NEM Position paper on Energy efficiency

Introduction

Society has increasingly higher expectations for energy management, both qualitative and quantitative. Energy consumption reduction and overall optimisation is therefore becoming one of the greatest challenges for society in the 21st century both in direct and indirect energy use. It is a key area, and as the European Commission states, there is an imperative need to strengthen the potential of Information and Communication Technologies (ICT) to play a central and critical role in the transition to an energy-efficient, low carbon economy; NEM could efficiently contribute toward that goal. Energy savings could be achieved in many sectors and especially at the end-user side, in homes and buildings. In home area networks (HAN), it is obvious that NEM could contribute appropriately to the goal. NEM also covers next-generation communication services, in particular virtual presence through 3D communication, leading to a more comfortable experience and decreased travel, leading to a reduction in energy consumption. This position paper has the double objective to describe how NEM could contribute to the energy challenge, and to elaborate a common NEM position regarding concrete actions viewed as urgent.

Energy efficiency in ICT could be addressed within two main areas:

1. The energy efficiency of the communication infrastructures: how to reduce the consumption of the communication network and the related connected devices.
2. The use of new ICT services raising awareness and helping people to use energy efficiently.

In this position paper, we address mainly the second aspect, where diverse NEM technologies could have a significant impact, taking into consideration, however, possible impacts on the first aspect.

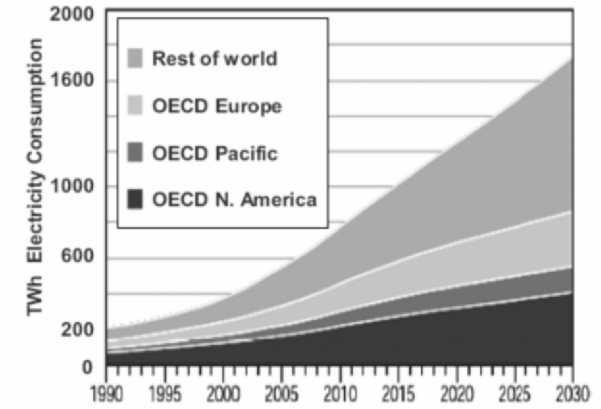

Figure 1: Estimated electricity consumption by ICT in the residential sector: 1990-2030. (Source ?)

Background and Scope

As the "connected everywhere and anytime" digital lifestyle becomes the norm, it can be expected that significant growth in the consumption of electricity will occur in the future. Electricity consumption can be classified into two major categories: direct and indirect power consumption. Direct power consumption is power consumed by equipment, i.e. the physical infrastructure, including electronic devices and (communication) networks. On the other hand, indirect power consumption is by far a more subtle problem, since it affects the surrounding societal environments through its energy and environmental performance.

The NEM community considers today four main axes to correctly assess the global significance of the energy challenge addressing both energy management and energy saving communication :

1. Energy management at the end-user side using advanced ICT, i.e. both in private and professional areas, such as in corporate buildings and private dwellings.
2. Smart grid and advanced metering for increased use of alternative energy resources and better coordination in consumption between the grid participants
3. Advanced communication services, while merging communication and multimedia, for increased virtualization, i.e. ambient and virtual reality, for relieving the increasing traffic burden of conventional means of travel (car, train, plane, …)
4. Training in the efficient use of energy using multimedia means

Home and Energy management using ICT

Today, most of the devices in the home area could or will be connected using specific connectivity features, both hard-wired or wireless and protocol-based, and some of them already address energy management issues such as central heating management, home automation, standby mode management, energy dashboard, etc. These applications require several physical devices and sensors, which are quite difficult to install due mainly to compatibility issues between solutions. There is still a lot of work to do to get a full plug&play, cheap, and widely compatible solution in combining green technologies and smart energy infrastructures. However, we are slowly seeing a trend towards that direction. The devices of the future that will populate the home area will be able to not only automatically adjust their own consumption based on the needs to fulfil their task, but also communicate and cooperate in order to more efficiently consume energy. It must be understood that the home will become an ecosystem of devices that will have to correlate to the tasks related to the customer's lifestyle and be optimised. ICT technologies such as those addressed by NEM have the potential to do so.

