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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

on mobilising Information and Communication Technologies to facilitate the transition to an energy-efficient, low-carbon economy

{SEC(2009) 268}
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1. INTRODUCTION

In December 2008, the European Union reiterated its commitment[1] to meeting its energy savings and carbon emissions targets by 2020 and stressed the urgency to step up efforts towards improving energy efficiency[2]. Energy efficiency is at the heart of the Union's efforts to tackle the problems of energy security and climate change[3]. With the recent financial crisis and downturn in the European economy, the case for energy and resource efficiency gains has become even stronger.

Reorienting technological innovation towards the challenges of energy-efficient and low-carbon growth will help Europe emerge from the economic crisis on a more sustainable footing. Information and Communication Technologies (ICTs) are known for their broader, economy-wide capacity for energy saving and for their potential to effect rapid and profound change across every facet of society, government and industry.

What is now needed is a policy framework that embeds ICTs squarely in the efforts to confront the crises we face today. Europe has an opportunity to take a leading position in delivering such a framework and the challenge is to seize it. A number of international organisations including the OECD[4] are also looking at ICTs in anticipation of the United Nations Climate Change Conference which will determine the follow-up to the Kyoto protocol.

This Communication presents a set of ambitious measures that focus on what can be achieved in the short term both **by the ICT sector and by fully exploiting the enabling capacity of ICTs** in all sectors of society and the economy. It provides the background to a Recommendation to be adopted by the Commission in the second half of 2009. The Recommendation will set out tasks, targets and timelines, for industry stakeholders and Member States to accelerate progress towards these ends.

2. WHAT ROLE CAN ICTS PLAY?

The potential of ICTs to improve energy efficiency is generally accepted[5,6]. However, in the absence of specific policy measures, to coordinate fragmented efforts and to incentivise action, this potential may not be realised in the timeframe of the 2020 targets. ICTs have a dual contribution to make:

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1 Council of the European Union, Presidency Conclusions 7224/1/07, 4 May 2007.
2 Council of the European Union, Presidency Conclusions 17271/08, 12 December 2008.
3 COM(2006) 545; COM(2008) 30.
4 OECD Conference *ICTs, the Environment and Climate Change*, Copenhagen, May 2009.
5 COM(2008) 772.
6 COM(2008) 241 — This Communication takes account of the opinions delivered by the European Economic and Social Committee, the Committee of the Regions and the own initiative Resolution adopted by the European Parliament.

The enabling role of ICTs

ICTs can **enable energy efficiency improvements** by reducing the amount of energy required to deliver a given service:

– By monitoring and directly managing energy consumption, ICTs can enable efficiency improvements in major energy-using sectors. Recent studies suggest that this capacity can be exploited to reduce energy consumption of buildings in the EU by up to 17% and to reduce carbon emissions in transport logistics by up to 27%[7].

– By providing the tools for more energy-efficient business models, working practices and lifestyles, such as eCommerce, teleworking and eGovernment applications, and advanced collaboration technologies, ICTs can reduce demand for energy and other material resources.

– By delivering innovative technologies, ICTs can reduce wasteful consumption of energy; solid-state lighting is one clear example. Emerging solutions in computing such as thin client[8], grid computing and virtualisation technologies promise to reduce redundancies existing in today's systems.

The quantifying role of ICTs

ICTs can **provide the quantitative basis** on which energy-efficient strategies can be devised, implemented and evaluated.

– Smart metering exploits the capacity of ICTs to quantify energy consumption and provide appropriate information to consumers. If consumers can understand where inefficiencies come from, they can act to mitigate or eradicate them completely. Trials with smart meters in the EU show that providing information to consumers on their actual energy consumption can lead to reductions of up to 10%[9].

– ICTs can also address the complexities of measuring energy performance **at a system[10] level**: software tools can provide information and data on how to better configure the various elements of a system so as to optimise its overall energy performance in a cost-effective manner. With the imperative need for energy and environmentally conscious design and planning, these software tools will spread from smaller to more complex systems, including urban areas and cities.

