JRC SCIENCE FOR POLICY REPORT

Revision of EU Ecolabel Criteria for Electronic Displays (previously Televisions)

Final Technical Report:
Final criteria

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1   INTRODUCTION

In 2009, EU Ecolabel criteria were adopted for televisions.[1] A review study was undertaken in 2013 with a view to updating the 2009 criteria.[2] The 2013 review study on the EU Ecolabel criteria for televisions was carried out by the Joint Research Centre Directorate B – Growth and Innovation (Institute for Prospective Technological Studies (JRC-IPTS) in 2013) with technical support from the Öko-Institut e.V. (OEKO). The work was developed for the European Commission's Directorate-General for the Environment.

The revision of the EU Ecolabel criteria for televisions was delayed so as to ensure alignment with EU Ecodesign[3] and EU Energy Labelling[4] Regulations that were being revised in parallel to the EU Ecolabel.

The revisions of the EU Ecodesign[5] and EU Energy Labelling[6] Regulations for televisions were recently finalised.

In 2013 and 2014, several versions of the technical report including draft criteria proposals were published. All relevant reports can be consulted on the product website[2]. The main purpose of the different versions of the technical report was to provide a summary of the technical background and rationale for each criterion proposal at different stages of the revision process.

Furthermore, during the course of the revision process, two general questionnaires on the scope and improvement potential as well as queries specific to certain criteria were sent out to selected stakeholders. The target groups were industry, Member States, NGOs and research institutions.

The first (T.R1.0) and second draft (T.R2.0) versions of the technical report were the basis for the first and second Ad-Hoc Working Group (AHWG) meetings which took place in October 2013 and May 2014 respectively. A third version of the report and criteria (T.R3.0) was produced after the AHWG2 and was open for stakeholders' consultation during November 2014.

A revised updated version (TR4.0 – TECHNICAL REPORT UPDATE (for last open consultation)) was produced in June 2019 in the light of new Ecodesign and Energy Labelling regulations. It provided an update of the criteria development process based on further research on updated legislation, environmental schemes currently in place, updated market figures and relevant technical data. Stakeholders' input received in November 2014 has been taken into consideration. Bilateral communication with stakeholders was maintained during the update process and reflected where relevant.

This **final version** of the report is a revision of TR4.0 based on the comments received in the last consultation (June -July 2019) and comments from EUEB of February 2020. It consists of the following:

- **Introduction**: this section describes the goal and content of the document, the sources of information and the upcoming steps in the project. This section aims to link the

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[1] 2009/300/EC: Commission Decision of 12 March 2009 establishing the revised ecological criteria for the award of the Community Eco-label to televisions (notified under document number C(2009) 1830) (Text with EEA relevance), available from - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009D0300

[2] JRC, EU Ecolabel and Green Public Procurement criteria revision for televisions, available from – http://susproc.jrc.ec.europa.eu/televisions/stakeholders.html

[3] COMMISSION REGULATION (EC) No 642/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions

[4] COMMISSION DELEGATED REGULATION (EU) No 1062/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of televisions

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.315.01.0241.01.ENG&toc=OJ:L:2019:315:TOC

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.315.01.0001.01.ENG&toc=OJ:L:2019:315:TOC

information and deliverables already published and the new draft criteria. Among the different sources of information listed and summarised in this section, special attention should be paid to the key environmental aspects of this product group and the criteria proposed. A subsection highlighting the synergies of the revised criteria with the new Ecodesign and Energy Labelling Regulations is included.

- **Assessment and verification:** this section includes information on the type of documentation required to show compliance with the criteria that shall be provided by applicants and recognised by competent bodies. In addition, the legal prerequisites that applicants shall guarantee are also mentioned in this section.

- **Criteria proposal:** this section presents the last and most updated EU Ecolabel criteria proposals for the product group 'Electronic Displays'. The proposal is written in a blue box and subsequently a brief rationale is given. The rationale is based on the most relevant aspects determined over the course of the project.

1.1   Methodology and sources of information

The current EU Ecolabel definition of 'Television' was assessed against a number of sources to determine its suitability. This included an analysis of alternative Ecolabels, existing statistical and technical categories and relevant legislation and standards in order to propose on that basis the scope and definition of the product for the revised criteria.

With regard to the market analysis, the study was mainly based on an analysis of European statistical data and available literature with a focus on televisions / electronic displays.

The main requirement of the EU Ecolabel is that criteria should be based on scientific evidence and should focus on the most significant environmental impacts during the whole life cycle of products. According to the European Commission Communication 'Building the Single Market for Green Products' (COM(2013)196), in general, better information on the environmental performance of products should be facilitated. This should be done by gradually incorporating the Product Environmental Footprint (PEF) methodology as appropriate *inter alia* in EU Ecolabel policies. This also includes the use of the International Reference Life Cycle Data System (ILCD) Handbook, which provides technical guidance for detailed LCA studies and the technical basis to derive product category-specific criteria. In the current revision process of Ecolabel criteria for televisions, these methods have been taken into account within the Technical Analysis.

Finally, the revision of the EU Ecolabel criteria largely considers the specific information provided by the stakeholders during the two AHWG meetings as well as during bilateral meetings. The information related to the revision of the EU Ecolabel criteria is summarised in the series of technical reports while the information described above is mainly included in the preliminary research (see detailed information on the revision web page[2]).

1.2   Summary of preliminary report and link to the EU Ecolabel criteria

The preliminary report forms the initial stage of the revision of the criteria for the product group 'televisions'. This includes the update and revision of the scope and definitions of the current criteria, an analysis of the televisions market and the implications for the EU Ecolabel, and a review of the scientific evidence to identify the main environmental impacts of these

appliances. The sections below provide a summary of the findings from the preliminary research.

1.2.1 Product group name, scope and definitions

Revised product group name:
Electronic displays

Revised scope and definition:
Scope: Electronic displays including televisions, monitors and digital signage displays. **Definitions:** **'Electronic display'** means a display screen and associated electronics that, as its primary function, displays visual information from wired or wireless sources. **'Television'** means an electronic display designed primarily for the display and reception of audiovisual signals and which consists of an electronic display and one or more tuners/receivers. **'Tuner/Receiver'** means an electronic circuit that detects television broadcast signal, such as terrestrial digital or satellite, but not internet unicast, and facilitates the selection of a TV channel from a group of network channels. **'Monitor' or 'computer monitor'** means an electronic display intended for one person for close viewing such as in a desk-based environment. **'Digital signage display'** means an electronic display that is designed primarily to be viewed by multiple people in non-desktop based environments. Its specifications shall include all of the following features: (a) unique identifier to enable addressing a specific display screen; (b) a function disabling unauthorised access to the display settings and displayed image; (c) network connection (encompassing a hard-wired or wireless interface) for controlling, monitoring or receiving the information to display from remote unicast or multicast but not broadcast sources; (d) designed to be installed hanging, mounted or fixed to a physical structure for viewing by multiple people; (e) does not integrate a tuner to display broadcast signals.

Rationale of proposed name, scope and proposed definitions

As highlighted in the preliminary research and during this revision, technological progress and convergence of different products increasingly blurred the line between television monitors and other display products. There are technical similarities among the different displays and a functionality overlap, with for example the classic television no longer the only way of watching video content[7] and, because of the enhanced resolution levels now available, televisions sometimes being used as monitors for game consoles. Thus, it is becoming more and more

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[7] Laptops, tablets or even smartphones can be used to watch video content, although the displays integrated in these products would be better tackled within the review of the Regulation on computers.

difficult to distinguish between the two product categories. At an initial stage of this EU Ecolabel revision process, it was proposed that external computer displays be moved from the revised scope of the EU Ecolabel for computers[8] to a revised scope of EU Ecolabel criteria for televisions, combining them under a new title 'Electronic Displays', subsuming TV sets, TV monitors, dual-function TV monitors and external computer displays.

In light of the recently revised EU Ecodesign and EU Energy Labelling Regulations, it is suggested scope be as harmonised as possible with these policy tools to ensure coherence and to allow the use of the same measurements and data. It is proposed to align the scope and definitions **to the revised Energy Labelling** scope **(televisions, monitors and signage displays).**

In addition, the relevant definitions of products in the EU Ecolabel revised scope have been included as defined in the revised EU Ecodesign and Energy Labelling Regulations.

1.2.2 Summary of key market aspects

The original Task 2 report (see product website[2] for further details) provided some insights into market and production structures. The following points summarise the key aspects of the market analysis, taking into consideration market figures updated since the publication of Task 2 in 2013.

- According to official European statistics[9] provided by Eurostat concerning production and trade data, the overall demand for televisions has decreased from 2012 and is not expected to increase rapidly in the future. As suggested originally in Task 2, much of this reduced demand is likely due to external factors, such as slowing economic growth, high unemployment rates, the completion of the analogue switch-off process in many western European markets, and saturation of flat panel televisions.
- LCD (liquid crystal display) remains the dominant flat panel display technology but OLED (organic light-emitting diode) displays are beginning to gain a higher market share.
- Virtually all LCDs utilise LED backlighting technology rather than the older CCFL (cold cathode fluorescent lamp) backlights.
- The OLED penetration of the display market is estimated to be about 1.0% in 2017. Competition from QLED (quantum dot light-emitting diode) LCD displays has likely impacted sales of OLED displays.
- The average screen sizes of displays have increased over the past years. Data for the UK shows that almost two thirds of homes have televisions of 40 inches or larger and almost 20% have televisions of 50 inches or more.[10]
- Features like smart interactive TV, HDR (High Dynamic Range) and UHD (Ultra High Definition), as well as price decreases, will encourage end users to choose larger display sizes.
- Smart TVs are now present in about 50% households in some EU Member State but lower penetration rates are seen in other Member States. Ultra-high-definition (4K) televisions account for around 50% of all European TV sales.[11]

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[8] Commission Decision 2011/337/EU of 6 June 2011 on establishing the ecological criteria or the award of the EU Ecolabel for notebook computers (OJ L 148, 7.6.2011, p. 5).

[9] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

[10] https://www.statista.com/statistics/438130/tv-sets-usage-in-homes-by-screen-size-in-the-uk/

[11] https://www.digitaltveurope.com/2018/04/09/ihs-half-of-tv-sets-shipped-in-western-europe-now-4k/

- As of 2018, 8K UHD displays with resolutions of 7 680 x 4 320 pixels (i.e. 33.2 million pixels) are beginning to enter the market. Global sales of 8K televisions are expected to reach around 11 million per annum by 2023.[12] Shipments of UHD computer monitors have also increased in recent years, especially in the gaming monitor sector.[13] As of December 2018, 8.3% of computer monitors registered with the US ENERGY STAR scheme were UHD.

- The numbers of electronic displays registered in June 2019 with the main environmental initiatives are varied:
    - ENERGY STAR[14]: 709 consumer televisions, 220 commercial televisions, 1 058 computer monitors, 283 signage displays.
    - Blue Angel (DE-UZ 145) on television sets – No licences.
    - EU Ecolabel[15]: 9 licences for televisions.
    - EPEAT[16]: 124 televisions and 1 049 computer monitors.
    - Nordic Ecolabelling[17]: 85 hospitality televisions and 3 consumer televisions.
    - TCO: 3 060 displays (no further detail) and no televisions.
- Front runners in terms of Ecolabelling are LG Electronics, Philips, Samsung, Sharp, Sony and Toshiba, and in terms of EU Energy Labelling Loewe, Panasonic, Philips, Samsung, Sharp, and Sony.
- According to IHSMarkit[18], a television replacement cycle is between 7 and 10 years. Other sources suggest that a LCD television replacement cycle is around 6 years.[19] Identifying the typical replacement cycle for displays is problematic as few data sources exist. A LCA conducted by the US EPA on computer monitors in 2001 estimated lifespans to be around 6.5 years, but those figures were for CRT monitors.[20] Other studies suggest that LCD monitor replacement cycles are around 8 years.[19] Given the wide range of computer monitor user types, from commercial users to domestic users, it is likely that lifespans will vary widely depending on the individual user type and current drivers for replacement.

- Market research organisations suggest that there are a number of drivers for consumers to replace televisions including a move from FHD (Full HD) to UHD, 4K to 8K, smaller to larger televisions, and high-end LCD to high-end OLED.[18] Research has suggested that consumers are willing to pay around EUR 50 more, on average, for an additional label class, and 50% more for an A-grade TV set compared to a G-grade one on the EU Energy Label 'A-G' scale.[21].

