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COMMISSION STAFF WORKING DOCUMENT

Accompanying document to the

Commission Regulation implementing Directive 2005/32/EC with regard to ecodesign requirements for standby and off-mode electric power consumption of electrical and electronic household and office equipment

IMPACT ASSESSMENT

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IMPACT ASSESSMENT

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Associated DG: DG ENTR

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EXECUTIVE SUMMARY

The Ecodesign Framework Directive[1] ("Ecodesign Directive") lists products which have been identified by the Council and the European Parliament as priorities for the Commission for implementation, including "a separate implementing measure reducing stand-by losses for a group of products" (Article 16). The Spring Council 2007 called for thorough and rapid implementation of the five priorities[2] set by the Energy Council on 23 November 2006[3], based on the Commission's Action Plan on Energy Efficiency. One of those priorities is to "dynamically and regularly improve and expand the scope of minimum efficiency requirements for energy-using products, including standby-loss reduction", by "fully utilizing the Eco-Design Directive". The emphasis on standby was supported by the European Parliament asking the Commission "to come forward with a one-watt performance requirement"[4].

The approach for developing the regulation on standby/off-mode and this impact assessment was structured in the following four steps:

Step 1: assessment of the criteria for ecodesign implementing measure set out in Article 15(2a)-15(2c) of the Ecodesign Directive, taking into account the ecodesign parameters identified in Annex I of the Ecodesign Directive;

Step 2: consideration of relevant Community initiatives, market forces and environmental performance disparities of the equipment on the market with equivalent functionality, as set out in Article 15(2) of the Ecodesign Directive;

Step 3: establishing policy objectives including the desirable level of ambition, the policy options to achieve them, and the key elements of the ecodesign implementing measure as required by Annex VII by the Ecodesign Directive;

Step 4: environmental, economic and social assessment of the impacts, with a view to the criteria on implementing measures set out in Article 15(5) of the Ecodesign Directive.

Step 1

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1 Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of ecodesign requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council, OJ L 191, 22.7.2005, p. 29.

2 Brussels European Council 8/9 March 2007, Presidency Conclusions, 7224/07.

3 TTE (Energy) Council on 23 November 2006, 15210/06.

4 European Parliament resolution of 31 January 2008 on an Action Plan for Energy Efficiency

In order to assess the criteria for ecodesign implementing measures as set out in Article 15(2) of the Ecodesign Directive, the Commission has carried out a technical, environmental and economic study for standby/off-mode ("preparatory study"), whichfollows the provisions of Article 15(4a) and Annex II of the Ecodesign Directive.

With regard to the criteria set out in Article 15(2) of the Ecodesign Directive, the preparatory study has established the following results for products with standby/off-mode operated/sold in the Community:

Article 15 (2a):	Annual sales volume in the Community:	several hundred million
Article 15 (2b):	Environmental impact: energy consumption related to standby/off-mode:	47 TWh in 2005
Article 15 (2c):	Improvement potential (applying cost effective existing technology)	More than 35 TWh by 2020

The improvement potential is due to the fact that technical solutions exist, which

– reduce the electricity consumption in standby/off-mode compared to the market average, while providing the same functionality ,

– reduce the life-cycle cost for the end-user,

– lead to wide disparities of electricity consumption in standby/off-mode of the products available on the market.

Though small when looked at in isolation for a single product, standby/off-mode leads to electricity consumption of the order of the electricity consumption of Greece when multiplied by the number of products with standby/off-mode used in the Community, and the total improvement potential is of the order of the electricity consumption of Denmark.

Step 2

There is little or no incentive for purchasers and manufacturers to do small, if any, additional investments for technologies leading to low standby/off-mode electricity consumption, because it is small for a single product. This barrier prevents market take-up of cost-effective technologies with improved environmental performance.

As set out in Articles 15(2) and 15(4c) of the Ecodesign Directive, relevant Community and national environmental legislation are considered, and related voluntary initiatives both on Community and Member State level are taken into account..

On Community level several programmes related to standby/off-mode have been launched, as e.g. the Energy Star programme for office equipment, the Ecolabel and the Commission's Codes of Conduct. However, these programmes address only a limited subset of products which contribute to electricity consumption in standby/off-mode, and only a limited number of manufacturers takes part in them. Several initiatives were taken in the Member States to

raise awareness for standby/off-mode electricity consumption. However, such initiatives alone cannot solve the problem leading to market failure. Furthermore, the Ecodesign Directive implies that legislative action on standby/off-mode cannot be taken on Member State level, and the Member States expect that a harmonised legislative framework is set, the legal basis being Article 95 of the Treaty.

Conclusion of Step 1 and Step 2

Products with standby and off-mode are placed in large quantities on the Community market. The Electricity consumption related to standby/off-mode is significant and significant cost-effective improvement potentials exist, which are linked to wide disparities of the electricity consumption with identical functionality in standby/off-mode.

On the other hand, market forces and initiatives on Community and Member States level do not address electricity consumption in standby/off-mode properly.

It is concluded that the criteria for ecodesign implementing measures set out in Article 15(2) of the Ecodesign Directive are met, and standby/off-mode should be covered by an ecodesign implementing measure pursuant to Article 15(1) of the Ecodesign Directive.

Step 3

Further to Annex II of the Ecodesign Directive, the level of ambition for improving the electricity consumption in standby/off-mode is determined on the basis of an analysis of the least life-cycle cost of products with standby/off-mode for the end-user.. Furthermore, benchmarks for technologies yielding best performance, as developed in the preparatory study and the discussions with stakeholders during the meeting of the Ecodesign Consultation Forum on 19 October 2007, are considered. The results are reflected in the objectives that the implementing measure aims to achieve, in particular to trigger the market transformation that would realise the improvement potentials.

The policy options considered include "no action", self-regulation, product-specific ecodesign requirements, labelling, and a horizontal ecodesign regulation, and their appropriateness to achieve the objectives was analysed. However, due to the clear mandate of the Legislator for establishing ecodesign requirements for standby/off-mode, the depth of the analysis for options other than an ecodesign implementing measure is proportionate for an implementing legal act, and the focus is on the assessment of its key elements taking into account the preparatory study and the input from stakeholders.

Step 4

An assessment of the proposed implementing measure is carried out. In particular, sub-options for the intensity of the measure, i.e. the timing for staged setting of ecodesign requirement on the power consumption for standby/off-mode, are analysed, taking into account the criteria set out in Article 15(5) of the Ecodesign Directive and the impacts on manufacturers, including SMEs.

Conclusion of Step 3 and Step 4

A comparison of the options shows that the appropriate policy option for realising cost-effective improvement potentials is a regulation setting ecodesign requirements for standby functions and off-mode for a broad range of products ("horizontal"). The requirements of the

regulation should be set in two stages, which become effective one year and four years, respectively, after the regulation has entered into force. This approach ensures:

– that cost-effective potentials to improve the electricity consumption of products in standby/off-mode are quickly realised, leading to important electricity and CO_2 savings, while reducing the life-cycle costs for the end-user;

– that by 2020 the annual electricity consumption will be reduced by approx. 35 TWh compared to a business-as-usual/no-action scenario;.

– accumulated electricity savings/electricity cost savings/CO2 emission savings of approx. 194 TWh/26.4 billion EURO/77.6 Mt until 2020;

– a clear legal framework providing a level playing field for manufacturers, ensuring fair competition;

– that requirements for standby/off-mode are harmonized in the Community, leading to a minimization of administrative burdens and costs for the economic operators;

– that no disproportionate burdens for manufacturers are created due to transitional periods which duly take into account re-design cycles;

– that additional energy savings will be triggered outside the Community because a broad range of the equipment covered are produced to identical specifications for the world market.

Monitoring of the impacts will mainly be done by market surveillance carried out by Member State authorities ensuring that the requirements are met. The appropriateness of scope, definitions and concepts will be monitored by the ongoing dialogue with stakeholders and Member States.

SECTION 1: PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

Organisation and timing

This implementing measure is one of the priorities of the Action Plan on Energy Efficiency[5] for adoption by the Commission for the year 2008[6].

The implementing measure is based on Directive 2005/32/EC establishing a framework for the Commission to set ecodesign requirements for energy-using products1 ("Ecodesign Directive"). An energy-using product (EuP), or a group of EuPs, shall be covered by ecodesign implementing measures, or by self-regulation (cf. criteria in Article 19), if the EuP represents significant sales volumes, while having a significant environmental impact and significant improvement potential (Article 15). The structure and content of an ecodesign implementing measure shall follow the provisions of the Ecodesign Directive (Annex VII).

The Commission has carried out a study on standby/off-mode in preparation of the implementing measure. On 19 October 2007 a meeting of the Ecodesign Consultation Forum established under Article 18 of the Ecodesign Directive was held (details are provided below). Article 19 of the Ecodesign Directive foresees a regulatory procedure with scrutiny for the adoption of ecodesign implementing measures. If both the Article 19 Committee and the European Parliament give a favourable opinion on the draft implementing measure and impact assessment, the adoption of the measure by the Commission is planned in 2008.

Impact Assessment Board

The preliminary version of this impact assessment was discussed in a meeting of the Commission's Impact Assessment Board on 30 April 2008. The corresponding opinion of the Board stated the following:

– The impact assessment responds well to the requirements of the Ecodesign Directive.

– The impact assessment sought appropriate input from a wide spectrum of stakeholders.

– The impact assessment needs to explain the methodology applied to design the implementing measure.

– The baseline scenario needs to be clarified.

– The analysis of the costs and benefits needs to be considerably improved.

– National initiatives should be discussed.

– The interaction with product-specific implementing measures needs to be clarified.

– The impact assessment should be a self-standing document, and key assumptions from background studies and reports from the stakeholder consultation should be annexed.

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5 COM(2006)545 final.

6 COM(2008)11 final.

The re-drafted impact assessment took these considerations into account. The opinion on the re-drafted version was given on 6 June 2008, and this final version of the impact assessment report reflects its recommendations as follows:

– The rationale for the required level of ambition of power consumption requirements and the appropriate timing of implementing dates is substantiated, and the relation to best achievable levels is put into perspective;

– The evolution of the electricity consumption is further explained for the case that requirements on the standby and off-mode power consumption are set, and the accumulated electricity savings are put into perspective with savings for individual products;

– The assessment of costs potentially arising by re-design for compliance with requirements has been further substantiated, and the costs are presented according to sub-options.

Transparency of the consultation process

External expertise on standby/off-mode was gathered in particular in the framework of a technical, environmental and economic analysis (in the following called "preparatory study") carried out by a consortium of external consultants[7] on behalf of the Commission's Directorate General for Energy and Transport (DG TREN). The preparatory study has followed the structure of the "Methodology Study Eco-design of Energy-using Products"[8] developed for the Commission's Directorate General for Enterprise and Industry (DG ENTR). MEEuP has been endorsed by stakeholders and is used by all ecodesign preparatory studies. The standby/off-mode preparatory study has been developed in an open process, taking into account input from relevant stakeholders including manufacturers and their associations, environmental NGOs, consumer organizations, EU Member State experts, experts from third countries (e.g. USA, Australia, Canada) and international organizations as e.g. the International Energy Agency (IEA). The standby/off-mode preparatory study provided a dedicated website[9] where interim results and further relevant materials were published regularly for timely stakeholder consultation and input. The study website was promoted on the ecodesign-specific websites of DG TREN and DG ENTR. An open consultation meeting for directly affected stakeholders was organised in the Commission's premises in Brussels on 4 May 2007 for discussing the preliminary results of the study.