The mere existence of the 2020 targets makes **accurate and verifiable quantification** of energy consumption a crucially important issue. More than any other sector, the ICT sector is best equipped to deliver on this challenge, and furthermore deliver the solutions and tools to support others in doing the same.

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7 Bio Intelligence Impacts of Information and Communication Technologies on Energy Efficiency. Smart 2020 Enabling the low-carbon economy in the information age.

8 Computers without hard disk drives; they rely mostly on central servers for data-processing activities.

9 Report on Methodology for Estimating Energy Savings, ESMA, March 2008.

10 In this context, a system consists of many energy-consuming entities; examples include data centres, buildings, factories and cities.

3. MAKING THE MOST OF ICTS: CHALLENGES AND SCOPE FOR ACTION

A widespread data gathering and analysis exercise[11] has been carried out by the Commission, to assess the potential role of ICTs in helping Member States meet the 2020 targets. The findings brought to light several challenges and enabled lines of action to be identified.

Identifying the challenges

The use of ICT equipment in the delivery of services represents about 1.75% of carbon emissions in Europe; a further 0.25% of carbon emissions come from the production of ICT and consumer electronic equipment. As the range and penetration of ICTs increase, their overall energy use is growing[12].

The other sectors of the economy and of society are responsible for the remaining 98% of carbon emissions. This is where the enabling capacity of ICTs is expected to make the greatest contribution to reducing emissions - up to 15% by 2020 according to some reports[13] - as well as cost savings.

Some ICT companies have committed to targets on energy savings and emissions reduction[14]. The targets and timelines, though often ambitious, differ widely, and there is little common basis for the sector to identify precisely where opportunities for greater efficiencies lie and where efforts should be focused. Furthermore, quantitative data on the benefits achieved and achievable through ICTs is often inconsistent[15]. The consequent **difficulty of comparing energy-saving solutions, especially at a system level,** can act as a deterrent to their adoption.

Eliminating such inconsistencies will require harmonised methodologies for measurement and quantification of energy performance. This will, in turn, provide reliable data for devising, implementing and evaluating energy-saving strategies.

The need for action

Unless there is a more systematic approach across the ICT sector to measuring and quantifying the energy performance of its own processes, there is a strong chance that the real benefits of ICT will be overlooked or misunderstood.

In the absence of a means by which consumers, whether individuals, businesses or public administrations, can verify and compare potential energy-saving strategies offered by ICTs and their cost effectiveness, the threat that so-called greenwashing[16] will take market share from solutions that offer legitimate benefits is very real.

In order to promote legitimacy, transparency and real progress in the application of ICTs to improving energy efficiency, there is a clear need to create a level playing field based on common ways of measuring energy performance – especially in more complex systems – and on a common understanding of commitments, targets and methodology.

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11 Results of the Public Consultation on Information and Communication Technologies Enabling Energy Efficiency; Report of the Ad Hoc advisory group on ICT for Energy Efficiency.

12 Smart 2020 report.

13 Bio Intelligence study.

14 Smart 2020 report.

15 The differences in data presented in the Bio Intelligence study and the Smart 2020 report illustrate this.

16 See for example The six sins of greenwashing: www.terrachoice.com/files/6_**sins**.pdf.

To this end, the Commission intends to issue a Recommendation setting out measures that will pave the way for ICTs to contribute to energy efficiency gains and emissions reductions across the economy and society, in a measurable and verifiable way. The measures will be structured around the three following strands of action.

– **Firstly,** the ICT sector will be invited to set itself targets and reach a collective agreement on measurement methodologies that focus on accuracy, transparency and verifiability of the energy consumption and carbon emissions of its processes, at company and sector level.

– **Secondly,** working partnerships between the ICT sector and other major energy-using sectors will be encouraged to identify where and how ICTs can play a role in improving efficiency and reducing emissions in those sectors and thus accelerate the delivery of tools to assess and to optimise energy performance on a comparable basis.

