Review study on Standby Regulation

Study on the Review of the Regulation (EC) No 1275/2008

Final report

Final version

7th April 2017

Van Holsteijn en Kemna B.V. (VHK)
Elektronicaweg 14
2628 XG Delft
The Netherlands
www.vhk.nl

Viegand Maagøe A/S (VM)
Nr. Farimagsgade 37
1364 Copenhagen K
Denmark
viegandmaagoe.dk

Prepared by:

Viegand Maagøe
Study team:
Jan Viegand, Baijia Huang and Larisa Maya-Drysdale (Viegand Maagøe)
Contract-manager: René Kemna (Van Holsteijn en Kemna)

Prepared for:

European Commission
DG ENER C.3
Office: DM24 4/149
B-1049 Brussels, Belgium

Contact person: Mugurel-George Paunescu
Email: Mugurel-George.PAUNESCU@ec.europa.eu

Project website: www.ecostandbyreview.eu

Specific contract no.: ENER/C3/412-418-LOT2/08/2014-558/SI2.710132
Implements Framework Contract: ENER/C3/2012-418-LOT 2

This study was ordered and paid for by the European Commission, Directorate-General for Energy.

Table of Contents

List of tables

List of figures

1 Introduction to the report

The aim of this interim report is to present the analyses and results conducted until this date from the review study on the Standby Regulation, (EC) No 1275/2008, including its four amendments published in September 2013. Furthermore, the main established conclusions for most of the items in the review are presented as concrete suggestions to be included in the consolidated version of the Commission Regulation.

This review study does not follow the MEErP methodology and therefore this report does not follow the MEErP structure. However, during the review some aspects of the methodology have been used as inspiration, particularly during the analysis and the presentation of the results. Taking this into account, the report has been divided in seven chapters presented below:

1. Introduction to the report
2. Scope of review study and structure of the report
3. Background for the review
4. Assessment of extending the current scope
   - 4.1. Assessment of inclusion of products equipped with electric motor operated by remote control
   - 4.2. Assessment of inclusion of products with low voltage external power supplies
   - 4.3. Assessment of inclusion of professional equipment
   - 4.4. Assessment of inclusion of other office equipment not stated in Annex I
5. Assessment of appropriateness and/or level of requirements
   - 5.1. Review of the requirements for standby/off operating modes
   - 5.2. Review of appropriateness and the level of requirements for networked standby of non-HiNA equipment (Tier III)
   - 5.3. Assessment of removal of the exemption from networked standby requirements for large format printing equipment
6. Clarifications of terms and definitions
7. Overall conclusions and recommendations for review in amended Regulation (EC) 1275/2008

The details of what assessed in this report as well as the detailed structure of this report are presented in the next section.

2 Scope of review study and structure of the report

2.1 Scope of review study

This review study focuses on:

1. Review of the appropriateness of the scope of the amended regulation.
2. Review of the appropriateness and/or level of requirements for:
   a. Standby/off operating modes, and,
   b. Networked standby of non-HiNA equipment with regard to Tier III (January 2019).

Additionally, other aspects were covered during this review which are shortly described below and assessed throughout the report.

2.1.1 Appropriateness of the scope

The review of the appropriateness of the scope has been done by assessing the potential inclusion of the aspects mentioned in the revision clause (Article 7). An additional aspect is to assess whether the exemption for products placed on the market with a low voltage external power supply is still valid and justified. Furthermore, the potential inclusion of other office equipment not specifically stated in Annex I has also been assessed.

2.1.2 Appropriateness and/or level of requirements

2.1.2.1 Requirements for standby/off operating modes

The review of the requirements for standby/off operating modes has been done by assessing the potential energy and costs savings from lowering the standby/off energy consumption requirements to 0.2 W, 0.3 W and 0.4 W, according to identified[1] BAT levels. This assessment has been established for products under current scope of the amended regulation.

For new product categories assessed for inclusion (see section 2.2.1), this assessment was done separately for each product category. From this, those product categories which presented a significant energy savings potential and a real technical possibility to achieve 0.2 W standby consumption in the future were selected for carrying out a second assessment, only from an energy point of view.

2.1.2.2 Appropriateness and level of requirements for networked standby of non-HiNA equipment (Tier III)

The review of appropriateness and level of requirements for networked standby of non-HiNA equipment (Tier III) has been done by assessing power consumption of products on the market, assessing power budgets for relevant products, and assessing products pointed out by stakeholders as having difficulties in complying with the Tier III requirement.

A qualitative assessment was performed as well for the new product categories assessed for inclusion (section 2.2.1), and the results from this assessment are presented separately at chapters 4 to 8.

2.1.2.3 Removal of exemption of networked standby requirements for large format printing equipment

The assessment of removing the exemption of networked standby requirements for large format printing equipment has been assessed according to technological progress. The assessment has been done by (i) checking on any potential alignment with other

[1] Topten.eu (2015), Standby and off mode: Recommendations for policy design.

voluntary schemes and regulatory measures according to the present scope of the regulation and in particular concerning large format printing equipment, (ii) reviewing present networked standby consumption levels and assessing the technical possibilities to comply with the most stringent Tier III requirements, and, (iii) assessing the market stock and potential energy savings.

2.2 Structure of the report

As stated before, the report consists of 7 chapters, and the first two are an introduction to the review study and to the report. Chapter 3 presents an overview of the reasons why this review is being carried out, and Chapter 7 presents the overall conclusions and recommendations for review in amended Regulation (EC) 1275/2008.

Chapters 4 and its sub-chapters assess the inclusion of additional product categories to the current scope of the amended regulation. All the sub-chapters follow very similar structure, defining the scope, alignment with current legislative/voluntary measures, and assessing the possibility of inclusion of these product categories. In order to facilitate the reading of this report, the structure which each of these four sub-chapters follows is presented next:

1. **Introduction** to the topic, which explains the specific reasons why the product category is assessed for inclusion.
2. **Scope** of the product category, which shows the difficulties on delimitating the scope and categorising the product group, concluding with the presentation of the scope and the product category definition.
3. **Alignment with other standards, regulations and voluntary schemes**, which was used to make recommendations which could create double regulation (i.e. at a vertical and horizontal levels), and in some cases the findings were used as inspiration and to identify the real technical potential of this product category to comply with current and future standby/off modes and networked standby requirements.
4. **Standby mode consumption**, which presents any difficulties on defining standby mode for the product category and shows current levels identified in the European market.
5. **Networked standby**, which qualitatively assesses the current and future potential of the product category to present networked standby and of complying with present requirements.
6. **Market estimation and growth**, which presents the methodology and main assumptions for estimating the current installed capacity of this product category in the European market.
7. **Potential energy savings**, which shows the energy savings potential from including this product category in scope, from the point of implementing this review in a future amendment of the regulation, all the way until 2030.
8. **Conclusions** of the assessment.

Chapters 5 is assessed separately as described in section 2.1, and does not follow the abovementioned structure. Chapter 6 presents an overview of additional problems presented by stakeholders, including Market Surveillance Authorities, concerning ambiguous definitions and potential solutions. Chapter 7 presents the overall conclusions and recommendations of the review study.

3 Background for the review

This review study focuses on the amended Commission Regulation (EC) No 1275/2008, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off modes and networked standby, electric power consumption of electrical and electronic household and office equipment. This Regulation is horizontal therefore in principle applicable to all electrical and electronic household and office products within the scope of the ecodesign regulation but there are some exemptions partly because some measures have been replaced by specific requirements defined for certain product groups (i.e. vertical Regulations). The regulation was amended four times through:

- Commission Regulation (EC) 278/2009 for external power supplies
- Commission Regulation (EC) 642/2009 for televisions
- Commission Regulation (EU) 617/2013 for computers
- Commission Regulation (EU) 801/2013 for networked standby

Regulation (EC) 278/2009, (EC) 642/2009 and (EU) 617/2013 are vertical regulations for external power supplies, televisions and computers respectively. Since the vertical regulations address the energy consumptions of different modes and are more dedicated to one product group, these products are exempt from Regulation (EC) No 1275/2008. The last amendment Regulation (EU) 801/2013 has introduced requirements for networked standby in the horizontal regulation.

Two guidelines accompany the Commission Regulation (EC) No 1275/2008. The first was published in 2009, and it provides guidance on the regulation, which answers the frequently asked questions by manufacturers and Member States about requirements for standby/off mode. The second was published in 2014, and it provides guidance related to questions about networked standby arisen from the implementation of Commission Regulation (EU) No 801/2013. Both guidelines include several decision trees to help determining e.g. whether a product is in scope, and whether it is a networked and a HiNA equipment. The guidelines clarified, among others, the term "professional equipment" which is now defined for IT equipment as Class A equipment according to EMC Directive. Therefore, all IT equipment in Class B is in scope of Regulation (EC) No 1275/2008, amended by (EU) No 801/2013. In addition, the guidelines provide explanations, which are crucial for the market surveillance and verification procedure, e.g. it has suggested test procedure for testing networked product for compliance.

3.1 Previous preparatory studies

There are two previous studies most relevant for the scope of this review study. The preparatory study Lot 6[2] for standby and off mode losses (2007) indicated the need for further research on networked products. After Lot 6, the preparatory study Lot 26[3] for networked standby was carried out in 2011. These studies showed that there was an energy saving potential and a need for EU action, as the potential energy savings from setting ecodesign requirements on standby and off modes were estimated as 35 TWh/year by 2020 and potential savings from networked standby were estimated as 36 TWh/year by 2020. Consultation Forum and impact assessment on Lot 6 and Lot 26 took place after the preparatory studies. The impacts of the draft regulations were found to

[2] Fraunhofer IZM (2007). EuP Preparatory Study Lot 6 "Standby and Off-mode Losses". Available at http://www.eceee.org/ecodesign/products/standby/Los_06_final_report.pdf
[3] Fraunhofer IZM (2011). EuP Preparatory Studies Lot 26: Networked Standby Losses Available at http://www.eceee.org/ecodesign/products/Lot26_networked_standby_losses

meet the criteria in Article 15 of Directive 2009/125/EC, and therefore Regulations (EC) No 1275/2008 and (EU) 801/2013 were adopted.

3.2 Support for implementation

To support Regulation (EC) No 1275/2008 amended by Regulation (EU) 801/2013, a standardisation request on harmonised standards has been issued and accepted by the ESOs (European Standardisation Organisations) The scope of the harmonised standards is the conditions providing networked standby of the product groups covered by the amended Regulation (EC) No 1275/2008 and the amended Regulation (EC) No 642/2009. The standards shall cover, for example, the procedure for measuring power of a product in a condition providing network standby, determination that the product is in networked standby as defined in the regulation. Harmonised standards can aim the market surveillance and verification procedure, as the level of testing according to a harmonised standard would be internationally recognised and uniform.

3.3 Review

The amended Commission Regulation (EC) 1275/2008 Article 7 states that the regulation should be reviewed no later than 7th January 2016 in light of technological progress, thus this review study has been commissioned. Article 7 specifically states that the review study should address the scope and the requirements for standby/off mode and the appropriateness and level of requirements for networked standby with regard to the third stage of implementation in 2019, focusing on, inter alia, professional equipment and products equipped with electric motors operated by remote control. This does not necessarily mean that the overall scope, i.e. electrical and electronic household and office equipment, should be subject to changes but that the review should explore whether (new) equipment within the general scope of household and office equipment should be included. In this context, Recital 8 says

"The application of this Regulation should be limited to products corresponding to household and office equipment intended for use in the domestic environment (…)"

"The scope should be defined such that equipment that is not yet available on the market, but have similar functionalities to those products explicitly named in this Regulation, are designed to fulfil the requirements. When appropriate, an amendment to this Regulation can complement the list of products."

In addition, some definitions in the regulation do not seem to be fully unambiguous and there are some issues raised by market surveillance that should be explored under this review study.

4 Assessment of extending the current scope

4.1 Assessment of inclusion of products equipped with electric motor operated by remote control

4.1.1 Introduction

Article 7 of the regulation states that products equipped with electric motors operated by remote control should be addressed in the present review study. This was originally suggested by Member States as there has been concern of products where the energy consumption in standby makes up for a large proportion of the total energy consumption in the use phase of the product, e.g. furniture such as elevation beds and height-adjustable desks, automatic windows, curtains, doors and gate controller, all equipped with electrical motors and primarily operated by remote controls. These products are typically 98%[4] of the time in standby mode waiting for a control signal sent by remote controls, switches, sensors, etc., and the market for these products is on an incline as indicated by industry stakeholders. It is therefore expected that the standby consumption in the EU will grow in the future.

4.1.2 Scope

Article 7 of regulation 1275/2008 stipulates that the review could address, inter alia, products equipped with electric motors operated by remote control. For the purpose of this regulation, products should be targeted that provide energy saving potential in non-active states, i.e. products that remain in standby or networked standby modes for substantial amounts of time.

A remote control is a component of an electronic or electrical product, used to operate the product over a short distance. Nowadays they can come in many forms, i.e. it can be a wired or wireless dedicated electronic device, an on/off switch in a convenient location, a smartphone via network, a tablet or a control panel over wired electrical connection or wireless communication protocols.

The scope of products equipped with electric motor operated by remote control covers the following products:
Residential and office building components such as windows, window blinds, awnings, garage doors, gates, and furniture such as table, beds and chairs which are equipped with electric motors used to move the position of the products and that have very short operational time. The electric motors can be controlled via a remote control or via an external network signal over a local network typically from a smartphone.

A schematic generic representation of abovementioned scope definition is shown in Figure 1. The represented standby or networked standby consumption occurs when the products are not active, i.e. when the electric motor is not operating. When the motors are activated over the network, they will be in networked standby and not traditional standby.

[4] Industry stakeholder consultation, December 2015.

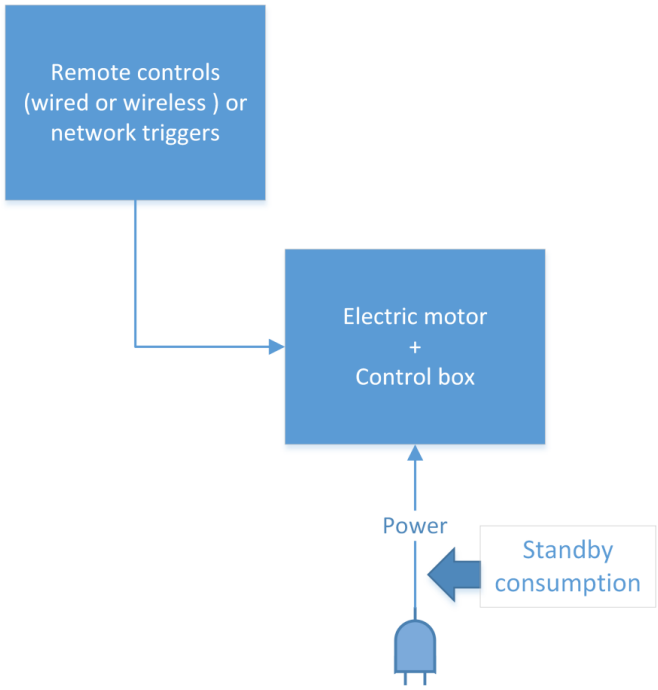

Figure 1. Generic representation of products equipped with electric motor included in scope.

From industry stakeholder consultation two generic product categorisations were identified which fit the abovementioned scope definition. These are suggested for the scope of this product group, and together with some examples they are shown in Table 1.

Table 1. Suggested categorisation of scope of product group.

Product category	Adjustable furniture	Building automation and controls
Product examples	Height-adjustable desks, elevation beds and chairs	Shutters, blinds, screens, awnings, pergola, curtains, doors, windows, skylights

4.1.3 Alignment with other standards, regulations and voluntary schemes

No vertical regulations were found relevant to these products that could be used to align with the current requirements in amended Regulation 1275/2008. However, a possible interference of the Energy Performance of Buildings Directive (EPBD) with building controls was identified, and it is discussed further in section 4.1.5.2.

The current Motor Regulation No 640/2009 already covers the efficiencies of motors in range of 0.75 kW – 375 kW. The regulation is in the process of revision which proposes to extend the range to 0.12 kW – 1000 kW. The majority of the motors used in the adjustable furniture and local building controls are likely to be covered by a revised Motor Regulation, however the Motor Regulation covers only motors' efficiency on a component level and not the standby consumption for the whole system, in comparison to the Standby Regulation. The inclusion of these products in the Standby Regulation could ensure that the end-product is well-designed so that the standby consumption of the whole product is low.

4.1.4 Adjustable furniture

4.1.4.1 Scope

Furniture equipped with electric motors enable the position, height or form of the furniture to be altered via signals from controls to a control box which translates the signals into movements to be carried out in many cases by electric motors and actuators, and in some others by other movement devices such as lift columns.

The focus of adjustable furniture in this review study is placed mainly on adjustable desks and beds due to the availability of consumption and market data, as well as the existence of efficient standby technology. Data on other adjustable furniture is not available at the time of the study and the market of these is believed to be smaller than the combined market of adjustable desks and beds, according to information from industry.

According to the scope categorisation defined in section 4.1.2, the proposed definition of adjustable furniture to be included in Annex I of the revised amended Regulation 1275/2008 is:

Furniture, of which the height, position or form can be changed via the movement of motors, actuators, lifting columns and other electric devices controlled by end-users by a control box and wired and/or wireless controls or via a network.

This definition is represented schematically in Figure 2.

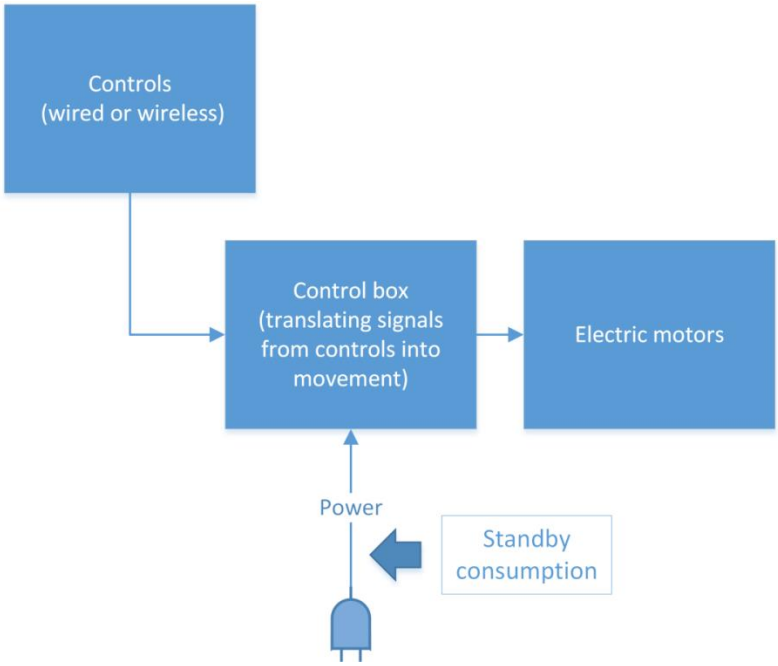

Figure 2. Representation of adjustable furniture in scope.

Although the standby analysis is only carried out for height-adjustable desks and elevation beds, it is believed that similar actuator and control box technology is used in a wide range of applications. Systems similar to height-adjustable desks can also be used for applications, such as height-adjustable kitchen counters, adjustable display and

monitor stands, motorised TV lift systems etc.[5]. See Figure 3 and Figure 4 for some of these examples. Similar technology for elevation beds can be used for applications such as electrically operated recliners, risers and sofas etc. See Figure 4 for some examples.

Figure 3. Example applications for lifting columns, actuators and control box system similar to height-adjustable desks, from left to right: lifting kitchen counter, adjustable display stand, and TV lift[6].

Figure 4. Example application for actuators and control box system similar to elevation/adjustable beds, electrically operated recliner sofa[7].

4.1.4.2 Standby mode consumption

Standby mode for adjustable furniture occurs when the motor, actuator, lifting column or another electric device is not moving the product and the control box is waiting for a signal from the wire or wireless controls.

As shown in Table 2, a study carried out in by the Danish Energy Agency[8] in 2012 showed that out of 24 height-adjustable desks and electric beds, 76% of them can achieve 1 W or lower on standby mode consumption, and 41% of them can achieve standby consumption of 0.5 W or lower. Average standby consumption for elevation beds in the study was approx. 1.5 W. The average standby consumption for height-

[5] http://www.linak.co.uk/deskline/applications.aspx
[6] http://www.linak.co.uk/deskline/applications.aspx
[7] http://www.backcentre.co.uk/2211-manual-recliners.htm
[8] Danish Energy Agency (2012), Measuring standby consumption of electrical furniture.

adjustable desks in the study was approx. 2.3 W. This is also in line with test data provided by Swedish Energy Agency during stakeholder consultation. The identified[9] best available technology (BAT) on the market already enables the standby consumption for height-adjustable desks, beds, industrial and technical workstations to be as low as 0.1 W, according to information provided by industry during stakeholder consultation (see also Figure 5).

Table 2. Numbers and percentages of products with different levels of standby consumption (Danish Energy Agency[8]).

Type	Number of products		
	Standby > 1 W	Standby ≤ 1 W	Standby ≤ 0.5 W
Height adjustable desks	1	2	0
Elevation beds	3	11	7
Total	**4 (24%)**	**13 (76%)**	**7 (41%)**

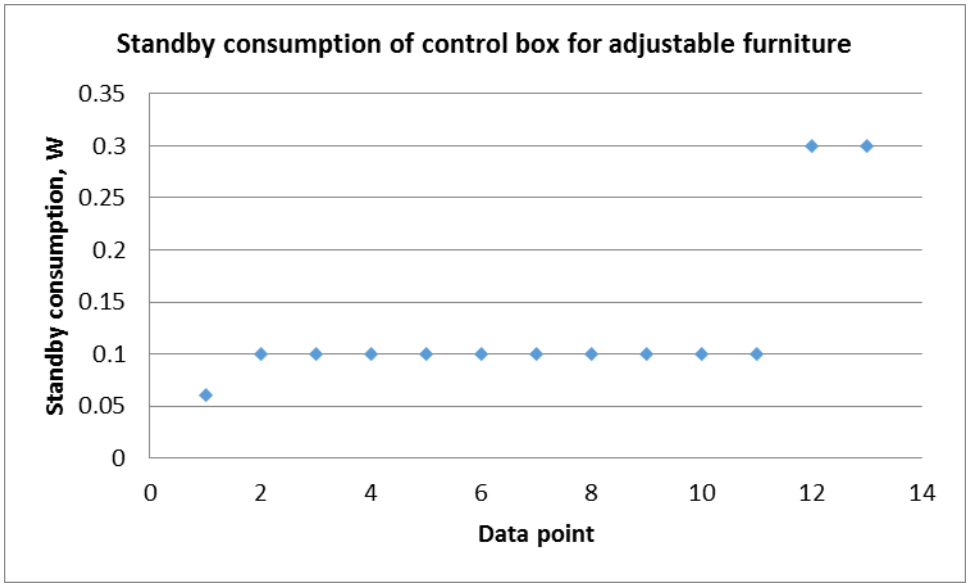

Figure 5 Standby consumption of control boxes examples found via Linak[10], Logicdata[11] and Movetec[12].

Figure 5 shows the standby consumption of control box examples found via several suppliers' websites, which consume well below 0.5 W. 8 out of the 13 examples are found for height-adjustable desks whose standby consumption was not below 0.5 W in the Danish Energy Agency study carried out in 2012[8], however the technological development in the recent years has enabled these products to achieve low standby consumption.

According to stakeholders consultation, for achieving a standby consumption of 0.5 W or lower, electronic transformers in the control box would need to be replaced with more efficient ones. These type of transformers follow a trend in the market of becoming more efficient, so it should not be difficult to find more efficient replacements. In terms of cost indications, it was stated by industry stakeholders that for adjustable furniture it will not

[9] Linak DESKLINE series and ZEROTM Technology, http://www.linak.co.uk/deskline/zero.aspx
[10] http://www.linak.co.uk/
[11] http://www.logicdata.at/en/products/logic-office/control-boxes
[12] http://www.movetec.dk/wp-content/uploads/2015/03/tc15.pdf

make a big difference in the end-product costs as, in spite the electronics are usually made of expensive components and circuitry, they only make up a small part of the whole product price. Even if the cost is slightly higher for a more efficient electronic transformer, it is believed that the production cost would be more or less the same[13].

4.1.4.3 Networked standby

Many building components and household appliances are becoming networked. However, it is not expected that adjustable furniture will as there is no need to remotely control the position, height or form of the furniture, since physical proximity is important for operating these products. In the case they become networked, there would typically be used wireless communication protocols such as Bluetooth, Zigbee and Z-Wave, which have ultra-low networked standby consumption and therefore these products should not have problems complying with networked standby requirements.

4.1.4.4 Market estimation and growth

Personalisation of the form of furniture is becoming more and more important to users as the technology evolves. The general market for adjustable furniture is expected to be on an incline, especially with adjustable desks and beds.

According to information from industry, in Scandinavia the penetration rate of height-adjustable desks is 90 % out of all office desks. In other countries such as Germany, where manufacturing is the dominating industry sector, the focus on office working environment is not prioritised as in Scandinavia, the penetration rate is down to 25 % . The penetration rate is even lower in southern European countries where less of adjustable furniture is expected to be used. However, according to industry, there has been a strong growth in sales in the recent years and it is estimated to pick up in the coming years. The growth rate is estimated to be 10 % per year from 2015 onwards. The stock of height-adjustable desks has therefore been estimated based on the total EU office stock[14] in m^2, the average space utilisation m^2 per staff (based on the only available data source[15] found) and the penetration rates abovementioned, which were obtained from the industry.

For elevation beds, the market size was estimated based on information from industry stakeholders, providing that ca. 0.5 million per year are being sold in the EU and it could potential increase up to 1 million sales per year in 2018. The market for elevation beds is on a steep incline, therefore the industry also predicted a 10 % growth per year from 2015 onwards.

An overview of the sales, stock and growth estimations for adjustable furniture can be seen in Table 3.

Table 3. Market estimation in 2016 and growth.

Market data	Height-adjustable desks	Elevation beds
2016 stock	38 000 000	4 000 000
2016 sales	3 400 000	667 000
Sales growth rate	10 % per year	10 % per year

[13] Interview with industry stakeholder, December 2015.
[14] Development of European Ecolabel and Green Public Procurement Criteria for Office Buildings JRC IPTS Draft Report. Economical and market analysis (2011).
[15] Public Works and Services - Government of the Northwest Territories (Canada). Office Space Standards and Guidelines (2012). Available at: http://www.pws.gov.nt.ca/pdf/publications/OfficeSpaceStdsGuidelines.pdf

Based on these data, the total annual sales and the accumulated stock have been calculated all the way until 2030 (see Figure 6 and Figure 7). These has been the basis to calculate potential energy savings.

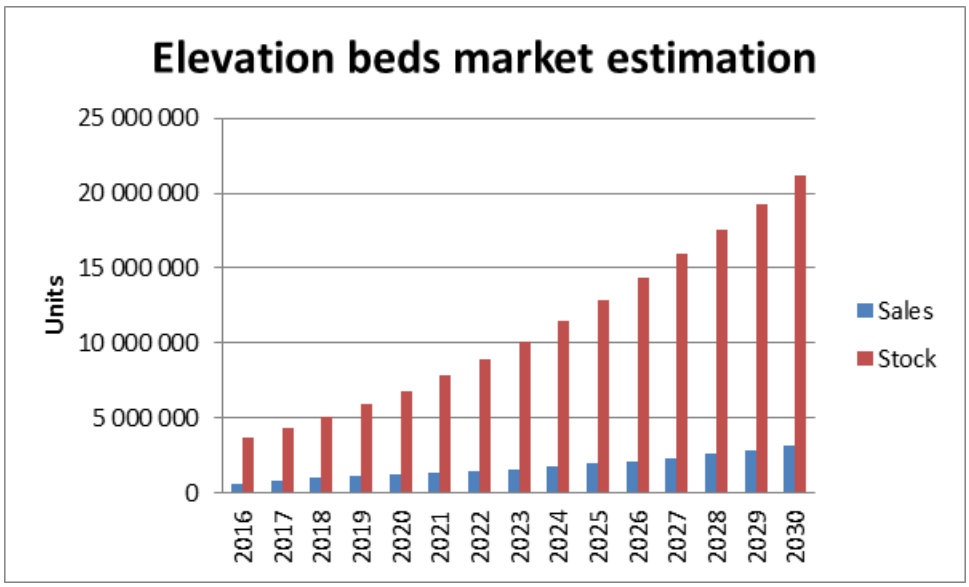

Figure 6. Market estimation of elevation beds 2016-2030.

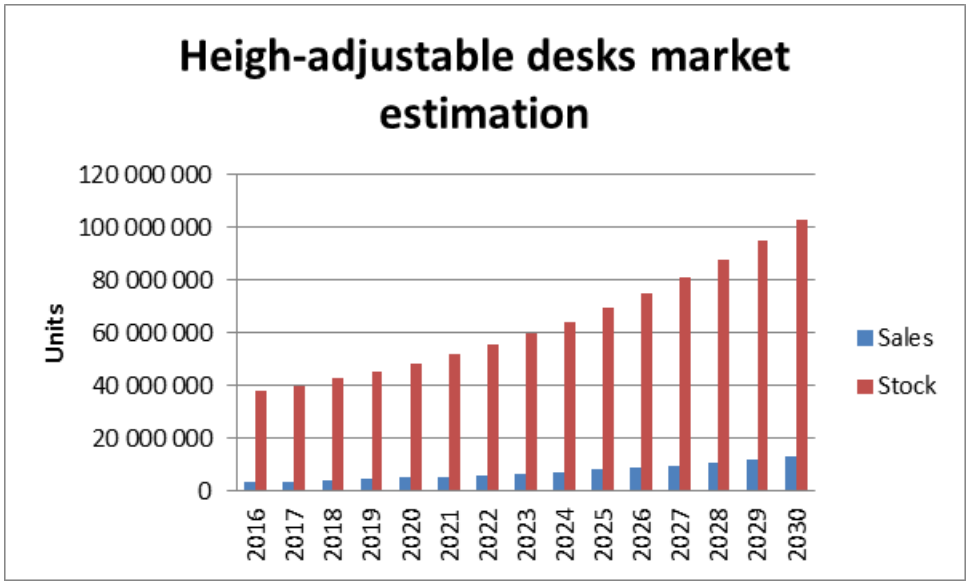

Figure 7. Market estimation of height-adjustable desks 2016-2030.

4.1.5 Local building controls

4.1.5.1 Scope

It has been identified during the desk research and consultation with industry that building automation and building controls can be categorised first by the complexity of the system and second by whether the system is controlled by the building users, professionals or completely automated. This categorisation hierarchy can be used to define the boundaries of the scope for this product group.

The scope of interest in this study is the local building controls mostly in residential buildings, homes and office buildings where the end-users, i.e. home owners and office

workers, can control the system. According to information from industry stakeholders, these systems often have the control box and the motor as one unit, which gives the movement to the end-products such as windows, curtains, blinds, etc. It is important to note that the remote controls can be wired or wirelessly connected to the motorised end product. These systems largely resemble the system previously described for adjustable furniture.

However, local building controls can also be automated if different sensors, such as rain, temperature and CO_2 sensors have been connected to give the command for movement of the end-product without the need of user interaction.

According to the scope categorisation defined in section 4.1.2, the proposed definition of local building controls to be included in Annex I of the revised amended regulation 1275/2008 is:

Products that move building components of residential and office buildings for access and climatic controls, and are controlled by end-users and/or sensors through a control box and wired and/or wireless remote controls or via a network, and the electric motor or actuator and the control unit within the product is one entity.

This definition is schematically represented in Figure 8.

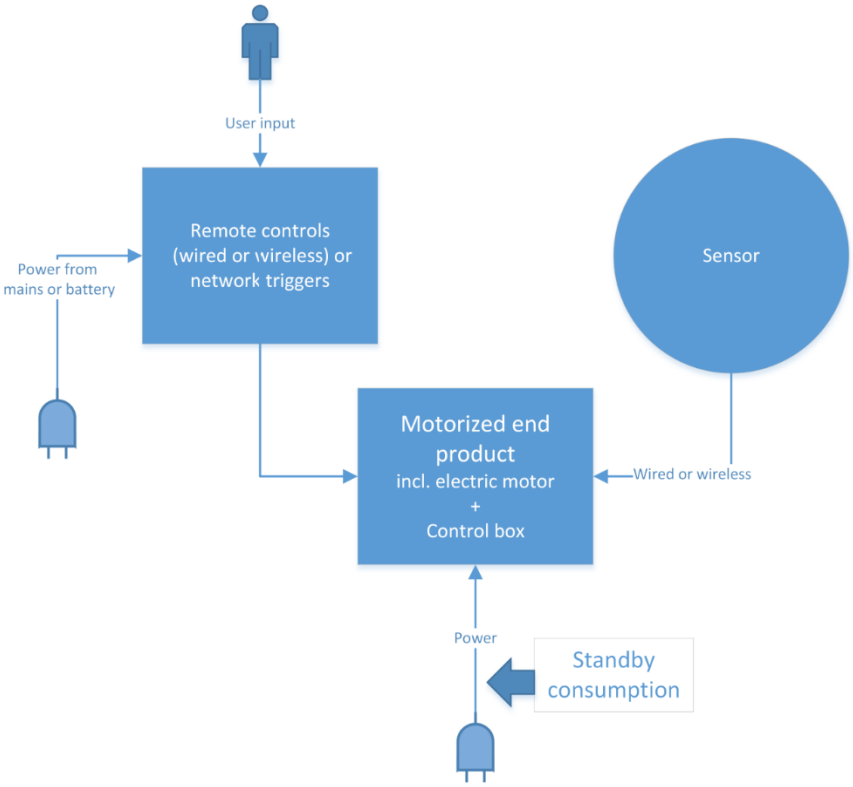

Figure 8. Representation of local building controls in scope.

Accessories (included in all packages)

Control unit	VELUX INTEGRA® control pad	Rain and wind sensor
KLC 400	KLR 200	KLA S105
Uses 230 V power supply	Handheld or wall-mounted	Uses 2 x 230 V power supplies
Power consumption max. 200 W	Battery-powered	Current max. 1.8 A

Figure 9. Examples of local building controls application for controlling skylights using actuators and control unit operated via a remote control, from top left and continuing clockwise: remote controllable skylight, remote control in form of a digital control pad, other accessories delivered together with skylight[16].

Figure 10. Examples of local building controls application for controlling blinds, using actuators operated via a remote control, from top left and continuing clockwise: motorised roller, Venetian and Roman blinds, remote control in the form of, network box to enable smartphone control via network, a switch, a wireless remote control device[17].

[16] http://www.velux.co.uk/products/velux-modular-skylights
[17] https://www.somfy.co.uk/products/interior-applications/interior-blind

Figure 9 and Figure 10 show the example applications of local building controls from two EU manufacturers. These applications as seen in the figures are largely used in residential houses as well as offices where users can locally control their environment and indoor climate for convenience. Figure 9 shows a motorised skylight solution that can be controlled by the control pad supplied with the skylight as well as automatically controlled by the rain sensor if rain is detected. Figure 10 shows motorised shading device solutions that can be controlled via smartphones over a network box, a switch placed in a convenient location (i.e. on the wall near windows) or a typical remote control device.

