M. COUMARANE
and
V. MANOHARAN

# Internet of things (IoT) role play in energy management system

*Internet of things (IoT) is the network of physical object-devices. IoT connects billion of devices via internet in the present network scenario. Interoperability, data exchange and communication features bring the devices in a network. IoT plays a vital role in energy management system (EMS). Online monitoring of remote energy meter through internet and sending SMS message to operator in case of power failure are the attractive feature of the EMS-IoT. Energy management system is the today need of the day in the context of energy security and global warming issues. Energy conservation and energy efficient measures are the key objective of energy management system.*

***Keywords:*** IOT; energy management, energy conservation, industrial internet of things.

## 1.0 Indroduction

In the developed countries 1% growth in GNP will register increase in energy consumption by 0.6%. However in India 1% growth in GNP will increase in energy consumption by 1.5%. The concept is not reached is root level in India. Globally, awareness and demands for energy conservation is on the rise amidst the growing demand for power consequent to raise in per capita consumption of energy. Energy conservation is the need of the hour to ensure bright future through sustained development. In India, about 600 million people are deprived of electrical energy and our conservation may light their homes

In recent days advanced technologies like internet of things (IoT) plays the role of bringing remote energy/power parameters into online monitoring and virtual display. This will be very much helpful in energy management and energy conservation measures. Energy conservation in any form will save ecology, environment, earth, future generation, other living being etc.,

Mr. M. Coumarane, Deputy Chief Engineer/Elect., Centre for Applied Research and Development (CARD), and Dr. V. Manoharan, General Manager, CARD and Disposal, NLC India Ltd, Neyveli. India. E-mail: couma_rane@yahoo.com

## 2.0 Internet of thing (IoT)

The internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to computer interaction [1]. The internet of things, in its most current version has been around for about 3-4 years.

Morphing from machine-to-machine technologies, the Industrial Internet of things is redefining traditional building
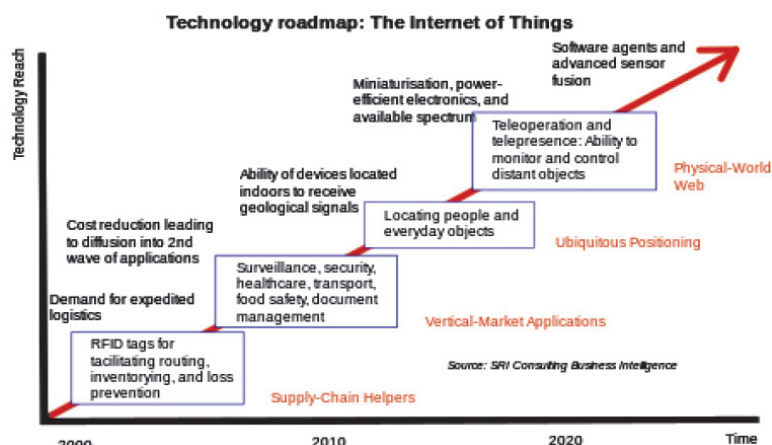


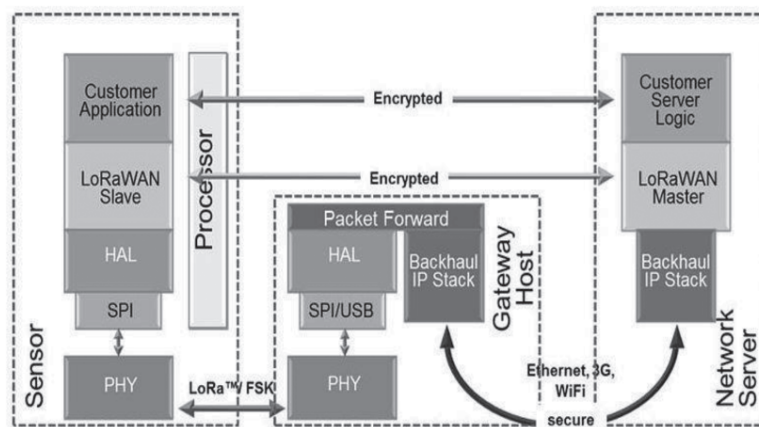Fig.1: Technology road map: the internet of things



Fig.2 Block diagram of internet of things (IoT) architecture

automation. Fuelled by a common network, (the Web/Cloud) and edge processing that is getting cheaper, faster and more powerful, the idea of incrementing everything in a building is catching on [2]. In most cases this new technology needs to live in a world where multiple generations of technology exist. The technology road map of internet of thing is shown in Fig.1) and IoT architecture block diagram is shown in Fig.2.