– **Thirdly,** Member States should be called upon to enable the EU-wide roll-out of ICT tools likely to trigger a shift in the behaviour of consumers, businesses and communities and at the same time drive demand for innovative ICT solutions to optimise the energy performance of their own operations.

4. THE GENERAL CONTEXT OF THE RECOMMENDATION

4.1. Reducing the energy and carbon footprints of ICTs

The ICT sector as a whole employs 6.6 million people across the 27 EU Member States. It boosts the innovation capacity of all sectors and contributes to more than 40% of overall productivity growth[17].

ICTs are now embedded in almost all parts of the European economy. As a result of its own success, use of ICT products and services represents about 7.8% of electricity consumption in the EU and may grow to 10.5% by 2020[18].

The increased consumption that arises from the growing use of ICT products is addressed by several legal instruments already in place. Under the Directive on the eco-design of Energy-using Products (EuP)[19], minimum energy requirements will be set for products such as external power supplies and computers. The Regulation on the Energy Star programme[20] awards the Energy Star to the best performing products in the market and requires Member States to apply demanding energy efficiency criteria in the public procurement of office equipment.

Other measures, such as the Ecolabel Regulation[21], complement this framework, providing for continuous improvements of ICT products throughout their life cycle including their energy efficiency. The Action Plan on Sustainable Consumption and Production and Sustainable

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17 Van Ark: EU KLEMS Growth and Productivity Accounts, 2007.

18 Bio Intelligence study.

19 Directive 2005/32/EC

20 Regulation (EC) N° 106/2008 of 15 January 2008

21 Regulation (EC) No 1980/2000 of the European Parliament and of the Council of 17 July 2000 (OJ L 237, 20.9.2000, p. 1).

Industrial Policy[22] provides an integrated and comprehensive framework to further develop and strengthen the implementation of the above-mentioned measures. In addition, EU legislation provides for the reduction of environmental impacts of ICT equipment at the end of its life[23].

There exists an untapped potential for the ICT sector to focus on **systemic improvements** and **further reduce the energy consumption of its own processes** (including operations, manufacturing, service delivery and the supply chain). If the sector were to adopt a more systematic approach to monitoring and measuring energy consumption at every step in a process, it could generate verifiable and comparable data, allowing it to identify opportunities for improvement, and to develop and apply solutions.

The ICT sector should be called upon to engage collectively in a process of self-improvement by agreeing on common methodologies and metrology tools to generate data about its energy performance, set realistic targets and benchmark progress. Such efforts should give due consideration to the full life cycle and related environmental impact. The ICT sector should lead by example and will be encouraged to commit to ambitious targets in relation to the European 2020 targets.In addition to the environmental and cost benefits, such efforts will undoubtedly lead to innovative practices that can be replicated in other industries.

The Recommendation will focus on buildings and construction, and on transport logistics, in view of their relatively large share in overall energy consumption and of ongoing endeavours by the Commission and Member States in these sectors.

4.1.1. Buildings and construction

Buildings account for approximately 40% of energy end-use in the EU, of which more than 50% is electrical power. The sector has significant untapped potential for cost-effective energy savings which, if realised, would mean an 11% reduction in total energy consumption in the EU by 2020[24].

Under the EuP Directive, implementing measures laying down requirements for energy and environmental performance, are being enacted for ICT products used in the buildings and construction sector. There is scope for ICT to contribute to further realising this potential, through the application of building and energy management systems, smart metering technologies, solid-state lighting and lighting control systems, intelligent sensors and optimisation software. In view of the contribution to energy performance of many different factors, including materials and technologies, and the various potential trade-offs among them, developing a systemic understanding of the energy performance of a building is highly desirable. As part of the Recovery Plan adopted in November 2008[25], the Commission proposes to launch partnerships between the public and private sectors to further develop and demonstrate green technologies and energy-efficient systems and materials in buildings with a view to reducing radically their energy consumption and carbon emissions.