- Across European countries, the average TV viewing time varies significantly, e.g. from 2.3 hours per day in Sweden to 4.1 hours per day in Italy. In general, average TV viewing times have decreased since 2010 as users switch to viewing media on other electronic displays[22].

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[12] https://www.statista.com/statistics/950951/worldwide-unit-sales-ultra-hdtv-8k/
[13] https://press.trendforce.com/press/20181205-3187.html
[14] www.energystar.gov/specifications
[15] http://ec.europa.eu/ecat/category/en/18/televisions
[16] https://epeat.sourcemap.com/
[17] www.svanen.se/en/Buy-Svanenmarkt/Ecolabelled-products/?categoryID=159&p=4
[18]   https://ihsmarkit.com/research-analysis/various-factors-will-influence-tv-panel-pricing-for-the-years-first-half.html
[19] Kalmykova et al., 2015, Waste Management 46 (2015) 511–522, "*Out with the old, out with the new – The effect of transitions in TVs and monitors technology on consumption and WEEE generation in Sweden 1996–2014*".
[20] https://www.epa.gov/sites/production/files/2014-01/documents/computer_display_lca.pdf
[21] https://ec.europa.eu/info/sites/info/files/impact_of_energy_labels_on_consumer_behaviour_en.pdf
[22] https://www.statista.com/topics/3871/tv-set-market-in-europe/

1.2.3 Key environmental aspects and relation with the criteria proposal

Based on the LCA review presented in the Task 3 report[2], the overall findings indicate that the production phase and the use phase are associated with the most significant environmental impacts during the life cycle of computer products.

Within the manufacturing phase of televisions, specific environmental 'hot spots' identified are the assembly process of the LCD module, the amount of chrome steel used in the housing and the printed circuit boards used.

One of the reasons is that critical raw materials are concentrated in these components, the extraction and processing of which are associated with major material requirements, appropriation of land and consumption of energy, and which cause severe environmental impacts: silver, gold and palladium in the motherboard and other printed circuit boards, or indium and gallium in the display and background illumination.

The direct influence of EU Ecolabel criteria on the production of single components, especially if provided by external suppliers, of televisions or computer displays is relatively limited. However, by improving design (e.g. design for dismantling and recycling) or indirectly by extending the lifetime or by reusing parts, the impacts of the manufacturing phase can be reduced as secondary resources from recycling or an extended lifetime can avoid primary production. Thus, the allocation of benefits from reuse and recycling is an area specifically highlighted in Task 4 (improvement potential) and the criteria development.

Since the publication of the original Task 3 report in 2013 few LCAs have been published on televisions or other electronic displays. One LCA published on computer monitors in 2015[23] included similar findings to those of the previously reviewed LCAs. The study found that the use phase of CRT and CFL backlit LCD monitors was the most important impact category, followed by the production phase. The LCA on LED backlit monitors found that improvements in energy efficiency have caused most burdens to shift to the production phase. In exploring the findings, the authors claim that the Printed Wiring Board (PWB) on all types of monitors had the largest share of overall impacts. They also claimed that the manufacturing phase (including pre-manufacturing) was the cause of most ecotoxicity impacts. In summarising, the authors suggest that extending the useful life of LED backlit LCD monitors should be a priority to reduce impacts.

Improvements in the energy efficiency of televisions, through the introduction of technologies such as LED backlights, will also have shifted more burdens to the production impacts.

The following table shows the link between the identified hotspots and the revised EU Ecolabel criteria proposal. The table only provides an indicative reference to the proposal. The details of the proposed criteria and further technical details are addressed in the next section.

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[23] Bhakar et al., 2015, Procedia CIRP, Volume 29, 2015, Pages 432–437,Procedia CIRP, "Life Cycle Assessment of CRT, LCD and LED Monitors", available from – https://www.sciencedirect.com/science/article/pii/S2212827115000414

Table 1. Link between the hotspots identified and the revised EU Ecolabel criteria

Section	Proposed criteria	Environmental hotspot
1 Energy consumption	Criterion 1.1 – Energy savings Criterion 1.2 – Power management	Energy consumption and resulting greenhouse gas emissions from production and use. Proposed criteria address energy efficiency at use phase.
2 Restricted substances	Criterion 2.1 - Excluded or limited substances	Air, soil and water pollution, bioaccumulation and effects on aquatic organisms due to raw material extraction and processing, and hazardous substances used in products. The proposed criteria reflect products with a restricted amount of hazardous constituents and with a reduced potential for hazardous emissions upon disposal.
	Criterion 2.2 – Activities to reduce supply chain fluorinated GHG emissions	Fluorinated greenhouse gases (F-GHGs) are among the most potent and persistent GHGs contributing to global climate change. These gases are relevant in the manufacture of semiconductors, light-emitting diodes, and liquid crystal display (LCD) flat panel displays, *inter alia* for televisions, computer monitors or tablet PCs. Over the last decade, major flat panel suppliers as well as the semiconductor industry have taken voluntary steps to reduce their F-GHG emissions. However, the goals and results are published at sectoral not at manufacturer or product level so it is not possible to propose, for example, a certain limit value as a criterion for the EU Ecolabel. The proposed criteria consist of a general requirement focused on the target of setting limits in the future.
3 Lifetime extension	Criterion 3.– Reparability and commercial guarantee	Use of finite resources and critical raw materials in production. The proposed criterion addresses design for durability and reparability and product life extension upon the end of its life.
4 End-of-life management	Criterion 4.1 – Material selection and information to improve recyclability	Generation of potentially hazardous waste electronic equipment upon its final disposal. The proposed criteria address material selection and design at production to ensure easy dismantling and compatibility with recycling in order to improve resource efficiency and to maximise the recovery of resources at the end of life.
	Criterion 4.2 – Design for dismantling and recycling	
5 Corporate production / supply chain management	Criterion 5.1 – Labour conditions during manufacture	Many product groups, also concerning displays, are associated with both environmental and social impacts in their life cycle. Within this context, it is also suggested that the EU Ecolabel should gradually introduce social requirements into its criteria documents.
	Criterion 5.2 – Sourcing of 'conflict-free' minerals	
6 Information	Criterion 6.1 – User information	Information provides consumers with options to use the product considering the environmental benefits associated with the different modes of the product. In addition, EU Ecolabel information encourages the purchase of the product.
	Criterion 6.2 – Information appearing on the EU Ecolabel	

1.3 EU Ecolabel within the new EU policy context for electronic displays: synergies of revised criteria with new Ecodesign and Energy Labelling Regulations

The Ecodesign Framework Directive[24] provides a framework that manufacturers of energy-related products are required to use to improve the environmental performance of their products. The framework sets out minimum energy efficiency requirements and other environmental criteria such as water consumption, emission levels or minimum durability of certain components that manufacturers have to fulfil before they can place their products on the market. The aim of the Ecodesign Framework is to cut out the least sustainable products. The new Ecodesign measure[5] for electronic displays has broadened the scope and includes material efficiency and information availability requirements in addition to the energy efficiency requirements.

The Energy Labelling Framework Regulation[25] enables end users to identify the better-performing energy-related products, via an A-G/green-to-red scale (under the old Energy Labelling Framework Directive 2010/30/EU, energy labels were allowed to include A+ to A+++ classes). The new Energy Labelling measure[6] sets the energy efficiency classes for electronic displays to incentivise the consumer's choice of more energy-efficient products.

In this context, the EU Ecolabelling Regulation complements both Ecodesign and Energy Labelling. It is a voluntary scheme that awards products with the best environmental performance throughout their life cycle. EU Ecolabel criteria set higher requirements than those included in Ecodesign (which represent the minimum for market access) and at least as far as the EU GPP (Green Public Procurement) which is aimed at public authorities seeking to procure environmentally friendly goods and services (Communication COM(2008) 400 'Public Procurement for a better Environment').

The legislative framework builds upon the combined effect of the aforementioned pieces of legislation. See the image below for a visualisation of this effect.

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[24]Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. OJ L OJ L 285, 31.10.2009, p. 10.

[25]   Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU. OJ L 198, 28.7.2017, p. 1 (Energy Labelling Framework Regulation).
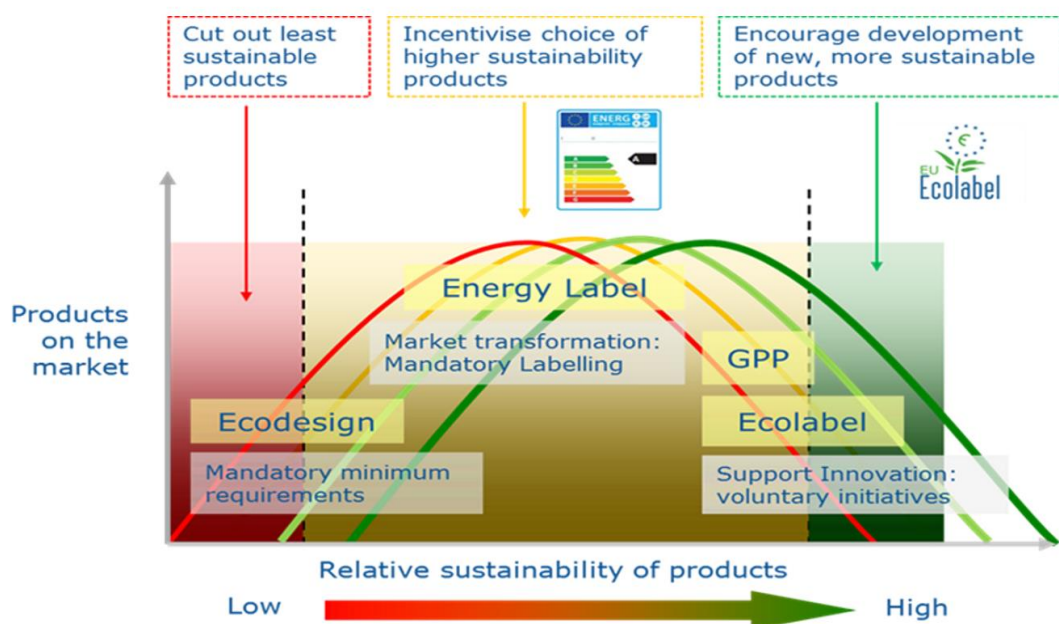
The revised EU Ecolabel criteria for electronic displays are aligned to the updated scope of products under the new Ecodesign and Energy Labelling Regulations (televisions, computer monitors and signage displays). In addition, the EU Ecolabel includes stricter energy efficiency requirements and addresses a number of other environmental issues, for instance hazardous substances in line with the EU Ecolabel Regulation or resource efficiency requirements in line with the Circular Economy Action Plans[26] . In addition, the EU Ecolabel Regulation allows the inclusion of social requirements, where relevant. The revision of the EU Ecolabel also includes social aspects in line with other recently voted products.

Furthermore, the requirements included in the EU GPP for computer and monitors[27] which covers computer displays reflected the EU Ecolabel criteria (as drafted in 2014) as far as possible in the criteria aiming to promote the use of EU Ecolabel monitors via green procurement and facilitate the verification process of EU GPP criteria.

A synergic approach has been followed in the revision of the EU Ecolabel, harmonisation with the other EU tools has been sought during the whole revision process. The requirements included in the new Ecodesign and Energy Labelling have been used as a baseline to build stricter requirements for the EU Ecolabel. The following table illustrates the coverage of each policy tool in terms of sustainability aspects and reflects the synergies created among the different tools. In this context, the harmonisation will ensure the development of new, more sustainable electronic displays.

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[26] http://ec.europa.eu/environment/circular-economy/index_en.htm

[27] http://ec.europa.eu/environment/gpp/pdf/EU_GPP_criteria_for_computers_and_monitors.pdf

Table 2. Summary of requirements on displays from different EU policies.

Section	Energy Labelling	Ecodesign	EU Ecolabel

1 Energy consumption	– Energy efficiency classes (A to G) based on Energy Efficiency Index (EEI) values.
	– Allowances reducing the value of $P_{measured}$ for the purposes of calculating the EEI.
		– EEI maximum limits that shall not be exceeded by displays.
		– Allowances reducing the value of $P_{measured}$ for the purposes of calculating the EEI.
		– Off mode, standby and networked standby mode requirements.
		– Automatic power down.
			Criterion 1.1 – Energy savings
			Strict Energy Efficiency classes. Only best displays in the market; ~10% would comply with thresholds.
			
			Until March 2021:
			  i. Energy efficiency class E (F for UHD resolutions and above, and for HDR) for televisions
			  ii. Energy efficiency class D (F for UHD resolutions and above, and for HDR) for monitors
			  iii. Energy efficiency class F for digital signage displays
			
			G class has been discarded.
			