4.1.5.1.1 Excluded from scope

Systems primarily not in scope are the automatic centralised controls of a building's heating, ventilation and air conditioning, lighting and other systems through a computer-based "Building Management System" (BMS) or a more recent terminology "Building Automation System" (BAS) or similar centralised systems. In large commercial buildings, the building automation systems are often much more complex and interlinked. In addition, the controllers which may control up to 12 motors or more, are situated outside the motors and the signals for movement often come from a building controller which is fed information by various sensors and other components. A schematic representation of these products can be seen in Figure 11

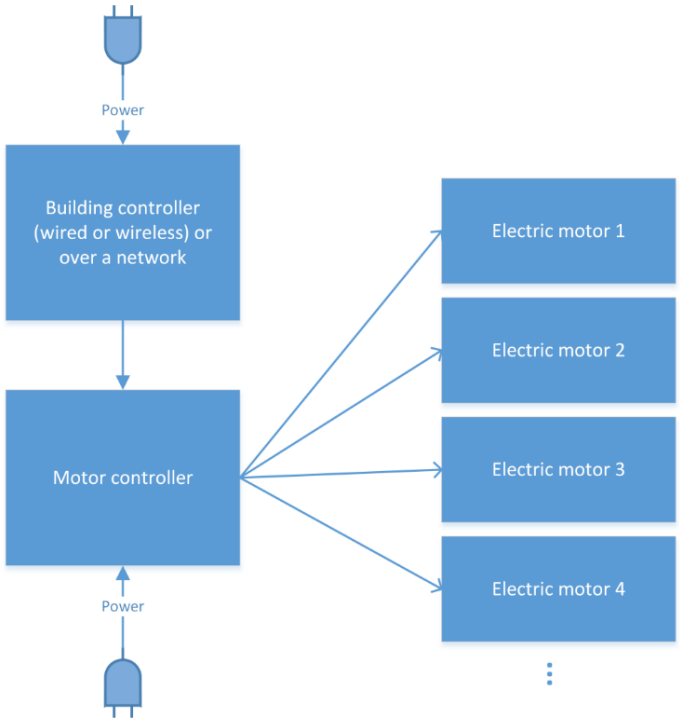

Figure 11. Representation of large building automation/management systems excluded from scope.

4.1.5.2 Possible overlap with Energy Performance of Buildings Directive

Local building controls in proposed scope are building components, and therefore there has been concern whether these products are already in the scope of Energy Performance of Buildings Directive (EPBD). Before assessing the potential of including

these products in the present amended Regulation 1275/2008, the possible interference as well as potential alignments with the EPBD were investigated.

EPBD sets a range of requirements on the energy performance of buildings, including the adoption of a methodology for calculating the energy performance of buildings according to the common general framework, and setting minimum energy performance requirements for new built and renovations, technical building systems requirements, nearly zero-energy buildings, energy performance certificates, etc. Each Member State can develop their own building regulations and requirements that live up to the requirements set by the EPBD.

The only point where the EPBD mentions specifically building automation is under technical building system requirements, stating that Member States shall encourage smart metering systems, installation of active control systems such as automation, control and monitoring system that aim to save energy. However, this is not a requirement.

In addition, national Building Regulations are developed to live up to EPBD requirements, and do not set specific energy requirements for building automation systems. For instance, in Denmark the theoretical energy use of all electricity-using products in a building is calculated as a total per floor area to prove that it meets the minimum requirement for electricity consumption in kWh/m^2 set by Building Regulations. This minimum requirement is only found for commercial buildings and not for residential buildings. It is not possible to separate the consumption only consumed by building automations, so for example, poorly performed window actuators and control panels can be used if it is compensated elsewhere such as decreasing the number of computers to be used in the building. The theoretical value is often calculated in design phase or construction phase, therefore it does not necessarily ensure that energy efficient products are being used for the actual building operation after commissioning.

For residential buildings, only the energy consumption for heating is assessed and not for the rest of the technical building components, and therefore the rest of these components should be included in the standby regulation to avoid large electricity consumption in standby mode from these products.

It is concluded that the inclusion of local building controls where possible into the standby regulation scope would not interfere with the EPBD, because EPBD focuses more on building as a whole and therefore small components in building automations could still end up being inefficient. Furthermore, local building controls have no minimum requirements for residential buildings which the products of interest are primarily used in, therefore the potential inclusion of these products used in residential buildings could close the loophole from EPBD.

4.1.5.3 Standby mode consumption

According to information provided by industry stakeholders, local building controls in scope can have a standby consumption ranging from 0.5 W to 2.5 W, depending on the electronic technology used for the type of motor.

One issue could occur for products which are partly or fully controlled by sensors, e.g. a skylight, which has a rain sensor to close the skylight in case of rain. When this sensor is activated, the product is not considered to be in standby mode and if it has to be active

continuously, the product cannot go into standby and would need to claim that power management is inappropriate for the intended use.

Newer product generations from some manufacturers implement a power management function by receiving signals from sensors in intervals and during the time it is not detecting signals, it can power down. Therefore, the technology exists for these kinds of products to go into standby mode in spite of sensor-based controls. These new generations can achieve 0.5 W in standby, according to stakeholder consultation from industry.

There are still products with advanced sensor systems for security such as access systems, which needs to have a continuous communications with sensors and which therefore cannot go into standby. These include systems for access to private areas. The manufacturer may use the inappropriateness rule in the regulation for such products.

Based on information provided by industry, the average for standby consumption for the variety of products in the EU market is approx. 1.5 W. To meet the standby requirement of 0.5 W, some products may need to be redesigned and therefore 3-4 years would be needed from R&D phase to final production.

4.1.5.4 Networked standby

Local building controls in scope can also have a networked standby, if a network is added into the system, which enables the users to control the motorised end-product via smartphone, tablets or any other wired and wireless control connected to a network and not being part of the original single functional unit. It may also be external sensors connected via a network and being able to activate the product. This can be seen schematically in Figure 12. It should be noted that a remote control or sensor that comes with the product is considered a part of the single functional unit, therefore it does not constitute a network.

These residential local building controls often use wireless communication protocols such as Bluetooth, Zigbee, Z-Wave, IO Home Control, RTS, and Wi-Fi, and some of these are also typically used by other networked electronic products such as wireless speakers which are already in scope of networked standby requirements. Some of these protocols enable ultra-low power consumption, therefore the technology for achieving low standby is available, however, the study team has no access to measured networked standby data of local building controls. Some industry stakeholders for these products have expressed concern about meeting the current networked standby requirement (6 W presently, 3 W and 2 W in future tiers).

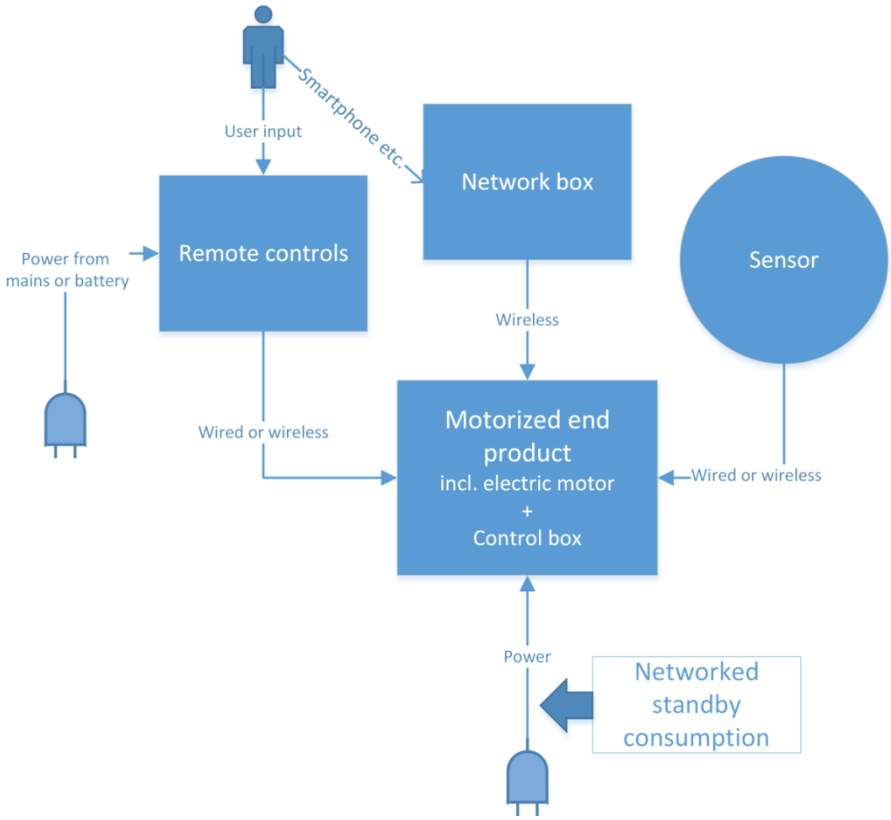

Figure 12. Representation of networked building automation and controls in scope. Network box is not part of the scope but it is shown to illustrate the interface between the network and the system in scope.

4.1.5.5 Market estimation and growth

The market for local building controls is predicted to increase steadily, and the reason is two-fold. Firstly, the focus on indoor climate and energy efficiency buildings is now wide-spread in the EU. Users want to ensure a good indoor climate while achieving energy efficiency. Sometimes, to improve indoor climate and energy efficiency in residential and office buildings there are added more skylights, vents and blinds in places (e.g. at the exterior of buildings) where users cannot physically reach, so local building controls give the users the access to these components. Secondly, the evolution of smart technologies has sparked a high demand in automated homes and systems, and therefore users start to prefer that the system runs the building components itself or that it can be controlled by users wherever they are via smartphones or other wireless controls.

According to industry, the market for building controls is approx. 10 million units sale per year, out of which ca. 75 % of the units are the simple building automation and control systems/products mostly used in residential sector (i.e. the local building controls in scope of this review study). The total stock for this has been estimated based on the sales per year and the 5 % growth rate predicted by the industry stakeholders. From these considerations, the total current stock for motors linked with automation has been estimated by industry stakeholders to be 50 million (considering only 75 % are relevant to scope). See Figure 13.

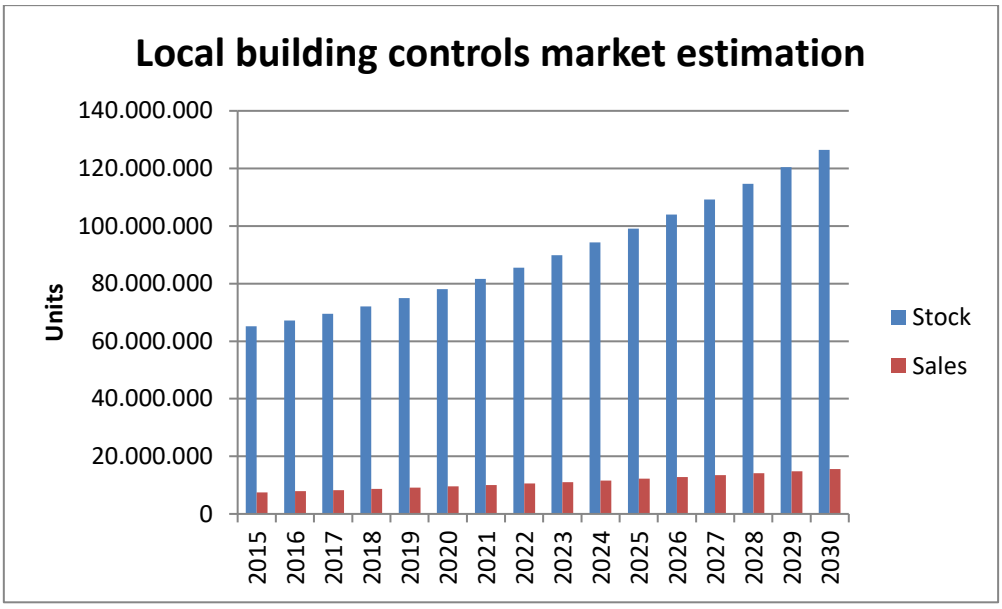

Figure 13. Market estimation of local building controls 2015-2030.

4.1.6 Total potential energy savings

Based on the standby consumption data and market estimates presented, a Business as Usual (BAU) scenario and a policy scenario are modelled for height-adjustable desks, elevation beds and local building controls. The BAU scenario assumes that the standby remains the average it is at the present, but the sales of these product groups increase up to 2030 according to data presented previously. In reality, a slight natural improvement in the standby consumption is likely to occur without regulatory measures, but at the same time, more of the products in the scope would become networked in the future which could result in higher standby/networked standby consumption, and this is not accounted for in the model. The estimated energy consumption up to 2030 from BAU is shown in Table 4.

Table 4. Business-as-usual (BAU) standby energy consumption.

Business-as-usual (BAU) standby energy consumption, TWh				
Product group	**2016**	**2020**	**2025**	**2030**
Height-adjustable desks	0.74	0.95	1.35	2.00
Elevation beds	0.05	0.09	0.17	0.27
Local building controls	0.87	1.01	1.28	1.63
Total	**1.65**	**2.04**	**2.79**	**3.90**

The policy scenario assumes that these product groups would be included in a future revision of the scope of amended Standby Regulation, (EC) 1275/2008, and the future products will therefore start to meet the requirement of max. 0.5 W in standby mode by 2019. The total stock will be completely replaced by the efficient products within 10 years as the technical lifetime of these products is approx. 10 years. The estimated energy consumption up to 2030 from this policy scenario is shown in Table 5.

Table 5. Policy scenario standby energy consumption.

Policy scenario standby energy consumption, TWh				
Product group	**2016**	**2020**	**2025**	**2030**
Height-adjustable desks	0.74	0.72	0.51	0.44
Elevation beds	0.05	0.07	0.08	0.09
Local building controls	1.01	0.99	0.73	0.67
Total	**1.65**	**1.75**	**1.38**	**1.08**

The potential energy savings from including these products into the scope of standby regulation are shown in Table 6 (per year) and cumulative energy savings in Table 7. The highest potential is from height-adjustable desks due to the high growth rate and the high standby consumption at present levels. Local building controls give also a large proportional potential saving due to the large sales and stock in the EU, in comparison with the elevation beds which has the lowest sales and the lowest saving potential. It should be noted that the actual saving for all products equipped with electric motors operated by remote control could be greater as the present calculation only includes three product types. However, no further data is available to make conclusions for other product types within this category. In spite of this, the projected energy savings potential is considerable for these three product types.

Table 6. Potential annual energy savings from standby energy consumption.

Potential annual energy savings (TWh/year)				
	2016	**2020**	**2025**	**2030**
Height-adjustable desks	-	0.15	0.74	1.56
Elevation beds	-	0.01	0.08	0.18
Local building controls	-	0.13	0.60	1.03
Total	**-**	**0.29**	**1.41**	**2.83**

Table 7. Cumulative energy savings from standby energy consumption.

Cumulative energy savings (TWh)				
	2016	**2020**	**2025**	**2030**
Height-adjustable desks	-	0.22	2.57	8.90
Elevation beds	-	0.02	0.25	0.97
Local building controls	-	0.20	2.17	6.83
Total	**-**	**0.43**	**4.98**	**16.70**

4.1.7 Conclusions

The results of the analysis show that there is large cumulative potential for including products equipped with electric motors operated by remote controls into the scope. The total annual energy savings for the three product types sum up to approx. 3 TWh in 2030, and the cumulative savings sum up to approx. 17 TWh by 2030. It is also shown in the analysis that technology for achieving the current standby and networked standby requirement already exist for these products, so there should be no problem with compliance. In addition, the inclusion of local building controls products can align well with the scope of the Energy Performance Buildings Directive, so the local building controls of residential sector are also regulated and contributing to energy efficiency in buildings.

However the analysis is only based on three product types: height-adjustable desks, elevation beds and local building controls, therefore it is recommended to include two main product categories to the list in Annex I of Regulation 1275/2008: (i) Adjustable

furniture and (ii) Local controls. Details on how this could be done are discussed in the overall conclusions and recommendations of the study (chapter 5.3).

4.2 Assessment of inclusion of products with low voltage external power supplies

4.2.1 Introduction

The Standby Regulation does not apply to electrical and electronic household and office equipment placed on the market with a low voltage external power supply (LV EPS) to work as intended. The background for this is explained in the recitals of Commission Regulation (EC) 278/2009[18] on ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies. The no-load condition in this regulation addresses the same parameter as the off mode condition in the Standby Regulation 1275/2008, and the no-load requirement for low voltage EPS is more demanding than the off mode requirement.

Nevertheless, it is crucial to note that although the LV EPS no-load requirement is more demanding than the off mode requirement, the product (LV EPS + the product being supplied with power from the LV EPS) may still consume more power than the requirement in the standby regulation for both off and standby modes due to consumption in the electronic circuitries (e.g. a soft off function and the reactivation functions).

According to the EPS review study[19] and some Member States during stakeholder consultation, the exemption was intended to capture mobile phones, which should not need to comply with the standby mode requirements because the standby and off modes consumption was already very low due to use of low power circuitry. The EPS review came to the conclusion that due to technological development of mobile phones and other electronic devices, there is an increasing number of devices, beyond mobile phones, that fall under the exemption. Similarly, today there are also mobile phones on the market delivered with a non-LV EPS or with both a non-LV EPS and a LV EPS or even without an EPS. Finally, the new USB 3.1 specification allows several voltage levels (USB Power Delivery rev. 1 specification at 5 V, 12 V and 20 V, and rev. 2 at 5 V, 9 V, 15 V and 20 V) and up to 100 W of power. This can also be used for faster charging of mobile phones.

All in all, the technological development of the market shows that many more products are now delivered with LV EPS, which makes it necessary to explore whether the exemption creates a major loophole.

[18] (14) Ecodesign requirements for the no-load condition of low voltage external power supplies address the same environmental impact parameter as ecodesign requirements for the off-mode condition of electrical and electronic household and office equipment placed on the market with a low voltage external power supply. As ecodesign requirements for the no-load condition of low voltage external power supplies should be more demanding than ecodesign requirements for off-mode condition of electrical and electronic household and office equipment placed on the market with a low voltage external power supply, the requirements of Regulation (EC) No 1275/2008 of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off-mode power consumption of electrical and electronic household and office equipment, should not apply to electrical and electronic household and office equipment which is placed on the market with a low voltage external power supply. Regulation (EC) No 1275/2008 should therefore be amended accordingly.

[19] ADDITIONAL ASSESSMENT IN THE FRAME OF THE REVIEW STUDY ON COMMISSION REGULATION (EC) NO. 278/2009 EXTERNAL POWER SUPPLIES, December 2013

It was concluded in the EPS Review Consultation Forum that this issue should be addressed in the review of 1275/2008, i.e. the current review study. Therefore, in spite this item is not in Article 7, it is of priority and therefore has been included as one of the focus items in this review.

In light of the recent discussions with industry, there is dispute between stakeholders on whether other portable devices were also meant to be exempted. This section investigates on the possible loopholes created by this exemption and possible solutions.

4.2.2 Scope

4.2.2.1 The exemption applies to many products that should be in scope

Industry stakeholders stated that there are indeed more and more products with low voltage EPS on the market. It has certainly created a loophole as many of other products which should be in scope are now exempted due to the use of low voltage EPS. These include small network equipment, charging stands, security cameras, digital cameras, game consoles, loud speakers, wireless headsets, amongst others. The EPS review team reported that based on a desk research on larger online shops such as Amazon and ebay, they estimate that there are potentially 30 % of router products, 60 % of tablet products and approximately 4 % of notebook products on the market that have low voltage EPS. In general, a large amount of portable products or products driven by re-chargeable batteries are equipped with LV EPS. Tablet and notebook products are currently exempted from amended Regulation 1275/2008 because they are covered by the computer regulation. Routers and other product groups which could potentially fall into this loophole are:

- **Small network equipment**: These are typically modem, gateways and routers with low voltage EPS. However, based upon technical data regarding these EPS[20], it is unlikely that these products would have any problem meeting the standby and the network standby requirements. The lost savings are not significant, but there may be a lack of consistency and there may be similar products within one product category where some are within the scope of the standby regulation and some are not.

- **Toys or other small products**: It is mentioned by some Member States that toys and other small electric products can be sold with low voltage EPS and therefore exempted. A test result showed that the EPS of an electric toy consumes 1.34 W on standby/off modes[21]. However, this is no representative data for the size of the market that is currently being exempted due to the low voltage EPS.

- **Products driven by re-chargeable batteries**: Contrary to the opinion of some stakeholders, products driven by batteries are not exempted from the Standby Regulation. However, industry stated that most battery-driven products are highly efficient. The examples of standby data for camcorder and wireless speakers provided by the industry show that the consumption of standby/off mode can vary between 0.06 W and 0.42 W, however the industry also indicated that some products could consume more than 0.5 W.

[20] ENERGY STAR dataset for small network equipment, 2015
[21] Testing by Swedish Market Surveillance Authority, 2014

4.2.2.2 Outdated definition of Low Voltage External Power Supplies

The definition of low voltage EPS is now outdated as it no longer covers fully the range of mobile phone and smartphone EPS, assuming the exemption was originally meant to exclude mobile phones from Standby Regulation. For example, a number of current mobile phone EPS would be considered standard rather than low voltage and be required to comply with the standby measure requirements (Nokia 108, Nokia Asha 210, Nokia Asha 501 with AC-11, 5 V, 450 mA, 2.25 W specification supplies), whilst others would still fall under the exemption (Nokia 301, Nokia 515, Nokia Lumia 520 with AC-20, 5 V, 750 mA, 3.75 W specification supplies). From a regulatory point of view, there should be a level playing field so the manufacturers of same type of products should meet the same obligations.

4.2.2.3 Agile chargers deliver different voltages

EPS with USB 3.1 can deliver different voltages between 5 V and 20 V all in one up to 100 W. It can be used for faster charging of mobiles but also other electronic products alike. It would be challenging to classify all these EPS either as low voltage or as standard EPS.

4.2.2.4 Wireless chargers fall into this exemption

Wireless charging is now emerging in the market of mass production. For example, IKEA has two nightstands and three lamps with wireless charging capability, but it can also be integrated with a lot of furniture as the two IKEA wireless chargers can potentially be integrated with any surface that has a void in the shape of the charger.

The Qi specifications developed by the WPC (Wireless Power Consortium) are the most widely used wireless technology. There are 883 products from a dozen different product groups registered in the Qi database using Qi specifications and 18 of them in the furniture sector including the two chargers from IKEA[22]. The market trend is going towards more wireless convenience and therefore the standby consumption of wireless products should be addressed. For example, the concept of cordless kitchen appliance has been proposed in 2013[23] and could be the future. The idea is that inductive power source can be integrated in the kitchen table/counter and other components of the integrated kitchen. Haier Group has already introduced such products into the Chinese market, and confirmed that cordless appliances are well appreciated by the customers.

A single IKEA wireless charger has voltage of 5 V dc and max current of 2000 mA, therefore it is categorised as low voltage EPS according to current definition. There are also emerging wireless charging furniture companies competing with IKEA, one table example has no need for EPS as battery pack is included in the table leg. This particular product would not be exempted due to lack of EPS, but it would be because it is not dependent on energy input from the mains in order to work as intended. However, in general wireless chargers are currently not covered by Standby Regulation due to LV EPS exemption.

According to WPC, the standby consumption, which is the no-load power consumption of the power supply with induction coil, is approx. 0.1–0.5 mW[24]. This applies both when

[22] http://www.wirelesspowerconsortium.com/products/

[23] http://www.wirelesspowerconsortium.com/data/downloadables/1/1/0/5/201304-white-paper-cordless-kitchen-appliances.pdf

[24] http://www.wirelesspowerconsortium.com/data/downloadables/1/3/7/4/how-it-works-20100420.pdf

the mobile device is not present and when the device's battery is fully charged. A charging station has a specification of 2.5 A and up to 20 W, and the standby power consumption is less than 0.2 W[25]. The standby consumption of wireless chargers may not be significant, however the study team has no measured standby data to support WPC's claim. It would be useful to collect standby information on these products for future assessments.

It is also worth considering the potential amount of products that would be exempted if popularity of wireless charging increases in the future, if the exemption is maintained.

4.2.2.5 Possible solutions

In this section, we explore potential solutions to close the loophole created by this exemption.

Set an upper current or power limit

This option means redefining low voltage EPS as < 6 V and between 550 mA and 2 A or setting an upper power limit of 12 W.

However, the thresholds are likely to become irrelevant quickly, especially taking into account the new USB standard (v3.1) which will allow dynamic adaptation to a range of powers much higher than previously possible, as mentioned for agile charging. Furthermore, some of the mobile phones are still below the 550 mA threshold and it is not possible to make sure products other than mobile phone are covered by the regulation. This option is therefore not assessed further.

Clarifying exemption

The industry stakeholders prefer to supplement the exemption by adding that this only applies to products only connected to the mains for battery charging purposes, excluding products with EPS that are intended to be continuously connected to the mains. However, the industry assumes that the exemption was originally meant for all portable devices and products driven by batteries.

The voltage and ampere output limits would however not be changed in the definition itself. This means that some mobile phones that are currently not exempted will still have to comply with the standby requirements.

Industry claims that products driven by batteries are in general highly efficient and therefore they should not need to comply with standby requirements, however there is no technical guarantee that products driven by rechargeable batteries always consume less than 0.5 W on standby mode, i.e. connected to EPS but fully charged. This could create a loophole for very cheap and inefficient products.

This option implies that products continuously connected to mains such as all small networked equipment with low voltage EPS would now be covered by the regulation and yield some energy savings, while all battery operated portable devices with low voltage EPS are still exempted from the Regulation with the exception of a few mobile phones and smartphones.

Removing exemption

[25] http://hubit.eggtronic.com/index.php/en/content/view/h04be040fs/easy-safe

As data provided by industry shows that there are more and more products on the market delivered with LV EPS in many different product categories, removing the exemption would be the solution with the most comprehensive coverage for closing the loophole.

According to the EPS review report, a major mobile phone manufacturer stated that mobile products would not have a problem meeting the standby requirements. The issue for them was the bureaucracy in terms of the paperwork and testing related to their inclusion in another regulation, as testing for standby consumption would need to be carried out for the whole product and not just the EPS anymore and the information requirements should be also attained. However the manufacturers of mobile phones which currently fall outside the current exemption are already carrying it out anyway.

There has been concern about mobile phones and smartphones needing to comply with power management requirements and possibility to deactivate wireless network. In this regard mobile phones and smartphones are optimised regarding powering down partly or fully components, e.g. CPU, in order to extend the battery life. Power consumption levels are very low and there would be no problems in complying with standby/off and network standby requirements.

Regarding the possibility to deactivate the wireless network, it is a standard functionality in typical mobile phones on the market that the user can turn on and off Wi-Fi, Bluetooth, the cellular radio connection, etc. It is therefore concluded this not to be a major issue.

Other portable products that are driven by batteries should not have problems complying with the standby requirement, assuming the standby consumption data provided by the industry are representative for all portable products (0.06 – 0.42 W on standby/off modes). This would also ensure that any portable product currently consuming more than 0.5 W on standby would reduce its consumption and hence secure additional savings. However, there is no available data on these inefficient products.

Some non-mobile products currently benefitting from the exemption may need to be developed further adding to the potential energy savings. Potential energy savings from these would be presented in a later section.

4.2.3 Standby mode consumption and networked standby

Based on desktop research, on data and information from the review study and impact assessment for EPS, as well as on further industry consultation, the standby consumption of some products with low voltage EPS have been identified. See Table 8 for the consumption of each product, showing that most of the products identified have standby consumption lower than 0.5 W or a networked standby consumption lower than 8 W.

Table 8. Idle, standby and off modes consumption of products that have been identified to use low voltage EPS[26,27,28].

Product	Idle (W)	Standby (W)	Networked standby (W)	Off (W)
Small network equipment[20]	-	-	7.48 – 9.53	-
Mobile phones and smartphones	0.75	No data	-	0.22
Camcorders	-	-	-	0.06
Wireless speakers	-	0.21 – 0.42	-	-
Game console 1	-	0.22 – 0.26	-	-
Game console 2	-	0.068	-	-
Game console 3	-	0.11	-	-
Charging stand	-	0.04	-	-
Wireless chargers	-	0.20	-	-

Small networked equipment has a networked standby consumption of 7.48 W which is averaged from the US ENERGY STAR database. Based on the data from ENERGY STAR, 51 % already meet the Tier II requirement of 8 W which becomes effective from 1st January 2017. Out of those small network equipment which do not meet the Tier II requirement, the average networked standby consumption is 9.53 W. This networked standby consumption would be assumed for potential energy savings in later section, if the exemption is removed or clarified.

There is no standby consumption data for mobiles and smartphones, only idle and no-load consumption are presented in Table 8. However, given that the original exemption was meant for mobile and smartphones due to their high efficiency and their no-load consumption (as low as 0.22 W), their standby consumption is believed to be equal to or lower than 0.5 W. It is not likely that inclusion of these in standby regulation will yield any additional savings.

Handheld game consoles have also been identified to have low voltage EPS, but it is seen from Table 8 that their average standby consumption is approx. 0.07 W. This confirms what industry indicated, that most battery operated devices are highly efficient. Wireless speakers, camcorders, digital media players (micro-consoles) and charging stands for game controllers have also been identified to have LV EPS, but their standby consumption is also lower than the standby limit set by the amended Regulation 1275/2008 as seen in Table 8. The inclusion of these specific product groups in standby regulation is unlikely to yield additional energy savings, but at the same they would not have any problem complying with current standby requirements if the exemption is removed.

4.2.4 Market estimation and growth

The industry stakeholders stated that the market for non-HiNA equipment with low voltage EPS is increasing while the HiNA equipment with low voltage EPS is very limited. The review study of EPS identified that potentially one third of the market for small networked equipment could be placed on the market with low voltage EPS. Table 9 shows

[26] Digital Europe inputs December 2015 – January 2016.

[27] http://www.vgchartz.com/yearly/2015/Europe/

[28] Digital Europe inputs for EPS review and Impact Assessment, 2015.

the market estimation for products with low voltage EPS. Following the current trend, it can be expected that there will be more and more products with low voltage EPS in the near future. However no estimate growth rate was provided for these products.

Table 9. Market estimation of products with low voltage EPS in the EU[26,27,28].

Products with low voltage EPS	Annual sales in EU (units)
Small network equipment (routers, modems, home gateways)	15,600,000
Mobile phones	60,000,000
Smartphones	166,000,000
Game consoles 1, 2 and 3	20,194,303
Charging stand	200,000
Total	**261,994,303**

Small network equipment with low voltage EPS is estimated to have an annual sales of 15.6 million units. It should be noted that the industry implied a much lower market share of small network equipment with low voltage EPS, i.e. only approx. 2.5% out of the sample they have used. That would result in 1.3 million units of small network equipment with low voltage EPS per year. Assuming all mobile phones and smartphones have low voltage EPS, even though some models do not have any more, the total annual sales is 226 million units. In addition, the sales of 4 single product models with low voltage EPS (game console, settop box and game controller) have been received, the total of 4 models sum up to an annual sales of over 20 million units. The total market share for game consoles, settop boxes and game controllers with low voltage EPS could be very large, due to the numerous models available on the market.

The partial stock presented above for products with LV EPS is approx. 262 million units, this approx. 16% of the total stock for products covered the standby Regulation currently (see Table 26 for the estimated total stock). This is a large amount of products to be exempted from the Regulation.

4.2.5 Potential energy savings

Standby consumption data obtained shows that most of the identified products with low voltage EPS is well below 0.5 W. Hence, removing the exemption does not necessarily bring additional energy savings than clarifying definition to only apply to portable devices operated by batteries. The only energy savings would come from small network equipment that are currently exempted.

The current standby consumption for small network equipment is averaged from the ENERGY STAR database, and therefore some products consume more than 8 W (the 2017 limits for HiNA networked standby). The potential energy savings calculated are only concerning small networked equipment (see Table 10 and Table 11), considering a worst-case scenario assuming all products in the dataset not complying with 8 W requirements are with low voltage EPS and therefore benefiting from the current exemption. Due to the limited data on sales development of small networked equipment with low voltage EPS, a simpler calculation for potential savings was made. The total stock of small networked equipment is the product of yearly sales and lifetime (4 years). The annual potential energy savings come from shifting all stock of small network equipment with low voltage EPS consuming approx. 9.53 W in average to more efficient ones that consume 8 W. The maximum savings for 2025 would be 30 GWh (if 2.5% of

the stock of small network equipment have LV EPS) or 362 GWh (if 30% of the stock of small network equipment have LV EPS), if this stock is completely changed by 2025.

Table 10. Potential energy savings based on market assumption from review study on EPS.

Assuming 30 % of the small network equipment have low voltage EPS	
Amount of small network equipment consume more than 8 W have low voltage EPS	7,577,143 units
Stock (assuming 4 years lifetime)	30,308,571 units
Average networked standby consumption of SNE consuming more than 8 W	9.53 W
Energy savings, GWh/year	**362**
Cumulative energy savings after 4 years, GWh	**1811**

Table 11. Potential energy savings based on market assumption from industry stakeholder consultation.

Assuming 2.5 % of the small network equipment have low voltage EPS	
Amount of small network equipment consume more than 8 W have low voltage EPS	631,429 units
Stock (assuming 4 years lifetime)	2,525,714 units
Average networked standby consumption of SNE consuming more than 8 W	9.53 W
Energy savings, GWh/year	**30**
Cumulative energy savings after 4 years, GWh	**151**

The energy savings by either removing the exemption or by clarifying the definition is estimated to be the same, because data shows that the only savings would come from small network equipment with LV EPS. Potential saving is approx. 30 GWh/year or 362 GWh/year depending on the share of products with low voltage EPS, maximum cumulative saving is estimated around 1811 GWh or 151 GWh after all stock is changed. However, the cost implication is higher in removing the exemption, because the small network equipment should not have been exempted in the first place, therefore additional cost for testing and documentation is not considered extra cost for the manufacturers. Removing the exemption implies that there will be additional costs for testing and documenting for compliance with Regulation 1275/2008 for standby for mobile phones, smartphones and some portable devices. One test laboratory has indicated that the commercial price of standby testing and reporting is around €1300 per product. Internal testing using own laboratory and staff may incur less costs.

4.2.6 Conclusions

According to the few available standby consumption data supplied by industry, there is little saving to be yielded by removing the exemption. Estimated savings from removing the exemption or clarifying the definition is approx. 30 GWh/year which comes only from regulating the small network equipment that are currently benefiting from the exemption. The energy savings potential estimated in this review study would therefore not be an argument for removing the exemption of LV EPS nor to adding clarification to the definition in the regulation.

However, considering the significant and emerging market share of LV EPS products (currently 16% of estimated total stock of products in scope), it is expected that the

estimated savings would be higher if performing a dedicated data collection of the standby consumption of all of these products.