In most cases, savings are achieved by providing better information to the clients about consumption or even about the source of the energy used, either in real time or in background. Not only energy consumption (data per year, data per month) must be given, but also capabilities to analyze and process historical data (performance comparisons, saving plans, trends, consumption profiles, pricing information etc.). Graphical rich displays showing all these data in a friendly manner will be quite convenient to encourage user acceptance.

Making the users aware of their electricity pattern usage, along with a tariff policy might also contribute to a more suitable matching of supply and demand figures. This requires that citizens have previously been sensitized to the impact of energy consumption on the environment, and, in parallel, have been incentivized to modify their consumption according to local or global needs. This is more easily achieved if that comes together with saving money due to a smart use of tariff schemes, usages, and service level agreements. Equally, showing to the energy consumers the real impact in terms of gas emissions, or carbon footprint generated by their energy usage might encourage them to take a greater responsibility for their energy consumption (energy accountability). Simulations on performance of the home area in terms of energy savings can be carried out, thus providing even more information to the user on the impact of using each of their home devices and how they can modify their use.

Moreover, an even more powerful service might be a coordinated functioning of these systems intended to raise effectiveness of home automation mechanisms including home control, domotics, appliance coordination of use, handling of HVAC, load management etc.. The home control system, having a good knowledge of user preferences and expectations, power transport and distribution grid status, weather conditions, tariff schemes might take clever decisions in order to make home life more comfortable

through a better utilization of energy resources. It can be envisaged that truly smart power management systems will supervise our future digital home in an integrated and automated manner, in collaboration with other telecommunication services arising from the forthcoming digital environment

Smart Grid and Advanced Meters

Today, the electric power industry is in the early stages of a historic change. From the growing introduction of intermittent distributed, renewable energy sources to new and efficient ways that residential, commercial and industrial users are consuming electricity, the underpinning grid infrastructure is transforming on an epic scale. The transmission and distribution electricity market is finding itself at the convergence of energy, telecommunications and information technology (IT), driving necessary change and innovation in support of a 21st century intelligent utility network, a "Smart Grid." Many in the utility industry and in society at large are greeting the concept of the intelligent grid with optimism, especially given the operational, economic, and environmental benefits that may flow from this new investment, but there are still many uncertainties about the ultimate standards for intelligent grid technologies, particularly communication technologies and protocols.

In respect of advanced meters, there are many initiatives promoting the adoption of smart meters in buildings. A first step would be the substitution of old-fashioned analogue electricity meters by new generation digital devices. When all households are able to adapt their energy use during a period of high prices or diminished availability, this would enhance the reliability of supply and improve energy market transactions, energy savings and, therefore, generating efficiency.

Rich advanced communication services

Today, people use phone calls, SMS/MMS, and increasingly videoconference services to communicate with people in remote locations. These basic services are of course very useful but are not sufficient to avoid travelling (as we experience in collaborative projects where we still need to meet physically regularly). Videoconference systems are still quite expensive and difficult to setup. This is however the first step in the direction of a real tele-immersion environment supported by telecommunication, where people could gain a strong impression of being physically connected.

Coaching using multimedia means

In parallel to the technological means which help people to manage their power consumption, NEM is also pushing an Energy dashboard which could show people their real instant energy consumption. Based on the analysis of that consumption and comparde with a optimum situation, specific applications could help or coach people towards better energy usage by giving specific directions. Such coaching applications could use advanced multimedia technologies merging real and virtual components in order to be more attractive.

Alternative Energy sources

Important aspect of the energy management is integration of local alternative energy production, ranging from photovoltaic batteries, water solar heating, private wind turbines, electric vehicles (future idea since amount of currently available vehicles does not allow taking full benefit of this concept). Two approaches can be considered. From one side local production can be used to lower private energy consumption and/or make a temporal compromise between grid and private energy provision. From the other side local energy can be sold to the grid when excess is produced. Third alternative is deployment of alternative generation by grid owner at customer premises in exchange for cheaper energy provision. The business models are various and some of them have already been adopted in many countries, e.g. Greece, UK, Germany etc.

