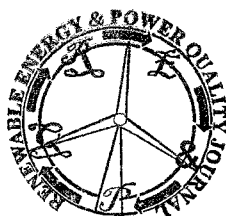


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## Smart meter based energy management system



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### Abstract.

The number of smart meters reached over 40 millions in Europe at the end of 2008<sup>1</sup>. Far beyond the simple energy metering, these devices enable companies to inform the customers, to control the load and to increase the energy consciousness.

The standardisation of the smart functionalities is in progress. The households for lack of knowledge and information do not care for the energy retrenchment.

New central software applications have been developed that can perform remote energy management functions through communication to the distributed smart meters (specific value calculation, trend monitoring, limit violation alarm, etc.). The paper gives an overview about the existing remote energy management systems and makes recommendations which functions would be useful in the Hungarian environment, too.

### Keywords

Energy management system, smart meters, public energy consumers

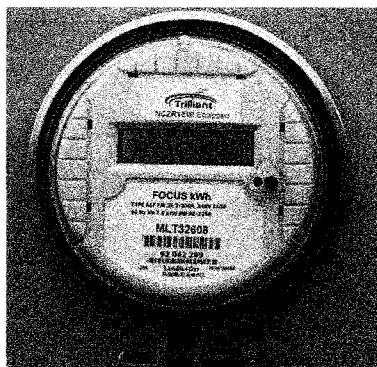


Figure 1. Trilliant smart meter<sup>2</sup>

### 1. Smart meters and their communication

The smart energy meter redeems the traditional Ferraris-wheel, electronic or digital meters. It has bidirectional communication capability for remote control and tariff based operation. The customer has up-to-date price, load and cost infos about gas-, water-, heat and electricity consumption. The smart meter is a basic end-user element of the smart grids, too.

The meters can have different communication tools:

a., The Zigbee network is one of the most widely used communication tools.<sup>3</sup> The ZigBee Smart Energy supports the energy meterings, as the Home Display, remote programming of thermostats, lighting and load management.

b., The Home Area Network (HAN) operates in wireless and on-the-wire mode, too (e.g. Power Line Carrier, or IEEE 802.15.4 wireless protocol). The main device communicates with all the meters in the building and the gateway keeps contact with the Neighborhood Area Network (NAN).

c., The WiMAX (Worldwide Interoperability for Microwave Access) is a scalable bandwidth alternative of other communication channels based on 802.11n standard.<sup>4</sup> Specifically serves the Intels and GE Energy's smart devices.<sup>5</sup>

On fig. 3. one can see the general, open smart communication system. Some Hungarian mobile telecommunication companies are going to develop their data transfer service in this structure. All the devices and communication methods can be integrated if they care for the necessary data content. Only the smart functionality is

<sup>1</sup> Berg Insight's Smart Metering in Western Europe report 2009

<sup>2</sup> [http://www.miltonhydro.com/images/smart\\_meter.jpg](http://www.miltonhydro.com/images/smart_meter.jpg)

<sup>3</sup> <http://gigaom.com/cleantech/the-race-is-still-on-zigbee-vs-wifi-for-smart-energy-homes/>

<sup>4</sup> <http://hu.wikipedia.org/wiki/WiMAX>

<sup>5</sup> <http://www.onworld.com/html/newssmartmeter.htm>