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Innovation policy
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Standardisation mandate addressed to CEN, CENELEC and ETSI in the field of ICT to enable efficient energy use in fixed and mobile information and communication networks

1. TITLE

Mandate addressed to the European Standardisation Organisations CEN, CENELEC and ETSI in the field of information and communication technologies on standardisation to enable efficient energy use in fixed and mobile information and communication networks, and their associated applications/domains, facilities and infrastructures, at both network and subscriber level.

2. RATIONALE

2.1. Introduction

Information and communication technologies (ICTs) now penetrate all parts of society. They bring efficiency benefits to businesses and organisations, and new lifestyle options for individuals. Economic evidence confirms that ICTs drive growth and improve competitiveness.

Europe's ICT infrastructure is developing fast, due to the advance of the single market, the liberalisation and deregulation of telecommunication policies, and the continuous restructuring of big market players that see global opportunities in the developing Information Society.

The booming developments in electronic commerce and the prospects for business development hold the promise of a world-class information infrastructure in Europe, led by market considerations. Convergence between digital technologies is also accelerating bandwidth demand.

The escalation in bandwidth demand is driving the need in all countries to expand telecommunications solutions, in general by using fibre and other high-capacity technologies for the network backbone (the core network) and a wider range of technologies for the access networks (from the closest base station or operator site to the client device), including various fixed technologies (VDSL2 for copper, GPON & 10GPON for optical, DOCSIS 2 for cable, power-line, etc.) and wireless technologies (GSM, UMTS, HSPA, LTE, LTE-Advanced, Wi-Fi, UWB, etc.).

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As more, improved telecommunications networks are deployed, the power needed to operate and cool the connected equipment is also likely to increase. For example, third-generation (3G) technologies generally operate at much higher frequencies than 2GHz, requiring a greater base station density. Moreover, 3G mobile phones consume more energy (e.g. to process digital signals) as users access high-speed internet and multimedia services more often. The increase in data throughput also requires an additional increase in base station density.

Communication over power lines will also spread. ITU-T has issued recommendation G.hn/G.9960 for high-speed powerline, coax and phoneline communications.

In the meantime, individuals are registering two growing impacts on their lives due to the evolution of ICT networks and services: the positive environmental impact brought about by telecommunications and dematerialisation and the negative impact in the shape of the energy consumed by the ICT equipment in their homes.

The positive (enabling) role that ICT solutions can have in reducing the environmental impact of other sectors (cutting CO_2 emissions by up to 15%) is increasingly being recognised. This means that there will be an increasing need for ICT solutions to combat climate change.

ICTs currently account for around 2% of total carbon emissions (not including TV sets, broadcast services and the energy used in raw material extraction and manufacturing processes), a figure expected to triple globally by 2020 compared to 2002. Fixed-line and mobile telecommunication networks generate around 24% of the total emissions due to ICTs (i.e. 0.5% of total carbon emissions, with 0.3% from the fixed-line network and 0.2% from the mobile network).

A wide set of initiatives is being implemented to significantly improve the energy efficiency of **end-use equipment**, in particular the setting of mandatory energy efficiency requirements under the 'Ecodesign Directive' and the energy labelling of office equipment under the Energy Labelling Framework Directive 92/75/EEC and the 'Energy Star' programme, including requirements for public procurement.

However, additional action to improve the energy efficiency of the **provider infrastructure** is urgently needed in order to counterbalance the expected growth in telecommunications networks.

In the European Union, telecommunications networks are one of the most rapidly growing sectors in terms of energy consumption, which is expected to reach 130 TWh per year by 2015.

However, the escalation of bandwidth demand not only presents a risk of network saturation but also means that growth in energy consumption is likely to be greater than predicted. It is therefore vital to consider ways to maintain sustainable growth in the transmission capacity of telecommunications networks while limiting energy consumption.

There are several 'green' alternatives currently being implemented by telecommunications operators and vendors to reduce internal energy consumption and to optimise the consumption of customer premises equipment. In addition, telecommunications companies offer services to help residential and professional customers reduce their overall energy consumption (e.g. through travel substitution). The

wide range of actions being taken include reducing the energy consumption of individual items of equipment (e.g. the shift from 'connected all the time' to 'available all the time'), improving delivery architectures (e.g. Next-Generation Networks) and further developing the services provided.