In addition, the initiative was discussed in meetings of Commission staff with stakeholder representatives, and with international partners on many occasions as e.g. the EU-US Summit process, the EU-Japan Energy and Regulatory Cooperation Dialogues, the IEA "Implementing Agreement Energy Efficient End Use Equipment" and the G8 Gleneagles process, the "1-Watt Initiative", the International Platform for Energy Efficiency Cooperation, during bilateral meetings of Commission services with delegations from China, India, Korea, APEC etc.

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7 "EuP Preparatory Study Lot 6 Standby and Off-mode losses", Fraunhofer IZM, final report of 2 October 2007; documentation available on the DG TREN ecodesign website http://ec.europa.eu/energy/demand/legislation/eco_design_en.htm

8 Methodology Report, final of 28 November 2005, VHK, available on DG TREN and DG ENTR ecodesign websites

9 www.ecostandby.org (not accessible anymore)

On 19 October 2007 a meeting of the Ecodesign Consultation Forum on standby/off-mode was held. Building on the results of the preparatory study, the Commission services presented a "working document" suggesting ecodesign requirements related to standby/off-mode losses[10]. On 19 September 2007 the working document was sent to the members of the Consultation Forum, and to the secretariats of the ENVI (Environment, Public Health and Food Safety) and ITRE (Industry, Research and Energy) Committees of the European Parliament for information. The working document was published on DG TREN's ecodesign website, and it was included in the Commission's CIRCA system alongside the stakeholder comments received in writing before and after the meeting.

Outcome of the consultation process

The positions of the main stakeholders, as expressed before, during and after the Consultation Forum meeting on 19 October 2007 as a reaction to the Commission services' working document can be summarised as follows.

The **Member States** support "horizontal" ecodesign legislation on standby/off-mode. The suggested levels for power consumption requirements and the staged timing were in general considered appropriate, although some concerns were raised that the suggested timing of three years for entry into force of the second stage is too short. Further issues that were raised include the definitions for "standby" and "off-mode", the need to avoid potential loopholes for escaping the requirements, and the appropriateness of requiring a "hard off switch".

The general approach to set mandatory minimum requirements in the framework of ecodesign is largely supported by **Industry**[11] associations. However, some concerns were expressed on the feasibility of "horizontal" ecodesign legislation on standby/off-mode. Specific issues that were raised include the scope of the implementing measure (e.g. the role of fixed installed equipment) and its definition for legislative purposes, the definitions of the relevant operating modes, the relation to "vertical" (i.e. product-specific) ecodesign implementing measures, the suggested power consumption requirements of the second stage (demanding), and the timing for entry into force (too short).

Environmental and Consumer NGOs welcome "horizontal" ecodesign legislation on standby/off-mode losses. Concerns were raised on potential loopholes allowing to escape the obligation to meet requirements, the scope of the operating modes addressed, in particular "networked standby" operating modes, the need for "hard-off switch" and the role of requirements for providing relevant information to consumers.

Further details on these issues are given below.

SECTION 2: PROBLEM DEFINITION

The underlying problem can be summarized in the following way: technical solutions exist on the market leading to low power consumption of electrical and electronic household and

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10 Available on DG TREN's ecodesign website

11 See e.g. contributions of ORGALIME and CECED to the consultation of Directive 92/75/EEC, available on http://ec.europa.eu/energy/demand/legislation/domestic_en.htm#consultation; "CECED vision on Energy Efficiency" of 1st July 2007, available on www.ceced.eu; letter of EICTA to DG TREN of 28 March 2007 related to the termination of the industry self-commitment of consumer electronics (cf. footnote 21)

office equipment in standby and off-mode, but the market penetration of equipment with low standby/off-mode power consumption less high as it could be.

Market failure

Standby functions – e.g. remote control activation of a television set – and off-mode losses – occurring when a product cannot be switched off completely when providing no service/function – are a common feature of electrical and electronic household and office equipment (consumer electronics, information and communication technology equipment, personal care products etc.). In general these products are competing on very price sensitive markets. On the other hand users are often not aware of the electricity consumption and costs for standby/off-mode, which usually are small for a *single* product[12], and low power consumption in standby/off-mode is not an important purchasing criterion. However, a typical household is in general equipped with dozens of products having standby/off-mode, and the resulting energy consumption and the related costs are significant.

As a consequence technical solutions reducing energy consumption in standby/off-mode are frequently not applied e.g. due to possible additional costs for the manufacturer, although such costs, if any, are in general very low. On the other hand, a slightly higher purchasing price is in general terms paying off for the user because the overall life-cycle cost, i.a. the purchasing cost plus the costs for operating the product, is reduced. This market failure leads to electricity consumption and related costs being (much) higher than necessary.

Baseline Scenario for the electricity consumption of standby/off-mode

In order to carry out a technical, environmental and economic analysis the preparatory study has considered typical household and office equipment categories (washing machine, oven, DVD player, audio mini system, computer electrical toothbrush etc.), with a detailed analysis of representative models of each category. In particular the study has, amongst others, provided the following key elements:

– a set of definitions of operating conditions that can be applied for all equipment categories;

– electricity consumption in standby/off-mode and usage patterns typical for the various equipment categories;

– the installed base ("stock"), the annual sales, and the typical life time;

– technologies yielding reduced electricity consumption in standby and off-mode and the additional costs for applying them compared to the current "market average";

– potential trade offs between electricity consumption and material related environmental impacts;

The structure of the methodology of the technical, environmental and economic analysis is contained in Annex II.

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[12] As an example, 5 Watts standby power consumption activated 20 hours per day imply an annual electricity consumption of 5 Watts x 20 hours/day x 365 days = 36.5 kWh, corresponding to approx 5 € electricity cost (cf. footnote 14)

Electricity consumption of standby/off-mode in 2005

The preparatory study comes to the conclusion that the large penetration rate of household and offices equipment leads to a very important overall electricity consumption related to standby/off-mode, although the standby/off-mode consumption of a *single* product is usually small (see above).

For the year **2005** the preparatory study estimates that an installed base of **3.7 bln**[13] products has standby/off-mode, leading to electricity consumption in standby/off-mode of **47 TWh** in EU-25, corresponding to electricity costs of **6.4 bln Euro**[14], and **19 mln tons of CO_2 emissions**[15]. A similar amount of electricity is consumed by more complex operating conditions/functions (data transfer etc.) which have been called "networked standby" in the preparatory study. However, these operating conditions at present cannot be addressed in a "horizontal" manner (see discussion in Section 5).

On the other hand, if applied appropriately standby functionalities can help to save electricity because they provide a convenient way to switch equipment into a condition with reduced power consumption compared to the "active" condition providing the main function, which typically use (much) more power. For optimizing the combined active/standby/off electricity consumption of a certain product it is therefore important to minimize the consumption in standby/off-mode, while ensuring that standby functionalities are not left out from the product.

Electricity consumption of standby/off-mode in 2020

Building on the technical, environmental and economic analysis, the baseline scenario for estimating the future evolution of the electricity consumption related to standby and off-mode until the year 2020 has been developed under the following conditions:

– The market trend as developed in the preparatory study leads to an increasing penetration rate of equipment having standby and/or off-mode, and, assuming typical life/usage times, the installed base of equipment having standby mode and off-mode will increase to approx. **4.6 bln** products in 2020.

On the other hand:

– Awareness raising campaigns aiming at market transformation by increasing the demand for products with low standby/off-mode, and "educating" users to switch off/plug off equipment when not used are/have been carried out in several EU Member States, leading to some extent to "better switch off habits" and/or influence the purchasing decision towards equipment with low electricity consumption in standby and off-mode. Nevertheless the Legislator has identified standby/off-mode as being a priority ecodesign measure, because the market failure is likely to remain unresolved since it is difficult and

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13 Here and in the following the aggregated EU figures are for EU-25 (data basis of the preparatory study); the figures for EU-27 are slightly higher (approx. 3% if extrapolated according to the difference between the electricity demand in EU-25 and EU-27 in 2006).

14 average electricity price in the EU 2005: 0.136 €/kWh

15 average specific EU emissions in 2003 for EU-25: 400g CO2 per kWh (EURELECTRIC, Environmental Statistics of the European Electricity Industry, Trends in Environmental Performance 2003-2004); this figure is higher if e.g. mining related effects are taken into account (MEEuP: plus 10%)

time consuming to address the underlying problem laid out above by promotional/awareness rising approaches aimed at individual consumers (cf. the discussion of the policy option related to labelling in Section 4).

– Several Community programmes as e.g. the Energy Star programme for office equipment, the Ecolabel and the Commission's Codes of Conduct address standby and off-mode. However, these programmes address only a limited subset of products which contribute to electricity consumption in standby/off-mode, and only a limited number of manufacturers takes part in them.

– Upcoming "Vertical" ecodesign implementing measures also could address to some extent the improvement potential. However, the major part of the large variety of electrical and electronic equipment will not/cannot be covered by "vertical" ecodesign measures. For those products the "horizontal" ecodesign measure is a particularly important (and efficient) way of reducing electricity consumption. It is therefore concluded that, without taking additional specific action on standby/off-mode in the framework of the ecodesign, the market transformation towards equipment with improved standby/off-mode electricity consumption will take place only slowly.

– It is assumed that the aggregated standby/off-mode electricity consumption of household and office equipment will be reduced by 1% annually by initiatives as described above.

– Functionalities addressed by the current definition of standby mode will be partly shifted to other operating modes, in particular "networked" modes, thereby not contributing to standby mode electricity consumption.

Under these assumptions, it is expected that electricity consumption in standby/off-mode will rise to approx. **49 TWh** per year in **2020** (approx. the total electricity consumption of Greece).

Structure of the industry sectors manufacturing equipment having standby/off mode

In order to facilitate the assessment of economic and social impacts of policy options on standby/off-mode, in principle quantified shares of annual sales of high and low volume producers (e.g. SMEs), and of EU and third-country producers, would be useful. However, as laid out above, standby functionalities and off-mode are common features of almost all household and office equipment categories, and a detailed breakdown of the market cannot be provided.

Furthermore, the impact of ecodesign requirement on the affordability of products would in principle require an assessment of income/structure of the users (households and tertiary sector) of the equipment having standby/off-mode. However, additional costs that may arise for technologies necessary to achieve compliance for equipment not yet meeting the requirements yet are expected to be very small, or zero. Therefore affordability is not expected to be negatively affected even for low income households. This is further discussed in Section 5.

Benchmarks and level of ambition

The preparatory study has shown that, depending on the functionality provided, existing cost effective technical solutions allow for standby/off-mode power consumption levels which are lower than the current market average. According to the "base cases" of the preparatory study,

which reflect the market average situation, standby/off-mode power consumption levels of electric and electronic household and office equipment are currently typically several Watts[16].

Benchmarks achievable by best available technology

The preparatory study and additional input from stakeholders in the Consultation Forum has shown that the lowest achievable off-mode power consumption levels ("benchmark") that can be achieved by applying the best available technology yields ranges approx. from 0.0 Watt to 0.3 Watt. The value depends on the individual product category and the properties as related to "electromagnetic compatibility" (EMC), and in particular the requirements set by the "EMC Directive"[17]. For product categories for which typically no EMC "filter" is required to comply with the EMC Directive, off-mode with zero power consumption is achievable with a "hard off switch", while for product categories which typically require an EMC filter to comply with the EMC Directive a power consumption of approx 0.3 Watt often cannot be avoided even with a "hard off switch".