			Dynamic approach. Once EPREL database is available.
			Best registered energy efficient classes under EPREL are requested.
			
			The **maximum on mode power demand** in normal configuration shall be ≤ 64 W (125W for digital signage displays, for UHD resolutions and above, and for HDR).
			
			Criterion 1.2 – Power management
			– Main allowances of ED/EL have been set as mandatory for the EU Ecolabel.
			– Requirement on quick start functionality aligned to Blue Angel.

2 Restricted substances		**Cadmium logo** - information of its presence or non-presence. **Halogenated flame retardants** - The use of halogenated flame retardants is not allowed in the enclosure and stand of electronic displays.	**Criterion 2.1 - Excluded or limited substances** **Prescriptive requirement on restriction of:** **Sub-criterion 2(a): SVHCs** Non-presence at or above 0.1% in the article and agreed subassemblies. **Sub-criterion 2(b): Restrictions on the presence of specific hazardous substances**

			Mercury and cadmium restricted among other specific substances (biocides, PAGs or arsenic compounds) **Sub-criterion 2(c): Hazard-based restrictions** EU Ecolabel hazards restricted with special attention to flame retardants and plasticisers.
			Criterion 2.2 – Activities to reduce supply chain fluorinated GHG emissions The applicant shall gather information from their LCD display suppliers by which they shall demonstrate their activities to reduce GHG emissions from the production process and the performance of abatement systems they have installed. Proposal in line with EPEAT and Nordic Swan.
3 Lifetime extension		**Repair and reuse** - **Availability of spare parts:** -7 years availability to professional repairers for Internal power supply; connectors to connect external equipment; capacitors; batteries; accumulators; DVD blue ray module -7 years availability to end users only external power supply and remote control -These parts can be replaced with the use of commonly available tools -Manufacturers shall ensure access to **information** for repairers. Main aspects to be included in the information: - the unequivocal appliance identification; - a disassembly map or exploded view; - list of necessary repair and test equipment; - component and diagnosis information (such as minimum and maximum theoretical values for measurements); - wiring and connection diagrams; –diagnostic fault and error codes (including manufacturer-specific codes, where applicable); and –data records of reported failure incidents stored on the electronic display (where applicable).	**Criterion 3.– Reparability and commercial guarantee** **-Design for repair:** - A number of spare parts (screen assembly and LCD backlight; stands; power and control circuit boards) which are not covered by Ecodesign, shall be accessible and exchangeable by the use of commercially available tools. - Adhesives shall not be used to fix the back cover of the electronic display. - Casing parts are free of electronic assemblies. **-Repair manual:** The applicant shall provide clear disassembly and repair instructions (e.g. hard or soft copy, video) and make them publicly available, to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for upgrades or repairs. **-Repair service / information.** **-Information on recommended price of spare parts included.** **-Availability of spare parts** 8 years for a number of spare parts (not covered by Ecodesign) and also for those covered by Ecodesign. -**Commercial guarantee** provision (3 years at no extra cost).

		– shall ensure the delivery of the spare parts for electronic displays within 15 working days after having received the order;	
4 End-of-life management		**Marking of plastic components** **– Marking** of plastic components heavier than **50 g.**	**Criterion 4.1 – Material selection and information to improve recyclability** **– Marking** of plastic components heavier than **25 g.** **– Recyclability** (EPEAT alignment): 　Use of single polymer or recyclable polymer blend. 　No use of paint and coatings. 　Plastic enclosures shall not contain moulded-in or glue-on metal. 　Casings, enclosures and bezels with flame retardants shall be recyclable. - Applicant shall make **available** to professional operators of the waste sector, in a **website and free of charge, information relevant for dismantling and recovery**. This should include at least: (**a) a diagram of the product showing the location of the plastic components containing flame retardants; (b) the location of components containing the toxic or ecotoxic substances.** **– Recycled content**: 10% post-consumer recycled plastic.
		Design for dismantling, recycling and recovery Manufacturers shall ensure that joining, fastening or sealing techniques do not prevent the safe and readily achievable removal of the components indicated in WEEE or in Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, when present. This **dismantling information** shall include the sequence of dismantling steps, tools or technologies needed to access the targeted components.	**Criterion 4.2 – Design for dismantling and recycling** Efficient dismantling is considered to be an important proxy for cost-effective dismantling/recycling and should be an important factor in product design. - **Manual dismantling shall be carried out by one person** of target parts (relevant in terms of CRM presence): Printed Wiring Boards >10 cm². Thin Film Transistor (TFT) unit >100 cm2 and film conductors. Polymethyl Methacrylate (PMMA) board light guide). + an additional component among: LED backlight units, speaker unit magnets (for display sizes greater than or equal to 25 inches) and HDD drive (if applicable in the case of smart devices).
			Criterion 5.1 – Labour conditions during manufacture

5 Corporate production / supply chain management			The proposal to address labour conditions during manufacturing reflects the significance of social issues in the computer/display manufacturing supply chain. This is evidenced by the investment made by industry to address working conditions through an industry Code of Conduct. In this respect, high-level reference is made in both the Act and the Annex criteria to a number of reference documents, namely: - the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy; - the UN Global Compact (Pillar 2); - the UN Guiding Principles on Business and Human Rights; and - the OECD Guidelines for Multi-National Enterprises.
			Criterion 5.2 – Sourcing of 'conflict-free' minerals The proposed criterion takes a proactive approach to the sourcing of tin, tantalum, tungsten and their ores and gold from conflict-affected and high-risk areas. This reflects the approach already taken by leading manufacturers, which rather than boycotting such areas seeks to support an improvement in working conditions.
6 Information	**Product information sheet:** - Technical information - Energy consumption and different modes - Availability of spare parts/software updates		**Criterion 6.1 – User instructions** - Information provides consumers with options to use the product considering the environmental benefits associated with the different modes of the product.
			Criterion 6.2 – Information appearing on the EU Ecolabel - EU Ecolabel information encourages the purchase of the product. The optional label with text box shall contain three out of the following texts: (a) High energy efficiency. (b) Restriction of hazardous chemicals. (c) Designed to be easy to repair and recycle. (d) Contains xy% post-consumer recycled plastic (only when greater than 25% as a percentage of the total plastic).

2   ASSESSMENT AND VERIFICATION

Final assessment and verification
The specific assessment and verification requirements are indicated within each criterion.
Where the applicant is required to provide declarations, documentation, analyses, test reports, or other evidence to show compliance with the criteria, these may originate from the applicant and/or his/her supplier(s) and/or their supplier(s), etc. as appropriate.
Competent bodies shall preferentially recognise attestations which are issued by bodies accredited in accordance with the relevant harmonised standard for testing and calibration laboratories and verifications by bodies that are accredited in accordance with the relevant harmonised standard for bodies certifying products, processes and services.
Where appropriate, test methods other than those indicated for each criterion may be used if the competent body assessing the application accepts their equivalence.
Where appropriate, competent bodies may require supporting documentation and may carry out independent verifications or site inspections to check compliance with these criteria.
Changes in suppliers and production sites pertaining to products to which the EU Ecolabel has been granted shall be notified to Competent Bodies, together with supporting information to enable verification of continued compliance with the criteria.
As a prerequisite the electronic display shall meet all applicable legal requirements of the country or countries in which the product is placed on the market. The applicant shall declare the product's compliance with this requirement.

Rationale and summary of the changes during the revision process:

The assessment and verification text appearing at the beginning of the Annex generally refers to the different types of evidence (e.g. declarations, test reports, etc.) that are considered relevant proofs of compliance for criteria. This text is necessary in order to establish the framework and general rules for verification procedures so that they do not need to be repeated in every individual assessment and verification text.

Each EU Ecolabel criterion text is followed by specific assessment and verification requirements stating which type of evidence should be provided to the Competent Body that is assessing the application. It is important to clarify here that when evidence is required from the supply chain, it is possible for the evidence to be submitted directly from the supplier to the Competent Body (this may be important when the proof requires information that may be commercially sensitive).

When evidence is required from tests or analyses, these should preferentially be carried out by laboratories that are accredited in accordance with relevant harmonised (ISO or EN) standards. However, this may not always be possible and in some cases it may be to accept evidence from in-house testing or testing by third parties that are in only accredited with relevant national standards. The same situation applies to test reports.

When a test method is specified in the assessment and verification text for a particular EU Ecolabel criterion, this method should be followed unless the applicant can demonstrate to the Competent Body that they have used another method that produces equivalent results. In such cases, the justification for equivalence must be clearly demonstrated and Competent Bodies should share this knowledge with other Competent Bodies.

Even in cases where evidence is provided exactly in accordance with the specific assessment and verification text for a particular EU Ecolabel criterion, it must be understood that the Competent Body reserves the right to request further information, to visit the site and even consider independent means of testing and verification. If the applicant objects to such actions, this could potentially jeopardise the award of the EU Ecolabel.

For any criteria that relate to supplied chemicals or materials, it is understood that suppliers can change with time, that one supplier can supply multiple different types and grades of chemical/material and that even for a given supplier and given chemical/material, variations in time are possible depending on upstream supply chain and other factors. Consequently, any significant changes in the supplied chemicals/materials must be communicated to the Competent Body and supported by any relevant evidence (e.g. supplier declarations) to demonstrate ongoing compliance with EU Ecolabel criteria.

The final paragraph in the general assessment and verification text has been inserted in order to make it clear that non-compliance of the EU Ecolabel product with all applicable legal requirements of the country or countries in which the product is placed on the market may result in the full or partial revocation of the EU Ecolabel license.

3   CRITERIA PROPOSAL

3.1   Criterion 1 – Energy consumption

3.1.1   Criterion 1.1 – Energy savings

Final proposal for criterion 1.1: Energy savings
a) Electronic displays shall meet the specifications of the Energy Efficiency Index set out in Annex II to Delegated Regulation (EU) 2019/2013 for the energy efficiency classes specified as follows or, alternatively for a more energy efficient class. Until 31 March of 2021: (i) Energy efficiency class E (F for UHD resolutions and above) for televisions; (ii) Energy efficiency class D (F for UHD resolutions and above) for monitors; (iii) Energy efficiency class F for digital signage displays. After 31 March of 2021: One of the top 2 energy classes which have registered models* under the product database[28] as from Article 12 of Regulation (EU) 2017/1369 [29] for a specific resolution and type of display (televisions, monitor or signage displays) on the submission date of the EU Ecolabel application. Note: once awarded, the applicant shall prove compliance with one of the top 2 energy classes which have registered models* at least every 2 years throughout the validity period of its license. * The top 2 energy classes must sum at least 25 registered models to be considered for a specific resolution and type of display (televisions, monitor or signage displays). In the case that 25 registered models minimum is not reached for a certain resolution and type of display, the top 2 energy classes which have registered models (independently on number of registered models) apply for this specific resolution and type of display.

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[28]   https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database_en
[29]   Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU (OJ L 198, 28.07.2017, p.1)

b) The maximum on mode power demand in normal configuration shall be ≤ 64 W (125W for digital signage displays, for UHD resolutions and above).

Assessment and verification: For requirement (a), the applicant shall submit a test report for the electronic display carried out according to the measurement methods indicated in Annex IV to Delegated Regulation (EU) 2019/2013. In addition, evidence of the top classes on EPREL database (with available models for the resolution and type of display model to be awarded) on the date of application and at least every 2 years throughout the validity period of its license, shall be provided. For requirement (b), the applicant shall submit a test report for the electronic display carried out according to the measurement methods and conditions indicated under points 1 and 2 of Annex III to Regulation (EU) 2019/2021.

Note: For displays presenting the HDR feature, measurement of the on mode power consumption to meet requirements (a) and (b) shall be done in the normal configuration, in standard dynamic range (SDR).

Definitions placed in ANNEX:

"Ultra-high Definition (UHD) Display" means an electronic display able to receive a UHD signal as defined in International Telecommunications Union Recommendation (ITU-R) BT.2020, and to display it on the screen at resolution 3 840 × 2 160 (UHD-4K), or 7 680 × 4 320 (UHD-8K).

'High Dynamic Range (HDR)' means a method to increase the contrast ratio of the image of an electronic display by using metadata generated during the creation of the video material and that the display management circuitry interprets to produce a contrast ratio and colour rendering perceived by the human eye as more realistic than that achieved by non HDR-compatible displays

'Normal configuration' means a display screen setting which is recommended to the end user by the manufacturer from the initial set-up menu or the factory setting that the electronic display has for the intended product use. It must deliver the optimal quality for the end user in a typical domestic or office environment. The normal configuration is the condition in which the declared values for off, standby, networked standby and on mode are measured.