Codes of conduct, promoted by regulators, are instruments in order to both initiate and monitor such actions. In general, the telecommunications sector seems to be choosing fibre-to-the-home (FTTH) architectures to deploy shared networks for all services and content — primarily because they form the basis for the introduction of new sustainable habits, uses and services (e-administration, e-healthcare, teleworking, etc.) that are to intended to both limit climate change and improve people's quality of life, and which are also claimed to be more energy-efficient than traditional networks.

According to the study published by the FTTH Council[1] in February 2008, the environmental impact of the deployment of the FTTH network will be positive. This study determined that the use of FTTH networks in Europe over a period of 15 years would prevent the emission of greenhouse gases equivalent to the carbon emitted during a 2 000 km car trip by each subscriber, thus offsetting the environmental cost of deploying the network.

The regulators should support the fast adoption of energy efficiency measures by all stakeholders (e.g. users, operators, vendors, standardisation organisations, fora, consortia) to make the deployment of a 'more sustainable' network economically feasible.

2.2. The political environment

The following European documents confirm the political priority attached to efficient energy in information and communication networks, both fixed and mobile, and their associated applications, facilities and infrastructures:

- Directive 2009/125/EC (Ecodesign Directive) establishing a framework for the setting of ecodesign requirements for energy-related products;
- COM(2009) 111 final[2]: Mobilising Information and Communication Technologies to facilitate the transition to an energy-efficient, low-carbon economy;
- C(2009) 7604 final[3]: Recommendation (9.10.2009) on mobilising Information and Communications Technologies to facilitate the transition to an energy-efficient, low-carbon economy;

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1 FTTHC — Study on FTTH and Sustainable Development (February 2008) - http://www.ftthcouncil.eu/pwc_study/?cid=528.

2 COM (2009)111: Mobilising Information and Communication Technologies to facilitate the transition to an energy-efficient, low-carbon economy - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0111:FIN:EN:PDF.

3 Commission Recommendation (9.10.2009) on mobilising Information and Communications Technologies to facilitate the transition to an energy-efficient, low-carbon economy - http://ec.europa.eu/information_society/activities/sustainable_growth/docs/recommendation_d_vista.pdf.

- COM(2008) 241 final[4]: Addressing the challenge of energy efficiency through Information and Communication Technologies;
- Regulation 106/2008 on a Community energy-efficiency labelling programme for office equipment;
- Council Decision 2006/1005/EC (EU-US Energy Star Programme) concerning conclusion of the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment;
- Directive 2006/32/EC[5]: Energy end-use efficiency and energy services.

All these policy objectives are being supported by a series of regulatory measures, studies, codes of conduct and mandates, including:

- Regulatory measures:
  - Regulations implementing the Ecodesign Directive 2009/125/EC, including:
    - Commission Regulation (EC) No 1275/2008 on ecodesign requirements for standby and off-mode power consumption
    - Commission Regulation (EC) No 107/2009 on ecodesign requirements for simple set-top boxes
    - Commission Regulation (EC) No 278/2009 on ecodesign requirements for external power supplies
    - Commission Regulation (EC) No 642/2009 on ecodesign requirements for televisions
  - Self-regulation as envisaged by the Ecodesign Directive is planned for 'imaging equipment' (copiers, printers etc.) and for complex set-top boxes (pay TV)
  - A regulation implementing the Ecodesign Directive with regard to computers, servers and monitors is planned for adoption in 2010
  - Technical, economic and environmental analyses of 'networked standby' and 'sound and imaging equipment' are under preparation for potential ecodesign measures[6]
- Studies:
    - 'Impacts of Information and Communication Technologies on Energy Efficiency' by Bio Intelligence Service (EU-funded study, September 2008)[7,8]

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[4] COM(2008)241: Addressing the challenge of energy efficiency through Information and Communication Technologies - http://ec.europa.eu/information_society/activities/sustainable_growth/docs/com_2008_241_1_en.pdf.

[5] Directive 2006/32/EC: Energy end-use efficiency and energy services - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:EN:PDF.

[6] www.ecostandby.org.

[7] Impacts of Information and Communication Technologies on Energy Efficiency, by Bio Intelligence Service — Executive Summary — ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-summary_en.pdf.

[8] Impacts of Information and Communication Technologies on Energy Efficiency, by Bio Intelligence Service — Final Report — ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf.

