ELSPAREFONDEN
Amagerfælledvej 56
DK-2300 København S
Tel.: +45 33 95 58 00
Fax: +45 33 13 30 54
www.elsparefonden.dk

The Danish Electricity Saving Trust's concept for energy saving devices, metering equipment and wireless communication

It may be possible for European consumers to save billions of Euros simply by ensuring that home appliances only consume electricity when in use. It is a question of eliminating unnecessary standby consumption and ensuring that lighting, ventilation, heating systems and air conditioners are operated based on actual demand.

This draft paper describes an international initiative taken by the Danish Electricity Saving Trust (hereinafter the Trust), with the aim of developing a substantial market for standardized energy saving devices and metering equipment targeted at the consumer market. The key idea is to offer consumers energy saving devices and metering equipment that are both low cost and high quality. Furthermore, it is important to ensure that these devices can be combined and can communicate wirelessly – regardless of the manufacturer.

The basic idea is to offer consumers the opportunity to set up their own home energy control system – on a step-by-step basis, based on Plug and Play (PnP) products and wireless communication.

Today, we have a standard TCP/IP protocol for communication between computers on the Internet. This standard has been a fundamental requirement for the massive global growth of the Internet. Unfortunately, a similar standard for wireless communication in homes still awaits development, even though inexpensive RF technology is at hand.

Substantial consumer benefits for saving energy, combined with a growing awareness by the energy sector of the part it plays in global climate issues, suggest that the potential market for energy saving devices is rather extensive. Furthermore, it is well worth noting that European consumers have grown accustomed to all kinds of communication devices such as mobile handsets, laptops, remote controllers, etc., and that consumers obviously prefer PnP products rather than the alternative expensive installations.

The challenge is to create a market where manufacturers and suppliers are able to sell energy saving devices and metering equipment in large volumes and at low prices, and where consumers can combine products freely without being tied to one manufacturer or closed system.

A lesson learned from the world of IT

The first IT systems on the market were mainframes delivered, installed and serviced by a single supplier. It is an accepted fact that these systems lost market share when the PC was introduced. PCs with open communication standards paved the way for a massive expansion of the market, in which a great number of competitors rapidly developed and refined the technology at ever lower prices. This vast growth and development of the IT sector would not have been possible within a market dominated by mainframe systems.

What is the Danish Electricity Saving Trust?

The Danish Electricity Saving Trust is a governmental, not-for profit organization, whose remit is to help consumers and public sector institutions save electricity. The Trust has an annual budget of around EUR 12 million. The funds are spent on the development of a market for energy efficient products, and campaigns offering sound and broadly based information to consumers about potential savings. Moreover, the Trust negotiates with manufacturers of power consuming appliances with a view to entering into product-related voluntary agreements. The Trust publicly recommends products covered by these agreements with the intention of encouraging consumers and public sector institutions to choose products on the recommended lists.

One aspect of the present initiative is that the Trust plans to encourage consumers to purchase energy saving devices covered by the Trust's energy saving recommended label.

Energy saving devices and demand management

Computer, television sets and home stereo systems use electricity when they are not in use – i.e. even though the consumer has switched off the device it continues to consume electricity in standby mode. On an annual basis, consumers can save a considerable amount of money by switching off a device or devices at the wall socket when leaving a room, and by reducing the temperature when the outdoor temperature rises.

The Trust has formulated a set of rules for energy saving devices and metering equipment, and how the measuring of data and device control will communicate within a building. It makes sense to compare these traffic rules to the protocols that form the backbone of the Internet. Terms for the use of free software and services on the homepage of the Trust have been formulated as well.

What is wireless communication?

The basic advantage of wireless communication is the ability to send and receive information through the air and hereby avoid the inconveniences of cables. Wireless communication is already a familiar concept to most people – just think of the TV remote controller, mobile phone and the baby alarm. It makes sense to utilize wireless communication in the home to solve the simple task of switching appliances on and off, to control the temperature, and to minimize lighting when there is daylight, or where no one is in a room.

Moreover, wireless communication can be utilized for home surveillance as part of a burglar alarm system. Sensors can be placed in a basement to make sure the owner is warned if there is a dramatic rise in the humidity level. Wireless communication offers a high degree of flexibility, because sensors and measuring devices can be placed wherever required. It is also an inexpensive solution because the installation requires no cabling.

The organization of wireless communication – master and slave

Wireless communication is based on a local master (a device) that controls the communication – with a number of slaves connected to the master.