Rationale of Proposed Criterion text

Although the initial proposal for revision was based on the Ecodesign formulas (TR1.0), at a later stage of the revision process it was suggested to align the energy criteria to the energy efficiency classes of the Energy Labelling Regulation which was under revision.

In August 2017, the new Energy Labelling Framework Regulation (EU) 2017/1369 of the European Parliament and of the Council entered into force, repealing Directive 2010/30/EU[30]. Under the repealed Directive, energy labels were allowed to include A+ to A+++ classes to address the overpopulation of the top 'A' class. Over time, due to technological development, the A+ to A+++ classes also became overpopulated, which significantly reduced the effectiveness of the labels. To resolve this, the new Framework Regulation requires a rescaling of existing energy labels, back to the original A to G scale.

The 'Discussion paper on the review of the Ecodesign and Energy Labelling Regulations for televisions and on the draft Regulation on electronic displays, including computer monitors' presented and discussed at the Consultation Forum meeting on 8 October 2012 identified regulatory gaps and market failures preventing full achievement of the identified energy savings potential. For the finalisation of the Energy Labelling Regulation revision, the information collection was extended and data analysis repeated, highlighting the appropriateness of corrective actions. In total, a database of over 3 000 models of electronic displays placed on the EU market was analysed between 2012 and the end of 2017.[6]

The revised energy efficiency classes are as shown below.

Energy efficiency class	New EEI[6]
A	EEI < 0.30
B	0.30 ≤ EEI < 0.40
C	0.40 ≤ EEI < 0.50
D	0.50≤ EEI < 0.60
E	0.60 ≤ EEI < 0.75
F	0.75 ≤ EEI < 0.90
G	0.90 ≤ EEI

The following figure illustrates a comparison between existing and revised energy classes. However, this comparison can only be approximated, as the formula to set the limits is different (i.e. a linear bar in the previous Regulation, a curve in the new proposal).

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[30]Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products. (OJ L 153, 18.6.2010, p. 1).
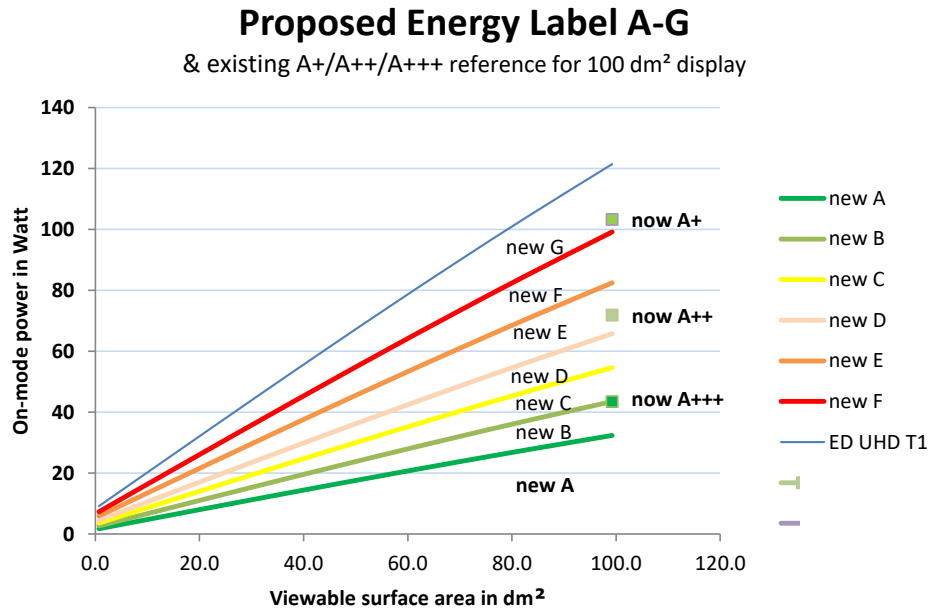
Figure 1: Approximate comparison between old and new energy labelling classes[6]

Figure 2 provides a visual distribution of the electronic displays, which are part of the 2014-2017 dataset used for the revision of the Energy Labelling Regulation (assuming that the same displays will be on the market when rescaling the televisions). All displays above the red curve would be eliminated by the minimum Ecodesign requirements. However, it is extremely unlikely that models on the market in 2014 will still be available on the market in 2021[6].
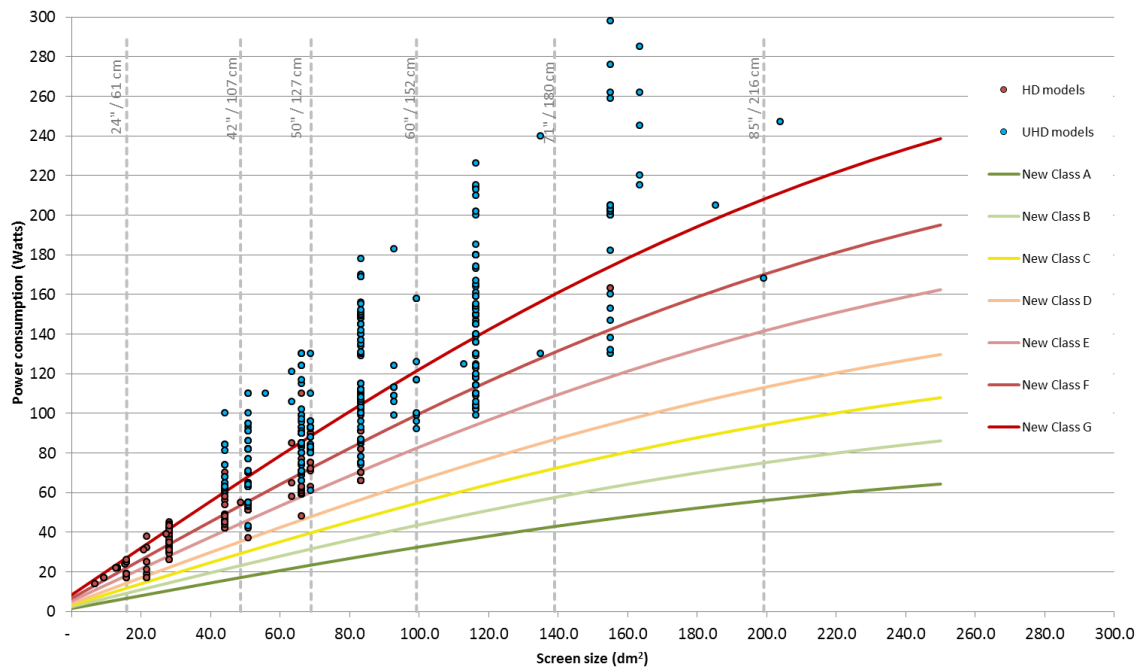
Figure 2: Distribution of displays from the 2018 dataset 'unadjusted' to the new labelling classes[6]

Figure 3 includes an adjustment of the energy efficiency to the same dataset on the basis of average improvements observed when comparing the datasets over the years (from 2012 to 2017).
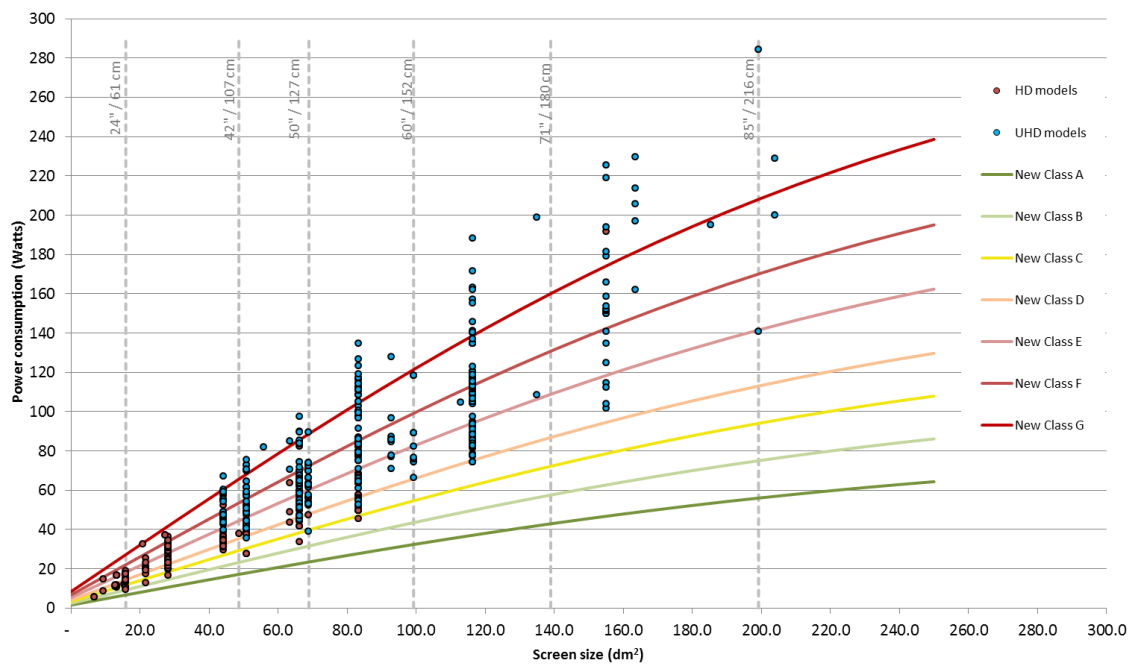
Figure 3: **Distribution of displays from the 2018 dataset with projection of expected improvements at entry into force of the rescaled labels[6]**

The following graph represents very recent data of best available televisions identified by Topten (www.topten.eu) according to the NEW label classes (May 2019).
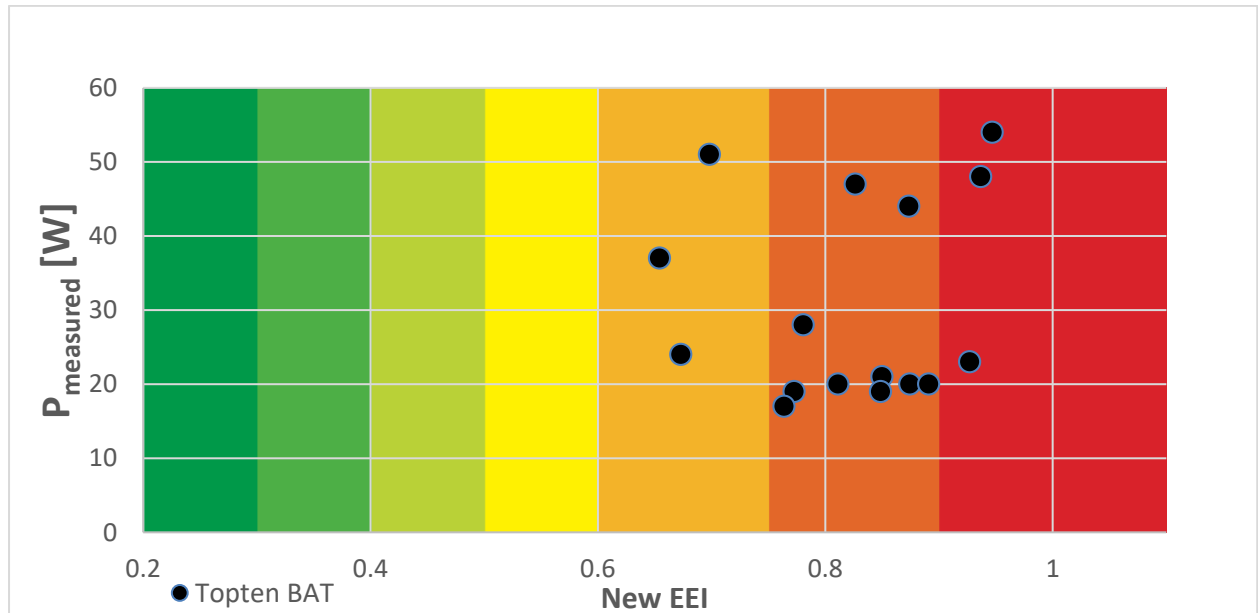
Figure 4 Distribution of full HD televisions, May 2019 (source: Topten.eu)
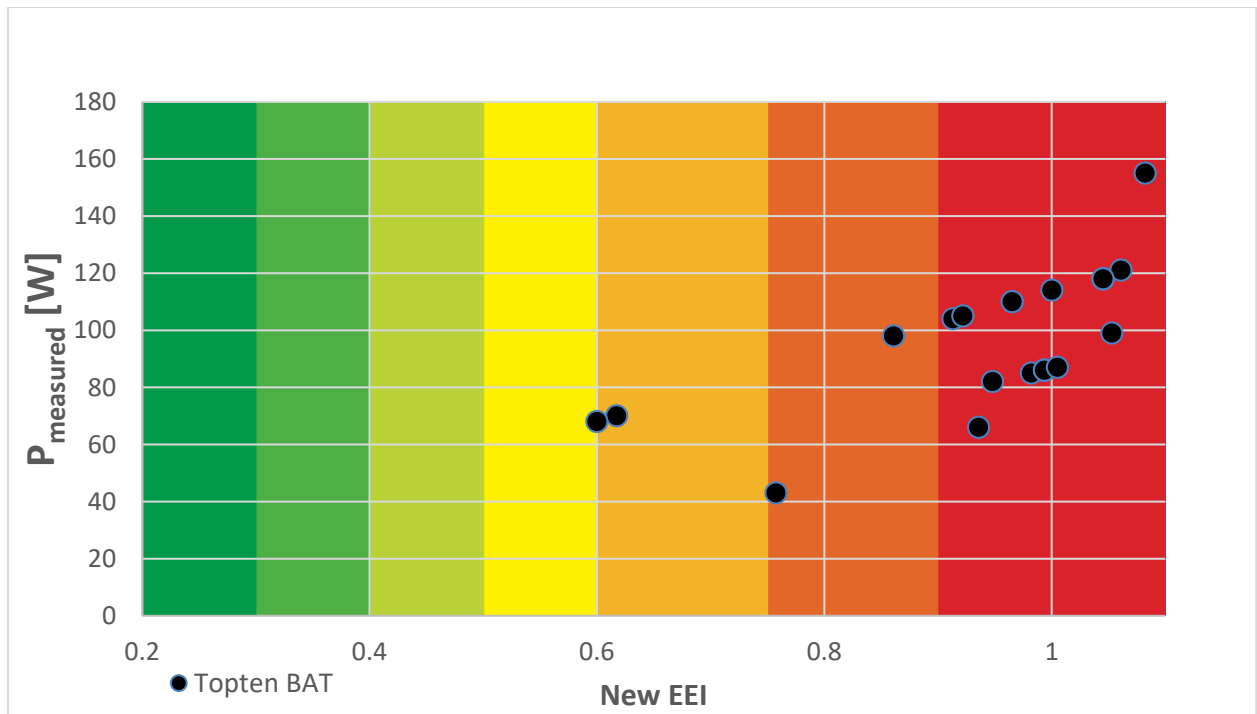
Figure 5 Distribution of UHD televisions, May 2019 (source: Topten.eu)

