Automatic Meter Reading and Advanced Metering Infrastructure

Automatic Meter Reading (AMR) developed by ST Electronics (Info-Comm Systems) deploys the latest technology to automatically collect data from water, electricity or gas meters and transfers the data to a central database for billing and analysis. This solution helps reduce field trips required to collect data and provides utility users with better control of their electricity and gas usage, and water consumption.

Radio Frequency AMR
ST Electronics’ AMR operation is based on Radio Frequency (RF) and is available in various forms to suit different operational requirements. The more common types are the handheld, mobile, and fixed network-based types of AMR. There are also two-way and one-way RF systems that can use licensed and unlicensed RF bands.

For the one-way “bubble-up” or continuous broadcasting type of system, the transmitter broadcasts readings continuously every few seconds. This means the reading device can be a receiver only, and the meter AMR device a transmitter only. Data goes one-way, from the meter AMR transmitter to the meter reading receiver.

In a two-way or “wake up” system, a radio transceiver sends a signal to a particular transmitter serial number, waking it up from a dormant state to transmit the data. The meter-attached transceiver and the reader transceiver both send and receive radio signals and data.

There are also hybrid systems that combine the one-way and two-way technologies, using one-way communication for reading and two-way communication for programming functions.

RF-based meter reading usually eliminates the need for the meter reader to enter the property or home, or to locate and open an underground meter pit. The utility agency enjoys cost efficiency through increased speed of reading, lower liability risks from entry into private properties, and also benefit from fewer missed readings due to inaccessibility to meters.

Fixed Network
Fixed Network AMR deploys a network that is permanently installed for meter reading. Through a series of antennas, towers, collectors, repeaters, or other permanently installed infrastructure, meter-reading data is automatically transmitted through AMR-capable meters to a central computer without the need for personnel on the field.

There are several types of network topologies that are used to transmit the meter data back to the central computer. Utility agencies are able to analyse the data to detect leakage, tampering and other abnormalities as the data is provided on a real time, or near real time basis. The Fixed Area Network-based AMR uses the latest technology in mesh networks where the meters act as repeaters to transmit data to nearby meters until it reaches the main data collector.

Advanced Metering Infrastructure
With the technological development of Fixed Area Network-based AMRs, a new concept known as “Advanced Metering Infrastructure” (AMI) was introduced. AMI combines communication networks with data (time-of-use and rate-of-usage) from smart meters for water or energy usage profiling, time-of-use billing, demand forecasting, demand response, rate-of-flow recording, leak detection, flow monitoring, water and energy conservation enforcement and remote shutoff. AMI is a new term coined to represent the networking technology of fixed network meter systems that go beyond AMR into remote utility management. The meters in an AMI system are often referred to as smart meters since they often use the collected data based on programmed logic.
Advanced metering systems provide benefits for utility agencies, retail providers and end users. Utility agencies benefit from increased efficiencies, outage detection, tamper notification and reduced labour cost as a result of automating readings, connections and disconnections. Retail providers are able to offer new innovative products in addition to customising packages for their customers. With the meter data readily available, more flexible billing cycles are available to their customers instead of strictly adhering to standard utility reading cycles. The timely usage information will allow end users to better manage their energy consumption and create more choices in terms of packages that best suit their needs.

Field-Proven Innovative AMR Solutions
For more than a decade, ST Electronics’ subsidiary, Telematics Wireless Ltd, has continuously engaged in the research and development of advanced AMR products and systems. Its ultra low power, miniature size, cost-efficiency and high performance AMR units are proven to be especially suited for integration with many types of water, electric and gas utility meters around the world.

One of the company’s recent achievements is a US$21.5m contract from Arad Technologies Ltd to supply AMR radio transceivers for Arad’s DIALOG 3G® AMR solutions. Today, more than three million AMR radio transceivers have been installed worldwide (For more details, refer to page 6).

The company offers a diversified line of products for the AMR market covering a wide range of utility meters [water, gas and electric], data collection methods [walk by, drive by, point to multi-point fixed networks, mesh networks and sub metering], network hardware (repeaters, data concentrators and gateways) and related communication technologies (frequency hopping, spread spectrum, frequency shift keying).

As a leading provider of AMR and AMI solutions, ST Electronics is capable of providing technologically-advanced solutions for the automatic monitoring of electricity, water and gas usage. With a growing global demand for smart grids and eco-enabling technologies, the company is poised to design and implement AMR/AMI solutions that are necessary to enable smart grid applications.

Field Area Network (FAN) for Typical Building Deployment
A typical mesh FAN deployment based on ST Electronics’ homegrown Tnet brand of mesh network products includes miniature mesh radio nodes that are integrated with smart meters, utilising DLMS/COSEM interfacing protocol. The mesh node is able to communicate with other neighbouring smart meters in the building or campus via radio frequency. The mesh networking protocol enables reliable two-way communication between various smart meters and between any meters and the Network Gateway. The protocols ensure self-construction, self-healing and redundant communication links, thus providing an exceptionally robust network. The defined AMI backbone of the building or campus is further interfaced with the WAN via the Network Gateway, enabling two-way communications between the MDMS and any smart meters in the system.

In October 2010, ST Electronics and Accenture were selected by Singapore’s Energy Market Authority to design and implement Phase 1 of its Intelligent Energy System (IES) pilot project. The IES pilot project will test and evaluate new applications and intelligent technologies for a smart grid to be deployed throughout Singapore. (For more details, refer to page 14-15)

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