### 3.0 Energy management system

An energy management system (EMS) is a system of computer-aided tools used by operators of electric utility grids to monitor, control, and optimize the performance of the generation and/or transmission/or distribution system. The computer technology is also referred to as SCADA/EMS or EMS/SCADA. Energy management systems are also often commonly used by individual commercial entities to monitor, measure, and control their electrical building loads. Energy management systems can also provide metering and monitoring functions that allow facility and building managers to gather data and insight that allows them to make more informed decisions about energy activities across their sites. EMS process block diagram is shown in Fig.3 and EMS
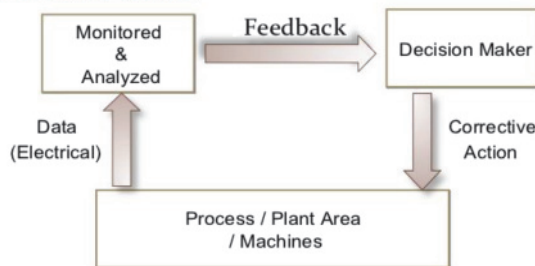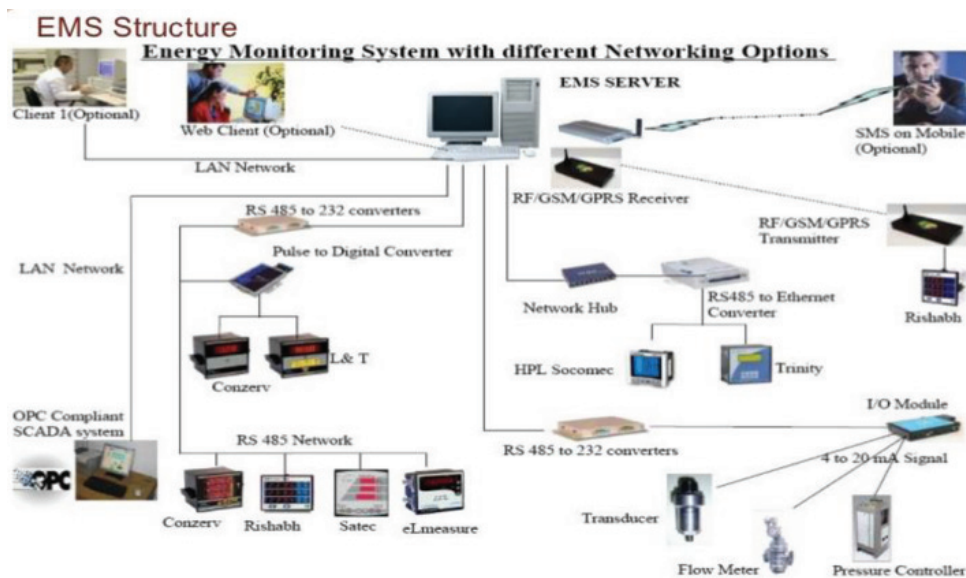


Fig.3: EMS process block diagram



Fig.4: EMS with different network options IoT case study at NLCIL-CARD



Fig.5: Advanced energy meter connection arrangement at NLCIL-CARD

network option is shown in Fig.4.

NLCIL-CARD implemented the IoT based energy management system. CARD-power supply and load distribution system connected three distribution transformer loading and power/energy parameters are monitored in online web display.

Useful data retrieval for selected parameter and period can be performed from Master report screen. All data are configured in a pattern display by means of SCADA software. Communication and IT play the major role in presenting data in an appropriate model and display. The advanced energy meter connection arrangement at site is shown in Fig.5.

Advanced energy metering system is comprised multi function meter (MFM), GPRS communication module and web server based SCADA system [3].

Internet of things (IoT) connect the physical device to Internet and establish the virtual scenario in display with text and graphical representation of data. MFM connected to power circuit with current and voltage sensors and sampling the data at every one minute interval.