Most of the models of best available televisions selected by Topten fall under F (orange) and G (red) (especially for UHD). Higher flexibility should therefore be given to UHD.

With regards to a power cap for televisions, Topten sets the following thresholds:

- TV models with HD resolution or lower: Maximum power in on mode, for all screen sizes: 64 W. (This corresponds to the maximum power of a 100cm A-class TV).
- TV models with 4K or UHD resolution: Maximum power in on mode, for all screen sizes: 85 W.

Against this background, **in the final proposal** following aspects have been covered:

– As a result of several comments received at EUEB, a **dynamic approach** has been proposed:

- Energy classes proposed before March 2021 correspond approximately to best 10% models in terms of energy efficiency according to available data. Higher flexibility is given to UHD and signage displays. F class was proposed for these displays. This is especially important for signage displays, for which there is a lack of data. It is considered that G class is not appropriate to be included in the EU Ecolabel.
- **After March 2021, EPREL database** could be used and then it is proposed to require one of the 2 top energy classes with registered models under the EPREL product database for a specific resolution and type of display (televisions, monitor or signage displays) on the date of application to ensure only best displays are awarded.

– With regards to the **power cap**, the cap discussed during the revision (64 W) has been kept. However, for UHD and above definitions, the power cap has been relaxed to 125w in order to allow

TVs above 55 inches to apply. Updated data provided by a CB showed that at least 6 out of 47 big TVs above 70 inches are able to reach this value.

– Reference to HDR (High Dynamic Range) has been included in order to allow developing technologies to apply. HDR is a feature in displays that may, or may not be activated, depending on the content that is being played by the user. If the content is normal SDR (Standard Dynamic Range) content then the HDR function is not activated and the displays functions normally, as reflected by the normal energy class of the product. However, if the content that is being played is HDR content, the display will use increased processing power and it will also boost its brightness and contrast, which will result in higher power consumption. Because the broadcast of HDR content is currently still very uncommon, and availability is limited to a few movies and series available on streaming platforms HDR feature has not been regulated by Ecodesign. However, for the purpose of consumer information, HDR is covered by the energy label, in addition to the normal SDR energy class of the display also the HDR energy class of the display. Therefore all the displays with HDR function will have 2 energy classes. By considering the HDR energy class for the EU Ecolabel criteria will potentially lead to a situation where no display on the EU market is able to qualify for the EU Ecolabel even when they have normal SDR energy class of F, E or D simply because they have HDR functionality, and their HDR energy class is G. Therefore it is proposed that for all displays (even those presenting HDR functionality) the energy class shall be measured in SDR mode.

– As a result of the Inter Service Consultation minor wording modifications have been introduced.

3.1.2 Criterion 1.2 – Power management

Final proposal for criterion 1.2: – Power management

(a) **Manual Brightness Control**: The electronic display shall allow the user to manually adjust the backlight intensity.

(b) **Automatic Brightness Control (ABC):** Electronic displays with automatic brightness control (ABC) shall meet the requirements to qualify for a 10 % reduction in $P_{measured}$ described in Annex II of the Commission Regulation (EU) 2019/2021 (section B, point 1).

(c) **Quick start functionality:** After enabling the quick start functionality (if the appliance supports the feature), the appliance shall automatically switch back to standby or off mode as a default setting 2 hours after the last user activity at the latest.

Assessment and verification: The applicant shall provide a declaration to certify that the appliance has been shipped with the power management settings stated above.

For requirement b) the applicant shall submit a test report for the electronic display showing that the conditions described are met. The relevant measurements shall be carried out according to Annex III to Commission Regulation (EU) 2019/2021 laying down eco-design requirements for electronic displays pursuant to Directive 2009/125/EC of the European Parliament and of the Council.

For requirement c) the applicant shall submit the relevant pages of the product documentation.

Definitions placed in ANNEX:

'Automatic Brightness Control' ('ABC') means the automatic mechanism that, when enabled, controls the brightness of an electronic display as a function of the ambient light level illuminating the front of the display.

'Luminance' means the photometric measure of the luminous intensity per unit area of light travelling in a given direction, expressed in units of candelas per square metre (cd/m^2). The term brightness is often used to subjectively qualify the luminance of a display.

'Fast start' or 'quick start' means an enhanced reactivation function capable of completing the transition into 'on mode' in a shorter time than that of the normal reactivation function.

'default' referring to a specific setting, means the value of a specific feature as set at the factory and available when the customer uses the product for the first time and after performing a 'reset to factory settings' action, if allowed by the product.

Rationale of Proposed Criterion text

ABC (Automatic Brightness Control)

ABC (Automatic Brightness Control) is an energy-saving feature that uses a built-in light sensor to detect ambient light levels in the room and adjusts screen brightness for viewer comfort. Reduced light levels mean reduced screen brightness and, consequently, energy savings.

An article on ambient light levels during television viewing[31] analysed the ambient light levels during television viewing in 60 homes over 7 days. The study revealed that the vast majority of viewing (79.5%) occurred at illuminance levels below 50 lux, while very little viewing (3.6%) occurred at illuminance levels greater than 300 lux. The authors of the study referenced the Energy Star Program Requirements for Televisions Version 5[32] test procedures for ABC-enabled televisions, which requires power measurements at 0 lux and 300 lux. They concluded that 0 lux illuminance is unnecessary and that other illuminance levels (10 lux, 50 lux and 100 lux) should be considered for power measurements, to better reflect actual illuminance levels during television viewing in residential applications. The Energy Star v.6.0[33] for Televisions requires power measurements to be taken at three different luminance levels: 10 lux, 50 lux and 100 lux.

A study of televisions on the market in 2014 showed that many televisions failed to take advantage of an opportunity to save power at low room light conditions of between 10 lux and 100 lux.[34]

In order to estimate potential energy savings by using ABC, the Energy Star database was consulted in 2014. Of 1 697 television units certified as Energy Star models, 556 were ABC-enabled. A total of 150 Energy Star models presented a maximum on mode power demand of 64 W and enabled ABC. The results showed an average 25% lower consumption at 50 lux compared to the measured power at 300 lux. (See Figure 6.)
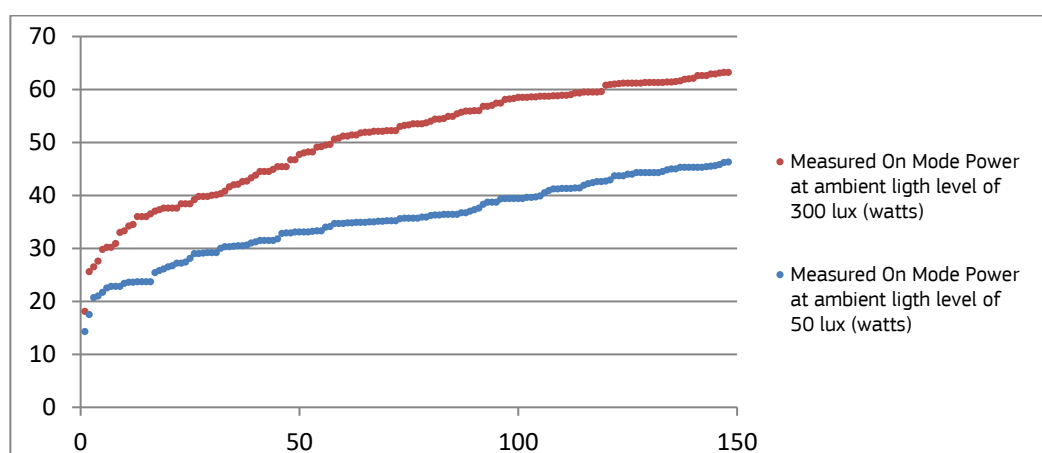
Figure 6: Measured on mode power at ambient light at 300 lux and 50 lux for Energy Star television models below 64 W maximum power demand (power cap proposed in EU Ecolabel)

The Impact Assessment[35] accompanying the new Energy Labelling and Ecodesign Regulations provides the following figures supporting the potential for energy savings related to ABC:

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[31] Invited Paper: Ambient Light Levels During Television Viewing. Kyle Sills, Konstantinos Papamichael, Keith Graeber, My Ton and Chris Wold (2014 Society for Information Display, SID Symposium Digest of Technical Papers, San Diego, CA, June 1–6, 2014, Volume 45, Issue 1, pages 599–602, June 2014).

[32] https://www.energystar.gov/index.cfm?c=archives.tv_v5_3

[33] https://www.energystar.gov/products/spec/television_specification_version_6_0_pd

[34] Technical Article How to comply with the Energy Star 6.0 standard for LED TVs: a demonstration of reduced power consumption with improved picture quality. Markus Luidolt and David Gamperl.

[35] Forthcoming.