- 'Smart 2020, Enabling the low carbon economy in the information age' by GeSI, (June 2008)[9]
- 'High Tech: Low Carbon' by EICTA (April 2008)[10]

- Codes of Conduct (CoC) published by JRC:
  - Energy consumption of broadband equipment[11]
  - Energy efficiency of external power supplies[12]
  - Data centre energy efficiency[13]
  - Energy efficiency of digital TV service systems[14]
  - Uninterruptible power supplies[15]

- Mandates:
  - M439: Standards for measurement of standby and off-mode power consumption
  - M441: Smart metering
  - M450: Standards for measurement of no-load-condition electric power consumption and average active efficiency of external power supplies
  - M451: Power consumption measurement of simple set-top boxes in active and standby modes
  - M455: Common charging capability for mobile telephones

Effective regulation through regulations, directives or codes of conduct requires specified goals to be achieved. Proof of achievement requires not only an accurate definition of the goal but also an agreed means of assessment and/or measurement. In the case of IT end-use equipment, product-specific energy efficiency requirements are being set under the Ecodesign Directive and applicable mandates to this end have been or could be given to the ESOs to develop measurement methods. This particular mandate will focus on networks and larger infrastructures.

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[9] Smart 2020 Enabling the low carbon economy in the information age - http://www.theclimategroup.org/assets/resources/publications/Smart2020Report.pdf.

[10] High Tech: Low Carbon - http://www.eicta.org/index.php?id=32&id_article=223.

[11] EC DG Joint Research Council Code of Conduct on energy consumption of broadband equipment - http://re.jrc.ec.europa.eu/energyefficiency/pdf/CoC%20Brodband%20Equipment/Code%20of%20Conduct%20Broadband%20Equipment%20V3%20final.pdf.

[12] EC DG Joint Research Council Code of Conduct on energy efficiency of external power supplies - http://re.jrc.ec.europa.eu/energyefficiency/pdf/CoC_Power_Supplies_Version4-March2009.pdf.

[13] EC DG Joint Research Council Code of Conduct on data centre energy efficiency - http://re.jrc.ec.europa.eu/energyefficiency/pdf/CoC%20data%20centres%20nov2008/CoC%20DC%20v%201.0%20FINAL.pdf.

[14] EC DG Joint Research Council Code of Conduct on Energy Efficiency of Digital TV Service Systems - http://re.jrc.ec.europa.eu/energyefficiency/pdf/CoC%20Digital%20TV-version%207.pdf.

[15] EC DG Joint Research Council Code of Conduct on Uninterruptible Power Supplies — http://re.jrc.ec.europa.eu/energyefficiency/pdf/Code%20of%20conduct%20UPS%20efficiency-V1-2006-12-22 %20Final.pdf.

Standardisation provides the framework for the definition of energy efficiency parameters and the measurement of those parameters, and serves to underpin any setting of political or corporate goals. Standardisation can also set specific goals to be achieved in the near and medium term, thus encouraging innovation in the design of products used to deliver the intended services. The active participation of all stakeholders in the standardisation process ensures transparency and global recognition of the outcome.

3. STANDARDISATION IN SUPPORT OF EFFICIENT ENERGY CONSUMPTION

CEN, CENELEC and ETSI, as well as other standardisation organisations, have identified energy efficiency as a key area for standardisation.

ETSI is currently focusing on Green Agenda activities in three areas: technical standardisation activities, electronic working tools, and promotion and identification of requirements via Green Agenda seminars.

The ETSI liaises with other standards organisations on two main topics: (i) energy efficiency in relation to the architectural aspects of broadband deployment, and (ii) eco-environmental issues, including measurement methods, definition of power consumption targets, thermal management, and powering architecture and supervision.

For the first topic, the ETSI Technical Committee on Access Terminals Transmission Multiplexing (ATTM) has established links with the Global eSustainability Initiative (GeSI-EE IOCG) launched by the Inter Operators Collaboration Group, with relevant CENELEC activities, with ITU-T, and with several worldwide fora such as ATIS, GSMA, BBF.

For the second topic, the ETSI Technical Committee on Environmental Engineering (EE) has established links with other ETSI Technical Committees (e.g. TC ATTM), CENELEC TC 111X/WG3, JRC for the relevant codes of conduct, ITU-T, and several worldwide fora (e.g. ATIS, GSMA, HGI, BBF).

CEN has developed standards for energy management systems (EN 16001) at corporate management level.