For standby, the preparatory study concludes that for some product categories power consumption for the reactivation function of 0.1 Watt can be achieved. However, such levels may imply technical solutions which may not be cost-effective, in particular for low-cost products, and may lead to material related trade-offs (e.g. back-up batteries), potentially resulting in an increase of life-cycle environmental impact and costs. For the display function, simple displays with a power consumption of 0.1 Watt are available, although the power consumption of more complex display functions (e.g. clock display) may be higher. More power is required for so called "sensor based safety functions". However, such functions are not covered by the definition for "standby" (see discussion in Section 4).

Level of ambition

According to the Ecodesign Directive requirements on energy consumption in use should aim at the life-cycle cost minimum for the end-user. The preparatory study concludes that a power consumption level of 0.5 Watt for off-mode and standby – reactivation function, and a power consumption level of 1 Watt for standby – reactivation and/or display function can be achieved for household and office equipment with technologies which reduce the life-cycle cost for the end-user. For some household and office equipment product categories lower power consumption levels for off-mode or standby may be feasible and may lead to a further reduction of life-cycle cost.

It is concluded that a power consumption of 0.5 Watt for off-mode or standby – reactivation function, and 1 Watt for standby – display, and display and reactivation function, is the appropriate level of ambition for the "horizontal" standby/off-mode regulation. The appropriateness of more ambitious requirements will be re-examined on a product-by-product basis for the products-specific implementing measures.

Although the technologies for achieving these power levels are available, the majority of products on the market now do not meet them. In order to take into account the effects on

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16 standby/off-mode examples: computer 3.6 Watt/2.2 Watt, DVD player 4.8 Watt/1.5 Watt, washing machine 5.7/1.2 Watt

17 Directive of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC; OJ L 390, 31.12.2004, p. 24.

manufacturers, and in particular SMEs, it will be argued in Section 5 that the appropriate intensity of ecodesign requirements, which optimally satisfies the provisions of the Ecodesign Directive, corresponds to the following transitional periods:

Stage 1, effective one year after entry into force of the regulation; power consumption requirements: 1 Watt for off-mode or standby – reactivation function, and 2 Watts for standby – display, and display and reactivation function.

Stage 2, effective four years after entry into force of the regulation; power consumption requirements corresponding to the level of ambition.

Legal basis for EU action

The Ecodesign Directive and, more specifically, its Article 16 provides the legal basis for the Commission to adopt an implementing measure reducing standby losses for a group of products.

SECTION 3: OBJECTIVES

As laid out in Section 2, the preparatory study has confirmed that a large cost-effective potential for reducing electricity consumption of electrical and electronic equipment exists. This potential is not captured, as outlined above. The general objective is to develop a policy which corrects the market failure, and which

- I) leads to significant reductions of the standby/off-mode electricity consumption, improving the environmental performance of the affected equipment throughout the life cycle;

- II) ensures the free movement of affected products within the internal market.

The Ecodesign Directive, Article 15 (5), requires that ecodesign implementing measures meet all the following criteria:

- a) there shall be no significant negative impacts on the functionality of the product, from the perspective of the user;

- b) health, safety and the environment shall not be adversely affected;

- c) there shall be no significant negative impact on consumers in particular as regards affordability and life cycle cost of the product;

- d) there shall be no significant negative impacts on industry's competitiveness;

- e) in principle, the setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers;

- f) no excessive administrative burden shall be imposed on manufacturers.

SECTION 4: POLICY OPTIONS

Option 1: No EU action

This option would have the following implications:

– The market failure would persist, although policies addressing specific products (e.g. the voluntary Energy Star programme) to some extent contribute to a reduction of standby/off-mode. However, the majority of the products contributing to standby/off-mode electricity consumption will not/cannot be addressed by product specific policies. The impact of this option is described in more detail in Section 2 ("Scenarios for 2020")

– It is to be expected that Member States would want to take individual, non-harmonized action on standby/off-mode (e.g. Germany[18]). This would hamper the functioning of the internal market and lead to high administrative burdens and costs for manufacturers, in contradiction to the goals of the Ecodesign Directive.

– There is a risk of competitive disadvantages, in particular for very price sensitive products, for those manufacturers designing their products to good standards vis-à-vis competitors not using technology leading to low standby and off-mode energy consumption, as developed hereunder.

– The specific mandate of the Legislator would not be respected.

Therefore this option is discarded from further analysis.

Option 2: Self regulation

This option is discarded for the following reasons:

– No initiative for self-regulation on standby/off-mode for electrical and electronic equipment has been brought forward by any industrial sector.

– Relevant voluntary initiatives have been terminated in 2007 by industry[19], which has called for a clear legal framework ("level playing field") ensuring fair competition, while voluntary agreements could lead to competitive advantages for free-riders and/or non-participants to the "self-commitment" (large share of the actors in "fragmented" markets like consumer electronics).

– The specific mandate of the Legislator would not be respected.

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[18] Feasibility study "Technical and legal application possibilities of the compulsory labelling of the standby consumption of electrical household and office appliances" carried out for the Federal Ministry of Economy in 2005.

[19] Industry self-commitment to improve the energy performance household consumer electronic products sold in the European Union (lead by EICTA); CECED voluntary agreements on several household appliances.

Option 3: Ecodesign requirements on standby/off-mode set *only* in the context of product-specific ecodesign implementing measures

This option means that ecodesign requirements on standby/off-mode would be set in product specific ecodesign implementing measures only, without setting "horizontal" ecodesign requirements on standby/off-mode for a group of products. This option would imply the following:

– For many products (e.g. personal care) the overall energy consumption is small and a dedicated vertical ecodesign implementing measure may not be justified, but standby/off mode often is the largest contribution to the overall energy consumption and the most significant environment aspect.

– Addressing standby/off-mode in product specific implementing measures only would realise only a part of the improvement potential in standby/off-mode.

– Standby/off-mode is common to a major part of the electrical and electronic equipment including fast moving sectors as e.g. Information and Communication Technology and Consumer Electronics, and the functional approach ensures that new product categories do not have inappropriately high energy consumption in standby/off-mode when introduced into the market.

– A horizontal measure on standby/off-mode is, from an administrative point of view, more effective a (large) number than of product specific measures, aiming at having largely the same effect.

– The specific mandate of the Legislator would not be respected.

Therefore, this option as being the **only** policy to reduce energy consumption of standby functions and off-mode is discarded.

However, where appropriate product specific measures will set complementary requirements related to standby/off-mode. Product specific impact assessments will further assess relevant aspects including

– appropriateness to set ecodesign requirements on standby/off-mode differing from the requirements set in the horizontal regulation;

– complementary ecodesign requirements on networked standby and/or hard off switch;

– product-specific ecodesign requirements on power management.

Option 4: Labelling targeting specifically the energy consumption of standby/off-mode

This option means that labelling targeting specifically standby/off-mode would be put in place without setting horizontal standby/off-mode eco-design requirements. This option would imply the following:

– In general two main objectives of labelling schemes are to increase the market penetration of, in this case, energy efficient products by providing incentives for innovation and technology development, and to help consumers to make cost effective purchasing decision

by addressing running costs. The first aspect is not relevant, because the technologies for reducing the energy consumption in standby/off-mode to very low levels readily exist.

– In principle labelling could be suitable to increase the market penetration of equipment with low standby/off-mode energy consumption, and the energy labelling framework Directive[20] could, arguably, provide the legislative framework for a horizontal label targeting the energy consumption of standby functions and off-mode.

– On the other hand, as outlined above, the absolute energy consumption in standby/off-mode of an individual product, and the difference in electricity costs between two grades are low, if the band between two grades is sufficiently narrow to allow for differentiation between products[21]. It is even lower when compared with the on-mode consumption of the product.

– Therefore little incentives for purchasing equipment with "good" standby/off-mode energy consumption grading exist, and, in addition to the policy framework marketing and awareness raising efforts would be needed.

– Consequently there is a high risk that any market transformation towards equipment with desirable levels of standby/off-mode energy consumption would anyway take place slowly.

– The administrative burdens for manufacturers would be higher when compared with the burdens associated to minimum requirements for standby/off-mode.

– Depending on the actual design of the labelling scheme, additional burdens could arise for retailers.

– The specific mandate of the Legislator would not be respected.

Provided that standby/off-mode electricity consumption is in the range 0.5 Watt – 1.0 Watt, there is little to no room for further improving energy consumption in standby/off-mode (e.g. due to unavoidable leaking currents and measurement uncertainties). Therefore it is not appropriate to complement horizontal ecodesign requirements on standby/off-mode by a labelling scheme targeting standby/off-mode.

Therefore this option is discarded for further analysis.

However, for some products it may be appropriate to consider operating conditions related to standby/off-mode, e.g. networked standby and safety functions, which could be taken into account in product-specific labelling initiatives. This will be considered in detail in the context of relevant “vertical” product-specific IA, as appropriate.

Option 5: "Horizontal" ecodesign implementing regulation on standby functions and off-mode

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[20] Council Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances, OJ L 297, 13.10.1992, p. 16.

[21] A continuous power consumption of one Watt power corresponds to approx 9 kWh electricity consumption, or electricity costs of approx one Euro, per year.

This option aims at improving the environmental impact of standby and off-mode functions, i.e., setting maximum levels for the related power consumption for a group of products. This sub-section contains details of the rationale for the elements of the corresponding regulation, as listed in Annex VII of the ecodesign framework directive.

1. Definition of the types of EuPs covered

The scope of the product categories addressed by an ecodesign measure on standby/off-mode losses are in line with the scope of the preparatory study which, as discussed with stakeholders during the first stages of the study, should address plug and play electrical and electronic household and office equipment. Fixed installed equipment/systems such as building infrastructure (e.g. "split" air conditioning installations), individual parts and industrial equipment are not in the scope. It has been argued (environmental NGOs) that the scope should comprise such equipment too (or all energy using products in the sense of the definition of 2005/32/EC). However, standby functions are typical for end-use equipment (being a function designed to be used by the end user), and the concepts and definitions appropriate for a horizontal regulation are not applicable to those fixed installed equipment/systems.

The scope of the regulation is defined by using an approach similar to the "Waste electrical and electronic equipment" (WEEE) Directive[22], while limiting the application to products corresponding to "household" and "office" equipment. In addition, the "catch all" clauses are included to ensure that products not being explicitly named in the product list, which can never be exhaustive, are covered. This approach has been supported by Member States, but has been criticised by manufacturers' representatives as not being clear enough. The scope definition has been further developed by explicitly excluding fixed installed equipment Information and Technology equipment having class A according to the EMC Directive from the scope.

2. Staged implementation of ecodesign requirements

Power levels for off-mode and standby

As described in Section 2 maximum power levels are foreseen which are scheduled to come into force in two stages:

Stage 1, effective one year after entry into force of the regulation; power consumption requirements: 1 Watt for off-mode or standby – reactivation function, and 2 Watts for standby – display, and display and reactivation function.

Stage 2, effective four years after entry into force of the regulation; power consumption requirements corresponding to the level of ambition.

The second stage corresponds to the desirable level of ambition, as discussed in Section 2. Taking into account possible impacts on manufacturers including SMEs as required by the Ecodesign Directive, less demanding requirements are set in a first stage, and additional time is given to achieve compliance with level of the requirements of the second stage. The duration of the transition periods is based on the assessment carried out in Section 5.

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[22] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE), OJ L 37, 13.2.2003, p. 24.

Definitions for "off-mode" and "standby"

The set of definitions for "off-mode" and "standby" are based on the preparatory study, which is also used for the on-going revision of the "standby standard" IEC 62301. Taking into stakeholder feedback, the definitions have been slightly modified compared to the preparatory study and/or Committee draft 59/490/CD for the revised IEC 62301.