The following chart provides an overview of the likely influence on energy use of activation of ABC control in some televisions found on the US market.
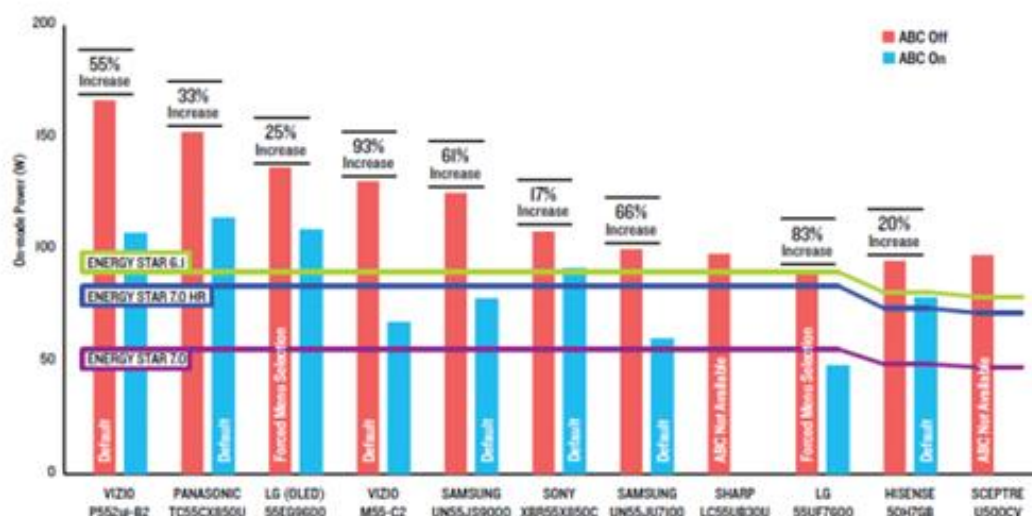
Figure 7. Comparison of 4K on-mode power use with ABC ON and OFF (Source: NRDC, https://www.nrdc.org/sites/default/files/uhd-tv-energy-use-report.pdf)

The following figure illustrates how a logarithmic response curve can find the ideal relationship between illuminance and luminance for the human eye.
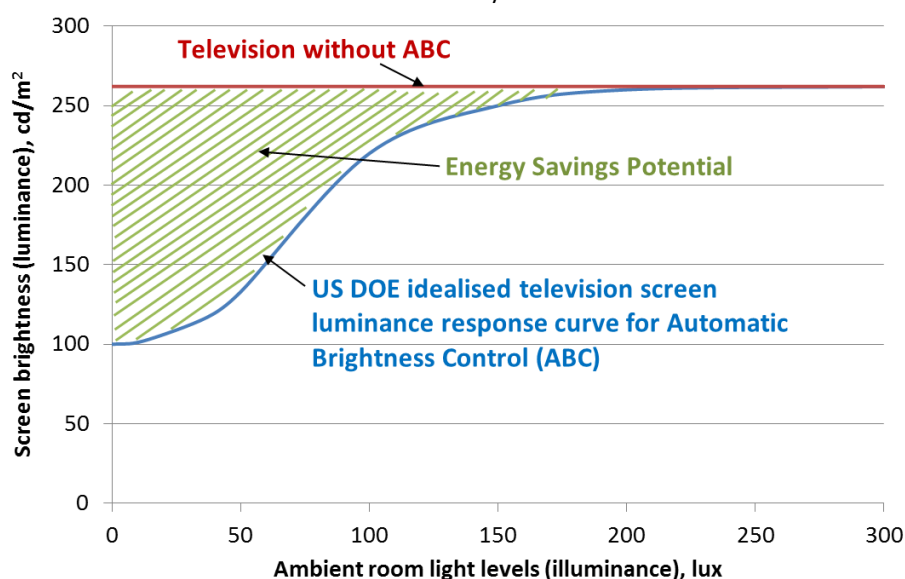
Figure 8. US DOE study (2012) looking at the room illuminance levels and screen luminance

NB: Found a logarithmic response curve of human eye – doubling of brightness perceived the same – 10 : 20 :: 100 : 200 (lux)

ABC implementation in displays, however, can differ greatly from the idealistic curve. An appropriate testing method is consequently deemed necessary.

Against this background, the revised Ecodesign and Energy Labelling Regulations includes allowances and adjustments for the purpose of the EEI calculation (15% reduction in $P_{measured}$ in Ecodesign and 10% reduction in $P_{measured}$ in Energy Labelling) if all the following requirements are met:

Ecodesign and Energy Labelling (allowances)	*ABC is enabled in the normal configuration of the electronic display and persists in any other standard dynamic range configuration available to the end user;*
	
	the value of $P_{measured}$, in the normal configuration, is measured, with ABC disabled or if ABC cannot be disabled, in an ambient light condition of 100 lux measured at the ABC sensor;
	
	if applicable, the value of $P_{measured}$ with ABC disabled shall be equal to or greater than the on mode power measured with ABC enabled in an ambient light condition of 100 lux measured at the ABC sensor;
	
	with ABC enabled, the measured value of the on mode power must decrease by 20% or more when the ambient light condition, measured at the ABC sensor, is reduced from 100 lux to 12 lux;
	
	the ABC control of the display screen luminance meets all of the following characteristics when the ambient light condition measured at the ABC sensor changes:
	
	   – *the measured screen luminance at 60 lux is between 65% and 95% of the screen luminance measured at 100 lux;*
	
	   – *the measured screen luminance at 35 lux is between 50% and 80% of the screen luminance measured at 100 lux;*
	
	   — *the measured screen luminance at 12 lux is between 35% and 70% of the screen luminance measured at 100 lux.*

Fast start functionality

With regards to the quick start functionality, a report created by Defra's Market Transformation Programme in 2011 on televisions[36] revealed that in November 2010 this functionality was only present in the high-end models of three manufacturers. High-end products could be estimated to represent around 10% of the total market. However, this feature was expected to become much more prevalent in televisions with a diagonal screen size greater than 32 inches in future. The report showed that additional power consumption requirements (above the 1 W regulatory level) may be around 11 W to 12 W, but could be as high as 30 W to 38 W for high-specification products. Representative data were not available on the proportion of televisions that currently feature such a function and their power demand to establish a threshold. However the Japanese Eco Mark criteria for Televisions Version 1.0[37] require that appliances with this function be set to the factory default as OFF. Furthermore, Blue Angel RAL-UZ 145 for Television Sets from July 2012 also included requirements on quick start (or fast start).

In this context, considering the potential energy savings, for the **final proposal** it has been suggested:

- That the conditions that permit the manufacturers to get reductions on the $P_{measured}$ for the EEI calculation in the new Energy Labelling and Ecodesign are made mandatory for the EU Ecolabel. Most of these conditions are considered relevant to be included as mandatory for the EU Ecolabel.

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[36] BNCE TV07: Power Impacts of "Quick Start" Standby Functionality in Televisions.
[37] Eco Mark Product Category No. 152 "TelevisionVersion 1.0" Certification Criteria. (See at: http://www.ecomark.jp/english/pdf/152eC1.pdf)

- A new requirement to disable the 'quick start' functionality by default for displays offering such a function.

3.2   Criterion 2 – Restricted substances

3.2.1   Criterion 2.1 – Excluded or limited substances

> **Final proposal for criterion 2.1: Excluded or limited substances**
>
> The presence in the product, or defined sub-assemblies and component parts, of substances that are identified according to Article 59 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council[38] or substances and mixtures that meet the criteria for classification according to Regulation (EC) No 1272/2008 of the European Parliament and of the Council[39] for the hazard classes, categories and associated hazard statement codes listed in Table 1 shall be restricted in accordance with sub-criterion 2.1. (a) and (c). For the purpose of this criterion, Candidate List Substances of Very High Concern (SVHCs) and hazard classes, categories and associated hazard statement codes are grouped in Table 1. Sub criterion 2.1. (b) limits the presence of specific substances.
>
> *Table 1. Grouping of candidate list SVHCs and hazard classes, categories and associated hazard statement codes*
>
> > **Group 1 hazards**
> >
> > *Hazards that identify a substance or mixture as being within Group 1:*
> >
> > - Substances that appear on the Candidate List for Substances of Very High Concern (SVHCs)
> > - Carcinogenic, Mutagenic and/or Toxic for Reproduction (CMR) Category 1A or 1B CMR: H340, H350, H350i, H360, H360F, H360D, H360FD, H360Fd, H360Df
>
> > **Group 2 hazards**
> >
> > *Hazards that identify a substance or mixture as being within Group 2:*
> >
> > - Category 2 CMR: H341, H351, H361f, H361d, H361fd , H362
> > - Category 1 aquatic toxicity: H400, H410
> > - Category 1 and 2 acute toxicity: H300, H310, H330
> > - Category 1 aspiration toxicity: H304
> > - Category 1 Specific Target Organ Toxicity (STOT): H370, H372

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[38]   Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, p.1).

[39]   Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (OJ L 353, 31.12.2008, p. 1).

<div style="border:1px solid">

Group 3 hazards

Hazards that identify a substance or mixture as being within Group 3:

- Category 2, 3 and 4 aquatic toxicity: H411, H412, H413
- Category 3 acute toxicity: H301, H311, H331, EUH070
- Category 2 STOT: H371, H373

</div>

2(a) Restriction of Substances of Very High Concern (SVHCs)

Substances that have been identified according to the procedure described in Article 59 (1) that have been identified according to the procedure described in Article 59 of that Regulation and included in the candidate list of substances of very high concern for authorisation shall not be intentionally added at concentrations greater than 0.10% (weight by weight). The same restriction shall apply to the sub-assemblies forming part of the product that are listed in Table 2.

No derogation from this requirement shall be granted.

Table 2. Sub-assemblies and component parts to which Criterion 2(a) shall apply

Printed Circuit Boards (Printed Wiring Boards, populated motherboards, power boards (power supply units) and module boards)>10 cm^2
Electrical wiring/cables (aggregated)
External cables (Power cable (AC and DC power cords), (modem cable and LAN cable if applicable), HDMI cable and RCA cable)
External housing (Back cover, front cover (bezel decoration) and stands)
External housing of remote control LED backlights (LED arrays)

In communicating this requirement to suppliers of the listed sub-assemblies/component parts, applicants may pre-screen the REACH Candidate List using the IEC 62474 declarable substance list[40]. The screening shall be based on identification of the potential for presence of substances in the product.

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[40] International Electrotechnical Commission (IEC), *IEC 62474: Material declaration for products of and for the electrotechnical industry, http://std.iec.ch/iec62474*

> _**Assessment and verification:**_ The applicant shall compile declarations of the non-presence of SVHCs at or above the specified concentration limit for the product and the sub-assemblies identified in Table 2. Declarations shall be with reference to the latest version of the Candidate List published by ECHA[41] on the submission date of the EU Ecolabel application. Where declarations are made based on a pre-screening of the Candidate List using IEC 62474, the screened list given to sub-assembly suppliers shall also be provided by the applicant. The version of the IEC 62474 declarable substance list used shall reflect the latest version of the Candidate List.
>
> The declarations can also be provided directly to competent bodies by any supplier in the applicant's supply chain.

2(b) Restrictions on the presence of specific substances

The hazardous substances specified in Table 3 shall not be intentionally added to or formed in the specified sub-assemblies and component parts at or above the stipulated concentration limits.

Table 3. Substance restrictions that shall apply to sub-assemblies and component parts

Substance group	**Scope of restriction** (substances and sub-assemblies/component parts)	**Concentration limits (where applicable)**
i) Metal solder and contacts	Exemption 8b in accordance with Directive 2011/65/EU relating to the use of _cadmium in electrical contacts_ shall not be permitted.	0,01% w/w _Test method:_ IEC 62321-5
ii) Polymer stabilisers, colourants and contaminants	The following organotin stabiliser compounds classified with Group 1 and 2 hazards shall not be present in _external cables_: Dibutyltin oxide Dibutyltin diacetate Dibutyltin dilaurate Dibutyltin maleate Dioctyl tin oxide Dioctyl tin dilaurate	n/a

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[41] ECHA, _Candidate List of substances of very high concern for Authorisation,_ http://www.echa.europa.eu/candidate-list-table

	External housing of the display shall not contain the following colourants:	
	Azo dyes that may cleave to the carcinogenic aryl amines listed in Appendix 8 of the Regulation (EC) No 1907/2006, and/or Colourant compounds included in the IEC 62474 declarable substances list.	n/a
	Polycyclic Aromatic Hydrocarbons (PAHs) classified with Group 1 and 2 hazards shall not be present at concentrations greater than or equal to individual and sum total concentration limits in any external plastic or man-made rubber surfaces of: *External cables* *External housing of the remote control* *Rubber parts of the remote control* The presence and concentration of the following PAHs shall be verified: *PAHs restricted by the Regulation (EC) No 1907/2006:* Benzo[a]pyrene Benzo[e]pyrene Benzo[a]anthracene Chrysen Benzo[b]fluoranthene Benzo[j]fluoranthene Benzo[k]fluoranthene Dibenzo[a,h]anthracene Additional PAHs subject to restriction: Acenaphthene Acenaphthylene Anthracene Benzo[ghi]perylene Fluoranthene	The individual concentration limits for PAHs restricted under Regulation (EC) No 1907/2006 shall be 1 mg/kg The sum total concentration limit for the 18 listed PAHs shall not be greater than 10 mg/kg *Test method*: AfPS GS 2014:01 PAK.