The proposed recast of the Directive on the Energy Performance of Buildings (EPBD) introduces a general framework for a methodology to calculate the energy performance of

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22 COM(2008) 397.
23 Directive 2002/95/EC and Directive 2002/96/EC
24 COM(2008) 780.
25 COM(2008) 800.

buildings. Implementation of the Directive will yield a large amount of information on the make-up of building stock across Europe[26].

Such information provides a useful baseline for the buildings and construction sector, as well as policy-makers. It also opens up opportunities for the development of software applications and tools for the purpose of **compliance with the EPBD**.

The ICT sector will be invited to work together with the buildings and construction sector to identify areas where the impact and cost-effectiveness of ICTs can be maximised, and to specify requirements. They should also promote interoperability between auditing tools, and building and energy management systems, with a view to developing a systemic understanding of a building's energy performance.

There is scope to go beyond the general methodological framework introduced in the Directive and agree on common methodologies for presenting data. Then ICTs could be applied for EU-wide collection, aggregation and comparative analyses to support benchmarking and policy evaluation.

4.1.2. Rationalising transport-related energy use through logistics

Transport systems represent about 26% of energy end-use in the EU. Many opportunities exist for improvements in energy efficiency and rationalisation, notably through logistics.

Under the Freight and Logistics Action Plan[27], a number of actions are introduced to expand the role of **logistics in the rationalisation of transport** and the reduction of its environmental impact. Specific measures under the Intelligent Transport Systems (ITS)[28] Action Plan focus on the deployment of ITS to promote modal shift, notably on transport corridors for freight, and through the provision of multi-modal journey planners for passengers to enable significant reductions in congestion.

The e-Freight and Intelligent Transport Systems (ITS) actions underline the relevance of ICT tools in achieving these aims. The November 2008 Recovery Plan foresees the launching of partnerships between the public and private sectors to develop a broad range of technologies and smart energy infrastructures for transport.

The ICT sector should work together with the transport logistics sector to build on the opportunity for improved and expanded information as identified by the Action Plan[29]. Meaningful information on energy consumption and carbon emissions of freight transport should be made available to those businesses that rely on freight transport for their own operations.

As such information becomes available through the wider use of ITS, it is important that it be collected, presented and aggregated in a standardised way, and be accessible to all potential users: from individuals and businesses using freight to public administrations and policy-makers.

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26 Directive 2002/91/EC; www.buildingsplatform.org.
27 COM(2007) 607.
28 COM(2008) 886.
29 COM (2007) 607.

4.2. Encouraging an enduring shift in the behaviour of consumers, businesses and communities

4.2.1. Energy end-use

Smart metering can allow for two-way, real-time information flows between network operators, energy suppliers and consumers, allowing all parties to better manage and control their energy consumption and associated costs. It also allows control loops to be introduced so devices can be remotely managed. When implemented in this way, benefits accrue to network operators and suppliers, and to consumers.

Smart meters generate more accurate information on consumer demand, information which in turn can be used by network operators to better manage their network and so reduce losses. They can also enable the implementation of demand-response mechanisms to reduce demand at peak times, thus avoiding unnecessary investments in additional capacity. Suppliers can furthermore use this information to develop pricing options which take into account different costs of energy consumed at different hours.

Smart meters can provide comprehensive information to consumers on their energy consumption and cost[30], allowing them to take real advantage of the Internal Energy Market. Results from field trials in a number of Member States indicate that the roll-out of smart metering can lower energy consumption by up to 10%[31], depending on the context and quality of the information fed back to the consumer.

However smart metering is not always implemented in this way; one-way information flow towards the supplier or network operator tends to be common practice. Given the high up-front investment costs and the expected 10 to 15 year lifespan of metering solutions, it is of the utmost importance that Member States agree on a **minimum level of functionality** for smart metering so that the same minimum options can be offered to all consumers, irrespective of where they live and who provides the service, and to ensure interoperability.

Member States should be called upon to agree on EU-wide minimum functional specifications for smart metering that will enable network operators, suppliers and notably also consumers, to effectively manage their energy needs and to use ICT solutions, once they become available, for automated energy management. In terms of functionality, this will require two-way, real-time information flows and the possibility of new control loops. These specifications would be compatible with the standardisation mandate for utility meters that has recently been issued by the Commission[32].