Conditions of equipment involving sensor-based safety functions are not included in the definition of standby in order to prevent that safety relevant functions could be left out of equipment merely for the sake of meeting ecodesign requirements. This is relevant mainly for wet appliances (water stop functions) and cooking equipment, e.g. sensors indicating that a cooking field is hot. Those functions will be taken into consideration in the relevant product-specific ecodesign implementing measures (e.g. for "wet" appliances, in preparation). In addition to standby/off-mode further functions have been investigated in the preparatory study and are called "networked standby", although it can be argued that functionalities as e.g. data transfer should rather be considered as pertaining to "main functions" (and not "standby"). "Networked" operating conditions significantly contribute to electricity consumption and it is expected that they will become even more important in the future, but horizontal ecodesign requirements cannot be set at this stage because the related concepts and definitions/classifications (three types of "networked" suggested in the study) have to be further developed. Furthermore, appropriate measurement methods are not available. The feasibility and appropriateness of horizontal requirements on "networked" operating conditions should be considered for a revision of the Regulation. A specific ecodesign preparatory study on networked standby is expected to be launched early 2009.

The definition for "off-mode" has been aligned with the definition in 59/490/CD.

Requirement on availability of standby/off-mode and power management

Loss of standby functionalities would lead to an increase of the overall energy consumption because users would often not switch the product into standby/off-mode, and the product would remain in the main function, usually consuming much more energy than in standby, longer than needed. The strategy for minimizing the overall energy consumption of equipment is therefore to require

– that equipment has a standby/off-mode with low power consumption levels, or an operating condition with a power consumption not exceeding the standby/off-mode power consumption,

– an automatic switch to standby when the main function is not used.

The first requirement also aims at avoiding loopholes and unfair competition, because there is a risk that equipment could be designed without providing standby/off-mode, with the aim to escape the requirements. The second requirement aims at ensuring that equipment is switched to standby/off-mode (i.e. conditions with very low power consumption) when the main function is not used. The automatic switch to standby/off-mode may require a more thorough re-design of the product, and is therefore foreseen for the second stage.

"Hard off switch"

In general a "hard off switch"[23] can help to reduce the overall energy consumption of a particular product. On the other hand it depends on the particular product if a hard off switch is appropriate (e.g. to require a hard off switch for a computer used in a network, a DECT phone, a Fax machine etc. has no benefits), and, depending on the characteristics of equipment related to requirements on electromagnetic compatibility (see discussion in Section 2), even with a hard off switch power consumption in the range of 0.3 Watt cannot be avoided. Furthermore, given the foreseen requirements for power consumption, the possible additional energy savings potentially triggered by a hard of switch are marginal and may not be cost-effective[24], and depend heavily on the individual user behaviour.

Therefore the regulation does not "horizontally" require a hard off switch, and it is up to the manufacturer to choose a hard off switch, being one particular technological solution, in order to comply with off-mode requirements. However, as stipulated by Recital (11) of the regulation, the technical feasibility and appropriateness of a "0 Watt" off-mode should be considered on a product by product basis in product specific ecodesign implementing measures.

3. Ecodesign parameters for which no ecodesign requirements are necessary

The aim of the regulation is to set ecodesign requirements on a pre-selected environmental impact parameter – energy consumption in the use-phase –, and no provision on further aspects is included. Further environmental aspects of the equipment covered have been addressed qualitatively to the extent possible for the "horizontal" (i.a. not product specific) context, and it is to be noted that the requirements introduced for reducing standby/off-mode power consumption do not negatively affect the other environmental performance parameters of the products covered (see below).

4. Measurement standard

Measurement method

Standard EN 62301 defines a method for measuring standby/off-mode power consumption. The underlying standard IEC 62301:2005 is currently being revised and further improved, and the final version of the revised IEC 62301 is not available yet. The regulation sets requirements on the measurement method to be used for conformity assessment, and the mandate to the European Standardisation Bodies for a corresponding harmonised standard was endorsed by the "98/34" Committee[25] in November 2008.

Verification procedure for market surveillance purposes

It has been argued by several Member States that the procedure in EN 62301 (and similar standards for energy labelling under Directive 92/75/EEC) leaves room for product design which could be systematically overstepping ecodesign power levels (energy efficiency grades in the case of labelling) by several percent. The tolerance for the first test of the verification procedure is therefore reduced from 15% to 10% for power consumption larger than 1 Watt, and from 0.15 Watt to 0.1 Watt for power consumption equal to, or smaller than, 1 Watt. The

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23 A switch on the product facilitating to disconnect it from the mains power source

24 Maximally achievable additional annual energy savings from avoiding 0.5 Watt are 4.4 kWh/0.60 €.

25 Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations, OJ L 204, 21.7.19998, p. 37.

mandate for the measurement method mentioned above also addresses measurement uncertainties.

5. Information to be provided by the manufacturers

In order to facilitate compliance checks manufacturers are requested to provide information in the technical documentation referred to in Annexes IV and V of Directive 2005/32/EC on the operating conditions subject to the definitions of standby/off-mode, and the corresponding power consumption levels. The mandate for the measurement method mentioned above also addresses a template for reporting relevant data.

6. Date for evaluation and possible revision

The main issues for a possible revision of the Regulation are

– the feasibility of horizontal requirements on "networked operating" conditions;

– the appropriateness of the levels for the ecodesign requirements for the power consumption of standby and off-mode;

– the appropriateness of the product scope.

The second stage of the ecodesign requirements becomes effective four years after entry into force of the Regulation. With a view to allow sufficient time to collect, analyse and complement data and experiences related to the second stage for a proper assessment of technological progress, a review can be presented to the Consultation Forum six years after entry into force of the regulation.

7. Interrelation with product specific ecodesign implementing measures

If a certain product is in the scope both of a product-specific ("vertical") and the "horizontal" regulation on standby/off-mode, then the product has to comply both with the horizontal and the vertical measure for affixing the CE mark. Vertical implementing measures are complementary in the sense that environmental aspects other than standby/off-mode are addressed, including further operational modes as e.g. "networked" operating modes and active mode.

However, in general vertical implementing measures prevail, because it may be appropriate for a certain product to set differing requirements on power consumption of standby/off-mode in a vertical implementing measure. In general these should not be less ambitious than those of the horizontal regulation, because the latter sets the "baseline" for standby/off-mode power consumption.

For products which are not in the scope of the regulation on standby/off-mode as e.g. products powered by energy sources other than electricity (gas, oil) or fixed installed equipment, standby/off-mode can be addressed in the related vertical implementing measure.

SECTION 5: ANALYSIS OF IMPACTS OF A "HORIZONTAL" ECODESIGN IMPLEMENTING REGULATION ON STANDBY AND OFF-MODE

Given that options 1-4 have been discarded in Section 4, this Section looks into the impacts of option 5. To this end an assessment of possible sub-options as regards the "intensity" of the measure – the combination of the levels of requirements and the timing for the levels pursuant to Article 15(4f) of the Ecodesign Directive – is carried out.

The assessment is done with a view to the criteria set out in Article 15(5) of the Ecodesign Directive, and the impacts on manufacturers including SMEs. The aim is to find a balance between the quick realization for achieving the appropriate level of ambition and the associated benefits for the environment and the user (due to reduction of life-cycle costs) on the one hand, and potential burdens related e.g. to un-planned re-design of equipment for achieving compliance with ecodesign requirements on the other hand, while avoiding negative impacts for the user, in particular as related to affordability and functionality.

The following sub-options for the intensity of the measure are considered

– Sub-option 1: Stage 1 – one year; Stage 2 – three years (suggestion of working document discussed in the Consultation Forum)

– Sub-option 2: Stage 1 – one year; Stage 2 – four years

– Sub-option 3: Stage 1 – two years; Stage 2 – four years

– Sub-option 4: Stage 1 – two years; Stage 2 – six years

In order to assess the impact of these sub-options, the following factors are taken into account:

Economic impacts

Savings:

– accumulated electricity cost savings until 2020 (depending on sub-options)

– annual electricity cost savings by 2020 (see Section 6)

Costs:

– possible additional costs related to the improved technology, e.g. for additional and/or more expensive components

– re-design of products currently not complying with the requirements (depending on sub-options)

– assessment of conformity with ecodesign requirements and re-assessment of conformity with further requirements (safety etc.)

– possible reorganization of the supply chain

Social impacts

– jobs related to the production of affected equipment

– affordability of equipment

Environmental impacts

– accumulated electricity savings and reductions of CO2 emissions until 2020

– possible trade-offs between low standby/off-mode power consumption and material–related environmental impactsannual electricity savings and reduction of CO2 emissions by 2020 (see Section 6)

In general, due to the fact that standby functionalities and off-mode are common features of almost all household and office equipment categories, detailed figures cannot always be provided and a semi-quantitative analysis is given.

Economic impacts

Life-cycle cost and additional costs related to the improved technology

As shown by the preparatory study, the power consumption levels of the first and of the second stage are provided by readily available technologies which lead to a reduction of the life-cycle cost for the affected equipment from the end-user perspective. It cannot be excluded that the purchasing cost of equipment increases, although the additional cost, if any, for technologies to achieve standby/off-mode power consumption levels as foreseen by the requirements of stage 1 and stage 2 are of order one EURO[26]. Therefore the requirements for stage 1 and stage 2 remain cost-effective also when a lower electricity price is assumed.

Accumulated electricity cost savings

The requirements of the first stage ensure that, during the time span between the first and the second stage, equipment placed on the market achieves certain standby/off-mode improved levels. In the opposite case there is a risk that equipment placed on the market, having life times up to 15 years, would be placed on the market for several years leading to unnecessary electricity consumption.

The accumulated electricity cost savings depend on the timing of first and second stage. Qualitatively, the sooner the requirements become effective and the shorter the delay between first and second stage, the higher the accumulated electricity cost savings.

Annex III shows the accumulated electricity savings for sub-options 1-4 until 2020. Table 1 gives an overview of electricity savings and the corresponding cost savings and avoided CO2 emissions.

	Accumulated electricity savings (TWh)	Accumulated electricity cost savings	Accumulated avoided CO2 emissions

[26] e.g. 0.2€ – 0.5€ for a power supply unit optimised for low standby power consumption; 2€ for changes in the hardware to achieve automatic transition to off

		(billion EURO)	(Mt)
Sub-option 1	203	27.6	81.2
Sub-option 2	194	26.4	77.6
Sub-option 3	167	22.7	66.8
Sub-option 4	152	20.7	60.8

Table 1: accumulated electricity and cost savings, and avoided CO2 emissions until 2020.

Cost – assessment of conformity with ecodesign requirements and re-assessment of conformity with further requirements

In general assessing the conformity with ecodesign requirements implies costs for manufacturers. The requirements of this regulation are simple, and the method to establish the power consumption of standby/off-mode is straightforward. It is estimated that the cost for measuring the power consumption does not exceed 500€ (in house by the manufacturer) and 1000€ (external laboratory) per sample product/model.

Furthermore, products not complying with ecodesign requirements need to be re-designed, which, in general, implies the need for assessing conformity no only with ecodesign requirements, but also re-assessing conformity with further applicable requirements (e.g. "Low Voltage Directive"[27] and EMC Directive). This is relevant in particular for the 1st stage. Depending on the product costs for re-assessing conformity with further requirements may be significantly higher than the costs for assessing conformity with ecodesign requirements only, and the resulting total cost for re-assessing conformity can be of order several thousand Euros. On the other hand:

– all manufacturers are affected by the need for a conformity assessment, because the regulation creates a level playing field;

– possible costs for re-assessment due to re-design are occurring only once upon introduction of the regulation;

– costs for assessing conformity are much smaller than further cost factors, therefore competitiveness of SMEs vis-à-vis high volume producing manufacturers is not significantly affected;

– manufacturers already now producing equipment complying with the requirements may have a, albeit very small, competitive, advantage.