	Fluorene Indeno[1,2,3-cd]pyrene Naphthalene Phenanthrene Pyrene	
iii) Biocidal products	Biocidal products intended to provide an anti-bacterial function shall not be incorporated into *External housing and rubber parts of the remote control*.	n/a
iv) Mercury in backlights	Exemption 3 in accordance with Directive 2011/65/EU relating to the use of mercury in *cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL)* shall not be permitted.	n/a
v) Glass fining agents	Arsenic and its compounds shall not be used in the manufacturing of LCD display unit glass and screen cover glass.	0,0050% w/w
vi) Chlorine-based plastics	Plastic parts >25g must not contain chlorinated polymers. Note: For this specific sub-requirement, plastic cable housing is not considered as a "plastic part".	n/a
vii) Phthalates	Diisononyl phthalate (DINP), Diisodecyl phthalate (DIDP) shall not be used in external power cables.	n/a

Assessment and verification: The applicant shall provide declarations of compliance and test reports according to the requirements in Table 3. Test reports, where required, shall be valid at the time of application for the relevant production model and all associated suppliers. Where sub-assemblies or component parts with the same technical specifications originate from a number of different suppliers, tests where applicable shall be carried out on parts from each supplier. The declarations/test reports can also be provided directly to competent bodies by any supplier in the applicant's supply chain.

2(c) Restrictions on substances classified under Regulation (EC) No 1272/2008

Flame retardants and plasticisers that are assigned any of the hazard classes, categories and associated hazard statement codes listed in Table 1, in accordance with Regulation (EC) No 1272/2008 shall not be intentionally added to or formed in the sub-assemblies

and component parts in Table 4 at or above a concentration limit of 0,10% (weight by weight).

Table 4. Sub-assemblies and component parts to which Criterion 2(c) shall apply

Parts containing flame retardants

- Printed Circuit Boards
- External cables
- External housing of the display

Parts containing plasticisers

- External cables
- Internal electrical wiring
- External housing of the display

<u>*Derogations for the use of hazardous flame retardants and plasticisers*</u>

The use of flame retardants and plasticisers meeting the criteria for classification with CLP hazards listed in Table 1 are derogated from the requirements of criterion 2(c) provided that they meet the conditions specified in Table 5.

Table 5. Derogations to restrictions on substances classified under Regulation (EC) No 1272/2008 and applicable conditions

Substances and mixtures	*Sub-assembly or component part*	*Scope of derogation*
Flame retardants	i) Printed Circuit Boards	Flame retardants classified with a Group 3 hazard and TBBPA (classified with Group 2) are derogated for use.
	ii) External cables	Flame retardant and its synergist classified with Group 3 hazard and Antimony trioxide -Sb_2O_3 -(classified with Group 2) are derogated for use.
	iii) External housing of the display	Flame retardants and their synergists classified with Group 2 and 3 hazards are derogated for use.
Plasticisers	i) External cables, internal electrical wiring and external housing of the display	Plasticisers classified with Group 3 hazards are derogated for use.

> _**Assessment and verification:**_ The applicant shall provide a declaration of compliance with criterion 2(c). The declaration shall be supported by the list of flame retardants, plasticisers and metal additives and coatings used in the sub-assemblies and component parts listed in Table 4 together with SDS supporting their hazard classification or non-classification.
>
> For the derogated substances and mixtures listed in Tables 5, the applicant shall provide proof that all the derogation conditions are met. Where test reports are required, they shall be valid at the time of application for a production model.
>
> The declarations/test reports can also be provided directly to competent bodies by any supplier in the applicant's supply chain.

Rationale of Proposed Criterion text

The Task 3 LCA review identified that, with regard to freshwater aquatic ecotoxicity, marine aquatic ecotoxicity and terrestrial ecotoxicity, the manufacturing phase is more significant than the use phase. The impacts are mainly associated with environmental pollution related to the extraction of raw materials and to the processing of sub-assemblies such as motherboards.

The impact categories listed above are also significant for the more energy-intensive products in their use phase, such as desktops, being associated with electricity generation. Emissions during the end-of-life phase can also be significant if displays are disposed of improperly – for example, by burning cables and printed wiring boards to recover metals.

In general, LCA studies are not able to identify and characterise the hazard inventory of substances that may be present in a final product sold to a consumer. A specific background report was prepared to scope and identify hazards that may be present (Hazardous substances paper)[42].

Following extensive discussions with stakeholders, a new approach was applied to the computers and televisions product groups. The methodology was based on the findings of the EU Ecolabel's Horizontal Task Force on Chemicals paper)[43].

- An initial screening of the bill of components/materials (see Section 2.4 of the Hazardous Substances paper) was carried out, followed by an initial identification of substance groups by their function.

- Case studies and OEM (Original Equipment Manufacturers) restricted substance listings were collated that enabled the state-of-the-art in hazard substitution to be identified.

- Additional input was requested from stakeholders in order to identify substitutions that have been made and also, if required, to identify derogations that may be required.

- A subgroup (SG) consisting of a representative cross-section of stakeholders was formed in order to obtain further information, discuss technical issues in detail and to develop a workable criterion proposal.

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[42] http://susproc.jrc.ec.europa.eu/televisions/docs/Task_Special_Hazardous_Substances_docx.pdf
[43] JRC-IPTS, _Findings of the EU Ecolabel Chemicals Horizontal Task Force – Proposed approach to hazardous substance criteria development_, 24th February 2014.

In order to screen and evaluate the existing evidence, two matrices were set up:

1. *Candidate List and RoHS screening matrix:* The IEC 62474 Declarable substance list for electrotechnical products[44] was used as the starting point for identifying substances from the most current ECHA Candidate List that may be relevant to computers and displays. The IEC list is frequently updated by a dedicated team and is therefore understood to be accurate as well as assisting in screening the list.
2. *Hazardous substance screening matrix[45]:* The evidence gathered during the revision was structured, firstly, according to substance groups, which can generally be seen to be related to functions associated with components of the product, and, secondly, according to the components/subcomponents where hazardous substances are/may be found.

The analysis carried out using the matrix was used to derive the following outputs which form the basis for the scope and ambition level of the criteria proposal:

- Hazard benchmarks: Substances that were currently used or were used until recently in mainstream products.
- Proposed substitution benchmarks: Substitutes for hazardous substances currently used in mainstream products that have been implemented, or are proposed for implementation, by leading manufacturers.
- Proposed restrictions: Substance or substance group restrictions that have been identified from OEM restriction lists or from risk assessment exercises by the European Commission, Member State or Intergovernmental bodies.

As a result, criteria with following elements were proposed:

- **2 (a) Substances of Very High Concern**

In discussions within the SG, there was a general agreement on setting a threshold of 0.10% for the non-presence of Candidate List substances. This is the threshold for notification under the REACH Regulation and, moreover, manufacturers and their suppliers are familiar with having to provide declarations at or above this threshold. Manufacturers' experience was also that there are very limited substances on the Candidate List that may be present above 0.1% at the article level (usually only plasticisers).

A more significant issue raised by manufacturers was whether the threshold should be applied at 'complex article' (the whole product), sub-assembly, component or material level. This would be stricter than current practice because many products are imported as a finished article. Some manufacturers do not assemble their final products, having decided to outsource their design and assembly.

However, it was agreed to introduce further selectivity in the criterion because *some manufacturers request declarations of compliance at what is termed 'sub-assembly' level*.

In order to arrive at a sub-assembly (components) list, stakeholders were consulted during the revision. A definition of the main subassemblies that might typically be verified was created with the

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[44] International Electrotechnical Commission, *IEC 62474 – Material Declaration for Products of and for the Electrotechnical Industry,* http://std.iec.ch/iec62474
[45] http://susproc.jrc.ec.europa.eu/televisions/docs/140429%20EU%20Ecolabel%20Electronic%20Displays_Hazardous%20substance%20matrix_AHWG2%20revision-v2.pdf

feedback received. A manufacturer from the SG stated that for the level described in table below they might be able to comply with the non-presence of Candidate List substances above 0.10%.

Table 3: Proposed definition of sub-assembly and main components

Original proposed list of components	Agreed with SG	Definitions
Printed Circuit Boards >10 cm^2	Printed Circuit Boards >10 cm^2	Populated motherboard, power board (power supply unit), module board and other PCBs assembly above 10 cm^2.
Electrical solder and metal contacts	----	Not easy to define and localise. Proposed to be removed. Solders form part of cables/wiring or PCBs (will be addressed at these components).
Electrical and data connections (internal and external)	Electrical wiring/cables (aggregated)	All these parts are very light in separate form. It could be proposed to address them in aggregated form.
	----	Data connectors: Tuner, HDMI, USB and data storage device (HDD, SSD) if present. (Normally embedded in PCBs.)
External cables	External cables	Power cable or cord, (modem cable and LAN cable if applicable), HDMI cable, RCA cable.
External housing and enclosure materials	External housing	Back cover, front cover (bezel decoration) and stands.
External casing and surfaces of remote control	External housing of remote control	Housing of remote control.
Display screen glass	-----	The screen glass is normally integrated in the LCD panel. Proposed to be removed as a separate component.
Screen LED backlights	LED backlights	LED arrays.

It was also noted in SG discussions that not all Candidate List substances are for electronics. The IEC 62474 substance declaration list[46] is used as a tool to pre-screen the Candidate List for relevance. This list includes notes on what functions substances serve and in which products and/or components they may be present. This is then provided to suppliers who must then provide declarations down to a concentration limit of 0.1%. In general, it was felt by SG members to be relevant and reasonable to carry out such a pre-screening.

- It is therefore proposed that in sub-criterion 2(a) SVHC **declarations are required for the product as a whole and a defined set of 'sub-assemblies'**. The additional declaration for sub-assemblies would introduce an additional level of strictness, differentiating those manufacturers who require more information from their suppliers.
- It is additionally proposed in sub-criterion 2(a) that, reflecting current practices, the process of screening the Candidate List for relevant substances is made easier for applicants by allowing use of the IEC 62474 declarable substance list.

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[46] International Electrotechnical Commission (IEC), *IEC 62474: Material declaration for products of and for the electrotechnical industry, http://std.iec.ch/iec62474*

- **2 (b)Restriction of specific hazardous substances**

The industry is more accustomed to communicating requirements for the non-presence of specific substances to suppliers than hazard restrictions. A sample of manufacturers' substance restriction lists were therefore analysed and a list compiled for the EU Ecolabel criterion, with a focus on restrictions that restrict Group 1 and 2 hazards.

For each restriction, specific substances have been identified, together with their hazard classification and a specification for how they shall be restricted. Combinations of laboratory tests and declarations are requested for verification. Reflecting current best practice, testing is proposed as being required for each supplier of identical components or sub-assemblies.

The different types of **restrictions** broadly fall into the following categories:

- plastic additives that impart a function that may be physical/mechanical, safety- or design-related e.*g. colourants, stabilisers*;

- restriction of *RoHS exceptions that may sunset*, e.g. lead solder in servers, cadmium in metal switches and relays;

- biocides use for consumer hygiene purposes, *e.g. biocide added to keyboard plastic;*
- contaminants and process residues in plastic and glass, *e.g. Polyaromatic Hydrocarbons in plastic and man-made rubber, arsenic in screen glass.*
- chlorine-based plastics and DINP and DIDP in external power cables base on Nordic Swan

Where possible, test methods for assessment and verification were cross-checked based on methods used by manufacturers and/or which are linked to RoHS.

- **Restriction of CLP hazards**

Leading manufacturers have started to identify, screen and request the substitution of hazardous flame retardants and plasticisers based on their hazard classifications. This is not yet the case for other types of hazardous substances that may be present in a display product. It was agreed early on in the AHWG and SG to focus attention on the hazard profile and substitution of flame retardants and plasticisers.

The initial background research highlighted that a complete picture of hazards that may be present in a display product is not available. Moreover, whilst the CAS numbers of colourants that may be used in different types of plastic can be identified from the catalogues of, for example, Clariant [47] and BASF [48], an overview of the hazard profile of additives such as colourants and their comparative improvement potential is not currently available. Suppliers are also often given flexibility as to how they meet certain specifications, e.g. plastic colour.

It was agreed early on in the AHWG and SG to focus attention on the hazard profile and **substitution of flame retardants and plasticisers**. Flame retardants and plasticisers have been the main focus for planned substitutions of hazardous substances by leading manufacturers. These substance groups are also notable for being the first examples of substitutions by computer and display

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[47] Clariant (2007) *The coloration of plastics and rubber*, Pigments & Additives Division.
[48] BASF, *Housing applications*, Accessed 2014, http://www.plasticadditives.basf.com/ev/internet/plastic-additives/en_GB/content/plastic-additives/Industries/Electrical_Electronics/electrical_electronics_applications

manufacturers where hazard classifications have formed the basis for decision making. This process has been supported by research programmes of the US EPA and assessments using tools such as Green Screen.