Strategic importance

As explained above, energy will be a rare resource in the near future and there is a need for everybody to find alternative solutions. These solutions could address not only energy production but also energy consumption.

It is well-known that Oil production will decrease rapidly over the next few years which implies that we need to find new sources of energy (solar, wind, tide, …) in order to substitute for oil (see figures below).

On the other hand, humans will still need more and more energy in order to increase their well-being, and that means there is an urgent need to optimise energy consumption.

NEM is positioned on this second aspect; networked media research could bring significant advances in the field of energy savings by delivering simulation, modelling, analysis, monitoring and visualisation tools.

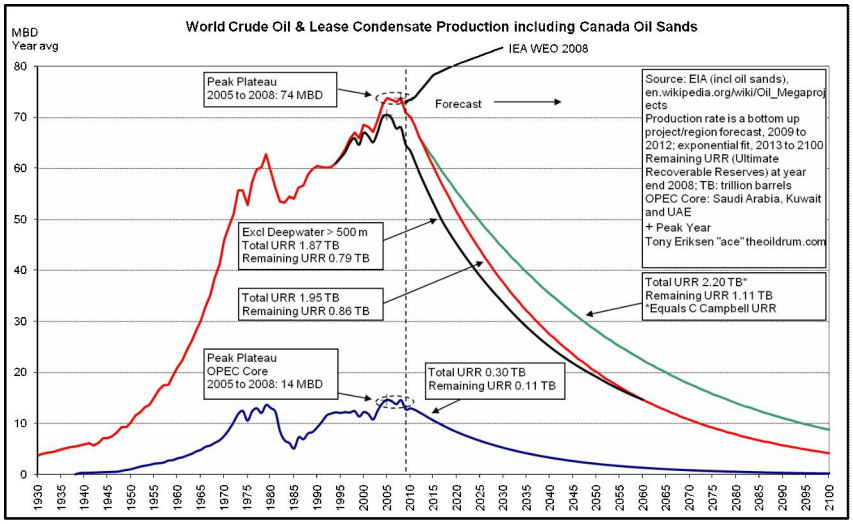

Figure 2: Oil production forecast up to 2100. (Source ?)

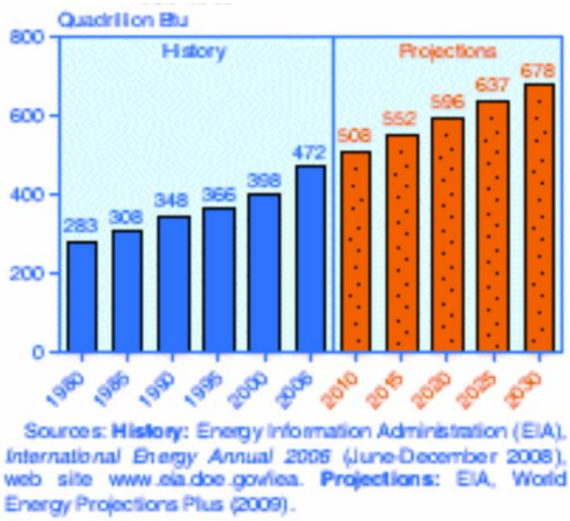

Figure 3: World marketed energy consumption forecast 1980-2030. (Source EIA)

Some enhancements have been already achieved, for instance the ongoing transition from analogue to digital terrestrial broadcasting is a major exercise that will have a

substantial impact on climate, by reduced energy use due to reduced transmitter power and increased spectral efficiency.

NEM position on Energy efficiency

As explained above, NEM could bring its contribution to improvements in global energy efficiency in the 2 main areas of energy management in home and buildings and new advanced communication services.

