

Chapter 27

Energy Management System Using Wireless Sensor Network

Ekata Mehul
eInfochips Pvt. Ltd., India

Rahul Shah
eInfochips Pvt. Ltd., India

ABSTRACT

Currently, there are global efforts being made for energy saving. Lot of efforts are being done exploring the generation of alternative resources of energy – also called renewable energies which includes solar, nuclear, water and wind, to name but a few. Besides investigations of renewable energies, a global attempt is also being made to save energy consumption and reduce carbon emissions. A need to have a comprehensive Energy Management System could not have been felt more by both businesses and individuals. This Chapter describes features required for a complete system of energy management focusing on Electrical Energy. The system is designed making use of wireless sensor network & standard protocols. Chapter will address firstly the theoretical aspects of energy management followed by the detailed model for Automatic Meter Reading concept. We will focus on the features of such an Energy Management System & limits our scope to the detailing of Automatic Meter Reading concept and design.

INTRODUCTION

In this era of global warming everybody needs to concentrate on the conservation of energy and other natural resources. Lot of invention is already being done in the direction of more production of energy; even the alternative methods are applied. But with all this also, the better & long term solution is to use them with caution, since we can not

take even single step without a bit of energy. And we already are aware of world moving towards energy & other natural resource crisis.

Businesses world-wide are now involved in saving energy consumption and reducing their carbon footprint. Lot of major companies viz. Suzlon (suzlon.com), Wipro, Schneider (schneider-electric.com) L&T, Meshnetics (meshnetics.com), to name the few have come up with their unique solutions and approaches to either save the energy or produce an alternative source of energy. But

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all these initiatives can bear results only when it is supported by a complete & comprehensive Energy Management System consisting of the all the features as listed below. Such energy management system will have immense opportunities for application in business, government and individual endeavors.

Today utilities like electricity, gas, water are being wasted in many more way. It is our responsibility towards the world to manage these resources efficiently. Technologies may contribute in reduction of energy and peak power consumption as well as to make a more efficient deregulated power market. Automatic meter reading, remote load control, etc are some of the examples of such technology. We try to figure out how to manage Electricity efficiently, conveniently and with lesser investment making it less costly as well.

Features Supported by Energy Management Systems:

- Remote collection of measured energy value: including kwa, kwh (Kilowatts per hour – energy usage), rms (revolutions – helps in measuring the energy usage), power factor, hourly consumption of energy and temperature, etc
- Tracking of complete energy usage at every fixed interval: Continuous tracking of energy usage can be done & plotting the energy usage with respect to time needs to be available.
- Tracking the tampering done with energy usage i.e. Outage Management: AMR communication capability will enable us to point out outage condition (Power out) with reduced response time and hence outage duration. Also the continuous tracking will help us quickly identify the tampering conditions.
- ON / OFF control of this energy supply which will indirectly enable wireless monitoring of energy consumption – Just on the single signal from the controller, the energy supply chain can be controlled. We need to have a feedback loop for the same, improving the energy efficiency
- Automated billing / Prepaid billing etc through web based interface / telephone network: Once the Remote reading is done, automated software for the Billing is used. We can even have prepaid billing implemented.
- Sub metering Solutions: the same automatic meter reading solution needs to be implemented with much lesser control.
- Usage of energy on demand i.e. demand side management: It means based on peak load demand we will offer different hourly prices for the customer which will enable customers to react according to change in prices of electricity. There are also some pricing schemes available which will try to manage peak load control by offering high pricing during Peak hours.
- Advanced Metering with Distribution Automation: Once the continuous tracking of the energy resources is done, this can be easily controlled using the software.
- Power quality control: Demand of good QoS can be monitored and can be provided dynamically. Once energy consumption data is available, it can be used for purpose of dynamic tariff management, dynamic load management, power quality monitoring, peak power consumption etc. and providing other value added services.
- Active load control/Load balancing/Load diagram, with information on every secondary substation load, the dispatcher can have more precise data about overloaded critical area and peak load as well, which enable us to take preventive measure before the dangerous situation. One of the driving forces for providing intelligent meter is load management because the only alternative for meeting the demand is to build new power plants.

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