CENELEC is currently analysing the role of standardisation to support efficient energy use in data centres. So far, potential standardisation needs have been identified in four specific domains: the definition of energy efficiency parameters; the algorithms using those parameters to create Key Performance Indicators; parameter measurement; and energy-efficient infrastructures capable of delivering energy-efficient solutions.

Related standardisation work addressing data centre facilities and infrastructures has been initiated. The outcome of this standardisation work could, at a later stage, support the further development of the EU Code of Conduct on Data Centre Energy Efficiency published by JRC.

The **Installations & Cabling Cooperation Group (I&C CG)** coordinates the development of standards on broadband issues between CEN, CENELEC and ETSI. This includes the coordination of energy efficiency standardisation and smart-metering standardisation.

The ESOs moreover cooperate in the **Smart Metering Coordination Group (SM-CG)**, which also includes representatives from other relevant standards organisations. The SM-CG provides a focal point for smart-meter standardisation in response to Mandate M/441 covering measuring instruments for the development of an open architecture for utility meters, along with communication protocols to enable interoperability

ITU-T has extended the scope of ITU-T SG5 to include the coordination and planning of ICT and 'climate change'-related standardisation at global level, with the aim of defining a global methodology for assessing the environmental impact of ICT goods and services. This includes terminology and definitions, the evaluation of direct and indirect impacts, data collection, power feeding systems, environmental protection, and the recycling of ICT equipment and facilities.

The **ICT4EE forum**[16] has been launched by the ICT industry following Commission Recommendation C(2009) 7604. The forum envisages a progressive decarbonisation process leading to a measurable and verifiable reduction in energy intensity and carbon emissions for all processes involved in the production, transport and sale of all ICT equipment and components.

The goals of the forum are to:

(a) develop a framework to measure energy and environmental performance, for which the sector will be expected to contribute baseline data by 2010;
(b) adopt and implement common methodologies to this end by 2011;
(c) identify, by 2011, energy efficiency targets that exceed the EU 2020 targets by 2015;

The ICT4EE Forum is working with ITU-T to develop that part of the common framework for measuring the energy performance of the ICT sector.

The Energy Efficiency Inter Operators Collaboration Group (EE IOCG), within the **Global e-Sustainability Initiative (GeSI)**, is developing a global strategy for the coordination of energy efficiency and sustainability standardisation at GeSI. It also acts as the GeSI Standardisation Branch and collaborates with many groups within the ICT sector. GeSI is a member of the ICT4EE Forum.

4. RESEARCH PROJECTS

Standardisation work will take into account all relevant research results, including, among others, those stemming from the following projects:

- 4GBB
- EARTH
- OPERA NET

These projects are outlined in Annex 1.

[16] www.ict4ee.eu.

5. PURPOSE OF THE MANDATE

5.1. Description of the mandated work

In **Phase 1** of the mandate, the European standardisation organisations CEN, CENELEC and ETSI, in cooperation with other relevant standards organisations, are invited:

- To analyse the economic environment and the political context for efficient energy use, with a focus on communication networks and associated services and applications/domains, while ensuring an adequate level of interoperability,
- To subsequently identify the potential role of ICT standardisation in achieving efficient energy use,
- To identify existing and/or ongoing standardisation and consensus-building activities on the issue within national, regional and international standardisation organisations, formal or otherwise, and to assess their relevance for achieving European policy objectives in this domain,
- To identify consistencies, relations, dependencies, hierarchy (taxonomy), overlaps and gaps in ICT standardisation work related to efficient energy use,
- To establish a standardisation work programme with a view to filling the gaps, taking into account relevant regulatory initiatives, R&D projects or standardisation activities carried out by relevant fora and consortia.

In **Phase 2**, standardisation activities will be launched following consultation of the Member States on the results of Phase 1.

The ESOs and other relevant standards organisations will then develop the standards identified in the standardisation work programme in phase 1. Development of the required standards will involve cooperation with relevant standards organisations identified in the work programme.

5.2. Modus operandi and coordination aspects

The technical coordination of standardisation activities under this mandate will be ensured by a group involving all relevant standards organisations. The group will include representatives of relevant Commission services.

6. EXECUTION OF THE MANDATE

6.1. Arrangements for execution of the mandate

Within 3 months of the acceptance of this mandate, CEN, CENELEC and ETSI will jointly present to the Commission a report setting out the arrangements they have made for the execution of the mandate. Particular attention will be given to the involvement of all relevant parties, in particular industry groups, and to the international working arrangements in place to identify and adopt internationally agreed standards. Relevant industry groups and alliances should be involved from the start.

