

## Chapter 2

# Role of Smart Metering and Implementation Issues in Smart Grid

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### **ABSTRACT**

*Smart grid provides the digital technology that allows for two-way communication between the utility and the customers. The smart grid consists of controls, computers, automation, and new technologies and equipment working together. The smart grid will move the energy industry into a new era of reliability, availability, and efficiency with economic and environmental health. A smart meter plays a major role in the smart grid and it is an electronic device that measures and records the energy consumption. It enables two-way communication between the meter and the supplier through advanced metering infrastructure (AMI). The mode of communication is enabled by either wireless or wired. The wireless communication includes Wi-Fi, wireless mesh networks, Zig Bee, cellular communications, and low power range Wi-Fi. This chapter deliberates about the evolution of electricity metering, major components of smart meter, communication infrastructure and protocols for smart metering, demand-side integration, recent developments, issues faced and solutions, merits and demerits.*

## **1. INTRODUCTION**

Smart grid provides the digital technology that allows for two-way communication between the utility and the customers. The definition for smart grid as per the European technology platform is “A Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies” as discussed in European Commission (2006). For the implementation of the smart grid, it requires information and communication technologies, sensing, measurement, control and automation technologies, power electronics and storage devices deliberated by Ekanayake et al (2012). Information and communication technologies are used to provide two-way communication between the different components of the power system and the load. Intelligent Electronic Devices (IED), Phasor Measurement Unit (PMU), Wide Area Monitoring, Protection and Control (WAMPAC) and smart meters are the most important components used in sensing, measurement, control and automation technologies respectively. It provides advanced protection, high security and less energy consumption. Power electronics and storage devices part deals about the different types of high voltage transmission and energy storage devices for reliable and flexible operation of the power system reflected by Ekanayake et al (2012).

Smart meters play a major role in the smart grid at the customer side. Sensors and sensor networks are the main parts of smart devices and smart metering. Generally, sensors are located at different parts of the grid. Sensors play an important role in remote monitoring and demand side management. As the sensors are located at all the parts of the grid, it is able to measure/monitor temperatures, operation of grid devices, power quality disturbances and detect outages. This process helps the control centers to receive accurate and actual condition of the grid.

A smart meter is an electronic device that measures and records the energy consumption. It also communicates the measured data into the central system frequently. It enables two-way communication between the meter and the supplier through Advanced Metering Infrastructure (AMI). The mode of communication is enabled by either wireless or wired. The wireless communication includes Wi-Fi, wireless mesh networks, Zig Bee, cellular communications and low power range Wi-Fi.

This chapter is about the evolution of electricity metering, major components of smart meter, communication infrastructure and protocols for smart metering, demand side integration, recent developments, real time implementation, issues faced and solutions, merits and demerits.

## **2. EVOLUTION OF ELECTRICITY METERING**

Electricity meters named as energy meters are used to record the energy supplied to the customer for over a duration and most of these meters are accumulation type. Accumulation meters located in the customer side are read manually to calculate the bill for energy consumed over a period. Nowadays the customers are started to use more advanced meters due to the advancements in the technology. These advanced meters are very much useful to identify the energy consumed by a particular customer for a specific period and the pattern of energy consumption. Based on the pattern the energy suppliers will design the tariff amount for a customer. It will in turn help the customer to analyze the energy consumption pattern and utilize the energy accordingly. Smart meters are still having more features like two-way communication, real time energy usage, bill price and control over the electrical appliances.

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