Advanced Metering Infrastructure

What is Advanced Metering Infrastructure?

AMI (Advanced Metering Infrastructure) is the collective term to describe the whole infrastructure from Smart Meter to two way-communication network to control center equipment and all the applications that enable the gathering and transfer of energy usage information in near real-time. AMI makes two-way communications with customers possible and is the backbone of smart grid. The objectives of AMI can be remote meter reading for error free data, network problem identification, load profiling, energy audit and partial load curtailment in place of load shedding.

Building Blocks of AMI

AMI is comprised of various hardware and software components, all of which play a role in measuring energy consumption and transmitting information about energy, water and gas usage to utility companies and customers. The overarching technological components of AMI include:

- ***Smart Meters-*** Advanced meter devices having the capacity to collect information about energy, water, and gas usage at various intervals and transmitting the data through fixed communication networks to utility, as well as receiving information like pricing signals from utility and conveying it to consumer.
- ***Communication Network:*** Advanced communication networks which supports two way communication enables information from smart meters to utility companies and vice-versa. Networks such as Broadband over PowerLine (BPL), Power Line Communications, Fiber Optic Communication, Fixed Radio Frequency or public networks (e.g., landline, cellular, paging) are used for such purposes.
- ***Meter Data Acquisition System-*** Software applications on the Control Centre hardware and the DCUs (Data Concentrator Units) used to acquire data from meters via communication network and send it to the MDMS
- ***Meter Data Management System (MDMS):*** Host system which receives, stores and analyzes the metering information.

1. ***Home Area Network (HAN) -*** It can be an extension of AMI deployed at consumer premises to facilitate the communication of home appliances with AMI and hence enable a better control of loads by both utility and consumer.

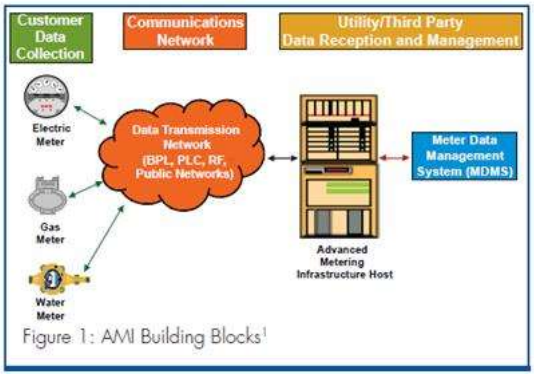

Figure-1: illustrates the components that make up AMI, including advanced electric, gas and water meters a data transmission network and a data management system

Benefits

The benefits of AMI are multifold and can be generally categorized as:

- ***Operational Benefits*** – AMI benefits the entire grid by improving the accuracy of meter reads, energy theft detection and response to power outages, while eliminating the need for on-site meter reading.
- ***Financial Benefits*** – AMI brings financial gains to utility, water and gas companies by reducing equipment and maintenance costs, enabling faster restoration of electric service during outages and streamlining the billing process.
- ***Customer Benefits*** – AMI benefits electric customers by detecting meter failures early, accommodating faster service restoration, and improving the accuracy and flexibility of billing. Further, AMI allows for time-based rate options that can help customers save money and manage their energy consumption.
- ***Security Benefits-***AMI technology enables enhanced monitoring of system resources, which mitigates potential threats on the grid by cyber-terrorist networks.

Challenges

Despite its widespread benefits, deploying AMI presents three majors challenges that include high upfront investments costs, integration with other grid systems, and standardization.

1. ***High Capital Costs:***A full scale deployment of AMI requires expenditures on all hardware and software components, including meters, network infrastructure and network management software, along with cost associated with the installation and maintenance of meters and information technology systems.

- ***Integration:*** AMI is a complex system of technologies that must be integrated with utilities' information technology systems, including Customer Information Systems (CIS), Geographical Information Systems (GIS), Outage Management Systems (OMS), Work Management (WMS), Mobile Workforce Management (MWM), SCADA/DMS, Distribution Automation System (DAS), etc.
- ***Standardization:*** Interoperability standards need to be defined, which set uniform requirements for AMI technology, deployment and general operations and are the keys to successfully connecting and maintaining an AMI-based grid system.

AMI in the Indian Context

Modernizing India's grid system by investing in AMI promises to mitigate a number of strains placed on the grid due to growing demand for electric, gas and water resources. In particular, AMI will improve three key features of India's grid system including:

1. ***System Reliability:*** AMI technology improves the distribution and overall reliability of electricity by enabling electricity distributors to identify and automatically respond to electric demand, which in turn minimizes power outages.

1. ***Energy Costs:*** Increased reliability and functionality and reduced power outages and streamlined billing operations will dramatically cut costs associated with providing and maintaining the grid, thereby significantly lowering electricity rates.

1. ***Electricity Theft:*** Power theft is a common problem in India. AMI systems that track energy usage will help monitor power almost in real time thus leading to increased system transparency.

References

Craig Glazer, "Smart Grid Regulatory Challenges and Opportunities (http://www.sari-energy.org/PageFiles/What_We_Do/activities/smart_grid_vision_for_india_power_sector_june_2010/Session_2-Policy_Regulation_and_Standards/Smart_Grid-Regulatory_Challenges_and_Opportunities.pdf)," PJM

www.SmartGrid.gov (http://www.smartgrid.gov/)

U.S. Aid, "The Smart Grid Vision For India's Power Sector, (http://www.sari-energy.org/PageFiles/What_We_Do/activities/smart_grid_vision_for_india_power_sector_june_2010/White_paper-Th_%2520Smart_Grid_Vision_for_India/White_Paper_on_the_Smart_Grid_Vision_for_India_-_final.pdf)" (March 2010).

United States Department of Energy, "Grid 2030: A National Vision for Electricity's Second 100 Years (http://www.climatevision.gov/sectors/electricpower/pdfs/electric_vision.pdf)," (July 2003).

United States Department of Energy, http://energy.gov/oe/technology-development/smart-grid (http://energy.gov/oe/technology-development/smart-grid)

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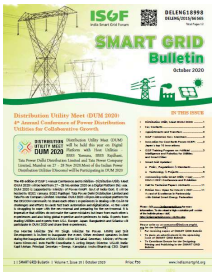

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