6.2. Work programme

Within **10 months** of the acceptance of this mandate, CEN, CENELEC and ETSI will jointly present to the Commission the conclusions of Phase 1, including the work programme identified for Phase 2.

6.3. Standstill

Where deliverables are European standards, notification by the Commission to the European Standards Organisations of its acceptance of the proposed work programme starts the period of standstill required under Directive 98/34, for those items where a standstill has not already been imposed.

6.4. Progress reports

CEN, CENELEC and ETSI will present annual progress reports to the Commission.

6.5. Evaluation

Three years after commencement of the work under Phase 2, CEN, CENELEC and ETSI will present an evaluation report to the Commission on the results achieved in terms of market impact. The terms of reference for the report will be agreed between the three European standardisation bodies and the Commission.

6.6. Results

CEN, CENELEC and ETSI will present to the Commission the standards listed in the programme in accordance with the mandate.

Annex 1: Projects on efficient and sustainable information and communication networks and their associated applications, facilities and infrastructures

1. 4GBB (EUREKA-CELTIC) — ENABLING 4TH GENERATION BROADBAND SYSTEMS VIA THE LAST COPPER DROP

Although optical fibre *as a technology* has been available for a long time, the transition to second-generation broadband, 2GBB, providing several Mbit/s, was not possible until ADSL became available, opening the market for broadband internet access. The current transition to 3GBB, providing tens of Mbit/s, to open the market for IPTV services, is made possible by the combination of Fibre-to-the-Cabinet (FTTC) and VDSL2. Again, these connections will soon outnumber the Fibre-to-the-Home (FTTH) connections so far deployed. The future transition to 4GBB will also require an enabling technology to reuse the last 20-200 metres of existing wiring. It should enable Gigabit/s data rates from distribution points like poles, street corners, footway boxes or basements. This technology is the 'Ultimate DSL technology'.

The goal of the project is to provide proof-of-concept for an ultimate DSL technology. The required technology is lacking and very challenging to develop, since telephony wire was designed for voice-band frequencies. Such a DSL technology is expected to initiate a new standard, and to impact wideband cable models, transmission schemes, multi-channel communication, resource management methods and spectrum allocation.

The project group comprises 2 manufacturers, 3 telecommunications operators, 3 small/medium-sized enterprises (SMEs), 3 universities and 2 research institutes.

Further information: http://www.celtic-initiative.org, http://www.eurekanetwork.org

2. EARTH (CALL 4 FP7) — ENERGY-AWARE RADIO AND NETWORK TECHNOLOGIES

The target of EARTH is to enhance the energy efficiency of mobile systems by a factor of at least 50 % compared with current systems. It will investigate the energy efficiency limits theoretically and practically achievable while providing high-capacity and uncompromised quality of service. The proposal primarily focuses on mobile cellular systems, LTE and its evolution, LTE-Advanced, where a potential impact on standardisation is envisaged. It will also consider 3G (UMTS/HSPA) technology for an immediate impact.

The project group comprises 6 industrial partners (4 vendors and 2 mobile operators), 1 European SME, 2 research centres, 5 universities and 1 standardisation body.

Further information will be available at: http://www.earth-project.eu/

3. OPERA NET (EUREKA-CELTIC) OPTIMISING POWER EFFICIENCY IN MOBILE RADIO NETWORKS

The main focus of OPERA-Net is to address the power and energy-efficiency technology barrier in order to implement next-generation mobile broadband systems, encompassing terminal, infrastructure and end-to-end systems. The consortium seeks to cover the whole value chain, from component design to equipment development, deployment and full operation of mobile networks.

Major outcomes expected from Opera-Net are:

- radical reduction of the power envelope to enable viable implementation of new technologies;
- increased power efficiency ratio of 'output utilised power' to 'input supply power';
- reduction in operational and capital expenditure (OPEX & CAPEX);
- reduction in consumed power to address environmental requirements;

The project's expected impacts are:

- power efficiency improvements for future air interfaces, bringing innovation gains by solving the power technology barrier;
- adjacent industries and segments within Europe leveraging wireless broadband to enable accelerated socio-economic growth (examples: media, health, security, internet, etc.);
- environmentally friendly ICT solutions, enabling Europe to drive global standardisation in this area.

The project group comprises 1 operator, 1 university, 1 public laboratory, 1 independent laboratory and 4 industrial organisations.

Further information: http://opera-net.org