The current lack of available standby consumption data on products with LV EPS or portable devices is in general supported by the fact that they are highly efficient and therefore there is no need to regulate them. However, to ensure this is indeed a fact, it is highly recommended to include products with LV EPS in the information requirements, so the manufacturers would disclose standby consumption data and the consumers would be aware of this. Furthermore, in this way it will be more data available for future assessments.

Cost of testing and reporting in a commercial professional laboratory (according to 1 laboratory source) would be around €1300 for standby and a bit more for networked standby (depending on product functionality and connectivity). Internal testing using own laboratory and staff may incur less costs."

4.3 Assessment of inclusion of professional equipment

4.3.1 Introduction

Article 7 of the consolidated Regulation (EC) 1275/2008 states that professional equipment should be addressed in the present review study. The scope of the present Standby Regulation originates from Lot 6 preparatory study, where home appliances and office equipment were in and products used on public, commercial and industrial applications (excluding offices) were out.

Although a clear definition of professional equipment is not found, the inclusion of office equipment in the scope of the regulation sets a thin boundary on what it is and what is not professional equipment. In principle, all equipment used in the workplace environment and possibly adjacent rooms which falls under Annex I of the regulation and which intended use is in the domestic environment, is not professional equipment as it is out of scope.

The lack of a definition for professional equipment, except for IT which in the Regulation 1275/2008 is defined as that falling under class A equipment[29], points at a wide range of non-household and non-office products which are not intended to be used in the domestic environment and that can be regarded as professional equipment.

To delimit the assessment of inclusion of these products, some specific professional products which have high sales volumes, long waiting times (i.e. meaning waiting for reactivation or for switching on from off) and/or high standby consumptions were identified, and their relevance for inclusion in the current consolidated regulation was assessed. Some of these products have already been identified and in some cases being assessed.

4.3.2 Scope

The scope of professional equipment products to be assessed in this review study has been narrowed according to the next criteria:

- Professional equipment has been divided in two product categories following Annex I of the standby consolidated regulation: (i) Professional white goods, and,

[29] According to standard EN 55022:2006

(ii) Professional IT equipment. This was based on the assumption that products under these categories are used in professional applications, and if not the same products, they will be very similar to the non-professional products. The actual upper limit for nominal voltage in the amended Standby Regulation is 250 V, and therefore all the products belonging to these two categories were looked at considering their nominal voltage ≤ 250 V. Both consumer equipment and toys, leisure and sports equipment have been excluded from the review as they are assumed to constitute a very small market when produced for and used in professional settings.

- For each of these two product categories, products with high stock volumes and/or high standby consumption have been identified, and an attempt to collect market data and electricity consumption on standby has been made.

- The intended use of these products must not be exclusively intended for domestic use. The definition of domestic environment in the amended Regulation (EC) 1275/2008 refers to the use of broadcast radio and television receivers without radio interference within a distance of 3 meters from Class B products. This does not establish a clear boundary between the household/office equipment and the professional equipment, in particular for professional white goods. In this case some industry stakeholders use the definition of *domestic use* as a reference to delimitate what is not professional white goods (found in the guidelines for the application of the Machinery Directive). In this way, it is indicated that professional products are those intended for commercial or industrial use. The guidelines on the application of the Machinery Directive of the Low Voltage Directive[30] state clearly that if a product is intended for commercial and industrial use, but at the same time is used by 'private persons (consumers)' in the home environment, the intended use declared by the manufacturer in the Declaration of Conformity and in the product information / instructions / advertising material is what defines whether a product is intended for domestic use or for commercial and industrial use. This assessment of inclusion of professional equipment therefore focuses on those intended for commercial and industrial use declared by the manufacturer in the Declaration of Conformity, even though they may also be used in the home environment.

4.3.3 Professional white goods

4.3.3.1 Scope

Commercial ovens, professional washing machines, professional dryers and professional dishwashers are white goods which have been identified with market data and standby consumption from previous preparatory studies[31,32,33], and therefore they have been the focus of this review study. Available information was supplied with additional information provided by industry stakeholders, to check on technological progress and update on methodological problems and levels of standby/off modes consumption. The rest of the

[30] Guidelines on the application of Directive 2006/95/35 (Electrical equipment designed for use within certain voltage limits). August 2007 (last modified: January 2012).
[31] Lot 22: Domestic and commercial ovens. August 2011. BIO Intelligent Service.
[32] Lot 24: Professional washing machines, dryers and dishwashers. Part: Washing machines and dryers. May 2011. Öko-Institut e.V & BIO Intelligent Service.
[33] Lot 24: Professional washing machines, dryers and dishwashers. Part: Dishwashers. May 2011. Öko-Institut e.V & BIO Intelligent Service.

appliances defined in Annex I (e.g. electric hot plates, toasters, fryers) have not been further included in this assessment.

4.3.3.1.1 Product definitions

Adapted definitions of professional washing machines, dryers, dishwashers and ovens have been elaborated based on the definition found in Lot 22 and 24 and the general premises for professional equipment explained in previous paragraphs:

- ***Professional washing machines*** *are machines which clean and rinse laundry by using water, chemical, mechanical and thermal means, which might also have a spin extraction or drying function, and which are (non-exclusively) intended for commercial and industrial use and are primarily designed to be put into service by a professional.*
- ***Professional dryers*** *are machines which dry laundry by thermally removing the moisture (evaporation) and which are (non-exclusively) intended for commercial and industrial use and are primarily designed to be put into service by a professional.*
- ***Professional dishwashers*** *are machines which clean, rinse, and dry wash ware like dishware, glassware, cutlery, and other utensils connected to the preparation, cooking, arrangement or serving of food (including drinks) by chemical, mechanical, and thermal means and which are (non-exclusively) intended for commercial and industrial use and are primarily designed to be put into service by a professional.*
- ***Professional ovens*** *are ovens designed to heat or bake products that are supplied directly to end-consumers in restaurants, hotels, bakeries, canteens, retailers, etc., excluding industrial and laboratory ovens, and which are (non-exclusively) intended for commercial use and are primarily designed to be put into service by a professional.*

In addition, the above mentioned professional white goods should be designed for use with a nominal voltage rating of 250 V or below, if to be included in the scope of amended Regulation 1275/2008.

4.3.3.2 Alignment with other standards, regulations and voluntary schemes

The potential for setting ecodesign requirements on professional washing machines, dryers, dishwashers and ovens has been investigated through preparatory studies Lot 22 and Lot 24. At the time of writing the report, there is no ecodesign or energy labelling regulations on these products.

Preparatory study Lot 22 concludes that although there are many ecodesign options that could reduce energy consumption for professional ovens and that there are Best Available Technology (BAT) options available, the energy savings are too small in comparison to the total energy consumption. Furthermore, that the changes are too expensive and sometimes impossible to most of the other ovens which are not BAT due to insolvable technological problems. Finally, it also concludes that that there are large uncertainties on the size of the energy savings due to the lack of EU standard testing method for lower power mode energy consumption. Nevertheless it states that the use of sensors and power management should reduce energy consumptions when ovens are not being used, implying that standby consumption could be improved. However, there is currently no further regulatory process on commercial ovens to the authors' knowledge.

Based on the conclusions of preparatory studies Lot 24, a working document of regulation for professional wet appliances was drafted in 2013. The Commission, however, has rejected the draft due to, for instance, the requirements not based on sound and comparable measurements, no harmonised test standards for measuring energy and water efficiency, and that maybe three separate measures are needed as there are three product types. In the light of this, the Commission has mandated ESOs (European Standardisation Organisations) to develop and harmonise necessary measurement methods and the Commission will re-evaluate setting ecodesign requirements once test results are available.

4.3.3.3 Standby mode consumption

4.3.3.3.1 Professional wet appliances

There are opposing opinions on whether professional white goods have standby mode. Although preparatory study Lot 24 has provided data on standby annual consumption, the same study states that standby for professional dishwashers standby mode includes the continuous heating of the tank to avoid long pre-heating times whilst for professional wet appliances it is uncertain what it is meant by the 'low-power' mode that was considered as standby mode. The German Electrical and Electronic Manufacturers' Association (ZVEI) indicated that the data used in these studies is in fact "ready-to-use" mode consumption, indicating that this is not standby. This is because in spite "ready-to-use" is a mode waiting for reactivation, it is still performing part of the white good's function by keeping the interior warm at high temperatures. Table 12 shows that indeed most of the low power modes identified in Lot 24 are "left-on" or "ready-to-use" modes for washing machines, dryers and at least one of the dishwasher categories. For some washing machines and dryer types, low-power mode consumption is either negligible or not available in these studies as it was considered irrelevant compared to the total energy consumption of the products.

Table 12. Low-power modes information given in preparatory study for Lot 24 professional wet appliances.

Product	Type of appliance	Low-power mode	Time in low-power modes per day (hours)	Low power-modes consumption (kWh/h)
WM1 Semi-professional washer extractor	Washing machine	Left-on mode	2	~0.003
WM2 professional washer extractor, <15 kg		Left-on mode	2	~0.003
WM3 Professional washer extractor, 15-40 kg		Left-on mode	2	~0.003
WM4 Professional washer extractor, > 40 kg		Left-on mode	Negligible	Negligible
WM5 Professional washer dryer		Left-on mode	No information available	No information available
WM6 Professional barrier washer		Left-on mode	No information available	No information available
WM7 Washing tunnel machine		Left-on mode	Negligible	Negligible
D1 Semi-professional dryer, condenser	Clothes dryer	Left-on mode	3	~0.0025
D2 Semi-professional dryer, air vented		Left-on mode	3	~0.0025
D3 Professional cabinet dryer		Left-on mode	3	~0.0025
D4 Professional tumble dryer, <15 kg		Left-on mode	No information available	No information available
D5 Professional tumble dryer, 15 – 40 kg		Left-on mode	No information available	No information available
D6 Professional tumble dryer, >40 kg		Left-on mode	Negligible	Negligible
D7 Pass-through (transfer) tumble dryer		Left-on mode	Negligible	Negligible
No 1 Under-counter water-change	Dishwasher	Left-on mode	2.6	0.01
No 2 Under-counter one-tank		*Ready-to-use*	*8.4*	*0.25*
No 3 Hood-type		*Ready-to-use*	*7.5*	*0.35*
No 4 Utensil/pot		*Ready-to-use*	*7.4*	*1*
No 5 One-tank conveyor-type		*Ready-to-use*	*6.5*	*0.8*
No 6 Multi-tank conveyor-type		*Ready-to-use*	*5.5*	*2*

At the time of writing the report, there is no test standard to define the low-power modes for professional white goods. PrEN50593 standard for electric dishwashers has defined a "ready-to-use" mode which is often referred to. In connection with the ambiguity of low-

power mode definitions, the preparatory study for Lot 24 recommended to establish harmonised test standards which also address energy consumption in low-power modes i.e. left-on or off modes, and if possible follow the terminology of low-power modes in the Standby Regulation. However the mandate for standardisation work upon the completion of Lot 24 preparatory study does not specifically mention the development of definition and testing for standby and off modes of wet appliances. It is unclear if the standards will address low-power modes as recommended by Lot 24.

As "ready-to-use" mode was clarified by the industry as not being standby because it offers more function than reactivation and display status, if professional equipment would be included in the scope, consumption in "ready-to-use" mode would not be the same as consumption in standby mode. It is important to note the difference between "ready-to-use"[34] and "left-on"[35] modes. "Ready-to-use" mode occurs before the washing cycle, when the dishwasher is continuously heating the tank in order to avoid long preheating time, whereas "left-on" mode occurs when the washing cycle ends, as the dishwasher does not switch off directly after the end of the programme, and so it remains in "left-on" mode for an indefinite time.

Table 13 shows the consumption data used for this review study, for left-on, standby and off modes, based on Lot 24 and on data collected from dialogue with industry during stakeholder consultation. The table shows that there is no standby nor off mode data found for the washing machines and dryers. Furthermore, it shows the wide range of consumption levels due to the lack of harmonisation on low-power modes. According to industry, the off mode consumption for all large dishwashers is not relevant, as the user instructions recommend disconnecting the machine from the mains when not in use for a longer period (e.g. overnight). Concerning professional washing machines and clothes dryers, consumption in off-mode was considered negligible by Lot 24 and it was therefore not assessed in the study.

[34] Definition of "ready-to-use" mode according to prEN50593: "mode after which the dishwasher has been filled with water, the water has been heated (ready for operation) and the machine is ready to start the cycle as described by the manufacturer"

[35] Definition of "left-on" mode according to Regulation (EU) No 1015/2010 for household washing machines and No 932/2012 for household driers: "means the lowest power consumption mode that may persist for an indefinite time after completion of the programme without any further intervention by the end-user besides unloading of the household washing machine/tumble drier"

Table 13. Consumption data for low power modes consumption for professional white goods (based on Lot 24 and industry data).

Product	Type of white good	Standby (W)	Off (W)	Left-on, (W)	Sources
WM1 Semi-professional washer extractor	Washing machine	-	-	3	Preparatory study Lot 24
WM2 professional washer extractor, <15 kg		-	-	3	Preparatory study Lot 24
WM3 Professional washer extractor, 15-40 kg		-	-	3	Preparatory study Lot 24
D1 Semi-professional dryer, condenser	Clothes dryer	-	-	2.5	Preparatory study Lot 24
D2 Semi-professional dryer, air vented		-	-	2.5	Preparatory study Lot 24
D3 Professional cabinet dryer		-	-	3	Preparatory study Lot 24
No 1 Under-counter water-change	Dish-washer	3-6[36]	0.2-0.5	10	Preparatory study Lot 24 / ZVEI
No 2 Under-counter one-tank		2-5[36]	0	250 *(Ready-to-use)*	Preparatory study Lot 24 / ZVEI
No 3 Hood-type		2-5[36]	0	350 *(Ready-to-use)*	Preparatory study Lot 24 / ZVEI
No 4 Utensil/pot		2-5[36]	0	1000 *(Ready-to-use)*	Preparatory study Lot 24 / ZVEI
No 5 One-tank conveyor-type		5-15[36]	0	800 *(Ready-to-use)*	Preparatory study Lot 24 / ZVEI
No 6 Multi-tank conveyor-type		5-15[36]	0	2000 *(Ready-to-use)*	Preparatory study Lot 24 / ZVEI

According to previous presented information, the relevant low power modes for professional wet appliances are:

- **Ready-to-use mode** (preparatory study and prEN50593[34]): it is not standby mode by definition set in 1275/2008.
- **Left-on mode** (preparatory study and Regulation (EU) No 1015/2010 for household appliances[35]): this mode matches definition of standby in 1275/2008 and its consumption could be minimised to standby/off mode level of requirements, providing that this is harmonized making this consumption data available for the relevant products.
- **Standby mode** (data given by industry): it matches with standby mode by definition set in 1275/2008.

[36] Provided by ZVEI specifically as standby mode and not 'ready-to-use' nor 'left-on' modes

- **Off mode** (data given by industry): it matches with off mode by definition set in 1275/2008, but no savings as for dishwashers (for which we have data) already consumes less than 0.5 W on off mode.

4.3.3.3.2 Commercial ovens

Commercial ovens at the current time do not need to comply with the Standby Regulation. The aim for trying to regulate commercial ovens is the same as for household appliances: setting requirements on power management and standby limit to achieve energy efficiency when human behaviour fail to ensure it.

According to preparatory study Lot 22, commercial ovens usually do not have standby/off modes, as these are either in use (although not necessarily always cooking food) or switched off. However when the ovens are switched off, this should be off mode. Some ovens are fitted with automatic timers to switch on and off, and some have a "sleep mode". Those with "sleep mode" switch to it after a predefined period of inactivity.

Many models have a lower power mode that maintains the ovens at approx. 200 °C. Danish Technological Institute[37] tested a few models in this mode over 24 hours, and the consumption in this low power mode varies from 1566 W to 2142 W. During desk research on manufacturers' websites, it was found that the lower power modes maintaining the commercial oven at a certain temperature are actually "sleep modes". These low power modes are not considered to be standby mode as defined by the Regulation 1275/2008, as they offer more than reactivation function and display status. An example of this difference is shown at Figure 14.

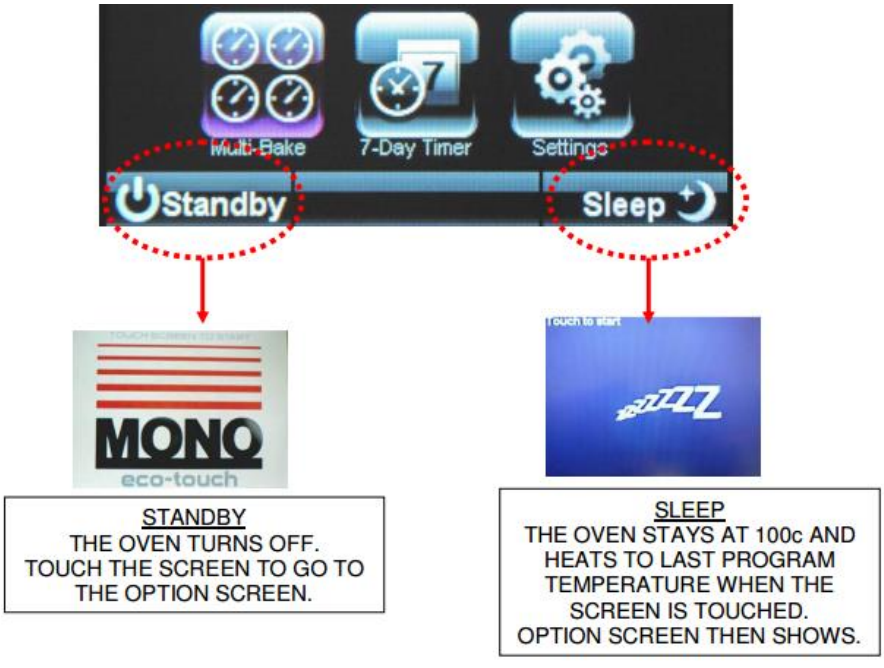

Figure 14. Screenshot of user mannual for a commercial oven[38].

Figure 14 demonstrates that for commercial ovens there is a standby mode, even though it could be considered as off mode by the industry. This is a so-called "soft-off", where the oven is still consuming a small amount of electricity. This is different from cutting off

[37] http://www.dti.dk/
[38] http://www.monoequip.com/UserFiles/Files/FG164-MXT%20new%20elec%20with%20prog.pdf

from the electricity mains, which is normally not consuming any power as commercial ovens are not usually disconnected in a daily basis after working hours.

If commercial ovens were to be included in the scope of Standby Regulation, the consumption of this standby or off mode should be less than 0.5 W. In addition, there should be a power management function that switches the oven from sleep mode to a standby or off mode that consumes less than 0.5 W. The power management function of switching to standby from sleep mode is already available in some of the models, due to which it is claimed by some manufacturers that up to 66% of the low power energy consumption can be reduced[39].

Lot 22 shows "standby-mode" consumption for four of the presented base cases (see Table 14). However, this mode is considered as "sleep mode" in the preparatory study. There is no available data for the actual standby or off mode consumption of commercial ovens.

Table 14. Standby consumption for commercial ovens provided by preparatory study Lot 22.

Product	Low-power mode	Time in low-power modes per year (hours)	Low power-modes consumption (kWh/h)	Sleep mode consumption (W)
Electric combi-steamer	Sleep mode[40]	936	1.5	1500
Gas combi-steamer	Sleep mode	936	0.6	600
Electric rack oven	Sleep mode	300	7.5	7500
Gas rack oven	Sleep mode	300	1.7	1700

According to information previously presented, the relevant low power modes for commercial ovens are:

- **Sleep mode** (presented as "standby" in Lot 22): it is not standby mode by definition set in 1275/2008, as it offers more than reactivation function, i.e. maintaining the oven at 100-200 °C.
- **Standby mode** (screenshot example): it matches with standby definition set in 1275/2008, even though it might be considered as off-mode.
- **Off mode**: this is when oven is disconnected from mains, i.e. unplugged from the electricity socket or to similar effect. No off-mode consumption has been obtained.

In summary, the assessment of standby mode consumption for all the presented professional white goods already points to an important problem, i.e. that it is difficult to submit products to requirements for an operational mode with functionalities that differ widely. This is why standby operational modes should be preferably addressed in product-specific regulations and why Recital 9 recalls: "*Operating modes not covered by this Regulation, such as the ACPI S3 mode of computers, should be considered in product-specific implementing measures pursuant to Directive 2005/32/EC.*"

[39] http://www.monoequip.com/products/ovens/convection-ovens/4-tray/eco-touch-convection-oven
[40] Defined as standby mode in preparatory study Lot 22

4.3.3.4 Networked standby

ZVEI did provide networked standby consumption data (see Table 15). This implies that networked standby can be identified for at least some professional dishwashers. According to industry only 1 % percent of all commercial dishwashers presently on the market is equipped with a data interface and therefore has networked standby, however this is likely to increase in the coming years due to the increasing market of smart appliances and networked appliances.

Table 15. Networked standby consumption for professional dishwashers (provided by industry association, ZVEI).

Category	Type of white good	Networked standby (W)
No 1 Under-counter water-change	Dishwasher	N/A, no data interface
No 2 Under-counter one-tank		2-5
No 3 Hood-type		2-5
No 4 Utensil/pot		2-5
No 5 One-tank conveyor-type		8-18
No 6 Multi-tank conveyor-type		8-18

Table 15 shows that at least 3 out of the 6 dishwasher categories have the technical possibility to comply with current networked standby requirement, while 2 types of very large dishwashers may need significant design change to achieve it. Under-counter water-change dishwashers have no network connection, however they would be covered by normal standby requirement.

There is no available data of networked standby consumption for professional washing machines, dryers and ovens, and it is therefore difficult to evaluate if there are many networked models and if they can comply with the current networked standby requirement. However it can be assumed that a large number of professional white goods will become networked in the near future.

4.3.3.5 Potential energy savings for professional white goods

Most of the professional white goods in scope of this review study will slightly increase in sales as projected by previous preparatory studies, with the exception of professional gas ovens. This trend is largely in agreement with the household gas ovens, as it can be generally seen in the EU where gas-fired ovens are slowly being replaced by electric ovens. From information on preparatory studies, annual sales, lifetime and growth rates for each product category have been obtained, and where annual sales were not available, it has been extrapolated with the annual growth rate. The EU-stock has been estimated by summing the sales across the number of years that is equal to the typical product lifetime. For some products, stock was directly taken from preparatory studies and interpolated or extrapolated where necessary.

Based on this information, the professional white goods which present availability of modes similar to standby/off modes in the Standby Regulation and consumption levels considered achievable to comply with the current requirement have been identified. For these, potential energy savings have been calculated, see Table 16 for inputs and assumptions.

Table 16. Inputs and assumptions for potential energy savings calculation.

Professional white good	Type of white good	Voltage (V)	Low power-modes consumption (W)	Low power hours per day	Assumption for calculation
WM1 Semi professional washer extractor	Washing machine	230-440	3 (left-on mode)	2.0	Saving is achieved by reducing current left-on consumption to the standby/off limit 0.5 W set by Regulation 1275/2008.
WM2 professional washer extractor, <15 kg		230-440	3 (left-on mode)	2.0	
WM3 Professional washer extractor, 15-40 kg		230-440	3 (left-on mode)	2.0	
D1 Semi-professional dryer, condenser	Clothes dryer	230-440	3 (left-on mode)	3.0	
D2 Semi-professional dryer, air vented		230-440	3 (left-on mode)	3.0	
D3 Professional cabinet dryer		230-440	3 (left-on mode)	3.0	
No 1 Under-counter water-change	Dishwasher	Normally 230, but possible 400	5 (standby mode)	17.4	Standby time is obtained by subtracting active and ready-to-use/left-on hours from 24 hours. Saving is achieved by reducing current standby consumption obtained from ZVEI to the standby/off limit 0.5 W set by Regulation 1275/2008.
No 2 Under-counter one-tank		230-440	4 (standby mode)	5.6	
No 3 Hood-type		400	4 (standby mode)	6.5	
No 4 Utensil/pot		400	4 (standby mode)	6.6	
No 5 One-tank conveyor-type		400	10 (standby mode)	7.5	
No 6 Multi-tank conveyor-type		400	10(standby mode)	8.5	
Electric combi-steamer	Oven	No information	1500 (sleep mode)	2.6	Sleep mode consumption is used for the calculation due to lack of standby consumption. The saving comes
Gas combi-steamer		No information	600 (sleep mode)	2.6	
Electric rack oven		No information	7500 (sleep mode)	0.8	

Professional white good	Type of white good	Voltage (V)	Low power-modes consumption (W)	Low power hours per day	Assumption for calculation
Gas rack oven		No information	1700 (sleep mode)	0.8	from assuming 66% of the low power mode consumption can be reduced by power management function switching from sleep mode to standby/off mode after a short period of time.

Using the information and data presented previously, the total low power modes consumption for BAU scenario is calculated. For the policy scenario, all products presented in Table 16 are assumed to be included in scope of a future revision of the Standby Regulation, which would become effective from 2019 (in line with the last Tier of networked standby requirement). The energy savings of the policy scenario from the BAU scenario is found by subtracting the two total consumptions.

It is important to note that for commercial ovens the sleep mode consumption is used for calculating the energy savings due to the lack of data on actual standby consumption. The assumption is slightly different from the one for other professional white goods. In this case it has been assumed that all the savings come from reducing the current standby mode consumption (i.e. defined as 'sleep mode' in Lot 22). The potential savings for commercial ovens are expected to come from a power management function which can reduce up to 66% of the "low power mode consumption" by switching the ovens from sleep mode to standby mode after a short period of time. However, this is expected without assuming these ovens would be able to comply with current standby requirement of 0.5W.

An important consideration for a potential inclusion of these products is the current delimitation of nominal voltage rating in the Standby Regulation (≤ 250 V). As Table 16 shows, many of the products present a nominal voltage that can be in the range of 230-440 V (1 to 3-phases) and four of the dishwasher types are operating at 400 V. Although there is no information available about specific voltage for the commercial ovens, it is reasonable to suspect that they can also have a nominal voltage at 230–400 V range. It is difficult to know the market share of them exclusively at 250 V or below, and if the professional white goods are to be included in the scope of the Standby Regulation, the voltage limit may very likely have to be raised.

The total annual savings from all product types presented above are estimated to be approximately 0.7 TWh/year by 2030. Some of the professional products have significantly high consumption in low power mode, i.e. most of the dishwashers and all commercial ovens presented. These products are included in the calculation to demonstrate the size of saving potential if the consumption of these products are addressed, however it is not verified by the industry if the policy scenario proposed is technically feasible. See Table 17 for the estimated energy savings for 2020 to 2030.

Table 17. Potential energy savings for relevant professional white goods.

Product	Type of white good	Potential energy savings		
		2020	2025	2030
WM1 Semi-professional washer extractor (GWh/year)	Washing machine	0.1	0.4	0.6
WM2 professional washer extractor, <15 kg (GWh/year)		0.2	0.7	1.2
WM3 Professional washer extractor, 15-40 kg (GWh/year)		0.0	0.1	0.2
D1 Semi-professional dryer, condenser (GWh/year)	Clothes dryer	0.0	0.1	0.1
D2 Semi-professional dryer, air vented (GWh/year)		0.0	0.1	0.1
D3 Professional cabinet dryer (GWh/year)		0.1	0.2	0.4
No 1 Under-counter water-change (GWh/year)	Dishwasher	1.4	5.0	8.8
No 2 Under-counter one-tank (GWh/year)		2.3	8.4	14.8
No 3 Hood-type (GWh/year)		1.3	4.7	8.2
No 4 Utensil/pot (GWh/year)		0.1	0.2	0.3
No 5 One-tank conveyor-type (GWh/year)		0.5	1.9	3.5
No 6 Multi-tank conveyor-type (GWh/year)		0.1	0.4	0.8
Electric combi-steamer (GWh/year)	Oven	84.4	299.6	520.2
Gas combi-steamer (GWh/year)		6.2	21.1	34.8
Electric rack oven (GWh/year)		10.9	39.6	70.5
Gas rack oven (GWh/year)		3.7	13.5	24.0
Annual savings (GWh/year)		**111**	**396**	**689**
Total cumulative savings (GWh)		**167**	**1,574**	**4,428**

The cumulative savings for all the professional white goods above are expected to be approx. 4.4 TWh by 2030, if the products would be included in the scope of the Standby Regulation from 2019. The above potential savings only come from half of the professional wet white goods categories from Lot 24 due to the data availability and the market size. The potential savings from the whole product group could be higher if all professional white goods would be included. However, it is important to notice that a part of these products may fall out of scope due to their nominal voltage rating.

The potential savings from networked standby have not been calculated due to the lack of data.

4.3.3.6 Conclusions

The result of the analysis provide enough evidence that there is currently no harmonised standby mode for professional white goods which can be used as the basis to establish a standby requirement. From vertical studies it has been observed that at least three different modes are reported as standby, but that according to industry and based on existing definitions some of these modes do not suit the definition of standby in Regulation 1275/2008. Without a harmonisation of what standby mode is for these

products, it makes no sense to force these products to comply with standby level of requirements. Rather than tackling this issue at a horizontal level, it is suggested this is done at vertical levels to make sure it is possible the products can provide this mode from technological and economical points of view, and to evaluate whether such a mode could be harmonized with standby mode according to the Standby Regulation. The findings provided in this review have shown this needs to be addressed, disregardless of the little significance standby contributes to the total energy consumption. Finally, the same confusion was observed for the off-mode.

It is still inconclusive if it is technologically possible for all professional white goods to meet the requirement, particularly for the commercial ovens where sleep mode consumption is rather high and standby/off modes consumption data are not available. Furthermore, whether a significant part of these products would fall out of the nominal voltage rating is unknown at this stage. The latter would mean that their standby consumption may be more appropriately regulated in a dedicated vertical regulation which addresses bigger products. Lifting up this rating in the horizontal Standby Regulation would require a costly and intensive assessment for establishing savings potentials of all the products in scope which should rather be handled at the specific vertical requirements.

According to the analysis presented, some of the assessed product groups could meet the standby limit (see below), however the energy savings from regulating these products is very small:

- **Professional washing machines**: Semi-professional and professional washer extractor (usually up to 40 kg), providing that left-on mode is agreed to match standby mode.
- **Professional dryers**: Semi-professional and professional condenser or air vented dryers and cabinet dryers (usually up to 30 kg), providing that left-on mode is agreed to match standby mode.
- **Professional dishwashers**: Under-counter dishwashers, providing a reduction on consumption level is technologically and economically possible.

The potential energy savings of professional white goods, i.e. 0.7 TWh annual savings and 4.4 TWh cumulative savings, is relatively small for making a drastic change to the scope of the Standby Regulation 1275/2008. The inclusion of these products would mean that a new category group would be added to the Annex I of the Regulation, but more importantly the low-power consumption modes should be harmonised. Furthermore, overall scope definition for the voltage limit may need to be raised, or the above presented calculated will not be achieved due to a part of the professional white goods have nominal voltage rating in the range of 230 – 440 V. The inclusion of professional white goods into scope could potentially be a proactive measure for the growing demand of networked appliances, which is seen in the domestic market, and began to accelerate also in the professional market. However based on the challenges presented above and the low potential energy savings calculated, it is not recommended to include professional white goods in the Standby Regulation at this point in time.

4.3.4 Professional IT equipment

4.3.4.1 Scope

4.3.4.1.1 Current scope

In the current regulation, the scope of IT (Information Technology) equipment is the following (Annex I point 2):

"Information technology equipment intended primarily for use in the domestic environment, but excluding desktop computers, integrated desktop computers and notebook computers as defined in Commission Regulation (EU) No 617/2013."

The following definitions apply (art. 2, point 7 and 8):

- 'Information technology equipment' means any equipment which has a primary function of either entry, storage, display, retrieval, transmission, processing, switching, or control, of data and of tele-communication messages or a combination of these functions and may be equipped with one or more terminal ports typically operated for information transfer.
- 'Domestic environment' means an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus concerned.

Regarding domestic environment, in the recitals of the regulation (point 8), the scope has further been defined as "...equipment, (which) corresponds to class B equipment as set out in EN 55022:2006." The standard referred to it as "Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement".

Definitions of class B and class A equipment in this regulation are (with ITE defined as Information Technology Equipment):

- Class B: Class B ITE is a category of apparatus which satisfies the class B ITE disturbance limits. Class B ITE is intended primarily for use in the domestic environment and may include:
    - equipment with no fixed place of use; for example, portable equipment powered by built-in batteries;
    - telecommunication equipment powered by a telecommunication network;
    - personal computers and auxiliary connected equipment.

  The domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus concerned.

- Class A: Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits.

  EN 55022:2006 has been substituted by EN 55022:2011, which has been retired but can be used until 3 May 2017. Substitution is EN 50561-1 (Power line communication apparatus used in low-voltage installations. Radio disturbance characteristics. Limits and methods of measurement. Apparatus for in-home use).

The standards are defining the allowed sizes of electromagnetic radiation within various frequency bands at specific distances for being defined as class A and B. Class B products

have stricter requirements, because they are meant for being used in residential and office environments etc., where there are many other electronic products, which could be disturbed by the electromagnetic radiation i.e. creating radio interference, if there was not put a limit on the radiation. However, there is no regulation forbidding to use class A products in homes and offices.

There is a further requirement for the definition of IT products in scope, which is art. 2, 1 (d): "(d) is designed for use with a nominal voltage rating of 250 V or below". This means that only 1 phase products are included, which will exclude many larger IT products mainly within the imaging equipment product group.

4.3.4.1.2 Issues with current definition of scope

An assessment of possible extension of the scope for inclusion of professional equipment should in principle focus on class A products, because these would be professional equipment in terms of the definition in the Standby Regulation. There are however issues with the current use of class A and B for defining products in scope or not. This will lead to a proposal for a revised definition of the scope of IT equipment, which is intended to capture more precisely IT products for the intended use in households and offices and thereby also cover professional equipment in offices.

Products which are within the overall scope of the regulation (mains connected electrical and electronic household and office equipment below 250 V intended for the end-user) and which would fall under Annex I, point 2 Information technology equipment (if being class B) include the following product types used in homes and offices:

- Computer products included in Commission Regulation (EU) No 617/2013 and not being desktop computers, integrated desktop computers and notebook computers: Desktop thin clients, workstations, mobile workstations, small-scale servers and computer servers.
- Network products such as switches, routers, modems, wireless access points, firewalls, USB hubs, etc.
- Imaging equipment such as printers, scanners, multifunctional devices, fax machines typically of smaller sizes, etc.
- Displays including computer monitors, photo frames, information and signage displays
- External hard disks, SSDs (Solid-State Drive), DVD drives, NAS (Networked Attached Storage), etc.
- Computer speakers

In Figure 15 and Figure 16, two examples of products are provided, which are not in scope of the Regulation because they are class A. Furthermore, LG has informed that all signage/commercial displays are class A (except very limited number of cases).