For these two topics, the NEM position is the following:

Energy management in home & buildings

In order to achieve this goal there is a strong need to push standardisation in order to insure interoperability between home devices. There are several means of connectivity according to the device functionalities (wired and wireless). As far as energy savings could apply to any of the home devices, there is a strong need to develop a set of standardised functionalities that could be implemented on any home devices. Here, it is very important to address existing appliances, which are already in use in households and will not be replaced soon, and new appliances. The relevant CEN/CENELEC Technical Committees could launch specific work item/s to develop such a protocol but there is also a need to push regulation in order to make these functionalities mandatory in any CE marked device. Furthermore, it is necessary to enable end users (residential/small and large consumers) to manage energy consumption through relevant energy management consoles or by using related energy management services (e.g. offered by network and power grid operators).

Smart Grid and advanced metering

To fully realize the benefits of advanced meters and the smart grid, it must be possible to monitor, control and exchange data between disparate utility systems. These systems often use a variety of data exchange formats and mechanisms that have historically prevented the systems from effectively communicating with each other. To address this, the Internet community has already developed Web services (SOAP/XML), a standards-based way for applications to integrate with each other. Web services use ubiquitous protocols and the Web infrastructure that exists in every organization, so they require little, if any, additional technology or training investment. The inherent interoperability that comes with using vendor-, platform-, and language-independent Web services technologies is vital in obtaining the maximum benefits from smart grids and advanced metering systems for the least amount of integration costs.

If the Smart Grid is defined as the convergence of information and operational technology applied to the electric grid (and to other utility distribution networks), providing more sustainable options to customers for participating in efficiency, conservation, and demand response programs and improved security, reliability and efficiency to utilities then the proper focus on deployment should be on utility communication infrastructure. An advanced metering system should provide utilities a single, open, extensible infrastructure over which they can run a wide set of functions that enable them to realize savings, efficiency gains and revenue enhancements in metering, customer services, distribution operations, and allied areas. The most cost effective and efficient system is to utilize existing power lines to create an adaptive, directed, self-healing neighbourhood network with a data concentrator that communicates over an IP based network with the utility and other head end applications. The system should also enable utilities to improve service quality and customer retention capability while setting the stage for future in-premise applications via a meter's open standard multi-purpose extension port interface. These future applications, leveraging the same IP based infrastructure that is at the core of the system, could include in-home customer displays, demand response, predictive warranty

services, remote appliance and machine diagnostics, and related services for many types of devices connected to the electricity grid.

New advance in communication services

In this field, there are already several basic technologies but the integration of all these heterogeneous technologies needs a lot of work. To realise this, it is necessary to construct and deliver novel architectures for Future Content Networks and for Future 3D Media technologies, enabling a number of applications that require the simultaneous tele-immersion of multiple persons into virtual worlds, or even more challengingly into physical worlds, enabling augmented immersive environment creation by the mixing of virtual with real and reconstructions of real environments. NEM is supporting a specific research objective and a specific budget in the next program for such a subject.

Coaching using multimedia means

Multimedia technologies such as 3D, virtual, object and content aggregation should be used to help people to understand how they can optimize their energy footprint. For that reason there is a need to define how object information (sensors, cameras) could be merged with multimedia content. The format of such information has to be standardised in order to avoid incompatibility and to assure users that any objects they might buy are compliant with such a service. This standardisation activity has to be done with EPOSS in order to ensure that the format supports all the needs of these multimedia applications.

Conclusions – Recommendations

Climate change is one of the most important challenges the world is facing in the near future. Effective action against it is required unless mankind is willing to confront a myriad of disasters and natural catastrophes. A general consensus was achieved on the fact that ICTs and, hence, NEM technologies, can largely contribute to cope with this problem. To achieve that objective NEM members are supporting the following aspects :

- Enable advanced ICT for the devices and make their functionality available in an open and service oriented way.
- Enable cooperation among devices and enable correlation to the user's tasks.
- Enhance energy efficiency by enhancing user awareness and dynamically enable them to adjust their lifestyle requirements to optimise energy consumption

With these targets in mind, the following positions should be encouraged:

- ✓ Promotion of the launching of services whose mission will be the provision of information to users about consumption in conjunction with other services developed under the framework of the digital home.
- ✓ Encouraging the deployment of advanced metering and home network management services.