The master communicating with the slaves can be a palmtop computer, a processor equipped with remote control or the user's home PC. In addition, the master can be connected to a server via the Internet. In this set-up the master will function as a liaison officer that controls the slaves locally and can report back data to the server and receive orders and data from the server. In this way the device is enabled for a number of remote control functions: Consumption data can be collected, surveillance can be maintained, advanced analysis of consumption data can be performed, and in addition, devices can be switched on and off.

The slave may be an electricity meter, a thermometer, a moisture sensor, light meter, a switch, or any hardware that adjust or control devices, i.e. a thermostatic valve. The slave obeys a command to adjust a setting or report back data readings.

The open standard ensures that any master can communicate with the slaves of any manufacturer. Likewise, the standard defines how a master communicates through the Internet. This standard ensures that remote reading and control through a server will be possible, as well as the processing of a variety of analysis software.

Wireless communication with low power consumption

Data measurements and simple commands to control devices only require the exchange a very limited set of information. In other words, the requirement for bandwidth is rather limited. This means that if the right RF technology is chosen power consumption will be low enough to make use of batteries – a significant benefit that will allow motion sensors, light meters and simple switches to be independent of power sockets.

For the present purposes, existing technologies such as WLAN and Bluetooth that are designed for the exchange of large amounts of information (e.g. images and music) are not suitable because these technologies have the unfortunate drawback of using a significant amount of power.

The Danish Electricity Saving Trust recommends Z-wave

Over recent years, enormous progress has been made in the area of RF communication. Apart from Bluetooth, ZigBee and WLAN enabled mobile phones and computers, a wide variety of devices also incorporate RF communication technologies.

Based on in-house research, the Trust has reached the conclusion that the most promising technology currently available is Z-Wave produced by Zensys. The primary features of Z-wave are the use of open communication protocols and very low power consumption. Z-wave is marketed worldwide and is a strong player on the American market.

The Trust's main reasons for recommending Z-Wave are as follows:

- Hardware comprises an inexpensive chip for integration into devices
- Low power consumption makes battery-powered sensors and switches a reality even where operating periods are quite extensive
- Operating distance of 30 m can be extended considerably because the Z-wave chip has a built-in repeat function that allows signal to be relayed from any other Z-wave chip
- Rapidly growing market share with increasing number of manufacturers utilizing the technology
- Alliance of companies using Z-Wave (Z-Wave Alliance Group) cooperates on development of the protocol, thereby ensuring that Z-Wave equipped devices inter-connect via open standards
- Z-Wave Alliance and communication protocol are open to all at low cost
- Well-defined communication protocols and open approach create the opportunity for great variety of third party products, thereby ensuring competition in the market and ultimately lower consumer prices.

The Danish Electricity Saving Trust recommends wireless products

The Trust recommends products that both save energy and meet the quality requirements of the Trust. Products that the Trust recommends can be found on the Trust's Web site and in printed material. Manufacturers also have the opportunity to label their products with the Trust's energy saving recommended logo. A number of conditions need to be fulfilled in order to obtain the endorsement of the Trust.

In general, a product needs to:

- Save power in a straightforward way
- Be relevant to the general public
- Provide documentation covering safety and compliance with regulatory requirements.

Wireless equipment also needs to ensure that:

• Masters and slaves are approved by the Z-Wave Alliance and are labelled with the Z-wave logo in order to ensure that masters and slaves from different manufactures communicate
• Masters should be able to control slaves recommended by the Trust
• Masters should be able to upload measuring data to the server of the Trust and be able to receive data and information from the server of the Trust using the data format laid down by the Trust if this is wished by the user
• Masters should have a facility for automatic upgrade of firmware in order to facilitate control of new types of slaves and apply the latest software developed by the Trust
• The Trust will promote the above components on the homepage of the Trust
• The Trust will develop freeware applications for masters, slaves and analysis of measured data.

The Trust requires the necessary documentation before approving the recommendation. Furthermore, the Trust will continuously monitor marketed and recommended products and display these on the elsparefonden.dk and the upcomming english site. Subject to a separate agreement, the Trust will allow manufacturers of recommended products to make use of the Trust's logo, software, etc. in any country.

All software developed by the Trust will be in both Danish and English with the possibility of translation to other languages.

Contact:
Göran Wilke
Tel: +45 33 95 58 01
Mobile: +45 21 20 55 58
Email: gw@elsparefonden.dk

Søren Østergaard Jensen
Tel: +45 72 20 24 88
Email: soren.o.jensen@teknologisk.dk

More information about Z-Wave:
http://www.zen-sys.com/
http://www.z-wavealliance.org/content/modules/Start/

More information about the Trust:
http://www.elsparefonden.dk

At http://www.elsparefonden.dk/english a number of publications in English are published.

ELSPAREFONDEN