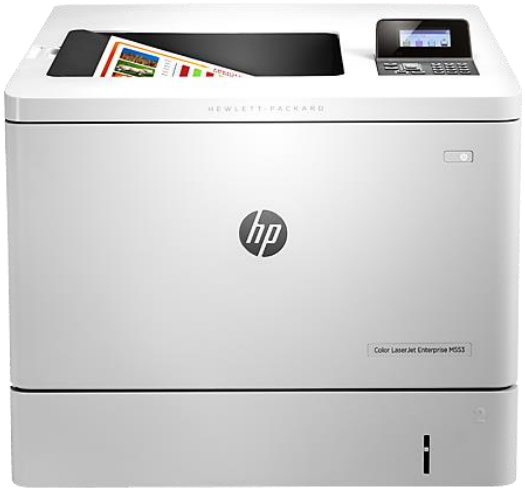

Figure 15. HP Color LaserJet Enterprise M553n: A4 colur laser printer, monthly page volume 2000 to 6000 pages, print speed up to 40 ppm.

Figure 16. LG 49SM5KB 49" signage display.

According to DIGITALEUROPE, there are also products which were not intended to be covered by the regulation, but are in scope because they have been certified as class B products. The rationale in this argument is that some clients today demand professional products, which are Class B, in order to reduce radio interference. These products may be switches in large datacentres.

All in all, the conclusion is that class A / B definition does have its limitations by being more arbitrary and only indirectly linked the overall scope of the regulation and thereby no precisely defining the products to be in scope. However, it has also proved difficult to find a precise definition to substitute the reference to class A and B.

4.3.4.1.3 Considered revised scope

The study team has considered the following revised scope for IT equipment by removing the references to class A / B and substitute the definition in Annex I point 2 with the following:

"Information technology equipment intended primarily for intermittent usage in households and offices as a personal device or as a workgroup device, but excluding

desktop computers, integrated desktop computers and notebook computers as defined in Commission Regulation (EU) No 617/2013".

The rationale behind this formulation is to include all IT equipment, which are used in the normal home and office environments in direct interaction with people. Production IT equipment such as production printers in a print department in a larger organisation or in a print shop and datacenter equipment should be excluded.

The term *intermittent usage* is defining that production equipment, which run most of time during a work day or full day-night, is not included. *Personal device* and *workgroup device* are based on a product segmentation from Lot 4, see table below.

Table 18. Product segmentation from Lot 4 task 2 report.

Environment	Description	Typical Number of users
Personal	A personal device is generally designed to support a single individual or a very small group (including families). Users generally take responsibility for care and maintenance of the device on an as-needed basis.	1 – 4 worker
Workgroup	A Workgroup device is a shared resource with which individual users produce their own documents. The device is not usually under the control of a single individual. Workgroup devices are found in organisations of all sizes. They may support an entire small business or several groups within larger businesses. This environment may be further divided into larger and smaller workgroups.	Smaller Workgroups consist of 5 – 24 workers. Larger Workgroups consist of 25 – 100 workers.
Production	Production devices are typically controlled by trained operators that produce documents for others at high speeds, high volumes or both.	The number of users typically includes and entire business enterprise. Devices in print-for-pay and data processing plants are also found in this environment.

According to DIGITALEUROPE, this definition is not sufficiently suitable for network products such as switches because there are products which are intended for use in both datacentres and locally in office environments. An example is larger managed and configurable switches which are used both in offices and in datacentres.

Therefore, the definition could be extended to exclude professional network products, and where professional network products should be defined as part of the definitions e.g.: 'professional network products' means managed network products or products with more than 24 ports. DIGITALEUROPE however does not agree that professional network products can be defined like this.

The possible disadvantages of the considered new definition is that, first of all, it is more difficult for manufacturers and for Market Surveillance Authorities to judge if a product is in scope or not because there is an element of interpretation in it regarding whether it is Class A or Class B, and, secondary, it is difficult to foresee how the implications would be for all the different kind of IT equipment on the market as some products that may fall in the current scope of the Standby Regulation (i.e. electrical and electronic household and office equipment) may be classified as Class A and those who don't fall into scope may be Class B.

The study team does not recommend one option over the other regarding definition of IT equipment in scope.

4.3.4.2 Alignment with other standards, regulations and voluntary schemes

4.3.4.2.1 Imaging equipment

There is an active voluntary agreement for Imaging Equipment (VA), which has been accepted by DG Energy as a valid alternative to an ecodesign implementing measure. The most recent version of the VA is 5.2 from April 2015. It is based on ENERGY STAR v. 2.0 specification.

There are three Tiers for 2015, 2016 and 2017, respectively, where the compliance rates to be achieved should be from 70 % to 80 % for TEC products (typical energy consumption; products in standard format with marking technologies other than ink jet and a few others) and from 90 % to 93 % for OM products (operational mode for all other products).

For TEC products there are no specific requirements on networked standby/standby/off, however the consumption in these states are included in the measurement method for TEC.

For OM products there are requirements on both standby/off and networked standby (in the form of a sleep mode with a single active network interface and a fax connection if applicable):

- Standby/off: Max. 0.5 W
- Networked standby (sleep): Dependant on marking engine 0.6-8.2 W + allowances for interfaces (0.2-2.0 W) and for other specific functionalities.

In addition to the Voluntary Agreement, there is the ENERGY STAR v.2.0 specification as an individual measure, which requirements are mandatory to follow for public purchasing within some limits.

4.3.4.2.2 Displays

There is a draft regulation on electronic displays (televisions and computer displays) repealing Regulation 642/2009 with regard to ecodesign requirements for televisions. Signage displays, projectors, interactive whiteboard displays, videoconference system displays and other displays for special products are not included. At this point of time, no public information is available on the progress of the adoption process.

There is also an ENERGY STAR specification on displays covering computer monitors, digital picture frames and signage displays. There are requirements for on, sleep and off modes:

- Sleep mode (corresponds to networked standby and standby (without the ability to wake up via a network activation)): Max. 0.5 W + allowance for bridging or network (0.1-2.0 W) + allowance for sensor and memory (0.2-0.5 W)
- Off mode: 0.5 W

4.3.4.3 Potential energy savings

The main point of revising the definition of Information Technology equipment in scope of the regulation is to create a level playing field for manufacturers, and, to ensure towards the consumers that equipment overall meant to be in scope will actually be in scope of the regulation and will comply with the requirements.

The impact of the energy consumption of professional IT equipment is currently very uncertain because it has not been possible to get any data or estimations that could be used for calculation of the impact from the market. On one hand, current class A products which are used as normal office products such as imaging equipment and information displays would be in scope and would have to comply with the requirements. On the other hand, there are also class B products like some switches in datacentres, which would be excluded using the proposed new definition of products in scope.

The study team has made an assessment as an example of potential energy savings for imaging equipment, which seems to be the product category with largest amount of products that would switch from being out of scope to in scope. The results are shown in Figure 17, where the annual potential energy savings in 2025 is approx. 0.10 TWh/year and 0.14 TWh/year in 2030.

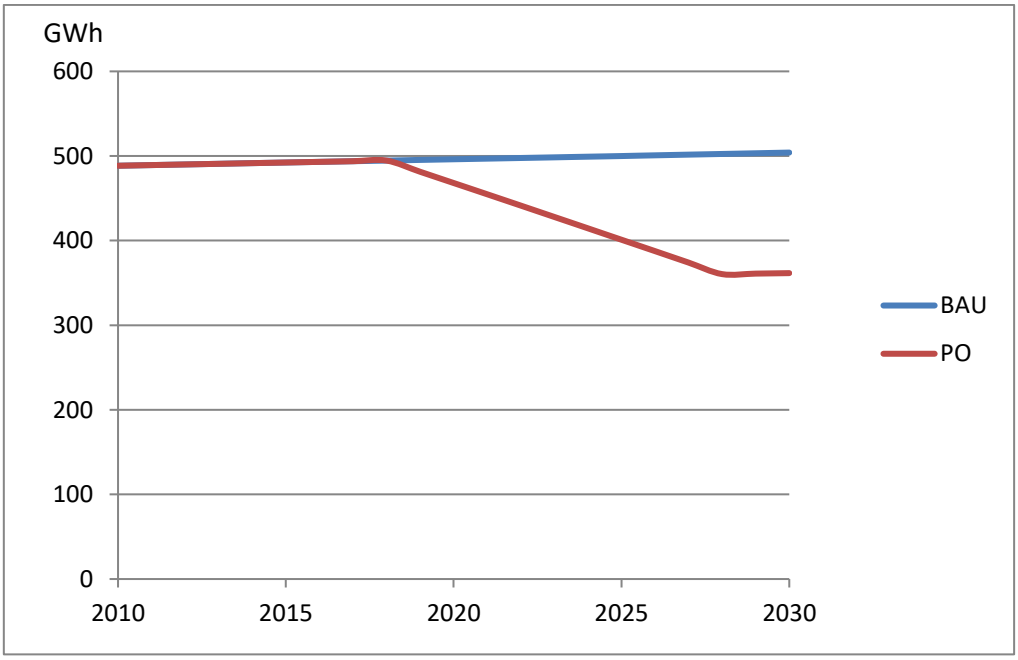

Figure 17. Energy consumption for BAU (Business As Usual) and PO (Policy Option with revised scope).

The assumptions for this calculation were:

- The growth projected was based on stock 2010-2025 from Lot26 Imaging Equipment Impact Assessment.
- Two product categories were assessed: Office Inkjet Printer/MFD and Office EP Printer.
- Networked standby power data from ENERGY STAR was used as the basis, where only products at the higher end of power consumption have been looked at, assuming it is those which are Class A. Therefore the average power consumption of these products has been calculated (in order to capture the higher consuming office products). It has been assumed these higher end products are all above the average of all the products (with 2.79 W average consumption).
- For BAU all class A products remain at 2.79 W (average of all products), while in PO (including class A products in scope) class A reduces power consumption to 2 W from 2019.
- The proportion of class A products from the total number of products is 50 %.

In order to reach 1 TWh/year in savings, the power consumption of high end Class A products would have to be about 8 W.

4.3.4.4 Conclusions

The result of the analyses show that the current definition of IT products in scope does not fully define the products in scope and a textual definition has been considered.

The main point of revising the definition of information technology equipment in scope of the regulation is to create a level playing field for manufacturers and to ensure towards the consumers that equipment overall meant to be in scope will actually be in scope of the Regulation and comply with the requirements.

The energy consumption impact is very uncertain, also because it has not been possible to get any data or estimations that could be used for calculation of the market impact. Based on the study team's assumptions total savings have been calculated to be about 0.14 TWh/year for 2030.

There are pros and contras for both options (keeping the class A/B definition or change to a new definition) and the study team does not recommend one over the other.

4.4 Assessment of inclusion of other office equipment not stated in Annex I

4.4.1 Introduction

In spite that the amended Standby Regulation 1275/2008 covers electrical and electronic office equipment, household and non-household office equipment, products such as paper shredders, laminating machine, binding machines, are not listed nor covered by any of the product groups in Annex I. This is in spite Lot 6 mentions that office equipment covers all ErPs installed directly in the workplace environments and in the possibly adjacent rooms.

Paper shredders have been identified as a specific product to be covered in this review study, as some Market Surveillance Authorities have been asked by manufacturers whether these products are in scope. Furthermore, the preparatory study Lot 6 mentions document shredders as part of office equipment, including also copiers, printers, etc. Categorisations for paper shredders – used in other studies – are 'other'[2], 'business equipment'[41] and 'miscellaneous'[42]. However, it is only Lot 6 which presents some data about the use of this product group. According to ecodesign Market Surveillance Administrative Cooperation (ADCO), paper shredders are normally seen as business equipment or IT equipment, but paper shredders do not fit into the definition of "information technology equipment" specified by the amended Regulation 1275/2008, and there is no separate category for business equipment in Annex I.

4.4.2 Scope

Other electrical business equipment similar to paper shredders present the same lack of coverage by the current regulation, such as binding machines, pencil sharpeners, staplers and typewriters (Lot 6). However, it is assumed that most of these products are being rapidly discontinued as they are being replaced by the use of computers and

[41] Electronics come of age: A taxonomy for miscellaneous and low power products. Nordman B. and Sanchez M., Lawrence Berkeley National Laboratory
[42] Standby and off-mode Energy Losses In New Appliances Measured in Shops (SELINA). ISR-University of Coimbra (2010).

electronic files in office environments or they are non-rechargeable battery powered or built into multi-functional devices at least regarding staplers. Furthermore, there is no data found publicly available for standby/off modes nor any estimation for current European stock for these products. A couple of measurements were taken for binding machines where the settings were only either on or off. It was considered that standby is the mode where the machine was not binding nor doing any active work (during on mode). This mode consumed 0 W.

On the other hand, data for paper shredders was available from Lot 6, from measurements taken to a couple of products and from desktop research, which showed variations in standby modes from 0 W (shredders with a 'zero energy standby feature') to 1.9 W (operating at 250 sheets daily capacity). At the time of writing this report, it seemed that one of the most important innovations for paper shredders was to reduce power consumption during standby mode, and it was therefore decided to use this product as the only exemplary case of electrical business equipment for the data analysis and calculation of savings potential.

4.4.3 Alignment with other standards, regulations and voluntary schemes

No Vertical Regulations were found covering paper shredders, neither EU ecodesign nor regulations outside EU, but two national voluntary labelling schemes were identified during consultation with stakeholders. These are explained below.

4.4.3.1 German Blue Angel criteria for paper shredders

In order to qualify a Blue Angel label, the paper shredder has to meet the power consumption and minimization requirements[43], which are:

- The device shall have a user-accessible power switch or limit power consumption in off mode to 0 W by appropriate measures (for example, mechanical micro switch).
- The shredder shall have an automatic switch off function that switches the device from ready mode to a lower power consumption mode (i.e. standby mode).
- Standby power consumption shall not exceed 0.1 W.

The power consumption minimization requirements for qualifying Blue Angel label are comparable with the standby regulation requirements: an automatic power down should be available to switch the device from ready mode to standby mode, the standby consumption shall not exceed 0.1 W and the power consumption in ready mode shall not exceed 2 Wh. Blue Angel labelled paper shredders would easily meet the Standby Regulation's requirement.

The manufacturers applying for Blue Angel labels must declare compliance with the requirements and have products tested by an accredited laboratory. Blue Angel requires that the paper shredder is tested in accordance to the harmonised test standard EN 50564.

EN 50564 can also be used to assess compliance with Regulation 1275/2008 and provide the technical documentation that enables the products to be CE-marked when placed on the market. This indicates that there is available test standards to be used to assess the

[43] https://www.blauer-engel.de/en/products/office/data-shredders/document-shredders

standby/off mode consumption of paper shredders, if they are to be included into the scope of Standby Regulation.

Furthermore, there are 38 paper shredder series from 5 different manufacturers of both EU countries and the USA already labelled with Blue Angel. This indicates that technology for low standby consumption is already widely available for paper shredders.

4.4.3.2 China Environmental Labelling for paper shredders

The Chinese Environmental Labelling standard for paper shredders has been implemented since June 2012 and it sets the requirements for active and standby modes consumption, noise levels and other environmental criteria, specifying testing methods. Standby consumption requirements depend on the type of label to be awarded and whether it has information display (see Table 19).

Table 19. China Environmental Labelling requirements for standby mode consumption[44].

		Standard label	Low carbon label
Standby consumption (W)	Without display	≤ 1.0	≤ 0.5
	With display	≤ 2.0	≤ 1.0

The presented low carbon label requirements for standby consumption are equivalent of the current standby requirements in Regulation 1275/2008, and the presented standard label requirements are equivalent to the previous tier of standby requirements.

The Environmental Labelling database shows in total 59 models registered from two companies, however it is not possible to distinguish those registered for standard label from those registered for low carbon label.

4.4.4 Standby mode consumption

Standby and off modes in paper shredders should not have problem aligning with the same definitions in amended Regulation 1275/2008.

Regarding test methods, paper shredders would be covered by the harmonised standard EN 50564, which can be used to declare compliance for Regulation 1275/2008.

The actual standby consumption data of typical paper shredders on the EU market is not available. The study team has only obtained a few standby consumption data via direct measurements and desktop research. Standby consumption data can be seen in Table 20.

Table 20. Lower power modes consumption of paper shredders.

Product	Standby consumption (W)	Other modes consumption (W)	Off-mode consumption (W)
Paper shredder 1 (250 sheets daily capacity)	1.9	1.8 (soft off)*	0 (hard off)**
Paper shredder 2 (similar to 1)	1	n.a.	n.a.
Paper shredder 3 (with 'zero energy standby' feature)	0	n.a.	n.a.

n.a. = mode not applicable for this product

[44] http://kjs.mep.gov.cn/hjbhbz/bzwb/other/hjbz/201204/W020120410340869419822.pdf

* = Driven by a soft switch, which is monitored by an analogue or digital circuit, which then in turn activates or deactivates an electronic power switch or a relay (Lot 6).
** = A hard switch, which galvanically cuts off all electric energy input at the mains level to the EuP.

The standby consumption data above show that there is available technology to enable a very low or zero consumption in standby mode, and there should be no technical problems in meeting the standby requirement of Regulation 1275/2008.

4.4.5 Networked standby

Although many household and office equipment are increasingly becoming networked, office equipment such as paper shredders might not be one of them as there is a need for being physically close to the shredder to put paper into the device. Furthermore, the assumed future decline in this type of products may prevent from future technological developments concerning their networked functionality.

4.4.6 Market estimation and growth

There is no available sale and stock data on paper shredders, therefore the market size, i.e. the total EU stock, is estimated based on the size of EU enterprises and the number of persons employed in the EU in 2012[45]. The main assumptions made to estimate the total installed stock in the EU are:

- There is one paper shredder for every 60 persons in micro enterprise group, which has been used to account for the numerous one-man enterprises which probably would not own paper shredders.
- There is one paper shredder for every 20 person in the small enterprises group, assuming these would own paper shredders.
- There is one paper shredder for every 13 persons in the medium-size and large enterprises. For larger companies there is often more auxiliary equipment than for the smaller ones, to ensure the availability of the equipment when needed.

These assumptions are based on the space allocation for auxiliary equipment found in the Office Space Standards and Guidelines[15]. It should be noted that there is a high uncertainty involved in this estimation, given the information on market is so limited.

The total stock of paper shredders in EU-28 is therefore estimated to be a little over 7 million (see Table 21). This figure is not expected to grow but most likely to either stagnate or decrease in the future, given the reduction in paper use in the office environment in the EU, including the shift from physical letters (with private and/or confidential content, where shredding may be needed) to electronic submissions to secure e-mail boxes.

Table 21. Market estimation based on the size of enterprises and the number of person employed in the EU-28 (2012 data).

Type of enterprise	Number of persons employed 2012	Estimated number of paper shredders
Micro enterprises: with less than 10 persons employed	39,000,000	650,000
Small enterprises: with 10-49 persons employed	28,000,000	1,400,000
Medium-sized enterprises: with 50-249 persons employed	22,967,000	1,722,525

[45] http://ec.europa.eu/eurostat/statistics-explained/index.php/Business_economy_-_size_class_analysis

Type of enterprise	Number of persons employed 2012	Estimated number of paper shredders
Large enterprises: with 250 or more persons employed	44,078,000	3,305,850
Total stock	**134,045,000**	**7,078,375**

4.4.7 Potential energy savings

The potential energy savings of including all business equipment into scope of amended Regulation 1275/2008 could not be estimated due to the lack of data on other products, therefore only potential energy savings for including paper shredders is estimated.

The business-as-usual (BAU) scenario is assumed to be the worst case scenario, which is that all current stock of paper shredders consumes 1.9 W in standby mode, the highest consumption presented in Table 20. The potential energy savings come from shifting the entire stock gradually (in the course of 10 years) from inefficient paper shredders to efficient ones under 0.5 W in standby mode. The standby time of the paper shredder is assumed 98% of time in a year (same assumption made for adjustable desks). The market of paper shredders is assumed saturated and therefore stagnate up to 2030. The potential energy savings under this policy option are shown in Table 22.

Table 22. Potential energy savings standby consumption from shifting all EU stock of paper shredders to those compliant with current standby requirements in amended 1275/2008.

Energy savings scenario	2020	2025	2030
BAU standby consumption (GWh/year)	115	115	115
Policy Option standby consumption (GWh/year)	98	56	30
Annual energy savings (GWh/year)	**17**	**60**	**85**
Cumulative energy savings (GWh)	**26**	**238**	**638**

As shown in Table 22, the BAU scenario yields a standby consumption of 115 GWh per year, and in the policy scenario where paper shredders would have to comply with the Regulation 1275/2008, the potential energy savings from specific standby consumption requirement are estimated to be maximum 85 GWh per year by 2030. The cumulative energy savings would be about 0.64 TWh by 2030, from replacing all current EU stock of paper shredders to those compliant with the current amended Standby Regulation requirements.

4.4.8 Conclusions

Based on the analysis for paper shredders, there is definitely a modest amount of energy savings to be covered if business equipment category is included in the scope of standby regulation. However as it was encountered by our case study for paper shredders, availability of sale, stock and standby consumption data is very limited for these products, therefore it is difficult to draw meaningful conclusion as the quantitative assessment presents a high level of uncertainty from the estimation of the stock and the assumed highest level of standby consumption based purely on direct measurements of a few units and from desktop research of the few data available in the internet.

However, the limited standby consumption data as well as registers with the Blue Angel criteria and the China Environmental Labelling showed that there is available technology to enable paper shredders to meet comfortably the standby requirement of Regulation 1275/2008. In addition, the inclusion of paper shredders into the scope would potentially yield a total cumulated energy savings of about 0.64 TWh by 2030, from an estimated stock of around 7 million. This is relatively small and the regulation should not be

modified to cover a single product type unless the whole business equipment category can be included. Depending on the stock and standby consumption of other business equipment, such as laminating machine, binding machines, etc., potential energy savings from each individual product group could yield similar (or lower) savings. However, without actual data, the analysis for the rest of the product category is inconclusive.

The inclusion of business equipment category in Annex I of amended Standby Regulation 1275/2008 is not recommended at the present time, due to the small energy savings and lack of data. A separate study is needed with the focus on collecting representative market data and measured consumption for the whole category, if the inclusion is to be considered. However given the impression that the market of businesses equipment is either saturated or declining, and the small saving potentials calculated for paper shredders with the limited data available, indicate that it may not be worthwhile to do a separate study on business equipment.

5 Assessment of appropriateness and/or level of requirements

5.1 Review of the requirements for standby/off operating modes

5.1.1 Introduction

Article 7 of the amended Commission Regulation (EC) 1275/2008 specifically states that this review study should address the scope and the requirements for standby/off modes. This task has been carried out by analysing the possibility of setting more ambitious requirements on (i) current scope and (ii) extended scope. The extended scope includes selected product categories investigated in the previous sections of this report. Those which showed very small energy savings potentials and/or high level of uncertainty in some important assumptions were not included in the extended scope.

For all products currently in scope, the current requirements for maximum consumption in standby or off modes are:

- Off mode (any off-mode condition): 0.50 W
- Standby mode (reactivation): 0.50 W
- Standby mode (including information or status display) 1.00

5.1.2 Current compliance level

Market surveillance authorities (MSA) have carried out testing and documentation control for standby consumption of a variety of products on the market. According to their results the level of compliance is currently very high and it has been such in the most recent years, being most of the products well below the 0.5 W limit. See Table 23 for country specific results.

The high compliance rate and the low average standby consumption show that the technology for standby/off mode has improved since the Standby Regulation first came into force. This is reasonable evidence that the standby/off mode requirement could be tightened.

Table 23. Market surveillance results from Denmark, Sweden, UK and Belgium[46].

Country	Market surveillance results
Denmark	• **2015**: 7 range hoods were controlled presenting a 100% compliance rate (best performer 0.22 W on off mode). • **2014**: 10 dishwashers were controlled presenting a 100% compliance rate on off mode (average 0.25 W & best performer 0.02 W). Clothes dryers were also controlled having a 90% compliance rate with 0.0 W (off-mode) for the best performer. • **2013**: 22 products have been controlled - 2 out of 22 did not comply with the standby requirements (91% compliance rate), for a variety of product types.
Sweden	• **2015**: 18 products were tested (100% compliance rate). • **2014**: 26 products were tested (96% compliance rate) Average standby consumption of all products tested in both years is 0.22 W.
UK	• **2014**: Household appliances – 96% compliance • **2011**: Blue-ray players – 67% compliance

[46] Data received from interviews with Market Surveillance Authorities in Denmark, Sweden, UK and Belgium, October 2015.

Country	Market surveillance results
	• **2010**: Radios – 50% compliance In general, the compliance rate is increasing over the years.
Belgium	For TVs[47], the average standby consumption has been: • **2014**: 0.34 W • **2013**: 0.34 W • **2012**: 0.35 W • **2011**: 0.41 W

5.1.3 Best Available Technology (BAT)

ECOS and Topten have pointed out that there are products on the current market consuming much less than 0.5 W in standby/off mode, i.e. BAT standby and off modes have been identified to consume as less as 0 W. Topten therefore suggests lowering the standby/off mode limit to 0.2 W[1]. See Table 24 for the standby/off modes consumption of identified BAT.

Table 24. Overview on standby and off mode power levels on topten[1].

Product group	TVs	Monitors	DVD / Blue Ray players*	Washing machines	Automatic coffee machines	Capsule coffee machines
Number of products in Topten sample	*66*	*52*	*6*	*35*	*5*	*19*
Average off-mode power (W)		0.15		0.18		
Best performer off-mode (W)		0.0		0.0		
Average standby (washing machines: left-on) (W)	0.33	0.28	0.22	1.3	0.22	0.22
Best performer standby (washing machines: left-on) (W)	0.2	0.1	0.2	0.0	0.0	0.0

The data shown in Table 24 is generally in agreement with the market surveillance results, in particular concerning off-modes of best performer household appliances and standby consumption of TVs (see Table 23). As indicated previously, although TVs are not in scope of the regulation, they can be used to exemplify the development of compliance with standby consumption. This is because the technology used in TVs can be assumed to be the same used in other consumer equipment such as imaging equipment. Table 23 and Table 24 show that technology exists for DVD/Blue ray players, washing machines, clothes dryers, washing machines, range hoods and coffee machines to consume below 0.5 W on standby and that the average is between 0.22 and 0.33 W (excl. left-on mode for washing machines). In addition, the best performing product for each of the shown product groups consumes only between 0 and 0.2 W on standby/off mode.

[47] Although TV is not in the scope of the 1275/2008, it can be used to demonstrate the development of standby consumption. In general, compliance rate is increasing over the years.

This demonstrates that the technology for very low standby and off mode consumption is available for several product groups, and the possibility of lowering the requirement should be investigated.

However, it should also be noted that in a horizontal regulation, the coverage of product groups is very broad and some product groups may have much more challenges to achieve a lower standby consumption than others, and even may be technically unfeasible. During consultation with stakeholders, industry stakeholders as well as with Member State MSAs, they all have expressed that the standby requirements with or without display are stringent enough for most products, and some of them (particularly industry) do not recommend to lower the limit further. It is for this reason that a technical feasibility study has been carried out, where available data on standby/off modes was retrieved from manufacturers' websites to corroborate the amount of products that could comply with a stringer level (e.g. of 0.2 W).

5.1.4 Technical feasibility of lowering standby/off requirements

The search for available standby/off modes data was done from a compiled list of manufacturers of relevant product groups listed in Annex I of the regulation. The list was based on disclosed manufacturers' names by Topten and augmented by brand names listed in independent home electronics stockists to ensure a good coverage of brands and Member States.

For each brand a thorough search of the website was undertaken for the standby/off data, based on the Standby Regulation's product information requirements (7(a) in Annex II). The prevalence of data depended very much on the product group. For example, standby (left-on & off modes) data for washing machines and clothes dryers was well established, whilst for ovens the focus of data availability was on the information requirements of the EU Energy label, which does not include a breakdown of standby power demand. For some product groups, an extensive search of websites only yielded a small data set due to the lack of published data for this group.

Table 25 presents average and BAT consumption levels based on retrieved manufacturers' data, including average consumption data from Fraunhofer USA (2014)[48].

Table 25. Overview of standby/off mode consumption of product categories in Annex I of Regulation 1275/2008.

Product categories	Standby consumption data	Off consumption data	Sources
Household appliances			
Washing machines[49]	0.0 W (BAT) 0.21 W (average from top 40% of the market) 2.78 W (average)	0.0 W (BAT) 0.33 W (average)	348 models from 12 manufacturers[50]
Tumble dryers[49]	0.1 W (BAT) 0.32 W (average from top 23% of the market) 1.04 W (average)	0.0 W (BAT) 0.18 W (average)	122 models from 10 manufacturers[51]

[48] Fraunhofer USA (2014), Energy consumption of consumer electronics in US homes in 2013.
[49] For washing machines, tumble dryers and dishwashers all the available data provided by manufacturers is for 'left-on' and off modes (i.e. standby data is not available)
[50] Bauknecht, Blomberg, Hoover, Electrolux, V-ZUG, Gorenje, Merker, Schulthess, Hotpoint, Miele, Samsung, Indesit.
[51] AEG, Bauknecht, Bosch, Siemens, Schulthess, Merker, Gorenje, Hoover, V-ZUG, Miele.

Product categories	Standby consumption data	Off consumption data	Sources
Dishwashers[49]	0.0 W (BAT) 0.17 W (average from top 38% of the market) 1.75 (average)	0.00 W (BAT) 0.33 W (average)	206 models from 8 manufacturers[52]
Coffee machines	0.0 W (BAT) 0.22 W (average)	-	26 models from 8 manufacturers[53] Topten.eu
Range hoods	-	0.22 W (BAT) 0.5 W(average)	MSA's[54]
Electric and microwave ovens	0.0 W (BAT) 0.34 W (average)	-	51 models from 2 manufacturers[55]
Information technology equipment			
Monitors	0.1 W (BAT) 0.28 W (average)	0.0 W (BAT) 0.15 W (average)	Topten.eu
External storage device	Standby/off: 0.3 W (average)	-	Fraunhofer USA (2014)
Printers and scanners	0.05 W (BAT) 1.35 W (average)	0.05 W (BAT) 0.16 (average)	91 products from 5 manufacturers
Consumer equipment			
TVs	0.02 (BAT) 0.34 W (average)	-	MSA's[56]
DVD/Blu-ray players	0.0 W (average Frauhofer USA 2014) 0.16 W (BAT) 0.42 W (average)	-	Fraunhofer USA (2014) 45 models from 9 manufacturers
Headphones	-	0.07 – 0.1 W 0.3 W (average)	MSA's Fraunhofer USA (2014)
Wireless speakers	0.003 W (BAT) 0.29 (average)	0.14 – 0.5 W	57 models from 9 manufacturers
Digital picture frame	Standby/off: 0.0 W (average)	-	Fraunhofer USA (2014)
Toys, leisure and sports equipment			
E-cigarette		0.21 – 0.39 W	MSA's[57]
Game consoles	0.13 W (BAT) 0.54 W(average)	-	11 models from 3 manufacturers , Fraunhofer USA (2014)
Handheld game consoles	0.07 W (BAT) 0.22 W (average)	-	7 models from 2 manufacturers

5.1.4.1 Household appliances

Standby consumption data for washing machines, tumble dryers and washing machines has been retrieved as 'left-on' mode. None of the data is available as standby, as the Standby Regulation requires the products in scope have availability of off mode and/or

[52] Bauknecht, Bosch, Siemens, Gaggenau, Hoover, Hotpoint, V-ZUG, Miele.
[53] Oecoplan, Philips/Saeco, KISS, Bosch, Cremesson, Nespresso, Krups, Tichibo
[54] Denmark MSA result 2015.
[55] Gorenje and DAEWOO
[56] Belgium MSA result 2011 -2014.
[57] Sweden MSA result 2014 – 2015.

standby mode. Furthermore, the Commission Regulation (EU) No 1015/2010 on ecodesign requirements for household washing machines requires the manufacturers to declare the power consumption of off-mode and left-on mode in the manufacturers' booklets of instructions and it is therefore assumed that the manufacturers provide data on only these two modes. In spite this requirement is only applicable to washing machines, it is found possible that some of the same manufacturers produce tumble dryers and washing machines and for that reason this data is also available for the other products.

5.1.4.1.1 Low power consumption modes for washing machines, clothes driers and dishwashers

The definitions of left-on mode and off-mode[58] in the Commission Regulation 1015/2010 are not harmonised with the definitions of standby and off modes in the Standby Regulation. In spite left-on/off modes refer to low power modes conditions, both are associated with sensor based protection function(s) (e.g. to protect the user from accidental water leakage) when the machines' washing programme is terminated and they are unloaded[59,60].

The definition of left-on mode in the Commission Regulation 1015/2010 is broad enough to fit in the definition of standby in the Standby Regulation, as it only specifies it is maintaining a low power consumption mode for an indefinite time without user intervention. It is for this reason that it is assumed that some left-on mode consumption data declared by manufacturers may relate to standby mode according to the Standby Regulation, whilst other data may not as it may imply a sensor based protection function that goes beyond a reactivation function and/or an information or status display. The same applies to clothes driers, as they are included in the left-on mode definition of the vertical regulation of washing machines, and to dishwashers[60]. Based on this assumption, it has been noticed that 40 % of the washing machines, 23 % of the tumble driers and 38 % of the dishwashers models retrieved from the manufacturers' online data search present 'left-on' mode consumption ≤ 0.5 W, which may be related to standby mode as defined in the Standby Regulation. The average figures for these products are shown in Table 25, which show that at least 132 models of washing machines, 27 of clothes dryers and 71 of dishwashers present averages of left-on consumption of 0.21 W, 0.32 W and 0.17 W respectively. These figures are therefore assumed to represent a condition similar to standby.

The definition of off-mode in the Commission Regulation 1015/2010 specifies that when the household washing machine is on off mode, its controls or switches are made accessible to and intended for operation by the user during normal use. It is unclear

[58] 'off-mode' means a condition where the household washing machine is switched off using appliance controls or switches accessible to and intended for operation by the end-user during normal use to attain the lowest power consumption that may persist for an indefinite time while the household washing machine is connected to a power source and used in accordance with the manufacturer's instructions; where there is no control or switch accessible to the end-user, 'off-mode' means the condition reached after the household washing machine reverts to a steady-state power consumption on its own.

[59] WORKING DOCUMENT ON A POSSIBLE COMMISSION REGULATION IMPLEMENTING DIRECTIVE 2005/32/EC WITH REGARD TO HOUSEHOLD WASHING MACHINES – Explanatory notes. Available at: http://www.eup-network.de/fileadmin/user_upload/Produktgruppen/Lots/Working_Documents/outline_washing-machines_implementing_measure.pdf

[60] WORKING DOCUMENT ON A POSSIBLE COMMISSION DIRECTIVE IMPLEMENTING COUNCIL DIRECTIVE 92/75/EC WITH REGARD TO HOUSEHOLD DISHWASHERS – Explanatory notes. Available at: http://www.eup-network.de/fileadmin/user_upload/Produktgruppen/Lots/Working_Documents/outline_dishwashers_labelling.pdf

whether these controls or switches operate only an indicator of off mode and/or functionalities to ensure electromagnetic compatibility (according to the Standby Regulation), or whether they relate to the sensor based protection function(s) indicated in the explanatory documents working documents[59,60]. However, it is also stated in the definition in the Regulation 1015/2010 that when these controls or switches are not accessible to the user, the washing machine should revert to a steady state power consumption on its own. This last part of the definition fits more the definition of off mode in the Standby Regulation, and it is therefore that the analysis of consumption data for washing machines, clothes driers and dishwashers was also done at the off mode consumption levels[61]. In this regard Table 25 shows that this is well under the requirement with averages of 0.33 W, 0.18 W and 0.33 W from 348 models of washing machines, 122 of tumble dryers and 206 of dish washers. The distribution of these figures is shown in Figure 18 where, apart from the three outliers, all comply with the requirement and even a great part (62 %) are 0.4 W and below, 51 % are 0.3 W and below, and 45 % are 0.2 W and below.

