and distribution line losses:-* About 5% of the electricity generated is lost during transmission and distribution. Smart Grid enables utilities to reduce transmission and distribution losses without expensive updates the structure of the network infrastructure.

### IV. CHALLENGES SMART GRID IN INDIA FACED

*1.Environmental Impact:-* Smart Grid development in a very fast pace because of the wide interest of politics and utilities in reducing the adverse impact that happens the energy consumption on the environment. Since the

maximum generation today in greenhouse gas emissions, smart grids reduces the results of air pollution and plays a significant role in the fight against global climate change issue.

2 *Cost*:- The ability to bypass the cost of the plant and network expansion is a great advantage, both the utilities and customers and smart grids will not reduce fund expansion, of course; therefore invested heavily to set up a connection between the customer and the smart grid required. Energy efficiency would be the second priority in order to save the costs in terms of customer.

3 *Theft Control*:- This is not a problem in developed countries such as USA, but in developing countries like India, where people a glimpse of the grid and higher poverty rate, the electricity theft is quite common. With the development of smart grid electricity theft can be controlled to a greater extent, thereby improving the efficiency of our distribution system. So Grids to create higher quality and reliable power supply, and it will be less power outages.

## V. NEED FOR SMART GRID IN INDIA

According to the Ministry of Energy, the transmission and distribution losses in India among the highest in the world, averaging 26 percent of total electricity production, and as high as 62 percent in some states. These losses do not include non-technical losses such as theft etc.; If these losses are present, the average loss of 50 percent. Some of the technical deficiencies in the Indian power grid are - it is a poorly planned distribution network, there is an overload of the system components, it is the lack of reactive power support and regulation services. India is rapidly venturing into renewable energy (RE) resources such as wind and solar. The government will also provide incentives for solar power generation in the form

of subsidies for various solar applications. A gap of renewable raw materials is that their supply may be interrupted, ie the offer may only during a certain time of the day, these conditions can not be controlled be harnessed. For this reason, it is necessary to have a grid that is very adaptable (in terms of supply and demand) to have. Therefore, the opportunities for the development of smart grids in India are immense, like a good power supply is one of the most important infrastructure requirements to support the overall development. Current Smart Grid activities in India are:

1. DRUM India - Distribution Reform upgrade management.
2. Four pilot sites (North Delhi, Bangalore, Gujarat, Maharashtra).
3. Smart Grid Vision for India.
4. Smart Grid Task Force - headed by Sam Pitroda.
5. Project BESCOB- Bangalore- integration of renewable and decentralized energy sources in power grid.

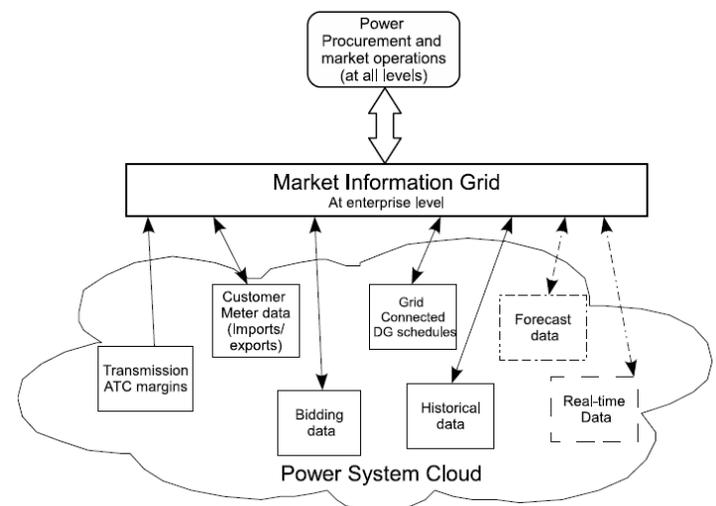


Figure 3: - All levels of future Indian market information grid

## VI. CONCLUSION

With the growing world population and thus increasing demand and the need for resource-depleting intelligent and efficient in our energy

consumption has to have become an imperative. Implementation of the smart grid concept would go a long way in solving many of today's energy issues and problems. The entire network needs to be improved to meet the requirements, ie transmission and distribution level requirements. Research continue to find to make all the desired properties possible the optimal solution and new technologies. Through the use of smart grid technology, energy can be used up to and would not be wasted. This technology also helps to save the earth from global warming. It refers to the modernized version of the earlier traditional methods of energy supply. Smart meters, Smart Homes, Smart City and so would make the Smart Grid. As the new technologies would be invented and strengthened existing ones to the desired specifications meet the Smart Grid would be reality and change the whole pattern of energy in the world.

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