[27] Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits, OJ L 374, 27.12.2006, p. 10.

Costs – re-design of products not complying with requirements

For products which do not comply with ecodesign requirements costs may arise for re-design due to additional costs for components, costs for adapting production, and administrative costs for re-assessment of conformity.

Due to the wide range of products affected by the regulation, an estimate for the aggregated costs for the sub-options cannot be given. However, based on stakeholder input, the impact of the sub-options is described using, as examples, white goods sector and TVs.

Additional costs for component technologies

As discussed above additional costs, if any, which may arise from applying technologies ensuring compliance with the power consumption requirements for standby/off-mode are small or negligible, and additional costs for technologies/solutions ensuring compliance with power management requirements have not been pointed out by stakeholders.

Costs for adapting product design and production

Costs for adapting product design and production capacities may arise due to un-planned re-design of products which do not comply with the requirements. The potential need for un-planned re-design depends on the typical product cycles of a particular product.

Due to the horizontal character of the regulation, re-design cycles for equipment covered can be in the range from less than a year (e.g. consumer electronics and information technology equipment) to several years (e.g. large household appliances). On the other hand a very limited set of product aspects is affected.

The power consumption requirements of stage 1 and stage 2 do not affect the main product functions, and the complexity of re-design is, in general, low.

The power management requirement of stage 2 may affect the main function, and re-design of products may be more complex.

Qualitatively, the shorter the period for entry into force of requirements and the shorter the delay between first and second stage, the higher the potential costs related to unplanned re-design. On the other hand, the longer the period for entry into force of requirements, the better re-design can be integrated into planned re-design without additional costs.

For information technology equipment, consumer equipment and small household appliances short product cycles are typical. As an example, new TV models based on a particular generation of chassis are released by manufacturers typically twice per year, although a new generation chassis is released typically every 18-30 months. On the other hand, for "large household appliances", e.g. washing machine, product cycles may be several years.

Sub-option 1

This sub-option implies the following.

For products with short product cycles, it is expected that no unplanned re-design is necessary, because both the requirements of stage 1 and stage 2 can be accommodated in planned re-design and new models.

For products with long product cycles, in particular large household appliances, it is expected that for some models unplanned re-design is required, although re-design for meeting ecodesign requirements will often be carried out together with modifications to a particular model which may be done anyway for other reasons. The requirements of stage 1 may imply that the product platforms (being usually the basis for several models) that product platform/model design and the production line may have to be adapted., and the conformity of the re-designed model with the applicable legislation (e.g. "Low Voltage Directive"[28] and EMC Directive) has to be re-assessed. According to stakeholder input from the white goods sector the total cost, including administrative costs, per product platform is in the range 50.000€-100.000€. On the other hand, tens of thousands of individual products will be produced per re-designed product platform during the time span between 1st and 2nd stage, but the additional costs per product cannot be precisely quantified, but are expected to be in the range 1€-10€ for large volume production.

It cannot be excluded that some manufacturers including SMEs may have more difficulties than others to manage investments for achieving compliance,, and the cost increment per product can be higher. However, for sub-options 1 and 2 foreseeing a transition period of one year for stage contributions provided by stakeholders during the Consultation Forum process do not indicate that re-design for compliance implies significant economical drawbacks. The requirements foreseen for stage 2 may imply the need for a more thorough re-design. . The additional two year period for entry into force of stage 2 means that re-design can be accommodated to some extent into planned re-design, but for models/platforms with long product cycles nevertheless re-design in two steps may be required, possibly implying additional costs. No figures are available beyond the costs quoted above, but feedback from manufacturers and some Member States suggests that a three year transition period for stage 2 is too short to achieve compliance with the requirements for tier 2 and may create disproportionate burdens for manufacturers, including difficulties to re-organise the supply chain timely.

Sub-option 2

This sub-option foresees a transition period for stage 1 of one year, and the corresponding conclusions for sub-option 1 remain valid.

For stage 2, a transition period of three years from stage 1 to stage 2 (one year more than sub-option 1), providing additional time to adapt models/production for long product cycles and re-organise the supply chain, and increased return on possible investments needed for achieving compliance with the requirements of stage 1.

Therefore it is expected that costs for re-design are lower than for sub-option 1.

Sub-option 3

This sub-option foresees a two-year transition period for stage 1. This implies that costs for re-design of products with long product cycle are lower than for sub-option 2, because re-design can be accommodated to a somewhat larger extent into planned re-design.

The transition period for stage 2 is four years as in sub-option 2, and the corresponding conclusions remain valid.

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[28] OJ L 374 of 27.12.2006, p. 10.

Therefore it is expected that costs for re-design are lower than for sub-option 2.

Sub-option 4

This sub-option foresees a two-year transition period for stage 1 as in sub-option 3, and the corresponding conclusions remain valid.

The transition period for stage 2 is six years, a further reduction of costs for re-design compared to sub-option 3, because the second stage requirements are expected to be accommodated almost completely into planned re-design.

Therefore it is expected that costs for re-design are lower than for sub-option 3, although the cost benefit compared to a four-year transition period for stage 2 is likely to be small because

– technical solutions are readily available for achieving the second stage,

– only the simplest standby functions and off mode are affected, and a generational re-design is not required;

– more complicated operating conditions, including networked conditions, are not affected.

Administrative costs for Member States

The form of the legislation is a regulation which is directly applicable in all Member States. This ensures no costs for national administrations for transposition of the implementing legislation into national legislation.

The costs for carrying out the verification procedure for market surveillance purposes depends mainly on the product price (assuming that an authority purchases), and the possible need for a second test on a sample of three additional products in the case that the power consumption levels established in the first test are excessive. In any case, it is to be expected that a product is tested not only for its conformity with ecodesign requirements, but also with further applicable requirements, and the part of the costs required for testing the power consumption of standby/off mode is expected to be small because the measurement is straightforward.

Social impacts

Jobs

It cannot be excluded that some companies, including small companies/SMEs, may have difficulties for achieving compliance in time. This may lead, in the extreme, to job losses because (some) products can no longer be placed on the market when the regulation becomes effective and a company has failed to ensure compliance in time.

On the other hand no risks for job losses due to negative impacts related to sub-option 1 have been pointed out during the Consultation Forum. It is concluded that, overall, the risk of job losses is small for sub-options 1 and 2, and negligible for sub-options 3 and 4.

Affordability of equipment

As shown above a significant price increase due to ecodesign requirements is not expected and therefore affordability is not negatively affected.

Environmental impacts

Accumulated reductions of CO2 emissions

The accumulated electricity savings and the reduction of CO2 emissions depend on the timing of first and second stage. Qualitatively, the sooner the requirements become effective and the shorter the delay between first and second stage, the higher the accumulated electricity savings and the related CO2 emissions. Therefore the positive impact of the sub-options is becoming lower for longer delays. The accumulated CO2 savings for sub-options 1-4 are shown in Table 1 above.

Possible trade-offs between low standby/off-mode power consumption and material–related environmental impacts

The preparatory study has qualitatively assessed possible trade-offs between reductions of standby/off mode power consumption, and material related impacts which possibly, but not necessarily, may be arising due to, e.g., additional integrated circuits. Even in the case that additional components are necessary to comply with ecodesign requirements (e.g. additional integrated circuits) trade-offs are not to be expected, i.e. the reduction of the use phase power consumption environmental impact is larger than possible additional material-related environmental impacts.

Comparison of the sub-options

The following table summarizes the considerations on the impacts of the sub-options and assesses them on a relative scale from 1 (bad) to 4 (good):

	Additional Costs for manufacturers	Electricity/CO2/electricity cost savings	Risk for Job losses in SMEs
Sub 1	2	4	2
Sub 2	3	3	3
Sub 3	4	2	4
Sub 4	4	1	4

Table 2: summary and assessment of sub-options 1-4

It is concluded that sub-option 2 is the preferred option, achieving the appropriate balance between positive environmental impacts and electricity cost savings, and possible risks related to jobs and additional costs. Sub-option 1 would lead to a slight increase of accumulated Electricity/CO2/electricity cost savings, but would impose higher burdens on manufacturers. On the other hand, sub-options 3 and 4 would impose lower burdens on manufacturers, while leading to lower accumulated electricity/CO2/electricity cost savings.

Annual electricity, electricity cost and CO2 emission savings by 2020

Electricity savings

With the requirements of the regulation/sub-option 2 the electricity consumption of electrical and electronic equipment in standby/off-mode is expected to be **13.6 TWh** by 2020. This is a reduction of 35 TWh (approx. the electricity consumption of Denmark) compared to the "no action" scenario above, see figure 1.

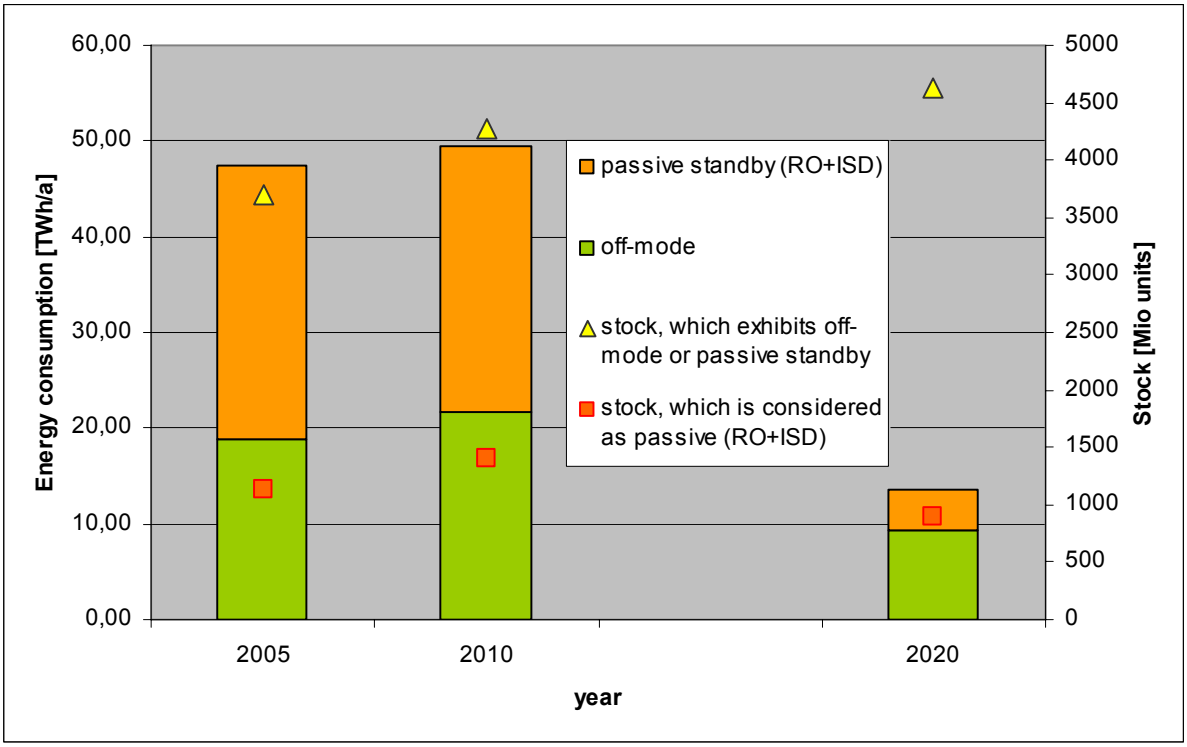

Figure 1: development of stock and electricity consumption of standby/off mode, assuming a 0.5W/1.0W power consumption level in 2020 (RO: reactivation only; ISD: information or status display)

In 2005 the aggregated electricity consumption corresponds to an average electricity consumption of 12.7 kWh per year per product in the stock that has standby and/or off mode. In 2020 the consumption corresponds to approx. 10.6 kWh per product in the stock that has standby and/or off mode in the "no action" scenario, while the consumption corresponds to approx. 3.0 kWh per product with the requirements of the regulation. The additional savings are due to the fact that the ecodesign requirements take the energy consumption of new equipment in one step to the energy consumption which is achievable with the best available technology, while in the no-action scenario only slow improvements are expected.