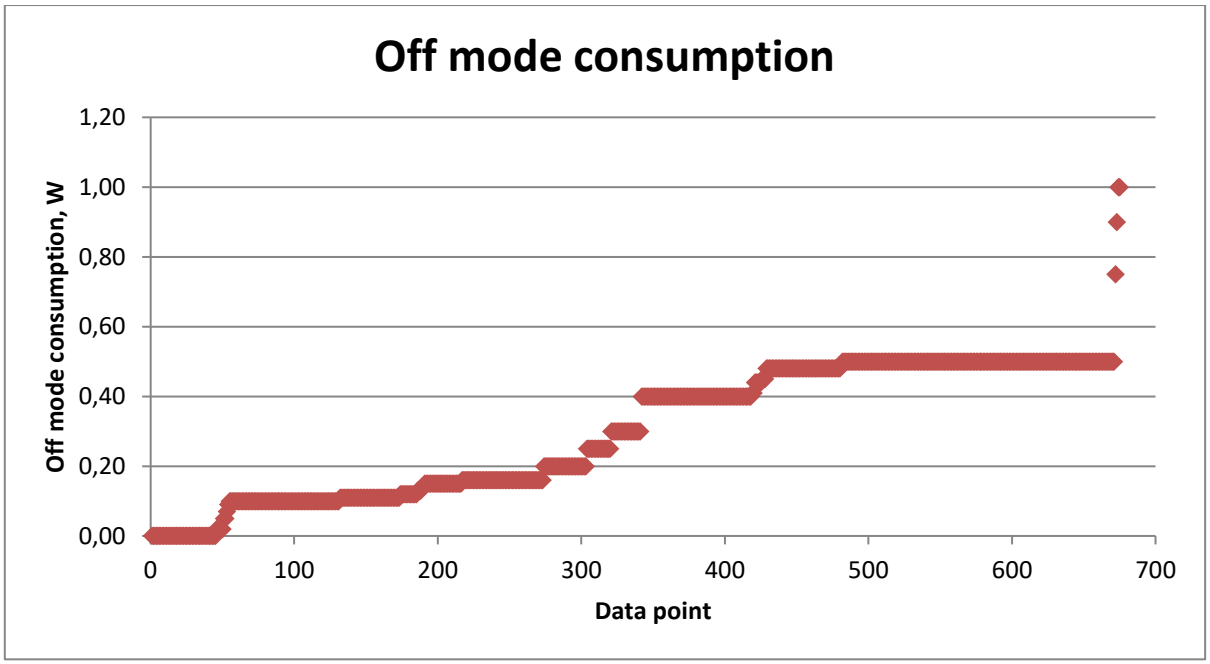

Figure 18. Off mode consumption of dishwashers, washing machines and clothes driers, which only have declared left-on mode rather than standby mode consumption.

Since no standby mode consumption data is available, it is therefore suggested to consider off mode consumption to assess a possible more stringent requirement. The figures discussed above show that a level of 0.4 W on standby/off modes could be achievable.

Regarding coffee machines, 54 % of the models retrieved presented standby mode consumption ≤ 0.2 W, 69 % ≤ 0.3 W and 73 % ≤ 0.4 W, therefore presenting an average consumption of 0.25 W. 65 % of the electric and microwave ovens models retrieved presented standby mode consumption ≤ 0.2 W and an average of 0.34 W. 33

[61] It is important to note that the ongoing revision of the ecodesign and energy label requirements for household washing machines and washer dryers is looking at the possibility to remove power in off-mode (Po) and power in left-on mode (Pl) from the calculation of the energy efficiency index, considering these are addressed in the current amended Standby Regulation. This highlights the importance of harmonising the definition of standby/off modes for these machines with those in the Standby Regulation.

% of the products (all electric ovens) consume approx. 1 W, because all of them are information/status display in the form of clock during standby mode.

5.1.4.2 Consumer equipment

The availability of standby/off modes consumption data for consumer equipment was significantly lower than that for household appliances. However, standby consumption data for 45 models of DVD/Blue-ray players and 57 of wireless speakers was retrieved.

Regarding DVD/Blu-ray players, 18 of the 45 models presented a standby consumption of ≤ 0.4 W, 13 models presented ≤ 0.3 W whilst 6 presented ≤ 0.2 W. Regarding wireless speakers, 34 of the 57 models presented a standby consumption of ≤ 0.4 W, 20 presented ≤ 0.3 W whilst 7 presented ≤ 0.2 W.

From these figures it can be concluded that most of the DVD/Blue-ray players and wireless speakers where data is available, a more stringent level of 0.3 W could be achieved as 30% of the data is already below this level. Furthermore, the technology for the functionality of standby and off mode, i.e. activation with a remote control etc., is basically the same for all of the same kind of electronics i.e. TV sets, audio equipment, DVD players etc. Therefore, the limits are achievable also for these other similar products.

5.1.4.3 IT equipment and toys, leisure and sports equipment

For most of the IT equipment which is not explicitly excluded from Annex I in the Standby Regulation, the standby mode is no longer relevant. It is therefore not common to find these data available, as in most of the cases it relates to networked standby. Topten and Fraunhofer (2014) present average standby/off modes consumption data of ≤ 0.3 W (see Table 25).

Regarding toys, leisure and sports equipment, it was found that many of the products in this category are LV EPS. Furthermore, since this category is too broad, some specific examples will be investigated to support the argumentation for lowering down the level of requirements.

All the standby consumption data (i.e. excluding left-on mode data) found via the manufacturers' websites are shown in Figure 19. It can be seen that many data points are well below 0.5 W limit, specifically 45% of the data shows to be ≤ 0.3 W and 58% ≤ 0.4 W, whilst 32% are ≤ 0.2 W. This indicates that for many of the models with publicly available standby consumption data, a more stringent level can be already achieved.

There are 19 data points that present a standby consumption of 1 W, based on the desk research online 18 of them are with information/status display during standby in the form of the clock, out of these 18, 17 of them are electric ovens and the last one is a micro audio system. It is possible that some other products with lower standby consumption also have status display during standby mode, but it is not clearly indicated on freely accessible website and therefore difficult to determine.

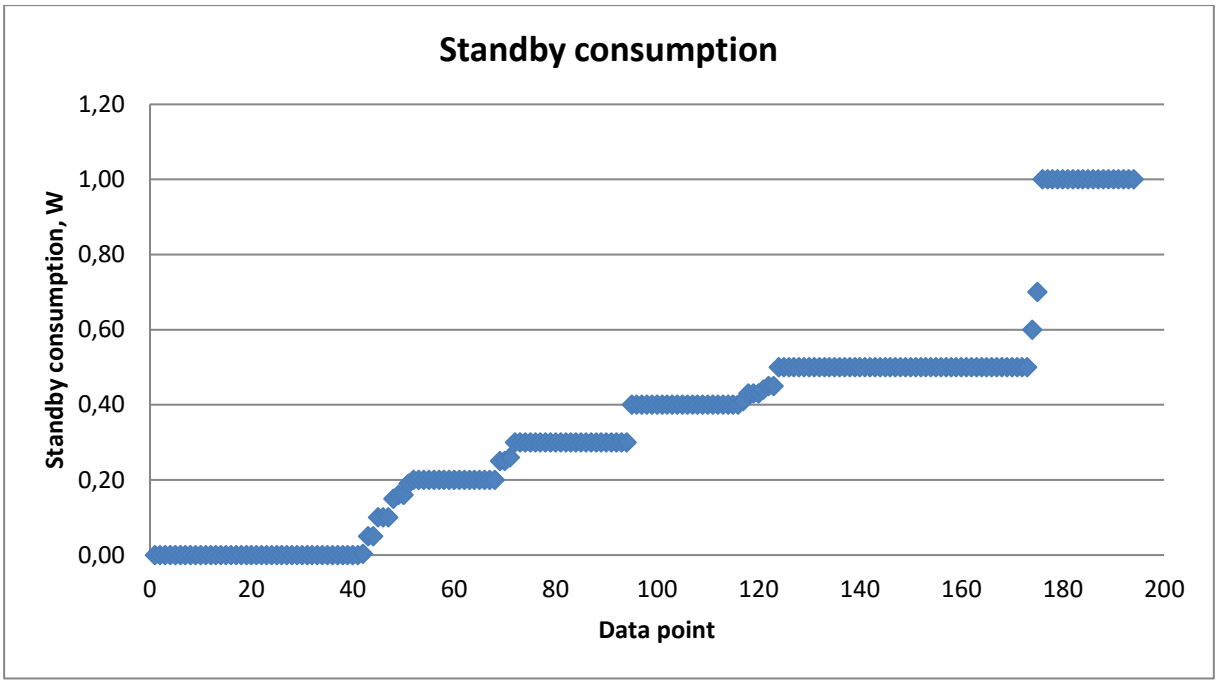

Figure 19. Standby consumption of DVD/blu-ray players, wireless speakers, coffee machines, electric and microwave ovens, printers and scanners.

Topten and ECOS have recommended that 0.2 W should be proposed as the new standby/off mode limit. Furthermore, there is a proposal for a new display regulation for both TVs and computer monitors repealing Regulation 642/2009 with regard to ecodesign requirements for televisions, which also proposes 0.2 W for off mode and 0.25 W for standby mode[62].

5.1.5 Market estimation and growth

Most the of products from preparatory study Lot 6 are still in the scope of amended Standby Regulation, but EPS for mobile phones, TVs, computers and lighting are not, which have very large stocks in the EU. In addition to the products in scope, the extended scope covers product groups which can potentially be included in regulation upon the completion of this review study, i.e. products equipped with electric motors.

Table 26 shows the market size for products that will be included in the energy saving analysis. Most data for current scope in amended Regulation 1275/2008 is retrieved from preparatory studies on standby/off and domestic appliances. Data on products considered for the extended scope has been retrieved from different data sources. See chapters 5 for references.

[62] Working document for displays, October 2015.

Table 26. Market stock estimation for 2020 and 2030 (based on Lot 6 and data estimated for extended scope).

Product	Product category	2020		2030	
		Stock, million units	Growth rate, %/a	Stock, million units	Growth rate, %/a
Electric toothbrush	Household appliances	51	1.4%	59	1.4%
Clothes dryers		72	1%	78	1%
Dishwashers		115	3%	149	2%
Electric hobs		164	2%	189	1%
Electric oven		75	0.1%	76	0.1%
Washing machine	Household appliances	196	0.3%	202	0.3%
Radio	Consumer equipment	117	0.1%	118	0.1%
DVD players		253	3.2%	369	3.2%
Audio mini-system		117	0.1%	118	0.1%
PC office peripheral	Information technology	15	2.6%	21	2.6%
PC Home peripheral		0	-5.6%	0	-5.6%
Laser printer		49	1.8%	31	1.8%
Inkjet printer		23	2.6%	28	2.6%
Local building controls	Products equipped with electric motor operated with remote control	140	5%	188	5%
Elevation beds		7	15%	21	10%
Height-adjustable desk		49	7%	103	8%
Total		**1519**		**1873**	

Stock estimation is based on the stock from preparatory study for Lot 6 but modified in light of recent technological development and excluding products which are not in scope of the amended Standby Regulation which were included in Lot 6. Some products are expected to decrease in stock or stagnate at the same level, because they are, for example, being replaced by other types of products. Such is the case for fax machines, which are no longer the preferred communication medium for business, cordless phones are being mainly replaced by mobile phones, and radios can be one of the functionalities of another product such as wireless speakers, mobile phones, etc.

Total stock of products is estimated to be 1.6 billion units in 2020, and it will increase to about 2 billion units in 2030. The total stock is approx. half of the original stock calculated for Lot 6 products because the subsequent four amendments have exempted a few very large product groups from the current Standby Regulation and the recent technological development have shown that the original estimated stock was too optimistic for products such as phones and PC peripherals. In addition, the list of products above is not exhaustive and other product groups such as toys and leisure equipment and other sound and imaging equipment are not included in the calculation, due to lack of data.

5.1.6 Potential energy savings – current scope

The BAU scenario in this analysis is assuming that the Standby Regulation is not being revised and all requirements on standby/off modes are maintained at the same level. This also assumes that the products currently not in scope will continue to have the same

standby consumption as they will not be covered by a review of the Standby Regulation. The policy scenario is assuming three different scenarios:

1. The standby/off modes requirement will be lowered to 0.4 W, in this way reflecting the results from the technical feasibility where it was observed most products can achieve this level at standby/off modes.
2. The standby/off modes requirement will be lowered to 0.3 W, in this way reflecting the results from the technical feasibility where most of the products except a part of the household appliances could achieve this level at standby/off modes.
3. The standby/off modes requirement will be lowered down to 0.2 W, being the most ambitious scenario and reflecting the results for many ovens, coffee machines and a smaller part of the household appliances (on off mode).

Although the current requirement for standby/off mode is 0.5 W, the average consumption for BAU scenario is assumed to be 0.45 W for all the products with available data. Manufacturers usually make sure the products are reliably below the requirement level for compliance to account for the variation in production and therefore the actual consumption is likely to be lower than 0.5 W. Although our data presented above show an even lower average approx. 0.36 W, the data is only presentative of a limited market share for mostly electronic products which are more efficient than other products in scope. The missing data for some household appliance, toys, leisure and sports equipment are likely to have a higher average, therefore it is assumed that the average of all products in current scope should be in the range of 0.4 – 0.5 W. Therefore we assumed 0.45 W as the baseline.

The calculation of potential energy savings was done for all products in scope and established from 2018, where the total stock will gradually all change to more efficient products in order to comply with these future requirements. To simplify the analysis, it is assumed that all the assessed products have regular standby mode without information or display.

Figure 20 shows the differences on annual energy consumption between the BAU and the three policy scenarios, indicating that the potential annual savings could start occurring from 2018 if the revised requirement for standby/off mode come into force in 2018.

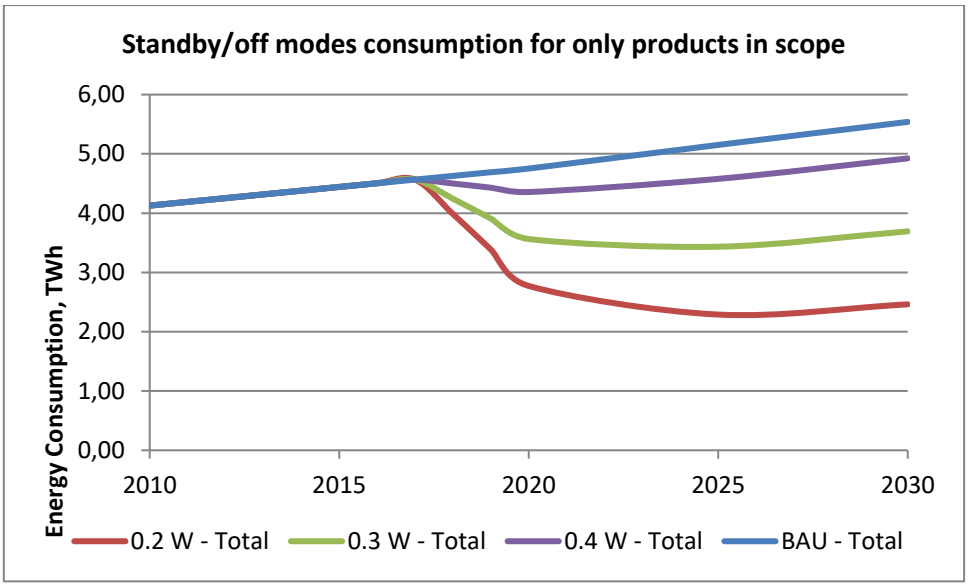

Figure 20. Standby/off modes consumption for products presented that are currently in scope.

All three scenarios follow the same trend, the total energy consumption is reduced greatly by 2024, and from 2024 onwards the total standby consumption increases slightly again due to the higher stock of electrical and electronic products in scope. The 0.2 W scenario will reduce the total standby/off modes consumption the most in comparison with 0.3 W and 0.4 W scenarios (see Figure 21).

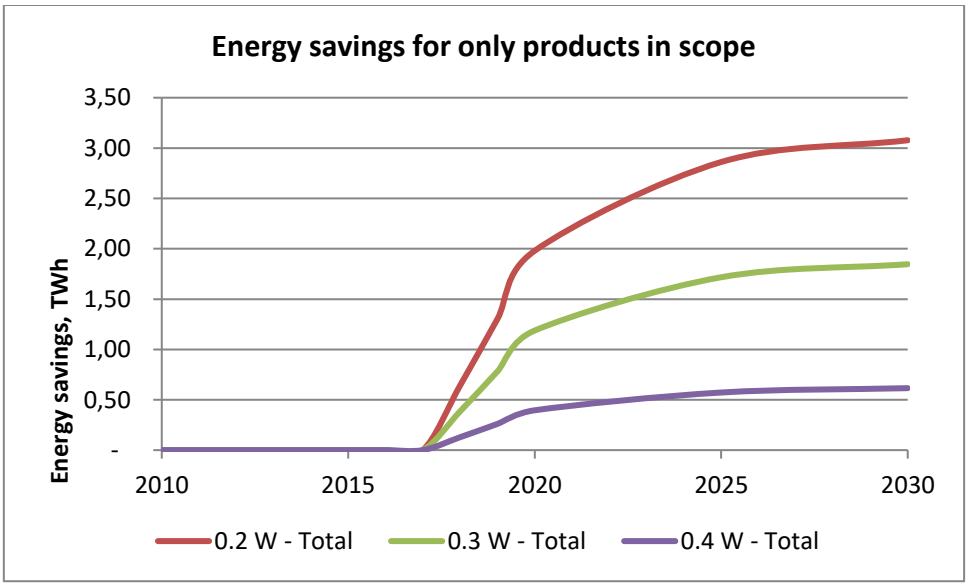

Figure 21 Annual energy savings from lowering the current standby/off modes requirements to 0.2 W, 0.3 W or 0.4 W for products currently in scope.

Table 27. Annual and cumulative energy savings 2018-2030 for products currently in scope (showing only 2020-2030).

Policy scenarios	Potential energy savings	2020	2025	2030
0.2 W scenario	Annual savings (TWh/year)	2.0	2.9	3.1
	Cumulative savings (TWh)	3.9	17.4	32.3
0.3 W scenario	Annual savings (TWh/year)	1.2	1.7	1.8
	Cumulative savings (TWh)	2.4	10.4	19.4
0.4 W scenario	Annual savings (TWh/year)	0.4	0.6	0.6
	Cumulative savings (TWh)	0.8	3.5	6.5

Table above shows the annual and cumulative savings for 0.2–0.4 W scenarios. The largest savings is obtained with 0.2 W scenario. Savings for 0.4 W scenario is very small for products already in scope of Regulation, however the savings is significantly larger when the products not in scope are included.

5.1.7 Cost savings analysis – current scope

The cost savings analysis is only carried out for products currently in scope. Improvement costs are obtained from preparatory study Lot 6, assuming the cost for achieving 0.2 W scenario from their current consumption level is the same as achieving 0.5 W level from their original standby/off consumption before the Standby Regulation came into force. In addition, the costs per W reduction is calculated and applied to 0.3 W and 0.4 W scenario. These costs are shown in Table 20, Table 21 and Table 22

Industry stated that it is very difficult to reduce the standby consumption any lower due to the cost benefits. An economic analysis would need to be carried out to assess how much lower the standby consumption could be reduced without affecting business too negatively.

Table 28, Table 29 and Table 30 show the results from a simplified cost saving analysis mainly for the end-consumers. Concerning the improvement costs, these may be outdated as the data is obtained from preparatory study Lot 6. Inflation rate and increase on electricity price have been applied to estimate the energy cost savings. A 100% mark-up (multiplying by 2) is applied to the improvement costs to account for the actual increase in the product price to the consumers.

These results show that the net cost savings for most products are positive, but negative for PC office peripheral and PC home peripheral as the improvement cost for the consumer is higher than the monetary savings that come from the reduced energy bill.

Table 28. Cost savings for changing all stock of current scope to achieve lower level in standby/off modes by 2030, energy cost saving is calculated assuming 0.2 W in standby/off modes.

Product	Product category	Improvement cost to consumers (mill EUR)	Energy cost savings (mill EUR)	Net cost saving (mill EUR)
Electric toothbrush	Household appliances	€ 138	€ 353	€ 214
Clothes dryers		€ 445	€ 498	€ 54
Dishwashers		€ 849	€ 869	€ 20
Electric hobs		€ 634	€ 1,230	€ 596
Electric oven		€ 254	€ 526	€ 272
Washing machine	Household appliances	€ 1,154	€ 1,350	€ 197
TV peripheral	Consumer equipment	€ 0	€ 0	€ 0
Radio		€ 278	€ 798	€ 520
DVD players		€ 2,110	€ 1,788	-€ 321
Audio mini-system		€ 674	€ 642	-€ 32
PC office peripheral	Information technology	€ 48	€ 34	-€ 14
PC Home peripheral		€ 175	€ 188	€ 13
Laser printer		€ 65	€ 105	€ 40
Inkjet printer		€ 442	€ 853	€ 411
Total		**€ 7,265**	**€ 9,235**	**€ 1,970**

Table 29. Cost savings for changing all stock of current scope to achieve lower level in standby/off modes by 2030, energy cost saving is calculated assuming 0.3 W in standby/off modes.

Product	Product category	Improvement cost to consumers (mill EUR)	Energy cost savings (mill EUR)	Net cost saving (mill EUR)
Electric toothbrush	Household appliances	€ 83	€ 212	€ 129
Clothes dryers		€ 267	€ 299	€ 32
Dishwashers		€ 510	€ 522	€ 12
Electric hobs		€ 0	€ 738	€ 738
Electric oven		€ 152	€ 316	€ 163
Washing machine	Household appliances	€ 692	€ 810	€ 118
TV peripheral	Consumer equipment	€ 0	€ 0	€ 0
Radio		€ 167	€ 479	€ 312
DVD players		€ 1,266	€ 1,073	-€ 193
Audio mini-system		€ 404	€ 385	-€ 19
PC office peripheral	Information technology	€ 29	€ 21	-€ 8
PC Home peripheral		€ 105	€ 113	€ 8
Laser printer		€ 39	€ 63	€ 24
Inkjet printer		€ 265	€ 512	€ 247
Total		**€ 3,978**	**€ 5,541**	**€ 1,563**

Table 30. Cost savings for changing all stock of current scope to achieve lower level in standby/off modes by 2030, energy cost saving is calculated assuming 0.4 W in standby/off modes.

Product	Product category	Improvement cost to consumers (mill EUR)	Energy cost savings (mill EUR)	Net cost saving (mill EUR)
Electric toothbrush	Household appliances	€ 28	€ 71	€ 43
Clothes dryers		€ 89	€ 100	€ 11
Dishwashers		€ 170	€ 174	€ 4
Electric hobs		€ 0	€ 246	€ 246
Electric oven		€ 51	€ 105	€ 54
Washing machine	Household appliances	€ 231	€ 270	€ 39
TV peripheral	Consumer equipment	€ 0	€ 0	€ 0
Radio		€ 56	€ 160	€ 104
DVD players		€ 422	€ 358	-€ 64
Audio mini-system		€ 135	€ 128	-€ 6
PC office peripheral	Information technology	€ 10	€ 7	-€ 3
PC Home peripheral		€ 35	€ 38	€ 3
Laser printer		€ 13	€ 21	€ 8
Inkjet printer		€ 88	€ 171	€ 82
Total		**€ 1,326**	**€ 1,847**	**€ 521**

5.1.8 Potential energy savings – extended scope

From the assessment of extending the scope done in Chapter 4, the only product group considered that could be potentially included in the scope is products equipped with electric motors operated by remote control. In this section, the potential energy savings for extending the scope are presented, including both the current standby/off mode requirement, i.e. the savings from local building controls and adjustable furniture meeting 0.5 W standby/off mode requirement, and also the three policy scenarios explained in previous section (see Table 31).

Table 31. Annual and cumulative energy savings 2019-2030 only for product types considered in the extended scope (showing only 2020-2030).

Product	Product category	Potential energy savings in 2030		
		0.2 W scenario	0.3 W scenario	0.4 W scenario
Electric toothbrush (TWh/year)	Household appliances	0.1	0.1	0.02
Clothes dryers (TWh/year)		0.2	0.1	0.03
Dishwashers (TWh/year)		0.3	0.2	0.06
Electric hobs (TWh/year)		0.4	0.2	0.08
Electric oven (TWh/year)		0.2	0.1	0.03
Washing machine (TWh/year)	Household appliances	0.4	0.3	0.08
Radio (TWh/year)	Consumer equipment	0.2	0.1	0.05
DVD players (TWh/year)		0.7	0.4	0.13
Audio mini-system (TWh/year)		0.2	0.1	0.04
PC office peripheral (TWh/year)	Information technology	0.0	0.0	0.00
PC Home peripheral (TWh/year)		0.0	0.0	0.01
Laser printer (TWh/year)		0.0	0.0	0.01
Inkjet printer (TWh/year)		0.3	0.2	0.06
SUBTOTAL current scope (TWh/year)		**3.1**	**1.8**	**0.6**
Building automation and controls (TWh/year)	Products equipped with electric motor operated with remote control	1.7	1.6	1.47
Elevation beds (TWh/year)		0.2	0.2	0.20
Height-adjustable desk (TWh/year)		1.85	1.77	1.68
TOTAL extended scope (TWh/year)		**6.9**	**5.4**	**4.0**

The 3 different categories, household appliances, consumer equipment and information equipment are estimated to yield similar savings, but household appliances are estimated to yield the highest savings due to the high sales in these products.

For products equipped with electric motor operated via remote control, the saving is significant, the annual savings in 2030 from these products alone are estimated be 4.0, 5.4 and 6.9 TWh respectively for 0.4 W, 0.3 W and 0.2 W scenario. In 0.4 and 0.3 W scenario, the savings from these products would surpass the savings from the products currently in scope as presented in the table above, because the BAU scenario assumes that all products in scope consume 0.5 W currently in standby/off modes, whereas the

products equipped with electric motors operated via remote control consume 1 W – 2.5 W in BAU scenario where they are not in scope.

Figure 22 shows the differences on annual energy consumption between the BAU and the policy scenarios, indicating that the potential annual savings will start around 2018 when it is assumed that revised requirements would come into force.

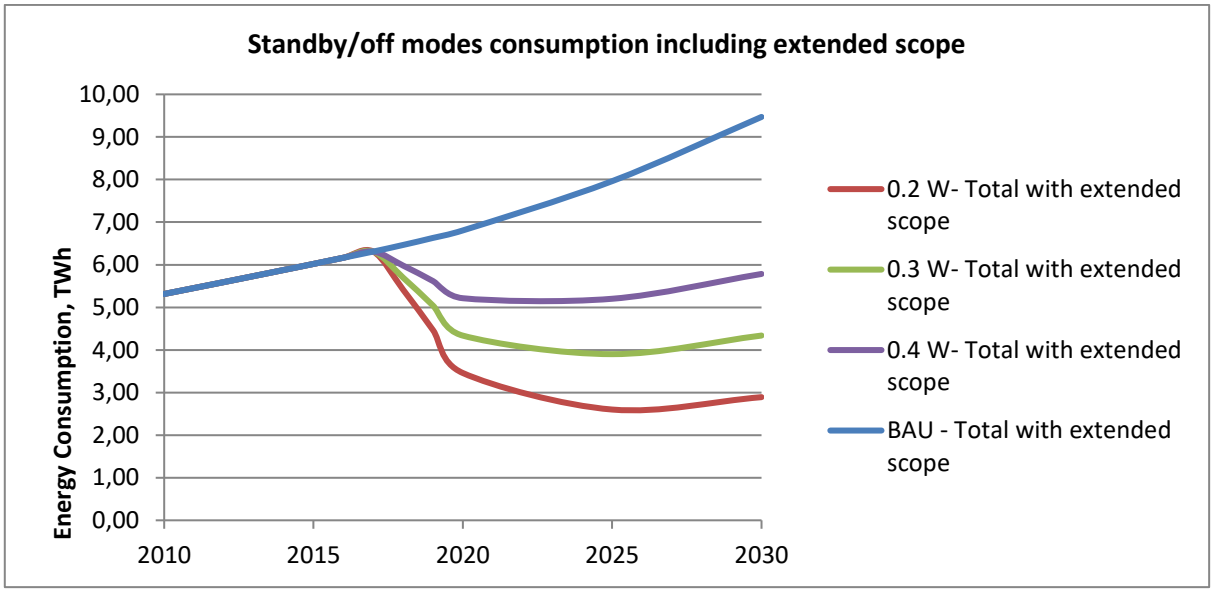

Figure 22. Annual energy savings from lowering the current standby/off modes requirements to 0.2 W, 0.3 W or 0.4 W including extended scope.

The annual energy savings for all three scenarios follow the same trend (see Figure 23), savings starts in 2018 and increases every year due to the increasing stock of electrical and electronic products in the EU.

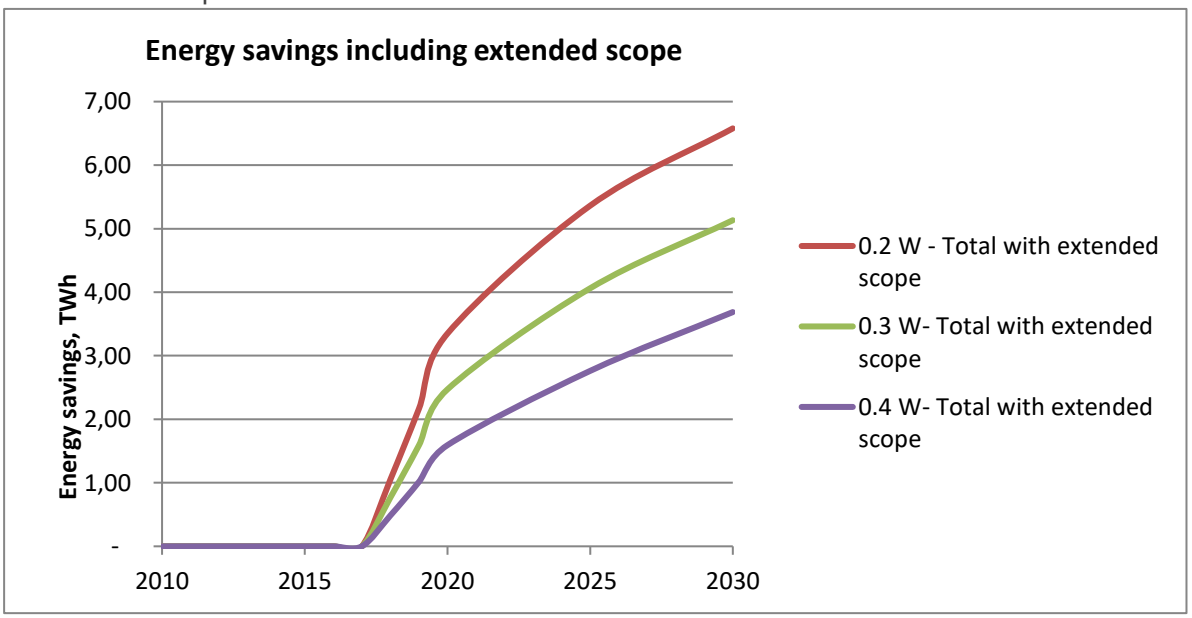

Figure 23. Total energy savings for extended scope.

Table 32. Annual and cumulative energy savings 2018-2030 for only products equipped with electric motors operated by remote controls (showing only 2020-2030).

Products equipped with electric motors operated by remote controls				
Policy scenarios	**Potential energy savings**	**2020**	**2025**	**2030**
0.2 W scenario	Annual savings (TWh/year)	1.4	2.5	3.5
	Cumulative savings (TWh)	2.9	14.8	31.6
0.3 W scenario	Annual savings (TWh/year)	1.3	2.3	3.3
	Cumulative savings (TWh)	2.5	12.5	26.9
0.4 W scenario	Annual savings (TWh/year)	1.2	2.2	3.1
	Cumulative savings (TWh)	2.3	11.7	25.2
0.5 W scenario (current requirement level)	Annual savings (TWh/year)	1.10	2.01	2.83
	Cumulative savings (TWh)	1.96	10.60	22.98

Table 33. Annual and cumulative energy savings 2018-2030 for products in current scope (showing only 2020-2030).

Current scope				
Policy scenarios	**Potential energy savings**	**2020**	**2025**	**2030**
0.2 W scenario	Annual savings (TWh/year)	2.0	2.9	3.1
	Cumulative savings (TWh)	3.9	17.4	32.3
0.3 W scenario	Annual savings (TWh/year)	1.2	1.7	1.8
	Cumulative savings (TWh)	2.4	10.4	19.4
0.4 W scenario	Annual savings (TWh/year)	0.4	0.6	0.6
	Cumulative savings (TWh)	0.8	3.5	6.5

Table 34. Annual and cumulative energy savings 2018-2030 for extended scope (showing only 2020-2030).

Extended scope(incl. products equipped with electric motors operated by remote controls)				
Policy scenarios	**Potential energy savings**	**2020**	**2025**	**2030**
0.2 W scenario	Annual savings (TWh/year)	3.5	5.6	6.9
	Cumulative savings (TWh)	6.8	32.2	64.0
0.3 W scenario	Annual savings (TWh/year)	2.6	4.3	5.4
	Cumulative savings (TWh)	5.1	24.3	49.0
0.4 W scenario	Annual savings (TWh/year)	1.7	3.0	4.0
	Cumulative savings (TWh)	3.3	16.4	34.1
0.3 W for current scope and 0.5 W for extended products	Annual savings (TWh/year)	2.3	3.7	4.6
	Cumulative savings (TWh)	4.4	21.0	42.4

As seen in the tables above, the annual and cumulative savings for 0.2 – 0.4 W scenarios are significant for extended scope, because the savings come from both including extended products into the Standby Regulation and from lowering the standby/off mode limit for current scope. However, if the limit is only lowered to 0.4 W, the savings from products currently in scope is only 0.6 TWh in 2030 while the products equipped with electric motors operated by remote control would yield the more savings i.e. 3.1 TWh in 2030. In 0.2 W scenario, products currently in scope would yield more savings, i.e. 3.1 TWh in 2030, while products equipped with electric motors operated by remote control would yield a saving of 3.5 TWh in 2030. In 0.3 W scenario, the savings from both groups are approx. the same in 2030, 1.8 TWh for products in scope, and 3.3 TWh for products currently outside.