MFM meter displays power and energy parameters like voltage, current, frequency, PF, kW and KWh and same it is displayed in web server based SCADA display through GSM/GPRS based communication module [1][5].

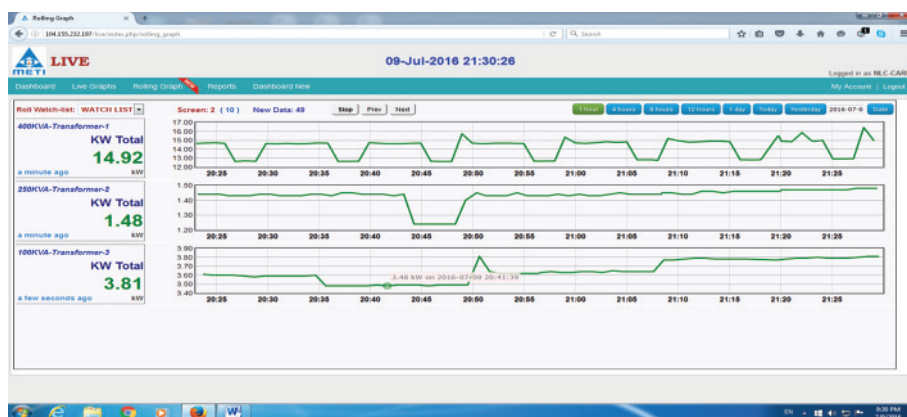The system screen shot picture of load profile is given in Fig.6 and master record screen is shown in Fig.7.
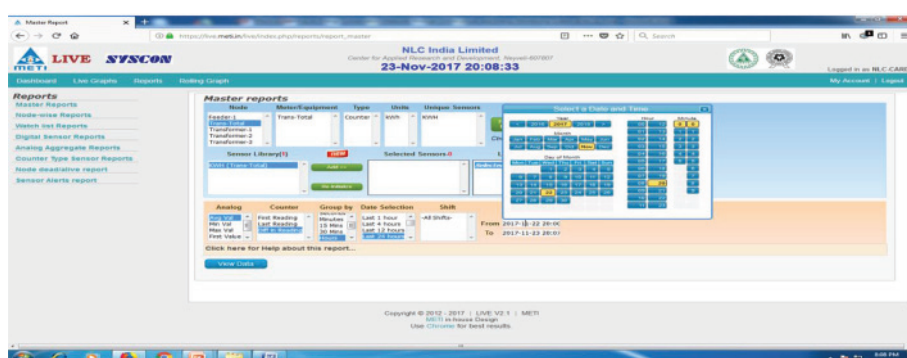
Fig.6: Load profile


Fig.7: Master report screen

## 4.0 Conclusions

Internet of things (IoT) connected advanced model of power and energy monitoring system is very useful in the context of energy conservation measures. It is assured that an effective planning can be done in the reduction of energy consumption based on the system recorded data and data analysis.

Day and night load pattern and peak hours, load profiles are verified and large quantity of Energy has been reduced based on internet of things (IoT) data exchanged from field EMS device to virtual display [4]. IoT role play is evident that attractive features and virtual display of the energy management system.

### References

1. Zhitao Guan, Jing Li, Yue Zhang. (2017): Achieving Efficient and Secure Data Acquisition for Cloud – Supported Internet of Things in Smart Grid. *IEEE Internet of Things Journal*. Pages: 1934–1944.

2. Tiany Song, Ruinian Li, Bo Mei. (2017): A Privacy Preserving Communication Protocol for IoT Applications in Smart Homes. *IEEE Internet of Things Journal*. Pages: 1844-1852.

3. Roy Pallavi, Kaushik Kaustav, Singh Pritam . (2017): GSM Based Energy Meter Reading System with Remote Cut-Off and GUI Application. *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering.* Vol. 6, Issue 6, June.

4. Modi Rakeshkumar. D1, Sukhadia Rakesh. (2017): P.IoT based Gateway for Electricity Energy Meter by using ZigBee, *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering.* Vol. 6, Issue 1, January.

5. Lanzisera S, Weber AR, Liao A, Pajak D, Meier AK. (2014): Communicating power supplies: Bringing the internet to the ubiquitous energy gateways of electronic devices. *IEEE Internet of Things Journal.* Apr; 1(2):153–60.