This improvement is due to reducing the power consumption of standby/off-mode operating conditions only. Additional reductions can be expected from the requirement on the automatic power down functionality, switching equipment from active mode to standby/off-mode. Further improvements in standby/off-mode are likely to lead to improved energy performance in further operating conditions, including the main function. However, these additional effects cannot be quantified because they depend on the details of the usage pattern and the active power consumption values of all equipment considered.

To a large extent the equipment covered by this regulation is produced for the world market. Therefore the requirements set in this regulation will impact on the design of equipment shipped to markets other than the EU, and the resulting reductions of environmental impact will be much higher than those estimated for the EU alone. It is not possible to quantify this effect because market data for the equipment covered by this regulation could not be analysed for other parts of the world.

Electricity cost savings by 2020

The annual electricity savings expected by 2020 correspond to savings of electricity costs of approx. 4.5 billion EURO in electricity prices of the year 2005[29] (of which 80%-90% in households). Due to economy of scale effects it is to be expected that potential added purchasing costs, if any, will decrease after ecodesign requirements are introduced, and the electricity cost savings are net savings. Furthermore, electricity costs are likely to further increase, and the resulting cost savings will be higher.

Additional electricity cost savings can be expected from the power management requirement and improved energy performance in further operating conditions which cannot be quantified.

Annual reduction of CO2 emissions by 2020

The annual electricity savings expected by 2020 correspond to annual CO_2 emission savings of 14 mln tons[30], and reductions of further electricity production-related environmental impacts (e.g. SO_2, NOx, heavy metals). As discussed above this improvement is due to reducing the power consumption of standby/off-mode operating conditions only, and further important reductions can be expected from requirement on automatic power down functionality, and improved energy performance in further operating conditions which cannot be quantified.

Additional reductions of CO2 emissions can be expected from the power management requirement and improved energy performance in further operating conditions, which cannot be quantified.

Impacts on trade

The process for establishing ecodesign requirements for standby/off-mode has been fully transparent, and after endorsement of the regulation by the Regulatory Committee a notification under WTO-TBT was issued.

Manufacturers, including EU manufacturers, who sell products both inside and outside (where no requirements on standby/off-mode are set to date) the EU may could either produce all products for compliance with the ecodesign requirements, independent of the market where the products are sold, or produce to different specifications for different markets. As a consequence a cost disadvantage could arise vis-à-vis manufacturers who do not sell products in the EU. However, the risk of competitive disadvantages is expected to be low, because additional costs for design/re-design to achieve compliance with ecodesign requirements are low. Furthermore, stakeholders affected by the regulation have not pointed out such a risk.

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29 Average electricity price in 2005 in EU-25: 13.6 Cent/kWh

30 assuming the specific CO2 emissions of 2003 (see footnote 15) which, however, is expected to change e.g. due to the Community's strategy for promoting renewable energy sources

Therefore no competitive disadvantages for EU manufacturers exporting affected products to third countries are expected.

SECTION 6: CONCLUSION

Following the principle of proportionality in the analysis effort, policy options 1 to 4 were discarded at an earlier phase of the analysis. The analysis of several sub-options for the intensity of an ecodesign regulation on standby and off-mode power consumption for electrical and electronic household and office equipment shows that sub-option 2 optimally fulfils the objectives as set out in Section 3. In particular, the regulation/sub-option 2 implies

- cost-effective reduction of standby/off-mode electricity losses;
- correction of a market failure and proper functioning of the internal market;
- no significant administrative burdens for manufacturers or retailers;
- insignificant, if any, increase of the purchasing cost (economies of scale for effective technologies to reduce stand-by consumption), which would be largely overcompensated by savings during the use-phase of the product;
- that the specific mandate of the Legislator is respected;
- accumulated electricity savings/electricity cost/CO2 emission savings of 194 TWh/26.4 billion EURO/77.6 Mt by 2020;
- a reduction of the electricity consumption of 35 TWh (approx. the electricity consumption of Denmark) by 2020 compared to the "no action" scenario, corresponding to electricity cost savings of 4.5 billion EURO, and 14 mln tons avoided CO2 emissions;
- a clear legal framework for product design which leaves flexibility for manufacturers to achieve the energy efficiency levels of the 2nd stage either in two steps, or earlier (before the 2nd stage comes into effect);
- costs for re-design and re-assessment upon introduction of the regulation, which are limited in absolute terms, and not significant in relative terms (per product);
- fair competition by creation of a level playing field;
- no significant impacts on the competitiveness of industry, and in particular SMEs due to the small absolute costs related to product re-design and re-assessment;
- a low risk for having negative impacts employment, in particular in SMEs.

SECTION 7: MONITORING AND EVALUATION

The appropriateness of scope, definitions and limits will be reviewed after maximum 6 years from the adoption of the measure (as required by Annex VII.9 of the Ecodesign Directive and laid down in the implementing measure). Account will be taken also of speed of technological development and input from stakeholders and Member States. Compliance with the legal

provisions will follow the usual process of "New Approach" regulations as expressed by the CE marking.

Compliance checks are mainly done by market surveillance carried out by Member State authorities ensuring that the requirements are met. Further information from the field as e.g. complaints by consumer organisation or competitors could alert on possible deviations from the provisions and/or of the need to take action.

Input is also expected from work carried out in the context of upcoming ecodesign activities on further product categories, and related activities as e.g. the Energy Star programme. Contributions are also expected from international cooperation as e.g. in the framework of the IEA Implementing Agreement for Energy Efficiency End-Use Equipment.

Annex I
Minutes of the meeting of the Ecodesign Consultation Forum of 19 October 2007 as related to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment[31]

The Commission staff presented the main aspects of the preparatory study on standby and off mode losses. The feasibility of a "horizontal" functional approach for the simple and basic functions/no function envisaged for ecodesign requirements and the corresponding suggestions for ecodesign requirements was highlighted (see presentation circulated together with these draft minutes).

Then the Commission staff presented the main aspects of the working document and the rationale of the approach for discussion (see presentation circulated together with these draft minutes).

Scope

The scope should be restricted to "plug-and-play" equipment, and not include fixed installed equipment (EUROVENT, CELMA). The Commission staff agreed to reconsider the role of the latter equipment. A very clear definition of the functions addressed is extremely important in particular for complex equipment like e.g. servers and the systems they are part of, and it may be necessary to leave such equipment out of the scope and restrict it for a first implementing measure to "mono-user" equipment (who is the "end user"? EICTA). A reference to the WEEE-Directive would be ambiguous (indicative list) which could lead to add-ons by the Member States to the list (Article 95 vs. Article 175 legal basis; ORGALIME), and could lead to a "moving scope" (EUROVENT). The "catch-all" elements of the WEEE list are problematic and bear the risk of de-harmonising the scope (ORGALIME).

On the other hand it was pointed out that it has to be ensured that products which are not available on the market today are covered (NL), and that the scope be as large as possible, as proposed (ECOS). Grey areas are unavoidable, but it is unclear how they will be dealt with (NL).

The chairman underlined that a clear scope and definitions will be developed, with a preference for an adaptation of a list which has already been adopted by the Legislator (supported by DE/BMU). The chairman stressed that it will be made sure that no "moving scope" is created (i.e. not simply referring to WEEE which could be amended). Furthermore, the preferred legal format is to have a regulation (legal basis Article 95) leaving no room for national interpretation of scope.

The Commission staff underlined that the "catch all" elements of the WEEE list are welcome since they provide the flexibility to cover e.g. products which are not on the market today, while making clear which product groups are addressed. Furthermore, the emphasis is on the function/no function aspect, and the end-use has been introduced to make clear that components are not addressed.

Definitions

[31] Complete minutes available on TREN ecodesign website

The approach to exclude security functionalities from the relevant functions was supported by CECED and ORGALIME. Such functionalities should be considered in "all-inclusive" product specific approaches (CECED). The approach was not supported by DE/UBA and ECOS, stressing that all standby modes should be covered.

The interrelation between off and networked standby has to be re-checked to prevent that useful functions are left out from equipment that help save energy for the sake of meeting the "standby" requirements (EICTA). The definitions have to make clear that equipment is providing *only* reactivation/display function for requirements on standby, and it has to be clarified what is considered to be a network, and what is considered to be "connected", e.g. connections between outside and inside airco equipment (EUROVENT).

The wording used for defining the modes should not only be "standby", but "Lot 6 passive standby", otherwise confusion could be created in the future and it is made clear that only a part of the standby issue is addressed (DE/UBA).

The Commission staff confirmed that a balance has to be found that ensures that the simple functions/no function addressed by the implementing measure is optimized, while making sure that the implementation of useful functions helping to save energy are not impeded for product design. The set of definitions will be rechecked in order to achieve this. Lighting sensors are considered "always-on" under the current definitions, and reactivation of a PC via a mouse click is not considered as "reactivation function".

Relation "horizontal" to "vertical" measures

The evidence coming out of the vertical studies/measures should be used for the horizontal measure (EICTA). The text in the part of the working document related to the "implementing measure", and the text in the "explanatory notes" of the working document seem to be contradicting, and the text in the suggestion for the implementing measure ("unless") is supported (CECED).

A vertical implementing measure should prevail over the horizontal measure as a principle. The transition time between entry into force of the horizontal measure and the vertical measures where standby is an issue, is particularly sensitive. (ORGALIME).

The chairman underlined that the knowledge acquired together with the stakeholders is sufficient to have an implementing measure on the simple functions/no function. If "all" (how many?) vertical implementing measures would have to be awaited, a horizontal measure would be feasible only in the distant future. This is clearly not an option.

This approach was supported by DE/BMU, stressing that demanding horizontal requirements are in line with the conclusions of the March Council, and more stringent levels should be set in the vertical measures, if appropriate. The chairman confirmed that the mechanism between horizontal and vertical measure must not be contradicting. The wording will be scrutinized and compatibility will be ensured. Any concerns on inconsistencies in the preparatory studies should be flagged. Furthermore, one of the aims to discuss standby at this early point in time in the ecodesign process is to set the scene for those operating modes timely, thereby facilitating consistency with the vertical measures.

"Networked standby"

NL pointed out that, although currently it is not feasible to include networked standby in a horizontal manner, by the next revision it is important to reconsider the feasibility of a horizontal networked standby requirements because it becomes increasingly important. A revision date has to be included in the measure, considering networked standby in the vertical measures only may not be enough (supported by DE/BMU). The energy consumption in networked standby will increase dramatically due to intelligent house/digital home solutions (ANEC). Another option could be to define horizontal requirements in a first stage on networked standby with "higher" levels (DE/BMU), or to have a functional adder approach (EICTA).