Products currently outside scope may need more time to achieve a lower level of standby requirement, e.g. 0.3 W, due to the fact that some are not yet compliant with the current

standby level of 0.5 W. For this reason it may be appropriate to consider a 0.3 W limit for products currently in scope and 0.5 W for the products proposed to be in scope i.e. products equipped with electric motors operated via remote controls. The annual savings from this consideration are approx. 4.6 TWh in 2030.

5.1.9 Conclusions

In this section, the level of ambition is assessed for the current standby/off mode requirements, in order to recommend whether the current limits should be revised.

It can be concluded that most of the products on the EU market are currently complying with the 0.5 W limit and compliance rates are high. When analysing the BAT and average standby/off modes consumptions, various products across different categories of Annex I of Regulation 1275/2008 are achieving 0 W – 0.4 W. Very low standby/off mode technology is available for many product types, such as displays, washing machines and coffee machines, and it is believed that similar technology can be applied to most product categories in Annex I. This provides technical justification of proposing 0.2 W as the new limit for standby/off mode consumption.

Annual energy savings from setting 0.4, 0.3 or 0.2 W as standby/off mode limit without extending the scope are estimated to be 0.6, 1.8 and 3.1 TWh by 2030 respectively. Cumulative savings are estimated to be 6.5, 19.4 and 32.3 TWh by 2030 respectively. Results of the cost analysis shows that overall cost savings for lowering the standby/off limits with the current regulation scope are positive, while two product categories yield negative cost savings. The size of the energy and cost saving is believed to be significant enough to support strengthening the requirement. For products that could potentially be in the scope of the regulation the saving is also significant, the annual savings in 2030 from these products alone are estimated be 3.1 to 3.5 TWh.

Based on the saving figures for all three scenarios, it can be recommended that the standby/off mode limits should be lowered to either 0.2 W or 0.3 W, the savings from lowering the requirement to 0.4 W are not significant when only looking at the current scope.

The savings would be much larger when including products equipped with electric motors and operated via remote control, however a large part of this saving can be obtained by simply including them into scope.

The policy scenario proposed is setting standby/off mode limit to 0.3 W for current scope and 0.5 W for extended scope. This gives approx. 4.6 TWh of annual savings in 2030 and 42.4 TWh of cumulative savings by 2030.

5.1.9.1 Information or status display

The additional allowance from standby consumption providing only a reactivation function or only a reactivation function and a mere indication of enabled reactivation function to the power consumption of equipment in any condition providing only information or status display, or providing only a combination of reactivation function and information or status display is proposed to remain the same. This means that the proposed standby mode limit of providing only information or status display or a combination of information or status display and a reactivation function is proposed to be 0.8 W.

Although very few data was found declaring specifically power consumption under this condition, it is assumed that the display technology has improved over the recent years

and that the actual consumption needed for the status display is likely to be below 0.5 W. However, the technology is no longer widely used by electrical and electronic products any more on the current market according to the online desk research done by the study team, and therefore only a few product types still maintain the use the of status display during standby mode. Therefore it was decided to keep the same extra allowance of 0.5 between these two conditions, and if the standby consumption limit without information or status display is proposed to be 0.3 W, then the other is proposed to be 0.8 W. This is only based on expert judgment, as no data on this mode was found during the online desk research.

5.2 Review of appropriateness and the level of requirements for networked standby of non-HiNA equipment (Tier III)

5.2.1 Introduction

The amended regulation 1275/2008 requires in Article 7 Revision: "The review will in particular address ... the appropriateness and level of the requirements for networked standby with regard to the third stage of implementation (2019)."

The stated requirements concerns Annex II point 5, where the power consumption of networked equipment other than HiNA equipment or other than equipment with HiNA functionality, in a condition providing networked standby into which the equipment is switched by the power management function, or a similar function, shall not exceed 2.00 W as of 1 January 2019 (Tier III). This level is 6.00 W from 1 January 2015 (Tier I) and 3.00 W from 1 January 2017 (Tier II).

It is worth noticing that there is a period of almost three years before the requirement takes effect and that the requirement is already in the regulation meaning that the manufacturers know and have known since the adoption of Commission Regulation (EU) No 801/2013 on 22 August 2013 (i.e. 5.5 years before effective date of 3rd stage) that they should comply with the requirement.

The study team has assessed available data for networked standby for products on the market. Though not abundant, especially for non-electronic products, they still give an indication of how far the current market is in complying with the 2 W limit.

In addition, the technical possibility for compliance has been assessed by analysing power budgets for network standby products and active components.

Finally, we have assessed a specific request from the industry regarding extending the definition of wireless access point to cover more than Wi-Fi (IEEE 802.11).

5.2.2 Appropriateness of the Tier III-requirements based on analysis of product data

5.2.2.1 General

In this section, relevant products on the market regarding the networked standby power consumption are assessed. The basis is the list from Annex I "List of energy-using products covered by this Regulation", where relevant product types have been selected, which according to the study team would present the most difficulties to comply with this requirement (based on expert judgment). An internet search has been made for collecting data on specific products and their networked standby consumption.

These data have been supplemented with relevant data in the EU ENERGY STAR database (www.eu-energystar.org). These data comprise registered ENERGY STAR products in EU and certified products in USA, for which the manufacturer has stated during the US certification that they are available on the EU market and subsequently will be copied to the EU ENERGY STAR database. Only data for products with networked.

There is, however, still only a limited amount of appliances on the market with network connection. The reason is that it is just in the recent years that there has been a focus and a consumer demand of products, which are connected to a network either for control or information purposes, or for content streaming and download of software and/or content updates. Mainly networked household appliances are limited in numbers, where there are more networked electronic devices and especially those, where it is an integral function of the appliance to be connected to a network. Furthermore, very few power consumption data for household appliances are publicly available, either because of non-compliance with the product information requirements in the Standby Regulation or because the manufacturer does not claim the product to have networked standby in spite of the network connection. Both of these situations may be due to the relatively recent entry into force of the regulation (January 2015), so manufacturers are still not very familiar with the networked standby definition and information requirements.

The study team carried out an intensive internet search for product information on products within the scope of the regulation. Unfortunately, only a small proportion of these products had network connection and had published the networked standby power consumption.

All in all, we were able to collect data on the following products for assessment grouped under the main headers in Annex I of the Regulation:

- Household appliances
  - Washing machines (market data, 5 products)
  - Clothes dryers (market data, 4 products)
  - Dishwashers (market data, 13 products)
  - Electric ovens (market data, 13 products)

- Information technology equipment:
  - Imaging equipment (market data, 59 products)
  - Game consoles (market data and Fraunhofer USA 2014 data, 6 products)
  - Projectors (market data, 112 products)

- Consumer equipment
  - DVD, blue-ray players (market data, 35 products)
  - Wireless speakers and audio equipment (market data, 41 products)

It was not possible to find products in the group "Toys, leisure and sports equipment", which were mains powered and where the power consumption (standby, off or networked standby) was publicly available.

Figure 24 illustrates the networked standby consumption for all the data points collected. In this figure, three data points are above 6 W, probably because the power state is not networked standby. All in all, 55 % of the data points are below 2 W (Tier III) and 73 % are below 3 W (Tier II).

In the following section, we assess each of the product types included in the list and chart above.

We have also analysed data available in the EU ENERGY STAR database, which are not included in the chart above because data come from a different data source with possible overlaps:

- Imaging equipment (ENERGY STAR data, 1219 products, possible overlap with the market data above obtained via desk research)
- Displays (ENERGY STAR data, 281 products)

The analyses are included in the in the next sections.

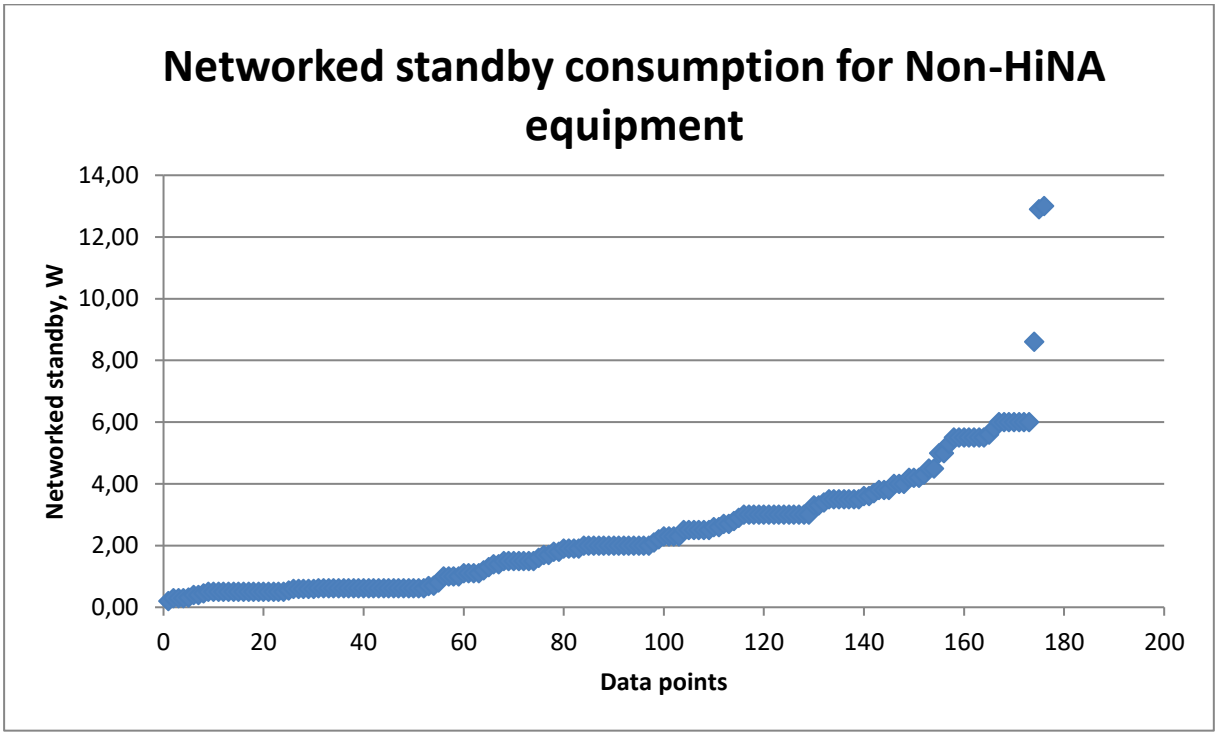

Figure 24. Networked standby consumption for various non-HiNA products (data obtained via desk research).

5.2.2.2 Washing machines

There is only a few data available for networked washing machines: 5 products have been found which are compliant with the current networked standby requirements, however none of them are compliant with Tier II or Tier III requirement (see Figure 25 below).

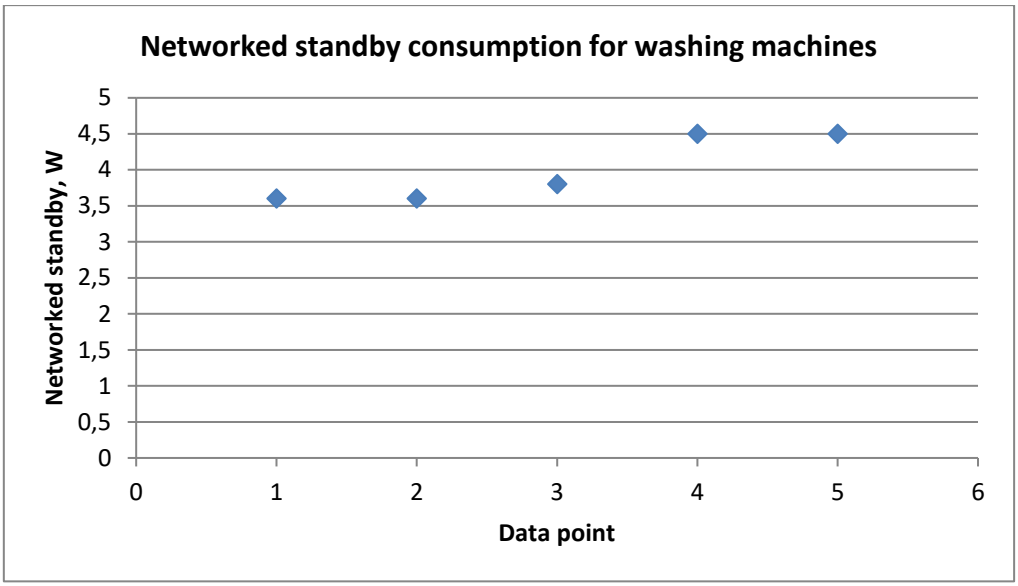

Figure 25. Networked standby consumption for washing machines.

An industry expert within household appliances has, however, stated that white goods manufacturers believe they will comply with both Tier II and Tier III in due time i.e. for all household appliances in scope.

Furthermore, the study team has been informed that one washing machine manufacturer should put a new washing machine on the market in 2016 with a networked standby consumption of 3 W. It is of the knowledge of the study team that other manufacturers are also developing new machines with networked functions, and therefore this information about compliance with Tier II and Tier III requirements becomes relevant.

5.2.2.3 Clothes dryers

Similar to washing machines, there is currently only a few data publicly available on networked clothes dryers: 4 products have been found and their networked standby consumptions complying with current and Tier II requirement, whilst one of the products is compliant already with Tier III requirement (see Figure 26).

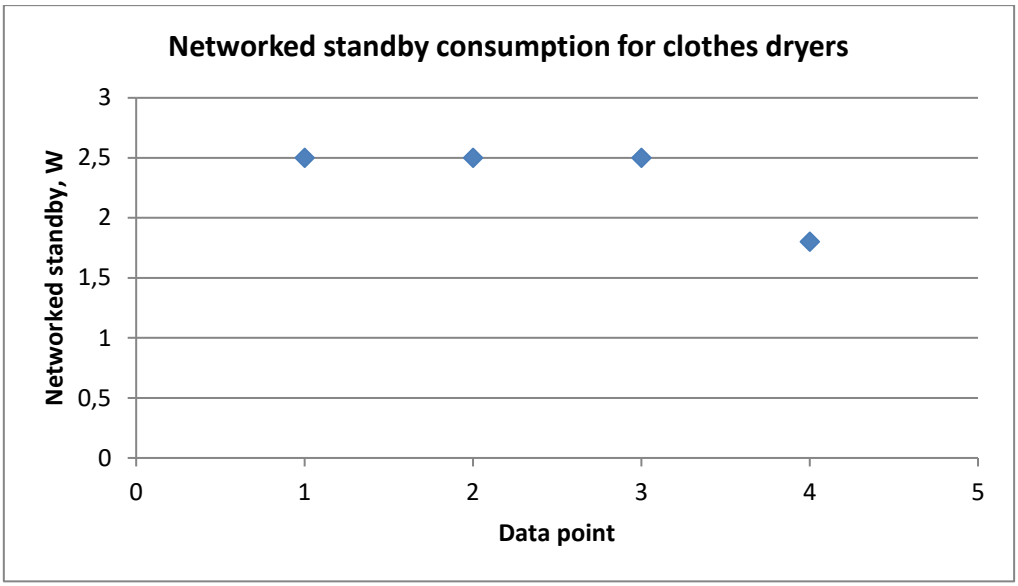

Figure 26. Networked standby consumption for clothes dryers.

5.2.2.4 Dishwashers

Publicly available consumption data on 13 dishwashers models have been found, and all of them are compliant with Tier III requirement already (see Figure 27).

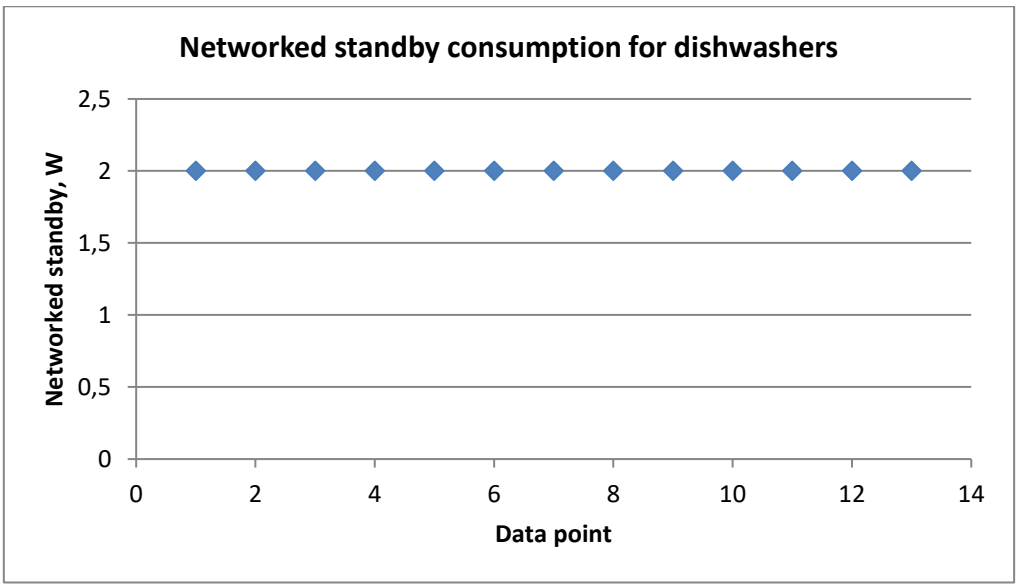

Figure 27. Networked standby consumption for dishwashers.

5.2.2.5 Electric ovens

Networked standby consumption for 13 electric ovens has been found, and all of them are compliant with the current requirement, twelve of them are compliant with Tier II requirement, but none of them comply with Tier III requirement (see Figure 28).

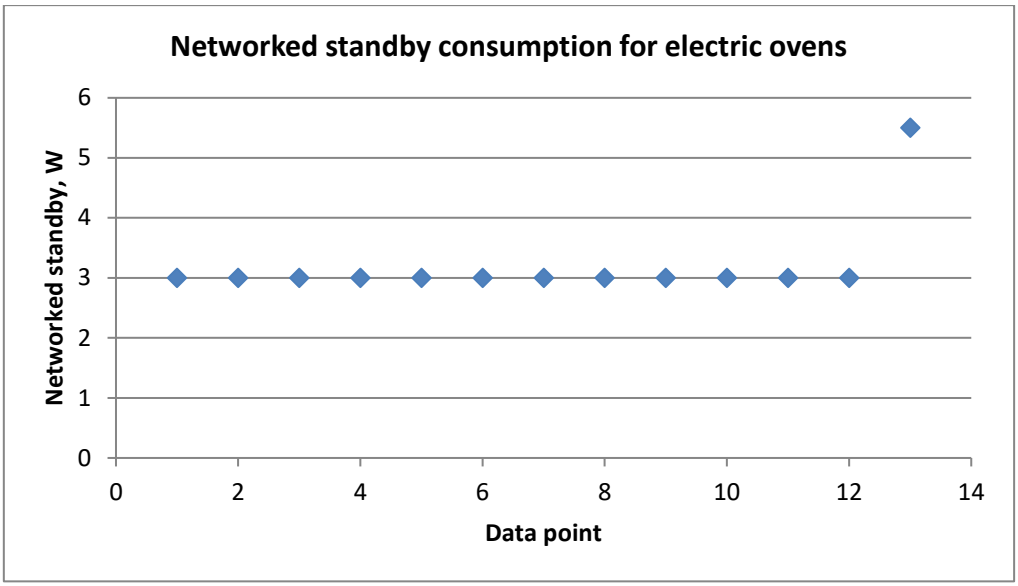

Figure 28. Networked standby consumption for electric ovens.

5.2.2.6 Imaging equipment

Networked standby consumption data has been found for 59 imaging equipment products, where 58 products are compliant with current networked standby requirement and one does not comply. 54 of the products can already comply with Tier II requirement and 46 of them can already meet Tier III requirement (see Figure 29).

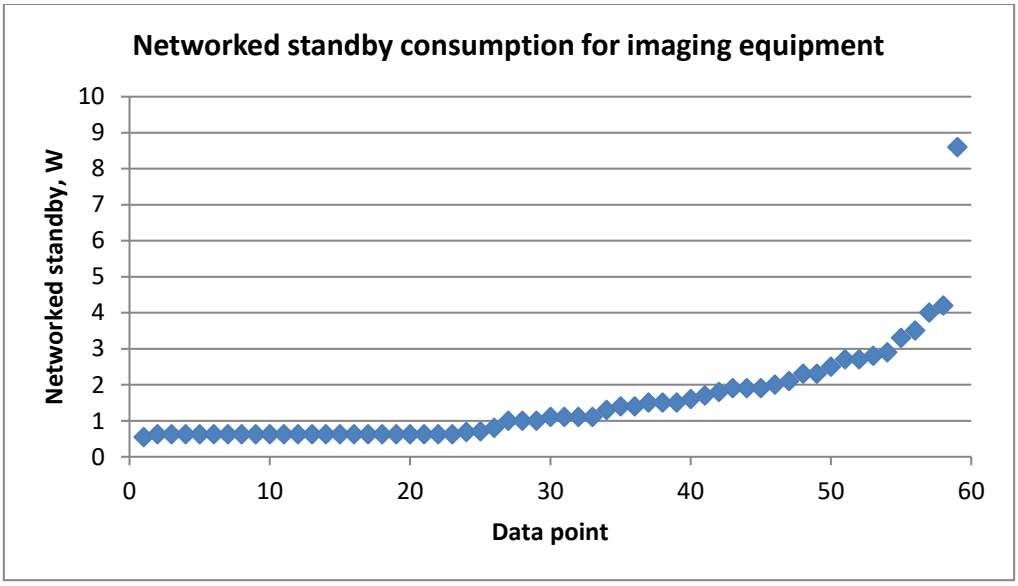

Figure 29. Networked standby consumption for imaging equipment (market data obtained via desk research).

The study team has also analysed data for products registered in the EU ENERGY STAR database. There are only network standby data available for the so-called OM (operational mode) products, where there are ENERGY STAR requirements on sleep and standby. The consumption in sleep with network interfaces active is interpreted the same as network standby consumption according to the Standby Regulation. The OM products do not include standard format printers, copiers, multifunction devices and fax machines

with electro-photographic, solid ink, high performance inkjet, dye sublimation etc. as marking engine. The dataset has been filtered to only include products in scope of the Standby Regulation, i.e. multifunctional units, printers and scanners that have networked standby.

Data from EU ENERGY STAR database for imaging equipment show that approx. 92% of the imagining equipment consume less or equal to 3 W in networked standby (Tier II) and approx. 50% of them already consume less or equal to 2 W (Tier II) – see Figure 30.

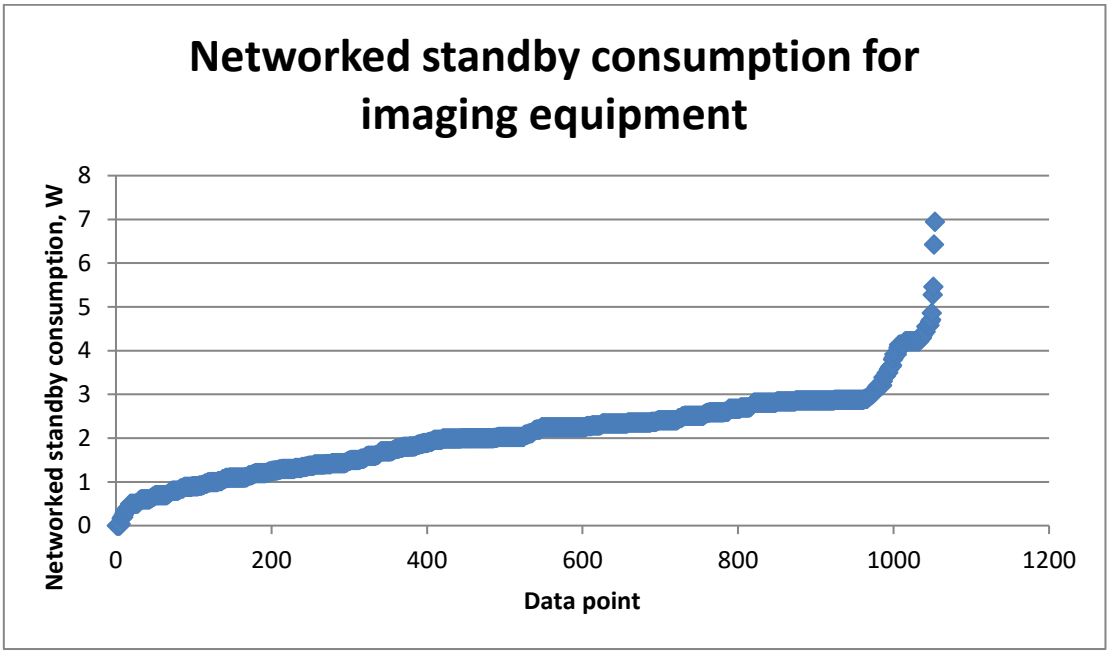

Figure 30. Networked standby consumption for imaging equipment (ENERGY STAR data).

Due to the fact that the definition of networked standby in the Standby Regulation and the ENERGY STAR specification are not fully coherent because ENERGY STAR does not use the term "networked standby" but "sleep" with some additional functionality including network connections, some of the products with high power consumption may not be in network standby.

5.2.2.7 Displays

Concerning displays, networked standby consumption data from the EU ENERGY STAR database for displays including both monitors and signage has been used. Data show that all 281 networked display models are consuming less than 2 W on networked standby. In spite these data includes also monitors, it is therefore concluded that there is no issue of compliance for signage displays (see Figure 31).

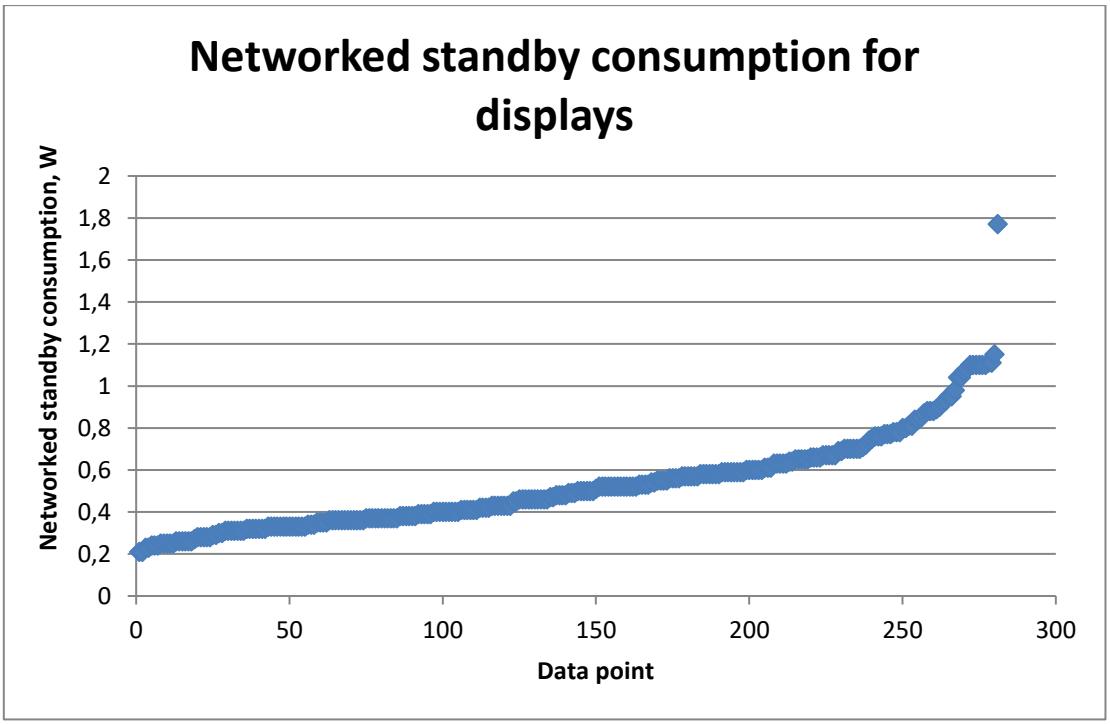

Figure 31. Networked standby consumption for monitors and signage displays.

5.2.2.8 DVD and Blu-ray players

Networked standby consumption has been found for 35 models of DVD and blue-ray players (see Figure 32). 12 of the DVD/Blu-ray players are under 2 W. All of them are compliant with current networked standby requirement. The technology for meeting Tier II requirement is already available and 1/3 of the products are already achieving it, it can therefore be concluded that DVD and Blu-ray players should have no problem meeting the Tier III networked standby requirement.

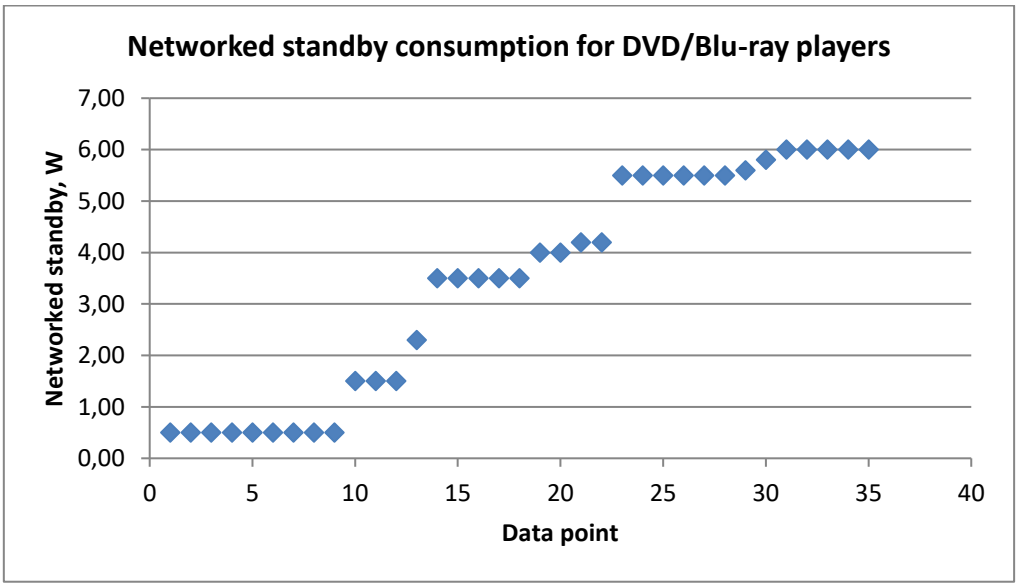

Figure 32. Networked standby consumption for DVD/Blu-ray players.

5.2.2.9 Wireless speakers and audio equipment

When searching the market for these products, the study team found that there are some wireless speakers, typically multi-room speakers, which can connect to several

other devices (speakers and audio sources). This kind of network they are establishing is called a mesh network, which is a network topology in which each node relays data for the network. The individual speakers function as end devices but at the same time multiple clients (other speakers and audio sources) can connect to them. The study team consider these speakers to have HiNA functionality because they "...provide IEEE 802.11 (Wi-Fi) connectivity to multiple clients", which is the part of the definition in the Regulation of 'wireless network access point', which again makes the product a HiNA product or with HiNA functionality. These products were therefore removed from the dataset and are not included in Figure 33.

There are variations of this Wi-Fi mesh network e.g. with a combination of Bluetooth streaming to one speaker, which distributes the audio to one or multiple speakers.

Of the 41 non-HiNA wireless speakers and audio equipment, 22 are under 2 W and the rest between 2.3 W and 6.0 W. One outlier consumes 13 W, but it is not completely certain if the consumption is for networked standby and not another state with additional functionality.

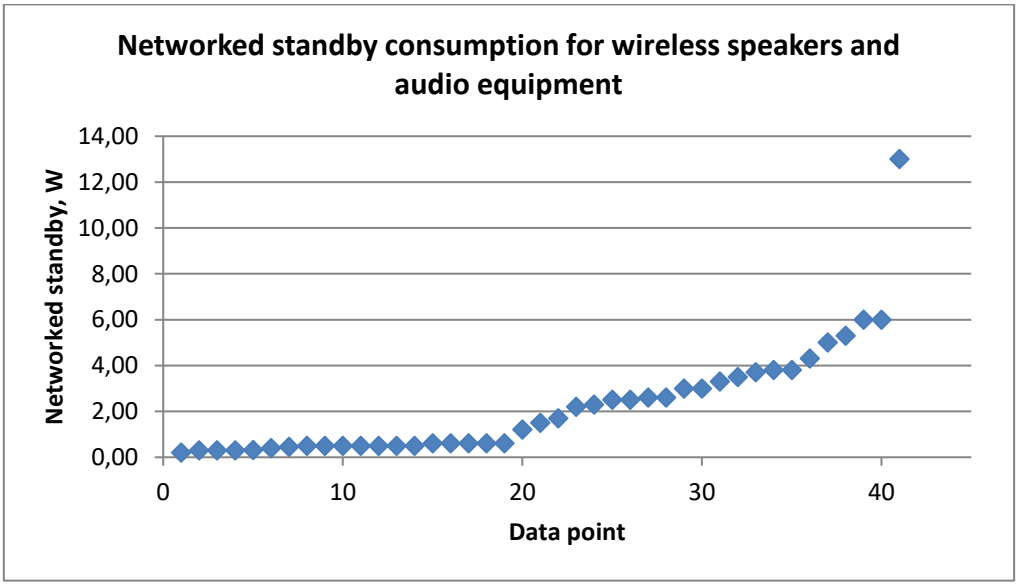

Figure 33. Networked standby consumption for wireless speakers and audio equipment.

We have received data from a manufacturer on a specific audio equipment where the current total network standby power consumption is about 5.5 W. The equipment includes an interface microcomputer, a System-on-a-Chip (SoC) and additional function devices such as audio amplifier, WLAN, Bluetooth, radio-tuner and media-driver. Due to development of the SoC, the networked standby power consumption will be reduced to about 3 W. It is not clear from the material received if this level is achieved while testing according to the verification procedure i.e. with one network port active at a time.

5.2.2.10 Game consoles

There is a voluntary agreement for game consoles recognised by the European Commission. This agreement refers to Standby Regulation 1275/2008 for standby mode definition and amendment 801/2013 for networked standby definition, therefore in principle there should be no problem with harmonising the low power modes in game

consoles. Networked standby consumption data have been found for 6 game consoles. Data from a few older generations have been removed from Figure 34, showing consumption level varying from 0.4 W to 12.9 W. However, there is uncertainty in whether the BAT level 0.4 W is actually a standby mode or networked standby mode, as it could do periodic internet check which spikes up to 13 W but after completing the check, the consumption is returned to 0.4 W.

Out of 6 game consoles, three newer models already meet the Tier III networked standby requirement and five models in total meet current requirement of 6 W. Some game consoles have been measured for networked standby with all wired ports connected and all wireless ports activated, when measured according to the verification procedure, the consumption level should be lower.

We have received data from a manufacturer on a specific game console and according to the manufacturer, the networked standby power consumption has been optimised. The console consumes 1.4 W using wireless connection (at 2.4 GHz) and 1.8 W with wired connection. Though the manufacturer also states that in the worst case, models will consume up to 2.1 W due to statistical variation of the manufactured units.