Smart metering is just a first step on the path to smart electricity grids. Ultimately, smart grids should facilitate, not just a better management of energy consumption, but the integration of alternative and renewable energy sources on a far greater scale than is possible today, with positive impacts for energy security and for the environment.

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30 This is one of the issues currently discussed in the Citizens' Energy Forum.

31 Report on Methodology for Estimating Energy Savings, ESMA, March 2008.

32 Standardisation mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication protocols enabling interoperability.

4.2.2. A leading role for Member States

Public authorities have at their disposal a range of instruments to induce low-carbon, energy-efficient behaviour in their communities, including: the power to develop and implement building and planning policies, to intervene through **procurement to create demand**, to launch **innovation programmes**, support **pilots and best practice**. They also have the means to directly influence their own energy consumption.

Member States, central, regional and local authorities should be called upon to take the lead in driving demand for innovative ICT-based solutions that will help them to incorporate energy efficiency into all aspects of service delivery and infrastructure management, urban planning and policy-making. The use of advanced software optimisation tools, in combination with reliable data, will be essential to effective decision-making.

Under Cohesion Policy 2007-2013, approximately EUR 86 billion is foreseen for investments in R&D and Innovation, which includes ICT use and technology development. Member States are encouraged to use these funds to support the development of ICT solutions that improve energy performance.

4.3 NEXT STEPS

A public consultation will be launched in order to ensure that the Commission and all stakeholders have the same understanding of the issues to tackle and of the proposed solutions. In particular, in the interest of transparency, and of achieving real and measurable progress, the Commission wishes to be assured that expectations, claims and commitments are based on a common language.

Following the public consultation, the adoption of a Recommendation is planned for the second half of 2009.

5. THE ROLE OF THE EUROPEAN COMMISSION

Supporting the implementation of the recommended measures

Following the publication of this Communication, the Commission will invite representatives of the sectors, where appropriate through relevant sector associations, to set up a working structure to achieve the goals set.

The Commission will also investigate the possibility of setting up a **European web portal** to serve as an open information and communication platform to engage both public and private stakeholders in sharing best practices, experiences, information and data that can serve to accelerate progress towards the goals set.

In collaboration with the Committee of the Regions, the Commission is working on delivering **a practical guide for regional and local authorities** on improving energy performance through innovative use of ICTs.

The Commission is also working to facilitate the contribution of the ICT21EE[33] initiative to the Covenant of Mayors in order to encourage and support cities and municipalities in using ICTs to reduce emissions.

Supporting R&D

In 2007, **ICT for Energy Efficiency** was introduced as a specific theme under the ICT priority of the 7th Framework Programme for Research and Technological Development (FP7). It focuses on solutions for the electricity grid (smart grid), buildings and transport, and R&D on solid-state lighting. Pilot projects on the same themes are supported under the Competitiveness and Innovation Programme. The Commission also provides funding to **energy-efficient ICTs**[34].

Investment has to be further focused on those areas of research that can deliver maximum benefits in terms of energy efficiency and reduced carbon emissions. Larger-scale, cross-sectoral and multi-disciplinary efforts will be increasingly important here. The Recovery Plan, proposed by the Commission in November 2008, includes such efforts in the form of public-private partnerships for R&D in the construction, automobile and manufacturing sectors.

In addition, numerous projects supporting ICT for energy efficiency and improving the energy performance of ICT products and services are financed under Cohesion Policy. In the context of the Recovery Plan, the Commission has taken steps to accelerate the implementation of Cohesion Policy programmes and to further increase the possibilities of funding for energy efficiency projects.

Supporting Innovation

Many of the ICT applications and solutions that will help Europe make the transition to a low-carbon economy will come from software innovations. There are roughly half a million software businesses in the EU. Typically employing 3 to 7 persons, these businesses have one of the highest levels of productivity and profitability of all sectors of the economy[35].