On the other hand it was argued that networked standby should be addressed as suggested by the preparatory study (INFORSE). At least appropriate consumer information has to be made available to the user on energy consumption in networked standby, and the horizontal measure should contain a clear commitment to deal with networked standby to give a clear signal to manufacturers, and for similar functions similar power levels should be implemented (ECOS). EICTA stressed that manufacturers are working on these issues for a long time already. Based on the results of the ecodesign preparatory study, networked standby will be included in the revision of IEC 62301 on standby (NL).

Requirements for off/standby

The two-tiered approach (one year/three year) is realistic and is supported, but a third tier (e.g. 5 years) could be added (DE, EUROACE, ECOS). On the other hand it was argued that, although in general this view is shared, for some products this timeline is too short because of redesign, and even "tiny" changes imply re-qualification (ORGALIME). At least two years (DE/BAM), or at least two to three years are needed, in particular for equipment with long redesign cycles (EPEE).

Requiring the same levels for reactivation function and off mode is a contradiction (CECED). In particular, the delay timer function helps to save energy and is important for energy demand management and should therefore not be covered by the considered implementing measure (CECED, ORGALIME). In longer term off mode levels should be 0.1 W (ECOS), or 0.2 W for a third tier (DK), and networked standby should be included in a possible revision of the measure (DK). On the other hand it was argued by EICTA that a maximum level of 0.5 W for off mode power consumption is in contradiction with requirements on electromagnetic compatibility for equipment with high rated power, e.g. 1 kW or more. Lighting installations with very heavy power loads should not be in the scope (CELMA).

A requirement for a hard-off switch should be considered (AT, ANEC, ECOS), already for the first tier (DE/BMU), and the consumer should have the option to switch equipment completely off (ECOS). On the other hand it was argued (NL, CECED) that a requirement for a hard-off switch is not appropriate since policy should not prescribe particular technical solutions, but rather set goals. A hard off switch may be useful for some products, but a requirement is not suitable for a horizontal measure and should be looked at in vertical measures (DE/BAM, DK, EICTA).

Consumers may indeed wish to have the hard off switch option, but in real life it is observed that it is rarely used; a clear and unambiguous definition for "hard-off switch" would be needed to have a clear view on the legal consequences, and to create a level playing field (avoiding that "hard-off switch" presence is understood by some that no further effort is required for stand by consumption while other manufacturers would bear the costs of the

switch AND the off / stand by modes related design) (ORGALIME). ORGALIME supports the proposal not to include a hard off switch in the considered implementing measure. The hard off switch should be easily accessible and the consumer needs to have information what the switch is actually doing (DE/UBA). The user must not be punished for using a hard off switch, and in particular memory settings should be retained when using the hard off switch (AT).

The interrelation with external power supplies and battery chargers has to be clarified, in particular if these products are included in the horizontal measure, and the definitions. The energy savings effects are limited, and the costs implied for achieving the suggested values are high and may not pay off. Re-design cycles are longer than one year (EPTA).

The Commission staff pointed out that the compatibility of the off mode power levels with electromagnetic compatibility requirements will be looked at again since the study did not deliver a clear answer on this issue. On request of EICTA it was clarified that "link-through" is considered to be a function, but under the applicable measurement standard peripherals are disconnected anyway.

Upon request of EICTA the chairman underlined that the suggested approach is complementary to the participation of the EU in the Energy Star programme for office equipment. Consistency with Energy Star criteria and measurement methods is aimed at, but the levels envisaged for ecodesign requirements could be more demanding than existing Energy Star criteria which would be updated if necessary.

Auto power down

ECOS pointed out that the wording of the "power management requirement" is not clear enough, and the most frequently used operational modes are the ones that should be addressed by this requirement. Furthermore it has to be ensured that power management works properly, and the manufacturer has to activate it when delivering the product. (DE/UBA, UK). The "signal" on the importance of power management contained in the horizontal measure should be further developed in the vertical measures (UK). On the other hand it has to be ensured that functionalities are not hampered, e.g. broadband modem relaying telephony functions have to be always available (EICTA).

The Commission staff confirmed that several suggestions were received for improving the text.

Compliance checking for market surveillance purposes

The working document defines a clear limit and gives clear guidance to market surveillance authorities, and there is no risk of "unlegal" decisions by national authorities since manufacturers can appeal to the Commission (DK). On the other hand it has to be avoided that results of testing laboratories are challenged on a regular basis due to the very significant dispersion of capabilities among laboratories, with the effect that the problems are shifted to the courts which would be overburdened (ORGALIME).

In general the procedure, as in the case of labelling, is lengthy and costly for Member States, and it should be considered how the process can be speeded up and burdens on enforcement bodies could be reduced (UK, NL, MT). Furthermore, accreditation is a crucial aspect if in practise action is taken against a non-complying product, and a very careful wording is needed for provisions on market surveillance (MT).

A "zero tolerance" for the second step of the verification procedure (in case that the first test failed) is a methodological mistake because quality of testing laboratories is not under the control of the manufacturers (ORGALIME). Such an approach would mean that the manufacturers would have to bear the burden for varying tolerances of testing laboratories, and would in fact have to comply with the limit value minus the error of the worst testing laboratory, thereby internalizing the variations of European testing laboratories, which is not acceptable (CECED).

CENELEC pointed out that EuP implementing measures should use harmonized standards. Verification procedures and definitions are a classic field for standardization, and the reference to IEC 62301 should be replaced by EN 62301, which contains a verification procedure. NL underlined that the relevant EN standards contain a verification procedure that direct manufacturers to the "wrong direction", leading to structurally higher figures than e.g. defined for labelling classes. A "fresh start" is therefore needed for EuP, and the approach to require that the average of products should meet the target is supported. The measurement tolerance cannot be fixed by a single value as currently done in EN standards.

In general thorough and active market surveillance is decisive for avoiding competitive disadvantages for those manufacturers investing to comply with legal obligations vis-à-vis manufacturers which do not respect the rules (EICTA).

The chairman confirmed that market surveillance is crucial. No obvious solutions exist, but the aspects raised by the Consultation Forum will be considered and further developed in the impact assessment.

Consumer information

Provisions on consumer/user information should be considered. This would create added value and help consumers to save energy, e.g. by information on networked standby (ECOS, ANEC).

The Commission staff underlined that the requirements on the standby modes addressed by the working document are stringent, and asking for consumer information related to these modes would have little additional benefit. Specific information on networked standby should be provided in the framework of vertical measures.

Annex II
Structure of the methodology used for establishing the technical, environmental and economic analysis

Following the "Methodology Study Eco-design of Energy Using Products" ("MEEuP"), the tasks listed below are carried out for developing the technical, environmental and economic analysis referred to in Annex II of the Ecodesign Directive:

Task 1: Product definition, existing standards and legislation

Task 2: Economics and market analysis

Task3: Analysis of consumer behaviour and local infrastructure

Task 4: Technical analysis of existing products

Task 5: Definition of base case ("average" model) and related environmental impact

Task 6: Technical analysis of best available technology

Task 7: Improvement potential

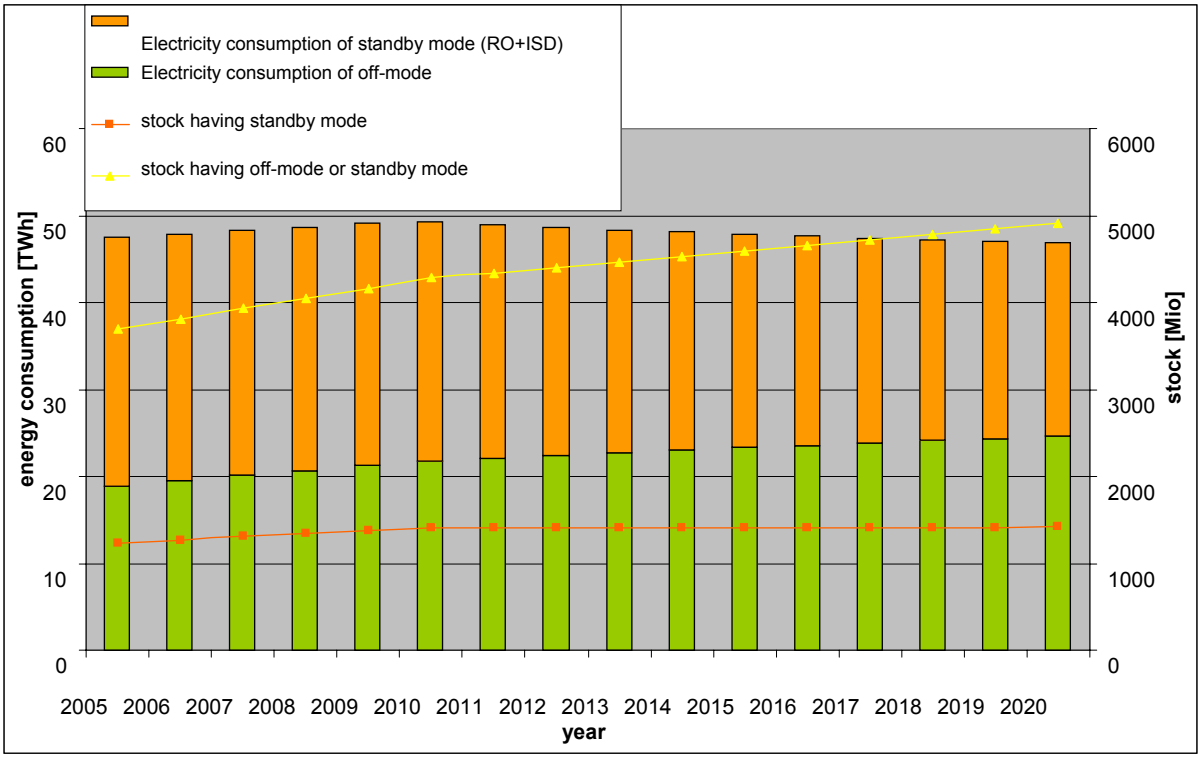
Task 8: Policy, impact and sensitivity analysis

Annex III
Scenarios

This Annex shows the evolution of the electricity consumption in standby/off mode under several assumptions for the intensity of the proposed Regulation.