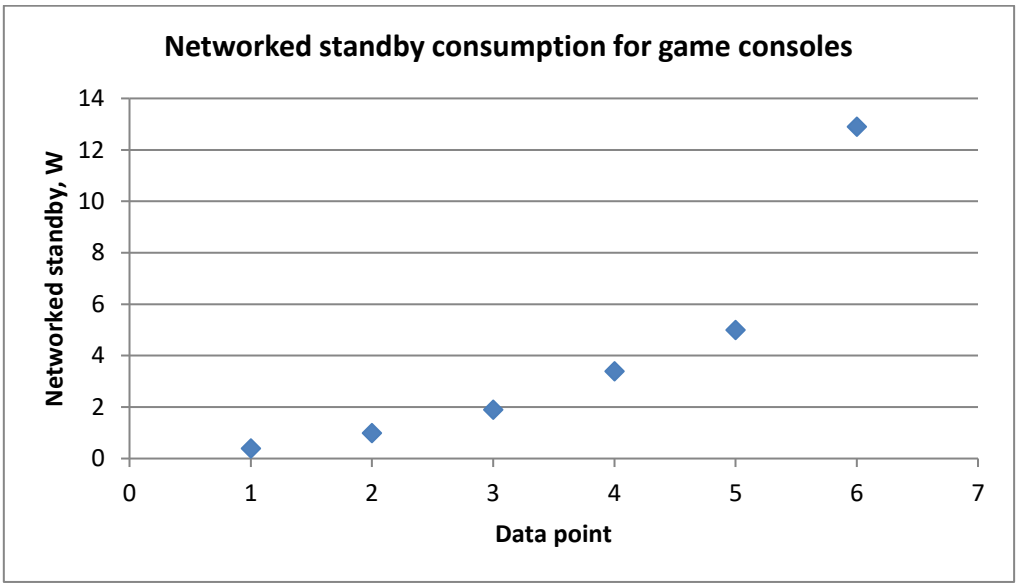

Figure 34. Networked standby consumption for game consoles.

5.2.2.11 Complex set top boxes

At the stakeholder meeting held in October 2015, cable CSTB products (Complex Set Top Box) were highlighted by the industry stakeholders as having most problems in complying with Tier III. Therefore, they have been assessed here.

After the stakeholder meeting, DIGITALEUROPE has submitted a position paper providing power budgets for the voltage conversion (EPS and dc/dc), for standby and for networked standby. The power budget has been provided for an IP CSTB (i.e. internet connected complex set top box) and the values are shown in Table 35.

Table 35. Power budget for an IP CSTB (dc) presented by DIGITALEUROPE.

Component	DC power budget
Main processor	1000mW
Internal Micro Controller Units	100 mW (estimated)
2 LEDs on	2x25mW= 50 mW
Bluetooth + WiFi 802.11 module in mode station	50mW
Micro controller for capacitive keyboard	20 mW
Margin due to dispersion of component 10 %	15mw
Smart card	? but a few mW[63]
TOTAL	**1200mW**

Based on the total dc consumption (1.2 W) and the voltage conversion efficiency from the position paper (EPS 18W - LEVEL VI, 3 W ac, 2.146 W dc -> 0.715), the total ac consumption is 1.7 W. This IP CSTB would then be able to comply with Tier III.

Additionally, the position paper stated that DOCSIS 3.1 interface (for cable modems) consumes more than 2 W dc (2.8 W ac using the above conversion efficiency), which should be added to the power budget, summing up to more than 3.2 W dc. Based on the voltage conversion efficiency above (0.715), the total consumption is 4.5 W and the CSTB would not be able to comply.

The study team has assessed the DOCSIS power levels based on relevant schemes for requirements for CSTB. These schemes use a TEC approach (TEC: Total Energy Consumption), where an annual energy consumption is calculated based on a typical use profile. The schemes use adders for various features such as DOCSIS. Based on the annual kWh adder for DOCSIS, the study team has calculated an average power draw by dividing the annual adder with total number of hours per year: 8760 (see Table 36).

This power level is an average – levelling both standby and on modes according to a defined use pattern. Typically, the power consumption is higher in on mode with high data traffic than in standby mode with low traffic. The power levels indicated below should therefore be seen in light of this consideration. Furthermore, the adder is reflecting the allowed adder for capturing a certain amount of products on the market, which e.g. in the case of ENERGY STAR is about 25 % at the time the requirements are set. Therefore, there are products with consumption levels well below the average power levels in the table.

Table 36. Average power for DOCSIS calculated on TEC adders for various schemes for CSTB.

[63] The position paper provided the power budget like this.

Scheme	Adder Type and kWh/year	Average power W
Voluntary Industry Agreement to improve the energy consumption of Complex Set Top Boxes within the EU **Version 3.1 19 June 2013 Tier 2**	DOCSIS 3.0 50	5.7
Voluntary Industry Agreement to improve the energy consumption of Complex Set Top Boxes within the EU Proposal from the industry group, **Version 4.0 16th July 2015 Tier III**	DOCSIS 3.0 30	3.4
Code of Conduct on Energy Efficiency of Digital TV Service Systems **Version 9 1 July 2013 Tier 2**	DOCSIS 3.0 25	2.9
ENERGY STAR Product Specification for Set-top Boxes **Version 4.1 Rev. Oct-2014**	DOCSIS 20	2.3
ENERGY STAR Product specification for Set-top Boxes **Draft 2 Version 5.0**	DOCSIS 3.X 45	5.1

The study team has furthermore received information on specific IP Complex Set Top Boxes from Swisscom[64]. Swisscom offers this TV box IP1200[65], which was introduced in April 2014. The active standby consumption is 3.8 W, where the box is fully connected and is still online.

The System-On-Chip used in this box (from Marvell) supports a standby mode with power consumptions lower than 0.5 W for the box with the capability to use Wake On LAN and Wake On Wireless LAN. Swisscom did however not implement this mode due to longer boot time.

A new box that Swisscom soon will offer the clients, will consume 0.3-0.4 W in networked standby. These figures are at ac level and can be compared with the above power budget of 1.7 W.

Most important for the low consumption levels is the chip set and how efficient it is to power down parts of the chip which is not used in networked standby. State of the art chip sets supports more power states with lower power consumption levels. The Swisscom TV boxes use cloud video recording and have therefore no disks built in. They have Wi-Fi and Ethernet interfaces.

This level of power consumption is similar to the power consumption of the latest version of Apple TV in networked standby (0.36 W), see section 5.2.3.4.

Assuming a power budget of 0.4 W for the basic functionality based on the data from Swisscom and Apple, the remaining power budget for a DOCSIS 3.1 interface is 1.6 W, which seems to be challenging, but not impossible based on the assessments above.

[64] Personal contact with Mr. Fabio Saegesser, Swisscom
[65] www.swisscom.ch/en/residential/more/save-energy/tv-box-ip1200.html

Additionally, one industry expert has informed the study team that most often, a CSTB with DOCSIS 3.1 would be used as the home internet connection and is therefore a HiNA product and should not comply with the non-HiNA requirements.

The expert said that there are some CSTB with TV channels received over DOCSIS and not used as home internet connection and therefore is a non-HiNA product. The expert said though that this would not be a major problem because there is still development of DOCSIS 3.1 and also for power management functionality and the expectation is that power levels will be brought down.

5.2.2.12 Projectors

Networked projectors have also been highlighted by industry stakeholders as problematic in terms of complying with 2 W in networked standby. Therefore, these have also been assessed. We have collected market data on networked standby consumption for 112 projectors of four different brands[66].

The networked connection is used to show content from connected devices such as computers and mobile devices over the network. Several of the projectors in the dataset (see Table 37) allow multiple devices to connect simultaneously to the projector and these type of projectors would be considered as projectors with HiNA functionality.

Within the timeline of this version of the report, the study team has not received information from the manufacturers about which of the projectors are with HiNA functionality. Therefore, it has not been possible to filter out these products and they are therefore kept in the dataset (see Table 37).

Table 37. Analysis of networked standby for 112 networked projectors.

Data analysis of 112 projectors	
Average networked standby consumption	3.88 W
Not exceeding 6 W of total dataset	87.5 %
Not exceeding 3 W of total dataset	52.7 %
Not exceeding 2 W of total dataset	8.0 %

Except for the SONY projectors, it is uncertain how many projectors of the other three brands in the dataset are HiNA and non-HiNA products without more technical details on these products. If all of the projectors in Table 37 were non HiNA-projectors, then the 2 W limit might be a challenge. However, exclusion of projectors with HiNA functionality would reduce or perhaps even eliminate the issue.

5.2.3 Best Available Technology (BAT)

The opportunities for products to comply with maximum 2.00 W on networked standby have been assessed by analysing the power budgets, i.e. the power needed for the keeping components and circuitry for networked standby active. These include:

- Power supply (internal or external)
- Network interfaces (wired or wireless)

[66] EPSON, SONY, BenQ, JVC

- Other components and circuitry needed in networked standby for being able to re-activate the product, when a network trigger is received e.g. chip for handling the instructions after the network trigger is received, System On Chip (SOC), memory for quick wake-up and safety.

5.2.3.1 Power supply

Power supply losses are typically larger at lower load points. If the active consumption of the product is more than 20 W, the load point would be at 10 % load or less, which may increase the losses.

However, there are still much focus on reduction of power supply losses and also technologies on the market to obtain a more flat efficiency curve. An alternative would be to have a dedicated auxiliary power supply for delivering low power for networked standby and standby/off designed for high efficiency at these power levels. An example of this has been provided in section 5.3: An auxiliary power supply delivering 12V, 3A with 85 % efficiency and a price of 2-3 USD (equivalent to 1.6-2.3 EUR).

Regulative activities include:

- A proposal on revised EPS regulation with the inclusion of a 10 % load point information requirement
- Code of Conduct on Energy Efficiency of External Power Supplies Version 5 setting requirements on 10 % load (e.g. 72 % efficiency at 10 W nominal power, 76 % at 20 W and 78 % at 30 W)

If the efficiency is 80-90 %, the loss would be maximum 0.2 - 0.4 W at 2 W consumption.

5.2.3.2 Network interfaces (wired or wireless)

Based on several sources, main network interfaces used currently excluding Wi-Fi and DOCSIS (see details on DOCSIS in the previous section 5.2.2.11) would have a power consumption at dc level (losses are included under the power supply) of less than 0.5 W. A recent source, the EDNA report[67], states average power consumption of four Ethernet interface products to be 0.59 W (dc), where 2 of the products consume 0.43 W. These data confirm a BAT level of 0.5 W.

There are Wi-Fi networked interfaces of less than 0.05 W, but also of several watts. The EDNA report states an average of three products to be 0.36 W, where the product with lowest consumption consumes 0.14 W.

There is ongoing work for developing a specification for low power Wi-Fi (IEEE 802.11ah) for sub 1 GHz frequency bands. Wi-Fi cards for several frequency bands (currently 2.4 GHz (most typical) and 5 GHz bands) typically have higher consumption levels, but mobile phones are examples of products with several radios (Wi-Fi 2.4 and 5 GHz, LTE, 2G, 3G, Bluetooth and NFC) and with low consumption levels.

The EDNA report reports ZigBee average consumption to be 0.13 W, where the product with lowest consumption consumes 0.09 W.

[67] "Energy Efficiency of the Internet of Things. Technology and Energy Assessment Report. Prepared for IEA 4E EDNA". April 2016.

All in all and with the major developments of network interfaces for mobile devices, non-chargeable battery devices for Internet of Things and networked connected smart appliances, the expectation is that there would be no problem in reaching 0.6 W (dc) for network interfaces.

5.2.3.3 Other components and circuitry

In the networked standby the product should mainly be able to be activated by a network trigger. Therefore, most other components and circuitry should be powered down.

However, there might be need some components and circuitry for fast wake-up (though not required by the regulation) and other features.

Counting from the allowed maximum power level of 2 W and subtracting the power supply loss and network interface, the power budget for other components and circuitry would be at least 1.2 W (dc).

5.2.3.4 Apple TV as a benchmark product

The study team has looked at the most recent version of the Apple TV, because it can be considered as a relevant benchmark for networked standby consumption for electronic devices.

This version was introduced in September 2015. The Apple TV is a TV box, which connects to a TV via an HDMI 1.4 connection. It connects to a local area network via Wi-Fi (802.11ac) and 10/100 BASE-T Ethernet. Media can be streamed via Airplay or via internet (Netflix, Hulu, iTunes, HBO NOW and SHOWTIME) and games can be played.

Apple TV uses the A8 chip, which is a 64-bit ARM based system on a chip (SoC). It is also used in the iPhone 6 and iPhone 6 Plus.

The power consumption in networked standby is very low: 0.36 W (at 230 V)[68].

It is naturally not possible to make the conclusion that all networked products could achieve this low level of power consumption in networked standby. Partly because other networked products may need to have additional components active in networked standby, partly because the Apple TV is a relatively high priced product (115 EUR (32 GB)-150 EUR (64 GB), US prices converted to EUR). However, it can be used as a BAT product for consumer equipment (according to product categorisation in Annex I), as the function it delivers fits the scope defined for this product group.

5.2.4 Market estimation and growth

As the demand for smarter control of electronic and consumer devices, household appliances and other household and office products increase, more and more traditionally offline products are now becoming networked. The market for non-HiNA products is growing in the recent years and it is estimated that all common household appliances would become networked in the next 10 years[69].

Based on the recent market trend and stock figures from preparatory studies for Lot 6 and Lot 26 as well as Ecodesign Impact Accounting report[70], the stock of non-HiNA equipment has been estimated (see Table 38). The estimated stock for some products

[68] www.apple.com/environment/pdf/products/appletv/AppleTV_PER_oct2015pdf.pdf
[69] Interview with Miele representative, IFA Messe, Berlin, 2014
[70] VHK (2013), Ecodesign Impact Accounting Part 1 - status

has been modified from estimated stock from preparatory studies in light of the recent technological development, i.e. home phones, NAS and simple and complex players/recorders are expected to have less growth. Furthermore, it is assumed that 10% of all the household appliances in the EU market are networked in 2017 and that all household appliances are networked by 2026.

Audio speakers were based on the stock for PC speakers originally from Lot 6 preparatory study and it is assumed that the demand for PC speakers is diminishing due to the replacement of wireless speakers which can be used by computers and other electronic devices such as smartphones. 10% of the audio speakers stock is assumed to be networked in 2013 and reach 100% networked by 2017. Similarly for DVD players and audio mini-systems, 10% of stock is assumed to be networked in 2013 and reach 100% by 2022. The rest of the products listed below are assumed to be networked currently and remain networked up to 2030. The estimated stock is shown in Table 38.

Table 38. Stock of non-HiNA equipment (million units).

Category	Product	2020	2025	2030
Household appliances	Electric oven	30	68	76
	Washing machine	78	179	202
	Clothes dryers	29	68	78
	Dishwashers	46	119	149
	Electric hobs	65	159	189
	Coffee makers	65	149	171
Consumer equipment	Audio speakers	49	40	31
	DVD players	203	311	369
	Audio minisystem	93	117	118
Information technology	Home NAS (Networked Attached Storage)	41	41	41
	Home Inkjet Printer/MFD	84	88	93
	Home EP Printer	7	8	9
	Home Phones	141	141	141
Consumer equipment	Simple Set Top Box	123	109	99
	Complex Set Top Box	113	129	151
	Simple Player/Recorder	190	168	152
	Complex Player/Recorder	28	31	37
Leisure equipment	Game Console	34	39	45
Information technology	Office Inkjet Printer/MFD	23	23	23
	Office EP Printer	10	10	10
	Office Phones	85	90	96
Total		**1535**	**2085**	**2277**

5.2.5 Potential energy savings

Potential energy savings are calculated for Tier III networked requirement for non-HiNA equipment. The result can be seen as the potential energy savings that would be lost if Tier III of non-HiNA equipment requirements is removed.

It is assumed that the BAU scenario is to keep the regulation as it is and the networked standby for non-HiNA equipment is tightened to 2 W in 2019. The total stocks of above presented products gradually shift towards 2 W during a period of ten years.

The alternative scenario assumes that Tier III requirement is removed, and therefore all non-HiNA equipment remains at 3 W during networked standby (see Figure 35).

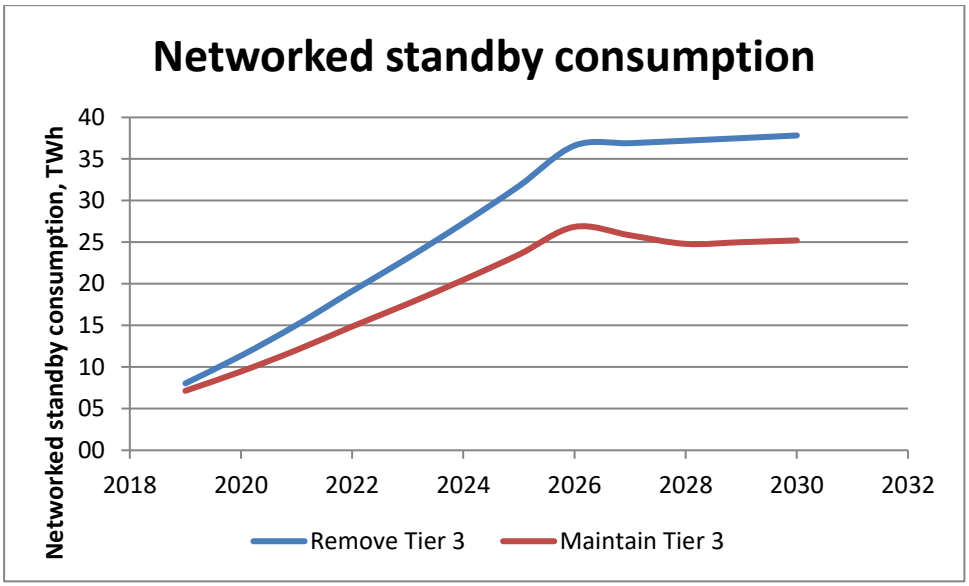

Figure 35. Networked standby consumption for removing Tier III and maintaining Tier III requirements.

It is assumed that the stock of products will all change to either 2 W or 3 W over the course of 10 years from the year the requirement comes into force. By removing Tier III scenario, the consumption limit of 3 W comes into force from 2017, and so it is assumed that by 2026 all stock would be changed so they all meet 3 W networked standby. For maintaining Tier III scenario, all stocks will start to change from 2019 and by 2028 all stock would be compliant with 2 W networked standby. The total energy savings potential are presented in Table 39.

Table 39. Annual energy savings from Tier III networked standby requirement.

Category	Product	Annual energy savings from Tier III requirement, TWh/year		
		2020	2025	2030
Household appliances	Electric oven	0.1	0.4	0.7
	Washing machine	0.0	0.1	0.2
	Clothes dryers	0.0	0.0	0.0
	Dishwashers	0.0	0.0	0.0
	Electric hobs	0.1	1.0	1.6
	Coffee makers	0.1	0.4	0.7
Consumer equipment	Audio speakers	0.0	0.1	0.1
	DVD players	0.2	1.2	2.1
	Audio minisystem	0.1	0.5	0.7
Information technology	Home NAS (Networked Attached Storage)	0.1	0.2	0.3
	Home Inkjet Printer/MFD	0.1	0.4	0.6
	Home EP Printer	0.0	0.0	0.1
	Home Phones	0.2	0.8	1.1
Consumer equipment	Simple Set Top Box	0.2	0.6	0.7
	Complex Set Top Box	0.2	0.6	1.0
	Simple Player/Recorder	0.3	0.9	1.2
	Complex Player/Recorder	0.0	0.2	0.3
Leisure equipment	Game Console	0.0	0.1	0.2
Information technology	Office Inkjet Printer/MFD	0.0	0.1	0.1
	Office EP Printer	0.0	0.0	0.1
	Office Phones	0.1	0.5	0.7
Total		**1.9**	**8.2**	**12.6**

5.2.6 Revising definition of wireless access points

An industry representative asked quite late in the review study process about considering to revise the definition of wireless access points to include other wireless technologies than Wi-Fi (IEEE 802.11). Wireless access point is defined in Article 2, 22 as:

'wireless network access point' means a device whose primary function is to provide IEEE 802.11 (Wi-Fi) connectivity to multiple clients.

One important consequence for a product being defined as a wireless network access point is that it will be characterised as HiNA equipment or equipment with HiNA functionality and thereby be allowed a higher power level in networked standby and should therefore not comply with Tier III for non-HiNA equipment. The representative mentioned the following wireless technologies as relevant to include in the definition:

- Other Wi-Fi technologies such as repeaters and extenders
- DECT phone base stations
- Bluetooth and Bluetooth Low Power
- Zigbee

- RF4CE (sub-category of ZigBee)
- NFC

Regarding Wi-Fi repeaters and extenders, it is the study team's opinion that these are falling under the current definition of wireless network access point, because their primary function is to provide Wi-Fi connectivity to multiple clients.

Regarding DECT phone, there should be no problem in meeting the 2 W limit in Tier III for non-HiNA because the current ENERGY STAR specification for telephony (not adopted in EU) has a limit for analogue public switched telephone network (PSTN) phones (not being VoIP or hybrid phones) of 1.3 W for cordless phones. There are currently 125 certified cordless phones in the US EPA database. Average consumption is 0.7 W, lowest consumption is 0.1 W and highest is 1.3 W.

Regarding the other wireless technologies included above, these are basically low consuming wireless technologies (see also Section 5.2.3.2 Network interfaces (wired or wireless)) and they should have no problem in complying with Tier III.

Overall, the study team does not see that there is a need to revise the current definition of wireless network access point on the basis of the information collected from the industry representative.

At the same time, the study team believes that an extension of definition to cover all kind of wireless technologies would require a more substantial market analysis to collect data for this kind of wireless access points and analyse the data, than is included in the scope of this review.

5.2.7 Conclusions

The overall conclusion is that there is large energy saving potential of approximately 8.2 TWh/year by 2025 and 12.6 TWh/per year by 2030 if Tier III will be maintained.

The majority of the products on the market will have no problems in complying with the requirements. Some CSTB, mainly with DOCSIS 3.1, and some projectors may have more challenges in complying.

5.3 Assessment of removal of the exemption from networked standby requirements for large format printing equipment

5.3.1 Introduction

The Regulation 1275/2008 exempts large format printing equipment from the Tier I (since 1 January 2015), Tier II (from 1 January 2017) and Tier III (from 1 January 2019) requirements on power consumption limits in a condition providing networked standby. These printers are not exempted from the other requirements in the regulation (e.g. standby/off-availability, power management, information, deactivation network connections)

This means also that:

- If the large format printer is not a networked equipment, it should comply with all the relevant requirements including availability, power consumption and power management in off mode and/or standby modes.
- If the large format printer is a networked equipment, it should have a power management function switching the printer into networked standby and it should offer a possibility of deactivating wireless network connection(s). This means that the large format printing equipment is allowed to consume more in networked standby than the limits provided in the regulation, but it should still power down.

Both networked equipment and other equipment should comply with the product information requirements and information to be provided by manufacturers.

In this section, the possibility of removing the exemption is assessed.

5.3.2 Scope

The current definition of large format printing equipment in the regulation is: '*printing equipment designed for printing on A2 media and larger, including equipment designed to accommodate continuous-form media of at least 406 mm width*.'

It is worth noticing that printers fall under Annex I (List of energy-using products covered by this regulation) point 2 information technology equipment, where only equipment intended primarily for use in the domestic environment – corresponding to class B equipment as set out in EN 55022:2006 – is in scope. Many printers used nowadays in office environments, including large format printing equipment, are class A and are as such out of scope. However, they are used in office environments and fit the regulation's definition of 'electrical and electronic household and office equipment' (i.e. Article 2). It is under this reasoning that, in spite some of these printers are class A, all the large format printing equipment fitting under the article 2 definition are assessed in this chapter. Due to the absence of distinction on the classes (A/B) in the available data, and because the review should also address professional equipment, the printing equipment is analysed independently of the class.

The scope is limited to large format printers for office use such as for printing drawings, plans, posters etc. in connection to CAD (Computer Aided Design), GIS (Geographical Information System), technical design, marketing material in engineering companies, architects, construction companies, advertising agency, public administrations, etc. and only products to be connected to the mains with nominal voltage rating of 250 V or below i.e. one-phase products. Products may be MFDs (multifunctional devices), which in addition to printing are able to scan and copy.

Definition of the scope could be based on the product segmentation used by InfoTrends (a market research and strategic consulting firm for the digital imaging and document solutions industry[71]), which is also referred to in the Lot 4 task 2 report and where "Workgroup" would be the relevant segment for large format printers. See the product segmentation below in Table 40.

Table 40. Product segmentation from Lot 4 task 2 report.

Environment	Description	Typical Number of users
Personal	A personal device is generally designed to support a single individual or a very small group (including families). Users generally take responsibility for care and maintenance of the device on an as-needed basis.	1 – 4 worker
Workgroup	A Workgroup device is a shared resource with which individual users produce their own documents. The device is not usually under the control of a single individual. Workgroup devices are found in organisations of all sizes. They may support an entire small business or several groups within larger businesses. This environment may be further divided into larger and smaller workgroups.	Smaller Workgroups consist of 5 – 24 workers. Larger Workgroups consist of 25 – 100 workers.
Production	Production devices are typically controlled by trained operators that produce documents for others at high speeds, high volumes or both.	The number of users typically includes and entire business enter-prise. Devices in print-for-pay and data processing plants are also found in this environment.

Large format printers use typically the following marking engines: Ink-jet, High Performance ink-jet, electro-photographic, solid ink and impact. Printers – also large format printers – with more computing power for the printing and added functionality use a so-called DFE (Digital Front-End), which is a functionally-integrated server or computer that acts as an interface to the printer. The consumption of DFEs should not be included, when measuring the large format printers' consumption. This is possible to do when using the ENERGY STAR specification[72] and test method[73].

According to ENERGY STAR a DFE is and add-on device that offers three or more of the following advanced features:

- Network connectivity in various environments;
- Mailbox functionality;
- Job queue management;
- Machine management (e.g., waking the Imaging Equipment from a reduced power state);
- Advanced graphic user-interface (UI);
- Ability to initiate communication with other host servers and client computers (e.g. scanning to email, polling remote mailboxes for jobs); or
- Ability to post-process pages (e.g., reformatting pages prior to printing).

Some DFEs are powered separately with a connection directly to the mains (Type 1 DFE) and others are powered from the printers' power supply via a dc connection (Type 2 DFE). Type 2 DFEs must have a board or assembly with a separate processing unit that is

[71] [71] http://infotrends.com/public/home.html
[72] ENERGY STAR® Product Specification for Imaging Equipment. Eligibility Criteria Version 2.0. Rev. Oct-2014.
[73] ENERGY STAR® Program Requirements. Product Specification for Imaging Equipment. Test Method for Determining Imaging Equipment Energy Use. Rev. Sep-2014.

capable of initiating activity over the network and can be physically removed, isolated, or disabled using common engineering practices to allow power measurements to be made.

The ENERGY STAR test method specifies the measurement of the DFE (ready mode and sleep mode). For ENERGY STAR compliant DFEs, the DFE consumption is not included in the consumption of the Imaging Equipment when assessing compliance with ENERGY STAR. The product specification describes how to subtract the DFE consumption from the overall product consumption, when the DFE is powered through the Imaging Equipment power supply: The dc consumption measured should be divided by 0.60 to account for internal power supply losses.

Thus, it is possible to separate the energy consumption of the DFE from the overall consumption of the large format printers and then having a figure for the printer itself.

5.3.3 Alignment with other standards, regulations and voluntary schemes

5.3.3.1 ENERGY STAR

Large format printers are covered by ENERGY STAR Imaging Equipment Specification version 2.0 as a product group under the OM (Operational Mode) requirements. Imaging Equipment is under the US-EU agreement on ENERGY STAR and the specification is adopted in both USA and EU. All one-phase products (i.e. with nominal voltage rating ≤ 250V) are included in scope and there is no distinguishing between class A and class B (i.e. both classes are covered).

The requirements specified for maximum power consumption in standby and networked standby (corresponds to "sleep mode" in the ENERGY STAR specification) are:

- Standby: 0.5 W
- Networked standby:
    - Inkjet: 4.9 W + functional adders for interface, memory, touch panel display and internal disk drives (those relevant for large format printers)
    - Impact and all other (incl. High Performance Ink Jet): 2.5 W + functional adders (as above mentioned)

An inkjet printer with Gigabit Ethernet network interface, 1 GB RAM, touch panel display and internal disk drives may consume maximum 6.25 W, while a similar printer with all other marking technologies may consume maximum 3.85 W. These figures should be compared with levels in 1275/2008 for non-HiNA: 6 W currently (Tier I), 3 W from 1 January 2017 (Tier II) and 2 W from 1 January 2019 (Tier III).

The ENERGY STAR requirements were developed during 2013 and took effect on 1 January 2014. Even though the goal is that the requirements should be set at level allowing 25 % of the products on the market to qualify (i.e. at the time of setting the requirements, not the effective date), the penetration rate is continuously increasing due to the market development. The US EPA and the European Commission therefore plan to revise the requirements during 2016.

Data collected and analysed as part of the work by Intertek and IDC for the European Commission and, reported in the most recent report (Q1-Q2 2015) [74], shows that ENERGY STAR qualification rate by sales volume Q1-Q2 2015 of all standard format imaging equipment was 71 %. However, the report states: "IDC insights suggest that all

[74] ENER/C3/2014-561 Support for ENERGY STAR Impact Assessment and Market Penetration Survey

large imaging equipment vendors claim that the full range of their imaging products meet the ENERGY STAR v2.0 specification." This means that for the products covered, the penetration rate is close to 100 %.[75]

The study team assumes that large format printing equipment in broad terms may have a smaller increase in ENERGY STAR penetration rates than that of standard format imaging equipment, due to not being part of the Voluntary Industry Agreement (see next section). However, due to the technical development, there will still be an important increase in penetration rate.

All in all, it is assumed that the majority of the large format printers on the market are compliant with the levels in the ENERGY STAR Imaging Equipment v.2.0 specification and that the dataset from registered products would be a valid representation of the market (see sections 4.4, 4.5 and 4.6).

Regarding the distribution of products on class A and class B, the study team has requested data or estimations from DIGITALEUROPE, but have not received any input within the deadline of the publication of this report. Our assumption based on communication with a few of the manufacturers is that half of the models are class A.

5.3.3.2 Lot 4 Imaging Equipment and Voluntary Agreement

Lot 4 preparatory study on imaging equipment resulted in a Voluntary Industry Agreement. The first version was signed on 16 February 2011. The most recent update is version 5.2 (from April 2015), which, as the previous versions, has been endorsed by the European Commission as a valid alternative to an ecodesign implementing measure.

Even though the energy requirements follow ENERGY STAR version 2.0 specification, the scope is limited compared to the specification and inter alia only standard format equipment are covered. I.e. large format equipment is not covered by the Voluntary Agreement. In Section 7.4.2.1 the Voluntary Agreement is described in further details.

5.3.4 Analyses of standby/off modes and networked standby consumption

The power consumption analyses have been based on a dataset from the EU ENERGY STAR database. The database contains, as of mid-February 2016, 133 large format printers and MFDs. The dataset contains required product parameters and energy consumption data.

In the following the dataset is described in terms of relevant parameters:

- Product types:
  - Printers: 105 units
  - MFDs: 28 units
- Marking engines:
  - Electro-photographic (EP): 30 units
  - High Performance IJ: 1 unit
  - Impact: 13 units
  - Ink Jet (IJ): 85 units
  - Solid Ink (SI): 4 units
- Year tested:

[75] No data on ENERGY STAR penetrations rates for large format printing equipment is available. DIGITALEUROPE has neither being able to provide any input here but stated that the penetration rate is below 100 %.

    - 2012: 8 units
    - 2013: 32 units
    - 2014: 24 units
    - 2015: 7 units
    - No information: 62 units
- With DFE:
    - Yes: 68 units (21 with own AC power supply, 47 draw power from product)
    - No: 65 units
- Registered at European Commission or at US EPA:
    - EC: 71 units
    - US EPA: 62 units

Brief conclusion is that most of the products are printers only, most are ink-jets, more than half of the devices with test date are designed more than 2 years ago, about half of the products are more powerful products with a DFE attached or embedded, and more than half of the products are registered directly in EU.

In the following, an analysis of the standby/off and the networked standby consumption is presented. Under the assumption that products with DFEs are larger and more powerful devices, a separate calculation for products with DFE and products without DFE has been done, which is shown in the following.

Figure 36 and Table 41 show the standby/off consumption for all products in the dataset.

It is clear to see that standby/off consumption is quite low compared to the mandatory maximum level (0.5 W); 59 % are below 0.2 W. Average of all 133 products is 0.17 W, while it is 0.26 W for products without DFE and 0.17 W for products with DFE.

The conclusion is that products with DFE have less difficulty to comply with lower limits than products without DFE.

Figure 37 and Table 42 show the networked standby (sleep with network interface) consumption for all products in the dataset.

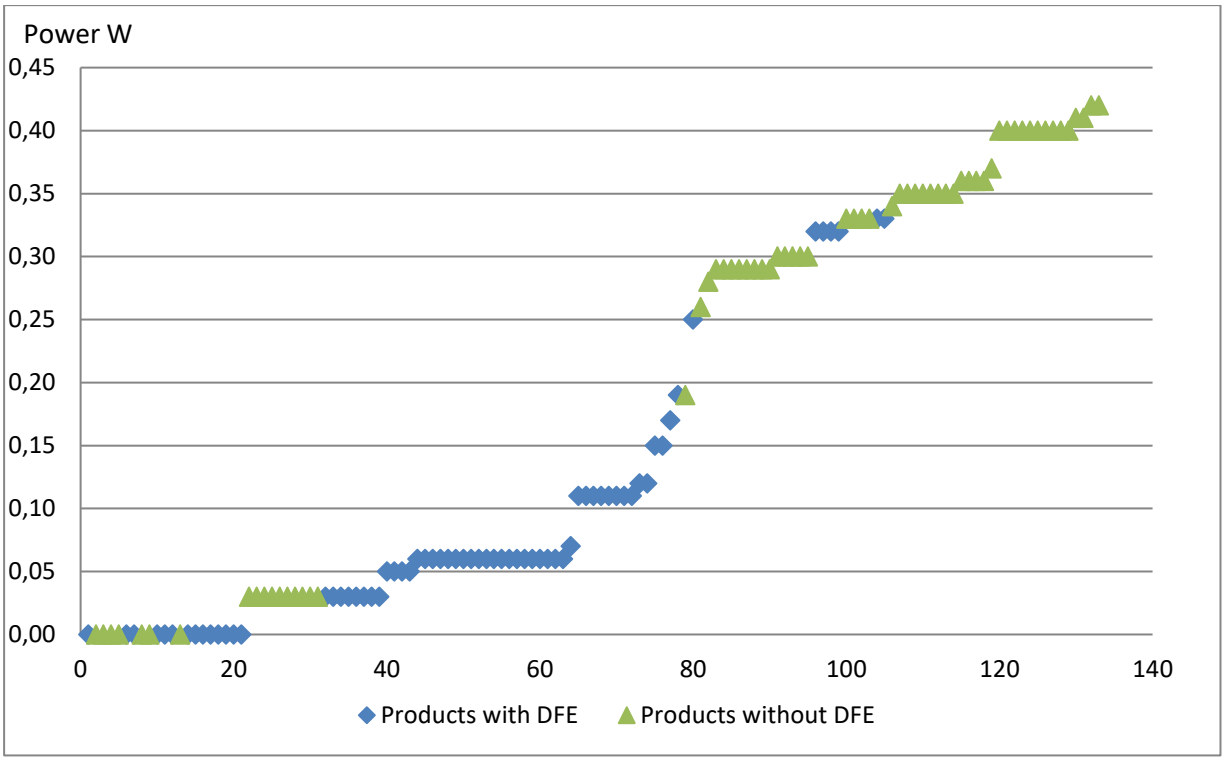

Figure 36. Standby/off consumption (excluding DFE consumption) for large format printers.