The **practical guide for regional and local authorities** (mentioned above) will set out how administrations can exploit ICTs in their climate change plans[36]. At the same time it will describe how the Cohesion funds can support business partnerships to deliver innovative ICT applications, and will set out practical steps to encourage synergies between Commission-supported research and innovation funding.

Further impetus should come from the so-called Knowledge and Innovation Communities (KICs) to be supported by the European Institute of Innovation and Technology (EIT)[37]. The first call for KICs addresses three priority themes: climate change mitigation and adaptation, sustainable energy, and future information and communication society.

The Recovery Plan proposed by the Commission in November 2008 includes a major budgetary effort to provide high speed broadband (BB) all over Europe. A follow-up

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33 ec.europa.eu/energy/sustainable/**covenant_mayors**_en.htm; CIP Project No: 225024 ICT21EE.

34 The total funding allocated to these initiatives amounts to more than 400 M€.

35 Eurostat 2007.

36 CdR 254/2008 fin.

37 http://ec.europa.eu/eit.

Communication goes a step further and specifies where investment should be targeted both for energy and BB[38]. This should contribute to a wider use of ICTs to respond to the climate and energy challenges, and open up opportunities to link communities and innovative businesses across Europe.

The proposed measures do not have any impact on the Community budget.

6. EVALUATION AND MONITORING

The measures that are intended to be put forward in the Commission's Recommendation address the contributions of the ICT sector and ICTs to meeting the 2020 targets. There will be a review in 2012; the results will be published and will form part of the evidence supporting follow-up intervention if appropriate.

The list of intended measures together with milestones, deliverables and timelines is summarised in the following table:

Actor/ Measure	**Milestone/Reporting**	**Deadline**
ICT Sector	Letters of intent by ICT sector	Within 6 months of adoption
	Targets and Roadmaps	end 2010
	Progress reports	Annually
ICT Sector with Buildings and Construction	Availability of requirements for ICT solutions Progress report	end 2012
ICT Sector with Logistics	Availability of energy consumption and carbon emissions data Progress Report	end 2012
Member States		
	Common functional specifications for smart metering	end 2012
	Urban planning strategies incorporating energy efficiency and carbon emissions	end 2010
	Progress Reports	annually

[38] COM(2009) 36.

7. CONCLUSIONS

Europe has set itself ambitious targets for 2020: saving 20% of primary energy consumption[39], reducing greenhouse gas emissions by 20% and raising the share of renewable energy to 20%. Improved energy efficiency is key to achieving these targets.

Though legislation is being enacted and implemented, data suggest that energy savings are not being realised fast enough. Recent reports suggest that when fully implemented, current measures should achieve energy savings of about 13% by 2020[40]. This represents a major achievement but still falls far short of what is needed.

There is an untapped opportunity to **complement** the existing measures with a set of specific actions to overcome barriers and exploit the full potential of ICTs to enable more efficient use of energy. The proposed policy framework aims to add impetus to the existing regulatory and non-regulatory measures in the area of energy efficiency and thereby contribute to the 2020 targets by:

- improving the energy efficiency of ICTs;
- using ICTs to bring about improved energy efficiency in the other energy-using systems and infrastructures that support our economy;
- using ICTs to provide a quantitative basis upon which energy-efficiency strategies can be devised, implemented and evaluated;
- inviting Member States to drive innovation, to deploy and to showcase ICTs for enabling energy-efficiency gains;
- reinforcing cooperation between all private and public players to reap the maximum benefits from the use of ICTs to improve energy efficiency.

The public consultation that will be launched will provide the opportunity for the Commission and all stakeholders to ensure a common understanding of the issues at stake and of the way to address them.

Engagement at national, regional and local level is necessary if real progress is to be made. It is therefore for the Council and the European Parliament and for national, regional and local policy-makers to confirm their full commitment to the lines of action announced in this Communication.

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39 Council of the European Union, Presidency Conclusions 8/9 March 2007 (7224/1/07).

40 COM(2008) 772.