In the following "RO" means "reactivation only"; and "ISD" means "information or status display"

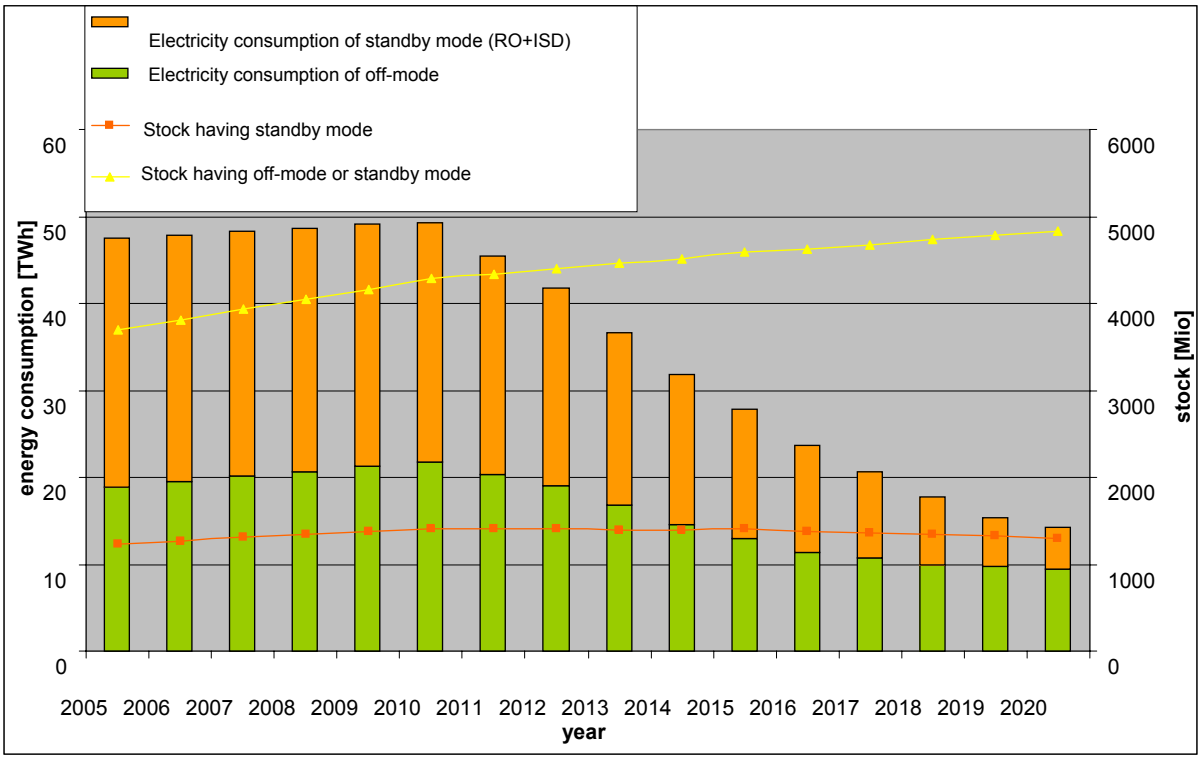
Business as usual scenario (baseline; 1% improvement per year for all products)



The aggregated electricity consumption for the years 2005-2020 is **769 TWh**.

Note that the standby part decreases to some extent without taking a targeted measure because a part of standby functionalities are expected to be shifted into "networked" operating conditions, which, for the time being, are not addressed "horizontally".

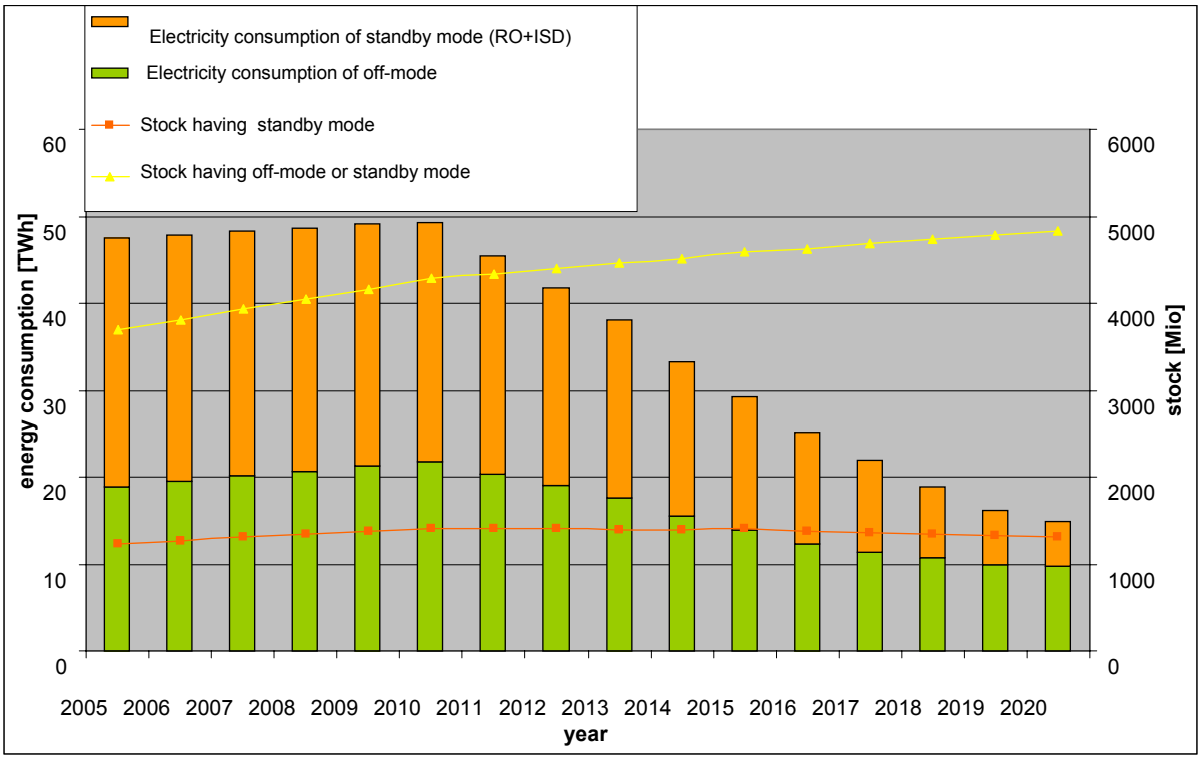
Scenario for sub-option 1: stage one/stage two requirements become effective after one year/three years respectively (assumption: Regulation in force early 2009)



Total aggregate until 2020: **566 TWh**

Aggregate saving: 203 TWh

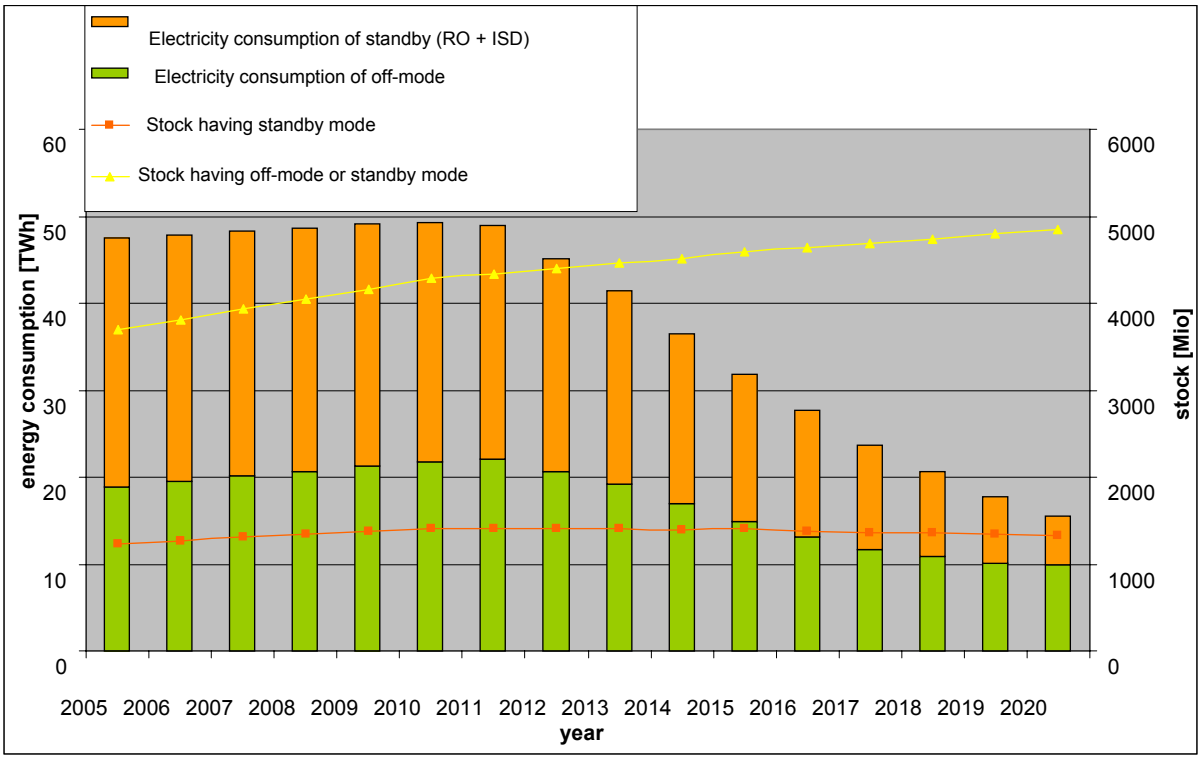
Scenario for sub-option 2: stage one/stage two requirements become effective after one year/four years respectively (assumption: Regulation in force early 2009)



Total aggregate until 2020: **575 TWh**

Aggregate saving: 194 TWh

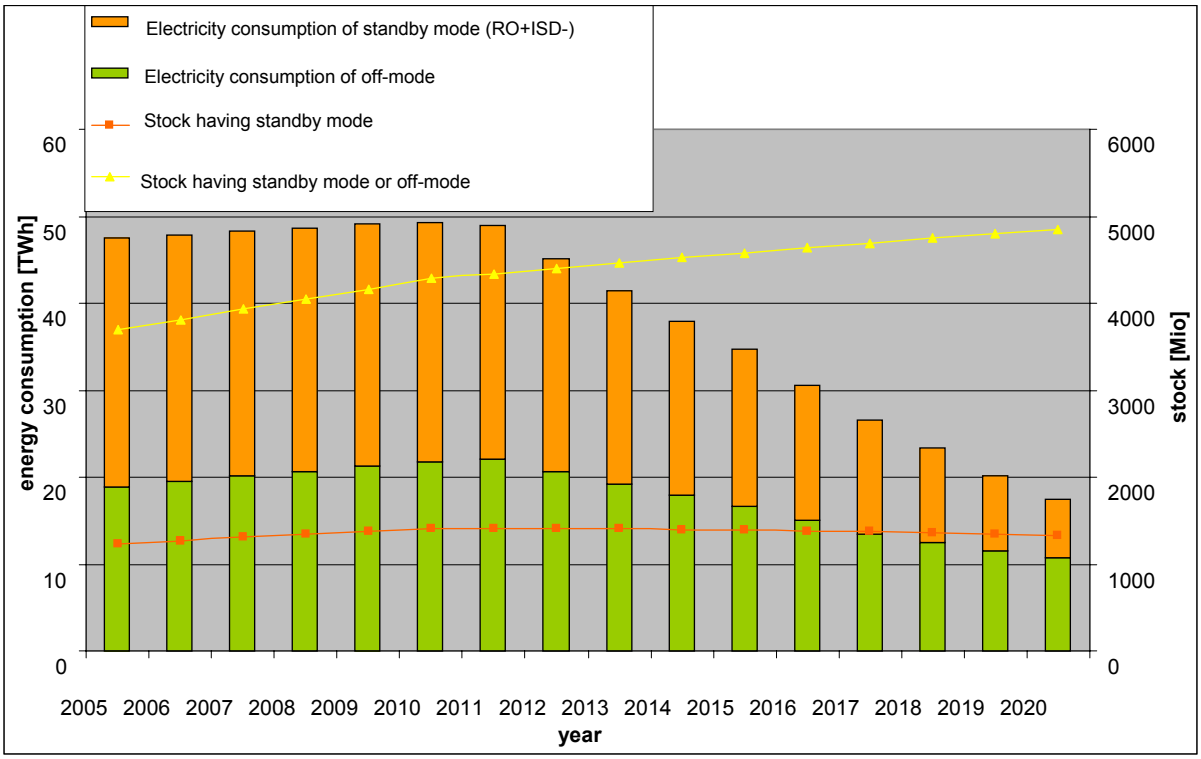
Scenario for sub-option 3: stage one/stage two requirements become effective after two years/four years respectively (assumption: Regulation in force early 2009)



Total aggregate until 2020: **600 TWh**

Aggregate saving: 169 TWh

Scenario for sub-option 4: stage one/stage two requirements become effective after two years/six years respectively (assumption: Regulation in force early 2009)



Total aggregate until 2020: **617 TWh**

Aggregate saving: 152 TWh