Table 41. Standby/off consumption (excluding DFE consumption) for large format printers.

	All			Products with DFE			Products without DFE		
Power W	Counts	%	% accum.	Counts	%	% accum.	Counts	%	% accum.
0.00 - 0.10	64	48	48	47	69	69	17	26	26
0.10 - 0.20	15	11	59	14	21	90	1	2	28
0.20 - 0.30	16	12	71	1	1	91	15	23	51
0.30 - 0.40	34	26	97	6	9	100	28	43	94
0.40 - 0.50	4	3	100	0	0	100	4	6	100
Total	133	100		68	100		65	100	

Intervals include the upper limit.

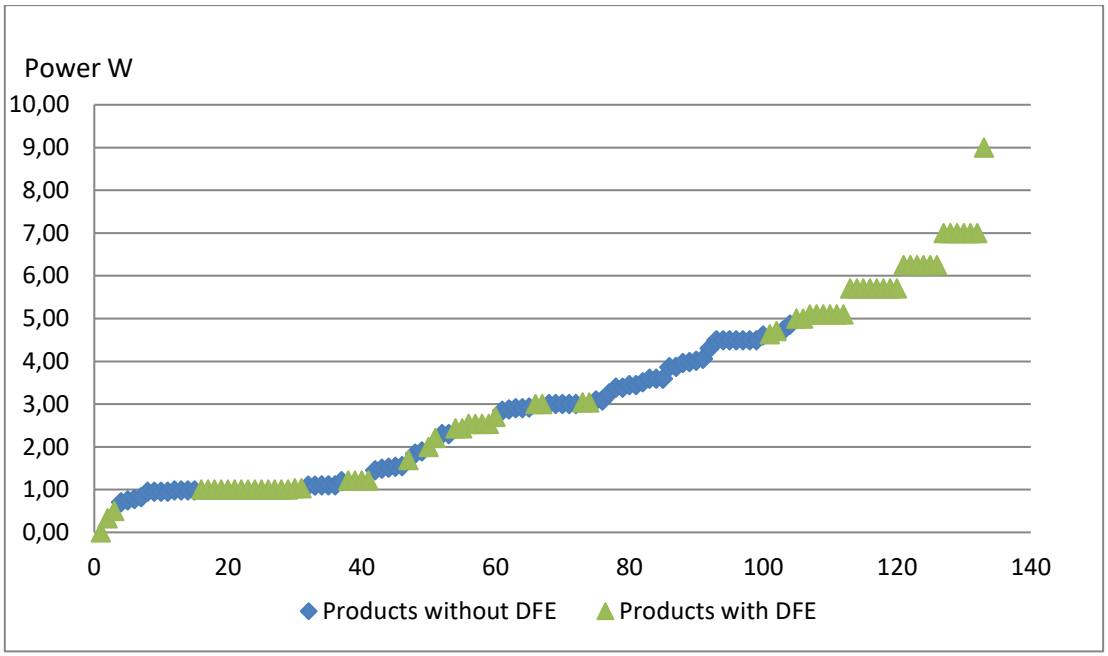

Figure 37. Networked standby (sleep with network interface) (excluding DFE consumption) for large format printers.

Table 42. Networked standby (sleep with network interface) (excluding DFE consumption) for large format printers (all and products with and without DFEs).

	All			Products with DFE			Products without DFE		
Power W	Counts	%	% accum.	Counts	%	% accum.	Counts	%	% accum.
0.00 - 1.00	29	22	22	17	25	25	12	18	18
1.00 - 2.00	21	16	38	8	12	37	13	20	38
2.00 - 3.00	22	17	54	10	15	51	12	18	57
3.00 - 4.00	17	13	67	2	3	54	15	23	80
4.00 - 5.00	17	13	80	4	6	60	13	20	100
5.00 - 6.00	14	11	90	14	21	81	0	0	100
6.00 - 7.00	12	9	99	12	18	99	0	0	100
7.00 - 8.00	0	0	99	0	0	99	0	0	100
8.00 - 9.00	1	1	100	1	1	100	0	0	100
Total	133	100		68	100		65	100	

Intervals include the upper limit.

The data shows overall that 90 % complies with the current network standby consumption (non-HiNA). 54 % complies with the 2nd stage limit of 3 W (1 January 2017) and 38 % complies with the 3rd stage limit of 2 W (1 January 2019). Average consumption is 3.12 W.

Average networked standby power for products without DFE is 2.67 W, while it is 3.55 W with DFE. It is also clear that products without DFE are more concentrated in the lower end, while products with DFE are in the higher end, though still all but one below 7 W.

5.3.4.1 Technological solutions for reducing standby/off and networked standby power levels

The data analyses above show that there is a substantial amount of products which comply with lower levels than 0.5 W in standby/off modes (e.g. 59 % for 0.2 W) and 2 W in networked standby (38 %), and therefore it is assumed that there should be no technical issues in bringing down higher power levels. As mentioned previously, more

than half of the devices (in dataset with date of test) are designed more than 2 years ago, and it is expected that the technological development until today and in the future will result in lower standby/off and networked standby levels for new and future products.

Furthermore, for the products not complying there are technical solutions to reduce the power levels.

For standby/off the main active components in the mode are the power supply and the electronics needed for switching on via a soft on button and internal signal (e.g. a timer).

For networked standby, there is additionally a need for an active network interface, typically wired Ethernet connection for large format printers.

Power supply losses may be too high compared to the maximum level due to having only one power supply installed with low efficiency at low load. According to an industry expert, it is possible to add an auxiliary power supply delivering 0.1 W up to 30 W for low power modes with a Bill of Material (BoM) cost of around 2-3 USD (equivalent to 1.6-2.3 EUR). Examples of the price levels of power supply electronics can be seen on a Chinese website for sourcing EPS[76]. E.g. a 12V, 3A EPS with 85 % efficiency and CE certificate with a minimum order of 50 pieces are sold at 2-3 USD.

A wired Ethernet interface would typically not consume more than 0.5-1 W. The ENERGY STAR Imaging Equipment specification allows an adder of 0.4 and 0.5 for 100 Mb and 1 Gb Ethernet interfaces (at AC level).

A shift in power supply and network interface would require a smaller redesign of the product.

DIGITALEUROPE comments for all imaging equipment – not only large format printers – are that it would be possible to comply with Tier II of networked standby requirements (3 W), but it would be more demanding for Tier III (2 W). DIGITALEUROPE furthermore states that the BoM costs of an auxiliary power supply would be higher than the stated above, but does not provide any information on what the cost would then be.

5.3.5 Market estimation and growth

The market for large format printers has been estimated based on IDC's global shipment figures of large format printers for the second quarter of 2014 and 2015, with 77,200 units and 78,200 units respectively.

The global quarterly shipment is scaled up to annual figures and scaled down to EU figures based on the GDP % for the EU countries out of the global GDP. The annual growth rate is assumed the same as the global rate (i.e. 1.3%), given by IDC estimate.

The sales for the EU are thus estimated and shown in Table 43. Assuming the product lifetime of 10 years, the total stock in the EU is also estimated.

[76] http://waweis.en.alibaba.com/productgrouplist-801270815/Fashional_Laptop_Adapters.html

Table 43. Annual sales growth rates and stock for large format printers in the EU.

	2015	2020	2025	2030
Annual sales (units)	74,134	79,061	84,316	89,920
Growth rate (%)	1.3%	1.3%	1.3%	1.3%
Stock (units)	699,688	746,560	796,258	849,183

5.3.6 Potential energy savings

The potential energy savings from large format printers come from the estimated amount of printers currently not meeting the networked standby requirement (i.e. Tier II). These products would need to be changed and comply with the requirement, from the assumed time point of 2018.

The annual sales presented in Table 43 have been allocated to the different range of networked standby consumption ranges shown previously. In this way, the approx. amount of printers which consume more than 3 W in 2018 and 2 W from 2019 onwards have been estimated. These products have an assumed average networked standby consumption of 5 W, and based on this figure the potential savings from reducing 5 W to 3 W in 2018 and then 2 W from 2019 onwards have been estimated as shown in Table 44.

Table 44. Potential energy savings from estimated stock in EU for large format printing equipment.

	2020	2025	2030
Annual savings (GWh/year)	2.0	6.4	8.9
Cumulative savings (GWh)	3.7	26.8	68.6

The potential energy savings are relatively small due to the low annual sales of these products and due to the fact that approx. one third of the sales already meet the Tier II or Tier III requirement of networked standby.

5.3.7 Conclusions

Based on the analyses made, the majority of the larger format printing equipment would be able to comply with the current networked standby requirements and with smaller redesigns, also for Tier II and Tier III. Furthermore, the majority of the products would also be able to meet stricter standby/off requirements than the current 0.5 W.

Regarding the definition of products in scope, the Class A/Class B delineation seems not optimal for large format printing equipment, because many of the products are Class A even though they are meant for offices as normal printers, displays, computers, etc. See the analysis of use of Class A / B for defining products in scope in section 4.3.

However, the potential energy savings are rather small based on the estimated stock. In spite the stock is based on many assumptions, it is not expected that the figures would be considerably higher for these kind of products. Therefore, justification for a possible removal of the exemption from the power consumption limits in networked standby for large format printing equipment would primarily not be based on the potential savings but rather on the other results of this analysis which show that it is not needed to have this exemption and also to ensure consistency with other products in the Standby Regulation.

A main assumption is that the redesign costs including the costs of Bill of Material are marginal as stated in this section.

If the exemption of large format printing equipment would be removed, it could be considered to revise the existing definition of large format printers to reflect those in scope used in household as well as in offices:

'Large format printing equipment' means printing equipment designed for printing on A2 media and larger, including equipment designed to accommodate continuous-form media of at least 406 mm width used in households and offices as personal device or workgroup device for intermittent printing.'

6 Clarifications of terms and definitions

6.1 Introduction

Regulations need to be complied with by the manufacturers and enforced by Market Surveillance Authorities (MSAs) in Member States, and therefore the definitions, description of energy-using products covered, description of ecodesign requirements, etc. used in the Commission Regulation 1275/2008 are to ensure a common understanding of modes, functions, products in scope, requirements, amongst others. However, ambiguities and/or unclarities in the wording can potentially lead to different interpretations evoked by manufacturers during the enforcement of the regulation, which makes effective and efficient enforcement of the regulation by MSAs far more difficult and constitutes a significant risk to the process.

Input on these unclear wordings was collected from MSAs, industry and other stakeholders along the course of this review study, and they can be summarised in the next bullet points:

- Lack of definition of what main function is and how the manufacturers should declare it, as this is recalled a few times in the regulation.
- There is no specific requirement on where the intended use should be declared, which makes it difficult to assure the validity of the exemption(s) of some requirements, when these are declared as 'inappropriate for the intended use' by the manufacturers.
- The requirement 3 in Annex II specifies that all networked equipment shall offer the user the possibility to deactivate the wireless network connection, where industry stakeholders are unclear if this also applies to wireless network access point and if it applies to products with several, but functionality-wise different wireless connections. Finally, the industry requests that it should be possible to claim that this requirement is inappropriate for the intended use for specific products.
- The definition for "reactivation function" creates misinterpretations, specifically when the activation of the main function from standby occurs for the first time.
- The categorisation of products in scope listed in Annex I is unclear, considering the list of products is non-exhaustive and that other relevant products shall also be targeted by MSAs. This creates difficulties for the MSAs on deciding whether some products are in scope or not. Examples are provided in section 6.4.
- The description of consumer equipment in scope for the distribution of sound and image 'other than telecommunications' (originally normal telephones were meant) may be less applicable nowadays, as many of the networked products currently in scope may use terminal nodes for transmitting of signal. E.g. VoIP phones is in scope of the regulation, but is also a telecommunication device.
- The requirement 7 of Annex II on product information refers only to networked equipment, as a result to the amendment to the Standby Regulation from Commission Regulation (EU) No 801/2013 This makes it difficult for MSAs to find online and freely accessible standby consumption data for non-networked equipment.
- Lack of manufacturers' information for some networked equipment.

- Generally, it is recommended to update the guidance document as specifically suggested in these clarifications, but also overall if the regulation is revised.

In the next sections these problems are discussed and assessed, making recommendations accordingly.

6.2 Lack of definition of main function

6.2.1 Definition

There is no specific definition in the regulation nor in the guidelines[77] following the Standby Regulation and its amendments for the term "main function". However, the term is being referred to in the definitions of "reactivation function", "active mode" and "HiNA equipment" as well as in the requirement of power management for non-networked and networked equipment. Furthermore, it is written in singular in some places and in plural in other places.

6.2.2 Problem

The problem often arises when there is a disagreement, between industry and MSAs, on whether a product is performing a main function during a certain condition. A special case where the definition of main function is debatable is for a washing machine. It is argued by some in the industry that the equipment is performing its main function when providing a safety function when the door is locked (i.e. as left-on mode). The MSAs argue that the main function of a washing machine is to wash and/or rinse clothes and therefore safety is the main function of only the door lock. For other products, artificially added functions can be created to avoid establishing a power management function.

6.2.3 Solution

The obvious solution would be to suggest a definition of the term "main function(s)" in a future revision of the amended Standby Regulation, to indicate what this term implies but without specifying what this means for each product. More precisely, a definition should be included in article 2, right after the existing definition of "reactivation function" (i.e. as point number 4). A suggested definition would be:

"*'Main function(s)' is or are the main delivered services for which a device is designed and constructed for, following an activation function*".

Concerning product-specific definitions of what the main function is, it is suggested that this information is required in the technical documentation, which itself should follow the product's CE declaration of conformity.

6.3 Lack of definition of intended use

6.3.1 Definition

There is no specific definition in the regulation nor in the guidelines[77] following the Standby Regulation and its amendments for the term "intended use". However, it is used to exempt products from requirements for availability of standby/off modes, power management function and possibility of deactivating wireless network connections, if these requirements are found inappropriate for the intended use of the product. It is,

[77] Guidelines accompanying Commission Regulation (EC) No 1275/2008 of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off-mode electric power consumption of electrical and electronic household equipment (October 2009)

however, required that technical justification for the inappropriateness is provided in technical documentation.

6.3.2 Problem

Intended use and the actual use of the product can be different. According to MSAs, manufacturers can avoid adapting their products to the requirements of the regulation by stating that the application of the standby mode is inappropriate for the intended use of their products. Manufacturers can thereby gain an economic advantage by avoiding additional costs of an on/off switch for mass-produced products. If the manufacturer clearly states the intended use in the technical documentation, this prevents the potential many misinterpretations of what intended use could be. However, the technical justification is often vague or simply a statement of the claim.

6.3.3 Solution

Independently of whether the product is declared inappropriate or not for standby or networked standby, the intended use should be clearly included in the technical documentation. MSAs suggest that these cases should be specified in the user's manual and directly visible on the device to avoid excessive energy consumption due to a different use of the product from what it is intended. This should guide the user to use the product in the way it is intended. This is suggested to be included as an ecodesign requirement in Annex II, 9€.

6.4 Deactivation of wireless network

6.4.1 Definition

The regulation states in Annex II (3a) that any networked equipment that can be connected to a wireless network shall offer the user the possibility to deactivate the wireless network connection(s). However, it also states that this requirement does not apply to products which rely on a single wireless network connection for intended use and have no wired connection.

6.4.2 Problem

Industry claims that this requirement is not appropriate for some products like alarm systems (e.g. with wireless connection to sensors), accessories operating through Bluetooth and other wireless interfaces but with different functionality of each wireless interface and wireless adapters such as access points. They therefore suggest that this requirement is exempted for products where the deactivation of the port is inappropriate for intended use.

6.4.3 Solution

First of all, it is important to notice that the text is only requiring the possibility for a user to deactivate the wireless network. It is obvious that if the user is deactivating the wireless network connection(s), it is an active action by the user well-knowing the consequences of closing the wireless connection. However, if the consequence of the deactivation is that a specific product is not able to perform its main function(s) after a deactivation, the requirement is unnecessary for this product and should not be there.

Since the preparation of the text of the Standby Regulation there has been a huge development of wireless networks and the use of them and new kinds of wireless products have been introduced to the market. With this in mind, the study team agrees that there is a need to clarify and adjust this requirement.

An immediate response from the study team to the claims by the industry is the following based on our interpretations:

- If a product has several wireless (e.g. Bluetooth and Wi-Fi) and wired connection, but where the intended use is provided only if one single of all the wireless connections (e.g. the Bluetooth) is active, then the requirement does not apply to the product.
- A wireless access point is not intended to fall under this clause, because typically it does not connect to a wireless network but establishes a network connection with a networked equipment. This is also supported by the descriptions in the guidance document. But there are also cases where wireless access points connect to other wireless access points and/or to wireless repeaters to extend the wireless range.

To clarify the requirement and remove the ambiguities, the study team recommends to edit the text based on the following points:

- Products covered by the clause should not include networked equipment with high network availability and networked equipment with high network availability functionality, which includes products typically highly dependent on the wireless connection. Excluding these products may also unintentionally exclude a few products which do not have any problems in complying with the current requirement. However, it is still seen as the best way of defining the edge products which should be covered by the requirement.
- It should be possible to claim that the requirement is inappropriate for the intended use if and only the main function(s) cannot be maintained if the wireless connections are deactivated. This would then secure that if a product is dependent on several wireless connections to provide the main function(s), then it can be exempted from the requirements. Use of this claim should be explained in the technical documentation.

A proposal for a new text in Annex II 3(a) is therefore suggested as:

(a) Possibility of deactivating wireless network connection(s)

Any networked equipment ***other than HiNA equipment or equipment with HiNA functionality*** *that can be connected to a wireless network shall,* ***unless inappropriate for the intended use****, offer the user the possibility to deactivate the wireless network connection(s).*

This requirement does not apply to products which rely on a single wireless network connection for intended use and that have no wired network connection.

Annex II 9(d) shall be updated accordingly.

6.5 Reactivation function

6.5.1 Definition

"Reactivation function" is defined in the regulation as "*a function facilitating the activation of other modes, including active mode, by remote switch, including remote control, internal sensor, timer to a condition providing additional functions, including the*

main function". It is also referred to in the definition of "standby mode" and in the power consumption requirement in standby mode.

6.5.2 Problem

The MSAs have reported that the definition in the regulation describes activation not reactivation. For example, a DVD player should go into standby mode regardless of whether it has played a DVD beforehand or not, if it is not providing its main function. Furthermore, some manufacturers could argue that the period between DVD player in off mode to it being activated via remote control is not standby, because it will be "activated" and not "reactivated".

6.5.3 Solution

It is suggested to modify the term "reactivation function" to "activation function" throughout the regulation, keeping the current definition in the regulation but renamed as "activation function".

6.6 Clarification of products in scope as listed in Annex I

6.6.1 Current Regulation

The list of products in scope in Annex I has 4 categories:

1. Household appliances
2. Information technology equipment
3. Consumer equipment
4. Toys, leisure and sports equipment

Under point 1, 3 and 4 there are typical examples of products listed, while point 2 covers all ICT primarily used in domestic environment except certain products covered by Regulation 617/2013.

6.6.2 Problem

MSAs from several Member States mentioned that it is hard to decide whether some products are in scope according to the list in Annex I and this makes it difficult to enforce the regulation. Furthermore, since the list of products is non-exhaustive, it is difficult to define what these terms cover, especially household appliances and toys, leisure and sports equipment.

Point 3 excludes consumer equipment used for telecommunications, which is less applicable nowadays, as many of the networked products currently in scope may use terminal nodes for transmitting of signal.

The term in point 4, "other toys, leisure and sport equipment" can be better defined regarding the scope and the products falling under this category. Based on the fact that the regulation refers to the WEEE directive's scope categorisation, the scope of the regulation can be interpreted freely. A large number of devices used in free time activities can be understood to fall under the term "other leisure equipment". An example for this was LED rod-lights that might be used for camping etc. In this instance, lighting standby usage falls under the lighting regulations, however, there are other instances where product requirements are required, but this definition of other leisure equipment is not particularly clear.

6.6.3 Solution

It has been suggested by MSAs that an open list e.g. using the phrase "particularly/especially" would be helpful in the enforcement of the regulation.

It is considered that the current list in Annex I presents some product sub-categories where the definitions are rather open, i.e. 'Other appliances for cooking and other processing of food…', '…other body care appliances', '…other equipment for the purpose of recording or reproducing…', 'Other toys, leisure and sport equipment'. Since a list can almost never be exhaustive enough to cover all possible products in scope in a horizontal regulation, the Annex I list is therefore recommended to retain, while adding a more comprehensive list to guidelines accompanying the regulation.

In addition, there could be added a text emphasizing that the list in Annex I is not exhaustive and therefore cannot be directly used to prove that a product is not covered by the regulation.

6.7 Product information requirements

6.7.1 Definition

Product information requirements, which amended the Standby Regulation in August 2013[78], specify data and information should be available on manufacturers' freely accessible websites but only for networked equipment (Annex II, 7).

6.7.2 Problem

MSAs have reported this as a problem, as data is not available for many products which are not networked equipment, making in this case the availability of data and information only accessible in technical documentation.

6.7.3 Solution

The suggested solution concerns amending two paragraphs of the set of requirements in point 7:

1. By removing the word 'networked equipment' from the first paragraph in the requirements, and replace it for 'as applicable', as it follows: "As of 1 January 2015, the following information for all equipment **as applicable** shall be visibly displayed on manufacturers' freely accessible websites:".
2. By removing the word 'networked' from the first requirement (7a), as it follows: "*(a) for each standby and/or off mode and the condition providing standby into which the equipment is switched by the power management function or similar function:*", as the requirement is also applicable to standby/off modes.

The rest of the requirements are only relevant to networked standby, and no further revisions to point 7 in Annex II are thus suggested.

6.8 Lack of manufacturers' information for some networked equipment

6.8.1 Definition

The requirements for technical documentation for networked equipment are not applicable if no information is provided, assuming the product is no networked equipment in this case. This is cited in the regulation in Annex II point 9 b):

[78] M4 Commission Regulation (EU) No 801/2013 of 22 August 2013

"If no information is provided, the equipment is considered not to be networked equipment unless it provides the functionalities of a router, network switch, wireless network access point (not being a terminal), hub, modem, VoIP telephone, video phone."

6.8.2 Problem

A MSA reported that, when checking compliance of some networked products, manufacturers only report standby consumption and not networked standby at all. This absence of information automatically means that the product is not networked. It is the impression of the MSA that these products can have both standby and networked standby, and there is therefore a possibility that consumption during networked standby does not comply with the level of requirement. However, due to the absence of networked information, the MSA would need to accept that this is not a networked product and will only check the consumption of standby mode.

This problem is not yet encountered by many MSAs as the networked standby requirements only recently came into force. The size of the problem is thus currently uncertain, and more data may need to be collected before a final solution can be proposed.

6.8.3 Potential solution

If the regulation is to be revised in terms of ambiguities of networked standby requirements, this could be a potential problem to be addressed. A revised regulation could ensure that if a product fits the definition of "networked equipment", this product is obliged to comply with the regulation's requirements including information requirement to technical documentation. If a MSA chooses to check a product and believes that it is networked equipment based on free accessible information, the manufacturer must supply with sufficient documentation. However, it the manufacturer considers the product not networked equipment, technical justification shall be provided.

Since the last paragraph of the requirement (i.e. definition previously cited), contradicts the applicability of the requirement to networked equipment, it is recommended to remove the paragraph.

7 Overall conclusions and recommendations for review in amended Regulation (EC) 1275/2008

7.1 Overall conclusions

In line with Article 7 of Regulation (EC) No 1275/2008, this review has focused on the scope and the appropriateness of the requirements for standby/off mode consumption and on the appropriateness of the tier III requirements for non-HiNA networked equipment.

Generally, the review of Regulation 1275/2008 shows that the regulation has worked reasonably well over the last 7 years. Data from market surveillance authorities suggests that compliance rates are high. The scope has proven to be altogether appropriate with only few products not yet in scope that would allow achieving relevant additional energy savings. Given the already rather stringent consumption limit of 0.5 W (respectively 1 W), also the level of ambition can be considered appropriate. Regarding the legal text and the definitions in particular, no excessive gaps were identified even though some potential loopholes will need to be observed. However, it is obvious that due to the horizontal nature of the regulation, definitions and descriptions are and have to be more "flexible" than in product-specific regulations. This seems to have created some difficulties for (only) a few products[79].

This does not mean that the regulation would not bear improvement potential. In fact, the assessment shows that including some products not yet in scope and a further tightening of the consumption requirements could bring about additional savings. The most important saving potential however is linked to Tier III. Finally, the text of the regulation could benefit from some clarification.

More specifically, the assessment of extending the current scope of the amended regulation by including five additional product groups has been done. These are: (i) Products equipped with electric motors operated by remote control, (ii) Products placed in the market with low voltage external power supplies, (iii) Professional equipment, and, (iv) Other office equipment not stated in Annex I (i.e. business equipment).

Furthermore, the current requirement for energy consumption on standby/off operating modes has been reviewed according to current level of technology, costs savings and potential energy savings, while the appropriateness and level of requirements of Tier III energy consumption on networked standby for non-HiNA equipment has also been reviewed. Concerning the review of current standby requirements, this was done to current and extended scope (i.e. including adjustable furniture and local building controls). Concerning the review of the appropriateness of networked standby requirements for non-HiNA, this has been done at an overall level for all products in scope plus more specifically at an individual level for the product groups that might be considered to have most difficulties to comply with Tier III requirement according to information from industry. Additionally, the assessment of removing the exemption of networked standby requirements for large format printing equipment has been done by

[79] For one of these products (i.e. coffee machines) the text was already specified through Amending Regulation 801/2013; for washing machines a solution could be found in the review of the product-specific regulation.

reassessing the scope according to technological progress and relevant voluntary agreements as well as by assessing the market size and potential energy savings.

Finally, identified ambiguities and/or unclarities in the wording of the amended Commission Regulation 1275/2008 have been assessed based on what reported by Market Surveillance Authorities (MSAs) and in some cases by manufacturers. The assessment was done by referring to the specific ambiguities and/or unclarities in the regulation, describing the interpretation problems they create and by providing potential solutions to solve these problems.

The assessment of extending the current scope by including **products equipped with electric motors operated by remote control** (either wired or wireless), i.e. **adjustable furniture** and **local building controls,** showed that there is potential for energy savings in the range of 1.41 TWh in 2025 and of 2.83 TWh in 2030. These are products, which technologies present similarities in terms of product configuration, meant to be controlled by the user and sold as a single unit. In spite of the fact that height-adjustable desks and elevation beds were the only two product types assessed in this review study for adjustable furniture, it is recommended to add the whole product category in the scope of the amended regulation. The type of technology making furniture adjustable and operated by electric motors is very similar and according to current standby levels and information from stakeholders it is not considered that there will be costly technological barriers to achieve current standby requirements as the technology already exists. This is the same case for local building controls.

Regarding products with low voltage external power supplies (LV EPS), the assessment of extending the current scope showed that very little potential for energy savings exists from removing the exemption. However, this conclusion is based on a few available standby consumption data points, and, considering the significant and emerging market of these products, it is expected the savings would be higher if performing a dedicated data collection exercise. This is why the inclusion of an information requirement could be considered for two reasons: To be able to better monitor and possibly address this growing market in the future and secondly for consumers to be aware of the consumption. This takes into account that the costs for testing and reporting would not be a barrier.

The assessment of extending the current scope provided also evidence that **professional white goods** present important methodological problems as there is currently a lack of harmonisation of low power modes for these products. For most of them it was possible to identify consumption data on either left-on, ready-to-use or sleep modes from previous preparatory studies, but these modes are different and not harmonized and therefore not fitting all the definition of standby in Regulation 1275/2008. Furthermore, according to input from industry, ready-to-use mode is not standby mode. Similar problems have already arisen with normal washing machines so that in the mid-term it would be preferable to address their standby/networked standby modes in the existing product-specific regulation currently under review. Due to the methodological problems and the fact that no test standard currently exists to measure standby consumption for professional white goods, it is not possible to recommend at this point in time their inclusion in the extended scope of the amended regulation. This may change in the near future for non-household washing machines, dryers and dishwashers, as there is already a mandate to develop these standards for professional wet appliances, but it is not the case for commercial ovens. Furthermore, their inclusion

depends also on whether the current limits for nominal voltage in the amended Standby Regulation (i.e. 250 V) are changed to include also three-phased products. In spite it was not possible to identify which of the assessed professional white goods exceed this voltage at this point of the study, it is expected that a significant share will do. Finally, the potential annual energy savings remain moderate with about 0,4 TWh in 2025 and 0.7 TWh in 2030[80].

Regarding **IT equipment,** professional equipment is defined as Class A products equipment according to EMC Directive. There are mainly Class A **Imaging Equipment** and **displays** products intended for use in offices etc., which could be included because they are products intended for use in the same way as many of the corresponding Class B products. At the same time, there are Class B network products, which are mainly used for larger datacentres and therefore should not be in scope.
It would be an option to not use the Class A/B definition but instead a descriptive definition aiming at capturing products within the overall scope of the regulation i.e. for use in households and offices. A proposal is provided in the report.
Very little data exists to calculate the energy impact of such change. The study team has made an assessment as an example of potential energy savings for imaging equipment, which seems to be the product category with largest amount of products that would switch from being out of scope to in scope. The result is total potential energy savings of about 0.14 TWh/year in 2030. There are pros and contras for both options (keeping the class A/B definition or change to a new definition) and the study team does not recommend one over the other.

Regarding the inclusion of **other office equipment not included in Annex I (i.e. business equipment)**, it was concluded not to include these in an extended scope. The estimated annual energy savings potential for paper shredders, as part of the business equipment product category, were considered small (approx. 0.06 TWh by 2025). Although the potential savings were calculated only for one product type in all business equipment category, it is not expected that the figure turns radically higher from the few direct measurements and data found on standby consumption for other business equipment. In spite the technology for paper shredders (and very likely for other business equipment) is available to reach current standby consumption requirements, it is expected that in the future the demand for this type of products will decrease.

The **review of the current standby/off modes requirements** showed that a revision of the requirement to 0.3 W is feasible for most of the product groups in current scope and would yield annual savings of 1.7 TWh in 2025 and 1.8 TWh by 2030. Furthermore, the cost savings for consumers for most of the products in scope would be positive. The figures established are assumed to be on the conservative side, as the data used for this estimation does not cover all the products in scope due to lack of available data from previous preparatory study Lot 6.

It is not recommended to apply the same standby level of requirement to the products that would be added when **extending the scope**, i.e. products equipped with electric motor operated by remote control, if this alternative would be considered. This is

[80] Only including about half of the professional wet appliances included in the previous preparatory study Lot 24 as for the rest no standby data was gathered.

because many products would need some time to adapt to complying with the standard, in spite that existing technology shows that reaching levels down to 0.3 W would not be problematic. The cumulative energy savings of including these products with current level (i.e. 0.5 W) and lowering the requirement for products currently in scope showed potential annual savings of 3.7 TWh in 2025 and 4.6 TWh in 2030.

The **review for appropriateness and level of requirements for networked standby of non-HiNA equipment (Tier III)** shows that it may be a challenging target for a few product types, but the assessment based on the data collected and information from the stakeholders show that there is no need to reconsider Tier III. The majority of the products on the market will have no problems in complying with the requirements. Some network connected projectors may have problems in complying, however, there are also several of these which belong to the HiNA functionality category and therefore are not subject to the non-HiNA requirements. Complex set top boxes with DOCSIS 3.1 cable modems and not being internet gateway and thereby HiNA do also have a challenge in complying due to currently high typical DOCSIS 3.1 power consumption levels. It is expected that the technological development will secure reduced power levels before the effective date. There is an energy saving potential of approximately 13 TWh/year from 2030 if Tier III will be maintained.

The **assessment of removal of the exemption from networked standby requirements for large format printing equipment** showed that the majority of the larger format printing equipment would be able to comply with the current networked standby requirements and with smaller redesigns, also for Tier II and Tier III. The majority of the products would also be able to meet stricter standby/off requirements than the current 0.5 W. Furthermore, the Class A/Class B delineation seems not optimal for large format printing equipment, because many of the products are Class A even though they are meant for offices as normal printers, displays, computers, etc.

However, the potential energy savings are rather small based on the estimated stock, below 0,01 TWh/year by 2030. In spite the stock is based on many assumptions, it is not expected that the figures would be considerably higher for these kind of products. Therefore, justification for a possible removal of the exemption from the power consumption limits in networked standby for large format printing equipment would primarily not be based on the potential savings but rather on the other results of this analysis which show that it is not needed to have this exemption and also to ensure consistency with other products in the Standby Regulation.

Seven ambiguities and/or unclarities were presented in the **clarification of terms and definitions**, concluding that three of them (i.e. scope of the applicability of deactivation of wireless network and of product information requirements and the re-naming of reactivation function) could be reformulated directly in the regulation to avoid problems with interpretation and provide clarity to the regulation. Furthermore, it was also concluded that by providing a definition for main function directly in the regulation, several interpretation problems could be avoided. Finally, that the clarification of what intended use is and that by providing further examples of what Annex I covers in the guidance document could also solve other recurrent interpretation problems.

7.2 Overall recommendations

Based on the above conclusions, it is recommended for a future revision of the amended Standby Regulation (EC) 1275/2008 that:

- The product categories of (i) adjustable furniture and (ii) local building controls are included in an extended scope. The specific suggestions for definitions and categorisation are shown in the draft review working document.

- The product category professional equipment is not considered for inclusion in an extended scope.

- The current standby requirements (reactivation function) are strengthened to 0.3 W, but this is recommended only for products currently in scope. For adjustable furniture and local building controls, it is suggested to apply the current level of requirement.

- The more stringent networked standby requirements for non-HiNA equipment as from 2019 (Tier III) should be kept in the regulation.

- The product information requirements should also apply to non-networked equipment.

- Further clarification on 'reactivation function', 'main function', 'intended use' and 'deactivation of wireless network' should be provided either directly in the regulation or in the guidance document. Furthermore, more examples of what Annex I product categories cover in the guidance document would provide better guidance to Market Surveillance Authorities.