Having identified the main substitute flame retardants and plasticisers used by leading manufacturers, their hazard classifications were used to develop derogations reflecting the specific range of substances used in different computer components.

Several discussions around Tetrabrombisphenol-A (TBBPA) were carried out during the revision. Manufacturers stated that TBBPA is being replaced with halogen-free FRs. However, due to cost and reliability issues, they claimed that TBBPA is still needed for bare PWB board in specific TV parts. Reliability issues include:

1) hardness: halogen-free PWB is harder than PWB using halogens; this means that it is easily broken;

2) smell test: quality assessment smell test for PWB assembly fails when using halogen-free PCB board.

- **Hazards have been restricted for flame retardants and plasticisers** in a way that reflects substitutions of hazardous substances made by leading manufacturers. Safer substances have been identified and their hazard profile determined and published in previous versions of this technical report.
- **Derogations** discussed during the revision have been included. Nordic Swan includes an exception for TBBPA use in PCBs. In line with this requirement, it is suggested that TBBPA is derogated exclusively for use in PCBs.

- As a result of the Inter Service Consultation minor wording modifications have been introduced. Considering that criterion address substances that are not classified under sub requirement 2.1. b, the term "hazardous" has been deleted from the criterion name which has been renamed as "Restricted substances".

3.2.2 Criterion 2.2 – Activities to reduce supply chain fluorinated greenhouse gas (GHG) emissions

Final proposal for criterion 2.2 – Activities to reduce supply chain fluorinated greenhouse gas (GHG) emissions

The applicant shall gather the following information from their LCD display suppliers by which they shall demonstrate their activities to reduce GHG emissions from the production process, including the performance of abatement systems they have installed:

(a) Specification of which of the F-GHGs are used and which are being reduced.

(b) Annual F-GHG emissions intensity (in kg CO_{2eq} per m² of flat panel displays (array glass) produced) across manufacturing sites for the most recent year.

(c) Indication of the destruction or removal efficiencies (DREs) of installed abatement systems for each of the F-GHGs used.

__Assessment and verification:__ The applicant shall provide the supporting documentation containing the information above from their display suppliers to the competent body. The documentation can also be provided directly to competent bodies by any supplier in the applicant's supply chain.

Rationale of Proposed Criterion text

Fluorinated greenhouse gases (GHG) are among the most potent and persistent GHGs contributing to global climate change; they are relevant in the manufacture of semiconductors, light-emitting diodes and LCD flat panel displays.

Generally, LCD panel manufacturers have used the following F-gases:

- NF_3, being used in chamber cleaning of the deposition process;

- SF_6, being used in LCD surface treatment of the dry etching process;

- CF_4 and $c-C_4F_8$, being used for OLED panel manufacturing.

A consideration could be changing SF_6 to NF_3, since the latter has a lower GWP (GWP – SF_6: 23,900, NF_3: 17,200).

In theory, there is the possibility that F_2 and COF_2 may replace NF_3, but in practice these two gases have scarcely been used. The reasons are that F_2 lacks stability and COF_2 has a lack of usage and manufacturing records. For these reasons, it is inevitable that F-gases have to be used in LCD manufacturing processes.

The efforts below are known to improve the emissions from flat panel display manufacturing:

- Participation in WLICC (World LCD Industry Cooperation Committee) with Korean, Japanese, Chinese and Taiwanese LCD manufacturing companies making several efforts to reduce F-gas emission voluntarily. WLICC was organised in July 2001 for a new industrial mechanism aimed at contributing to the promotion of global LCD industry cooperation to work on environmental issues. WLICC has made efforts to reduce PFC emission through a fair and

equitable burden among members, and active information exchanges, adopting effective approaches toward implementation of global warming countermeasures.

- Being designated as one of the companies that are managed and controlled by the Korean GHG gas Regulation, i.e. having plans for prolonged investment in treatment facilities to reduce F-gas emission.

It is difficult to compare panel suppliers' F-GHG emissions due to a lack of consistency in estimating emissions, estimating emissions reductions, and monitoring the efficacy of installed abatement systems. Also, stakeholder feedback did not provide enough information to establish a prescriptive criterion on abating fluorinated GHG emissions during LCD production.

US EPA (2013)[49] has developed sets of questions that are intended to be a starting point to help panel purchasers and retailers to understand how their suppliers are reducing their F-GHG emissions and identify opportunities for discussions to target and implement further mitigation efforts.

- It was difficult to set product-related criteria due to the difficulties to compare panel suppliers' F-GHG emissions. Therefore, a process-oriented approach has been proposed, based on Nordic Ecolabelling criteria for television displays and the questions developed by US EPA with a focus on gathering information to set the basis for the future setting of limits (e.g. amount and type of GHGs used per display/abated amount ratio).

- As a result of the Inter Service Consultation minor wording modifications have been introduced.

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[49] http://www.epa.gov/climateleadership/documents/questions_for_suppliers.pdf

3.3 Criterion 3 – Reparability and commercial guarantee

The research results of Task 3 and Task 4 revealed that close attention should be paid to the extension of the lifetime of televisions and external computer displays to reduce the overall environmental impacts caused by ever shorter lifecycles and continual manufacturing of new products which increases the environmental and social burdens of primary extraction and to reduce the impacts caused by the manufacturing processes.

In the current criteria documents, requirements affecting the lifetime of televisions and external computer displays are subsumed under different criteria titles (televisions: 'lifetime extension'; external computer displays: 'user reparability').

To illustrate the importance of lifetime extension for televisions and external computer displays, for the revision it was proposed to cluster the associated criteria, and complement them with some new proposals.

Final proposal for criterion 3: – Reparability and commercial guarantee
(a) Design for repair: (i) The following spare parts of electronic displays shall be accessible and exchangeable by the use of commercially available tools (i.e. all tools except proprietary tools, e.g. screwdriver, spatula, pliers, or tweezers): -screen assembly and LED backlight, -stands, and -power and control circuit boards. (ii) Adhesives which need to be removed with heat or chemicals shall not be used to fix the back cover of the electronic display. (iii) Casing parts are free of electronic assemblies which cannot be removed with use of commercially available tools. (b) Repair manual: The applicant shall provide clear disassembly and repair instructions (e.g. hard or soft copy, video) and make them publicly available (at no additional cost), to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for upgrades or repairs. (c) Repair Service / Information: Information should be included in the user instructions or the manufacturer's website to let the user know where to go to obtain professional repairs and servicing of the electronic display, including contact details as appropriate and the recommended manufacturer price of spare parts. During the guarantee period referred to in (e) this may be limited to the applicant's Authorized Service Providers. (d) Availability of spare parts: The applicant shall ensure that original or backwardly compatible spare parts (those mentioned in (i) and included under Annex II (D. Material efficiency requirements. Point 5. A) Availability of spare parts) of Regulation (EU) 2019/2021, as a minimum) are publicly available for at least 8 years following the end of the model production;

> (e) Commercial guarantee: without prejudice to the legal obligations of the seller under national law on legal and commercial guarantees, the applicant shall provide at no additional cost a minimum of a 3 year commercial guarantee during which time they shall ensure the goods are in conformity with the contract of sale. This guarantee shall include a service agreement with pick-up and return for cases where repair in not done on-site.
>
> (f) Information on repair, spare parts and commercial guarantee shall be provided in accessible formats for persons with disabilities upon request, in accordance with the accessibility requirements in Directive 2019/882.
>
> *Assessment and verification: The applicant shall declare the compliance of the product with these requirements to the competent body. Additionally, the applicant shall provide:*
>
> *(a) An exploded diagram showing how casing parts, chassis and electric/electronic assemblies are assembled in the product.*
>
> *(b) A copy of the commercial guarantee.*
>
> *(c) A copy of the repair manual.*
>
> *(d) A copy of the user instructions.*
>
> *(e) A public the list of authorised dealers of spare parts.*
>
> Definitions placed in the ANNEX:
>
> Proprietary tools are tools that are not available for purchase by the general public or for which any applicable patents are not available to license under fair, reasonable, and non-discriminatory terms.
>
> Spare parts are all components or assemblies that can potentially fail and/or that are expected to need replacement within the service life of the product. Other parts which have a lifetime usually exceeding the typical life span of the product are not spare parts.

Rationale of Proposed Criterion text

To avoid an earlier replacement of the whole television or external computer display in the case of defective single components, the reparability of products is a major factor facilitating a lifetime extension.

A case study by WRAP (2011)[50] of three LCD television models to illustrate and encourage the durability and repair summarises the following most common faults that cause failure and shorten the product's lifetime:

- screen faults – due to damage, sometimes caused by impact;
- power circuit board faults;
- main circuit board faults – including hardware and microchip software;

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[50] Cf. http://www.wrap.org.uk/sites/files/wrap/TV%20case%20study%20AG.pdf

- damage to connections – often between circuit boards; and
- damage to television stands.

Assemblies such as the screen that are fragile and critical to use are particularly susceptible to damage. Damage occurs through strains on connectors and PCBs (printed circuit boards) that are subject to flexing, causing strain on soldered joints. Electronic components and solder can also become damaged by variations in temperature and humidity, for example, which exacerbate poorly soldered joints and corrupt chips.

The following aspects have been addressed during the revision of this criterion:

- **Design for repair:** the criterion aims to ensure that the consumer is able to easily repair an EU Ecolabel computer product. A list of key components with significant potential for failure and a reference to universal tools have been included. The importance of reparability criteria was remarked on by a consumer organisation stakeholder.
- **Repair manual:** provision of clear instructions in the form of a repair manual to enable replacement of the key components.
- **Repair service/information:** provision of information to let the user know where to go to obtain professional repairs and servicing of the device.
- **Availability of spare parts:** availability of spare parts for a certain period of time after ceasing production. From the industry side, manufacturers claimed that 7 and 5 years seem too high to be realistic values and they remarked that producers say that consumers tend not to repair televisions and monitors since it is not convenient for them.
- **Extended commercial guarantee**: the relevance of an extended guarantee was questioned during the revision. On one hand, some stakeholders mentioned that the main failures on displays normally lead to TV replacement while, on the other hand, others expressed the opinion that an extended legal guarantee contributes to the quality and durability of the product. Finally, a requirement was included on an extended guarantee (aligned to the computer product group). The Consumer Sales Directive (1999/44/EC) regulates aspects of the sale of consumer goods and associated legal guarantees. According to Directive 1999/44/EC, the term guarantee shall mean any undertaking by a seller or producer to the consumer, given without extra charge, to reimburse the price paid or to replace, repair or handle consumer goods in any way if they do not meet the specifications set out in the guarantee statement or in the relevant advertising. In addition, Directive 2011/83/EU on consumer rights defines the concept of 'commercial guarantee' (also known as 'warranty'), which can be offered by sellers or producers in addition to the legal guarantee obligation. This can either be included in the price of the product or at an extra cost.

The Joint Research Centre Directorate B's Circular Economy & Industrial Leadership unit has compiled multi-level approaches for assessing the reparability and upgradability of products. In April 2019, a draft report was published describing the application of such approaches to televisions[51].

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[51] http://susproc.jrc.ec.europa.eu/E4C/documents.html

The study identifies the following priority parts of relevance for the repair/upgrade of a television and their correspondent priority weight (1 to 3) taking into consideration the likelihood of failure and the functional relevance:

- Main board (3)
- T-con board (3)
- Sound board (3)
- Power board (3)
- Inverter board (sometimes combined with power board) (3)
- Internal/external power supply (2)
- Transistor column (3)
- Speakers (3)
- LVDS cable (3)
- Lamps (3)
- TV stand (2)
- Remote control (2)
- Connectors for external equipment (2)
- Capacitors, batteries and accumulators (3)
- DVD/Blue ray module (when applicable) (1)
- HD/SSD (when applicable) (1)

However, according to the input of stakeholders involved in the development of the study, among the typical repair operations, the most expensive part to replace in a TV is the screen (LCD module). The most common and cheaper repair operations are instead related to the remote control and power supplies (capacitors). Repair of the main board, power board or sound board can be found in a middle position. Repair of speakers can be expected to be relatively cheaper when the problem is not related to the board. Faults in the main board or the display module can be fixed by either replacing or repairing these parts.

In addition, the study identifies the following technical barriers to repair:
- Difficulties in the identification of parts. In some cases it can be hard to identify parts, for instance when marking has become illegible due to overheating. In such cases, the availability of diagrams and lists of parts is important to facilitate their identification. However, this information is not always available to independent repairers.
- Use of adhesives. Some manufacturers use adhesives to fix the back cover of TVs which makes disassembly difficult with common tools.
- Use of specific tools. The use of specific tools for the disassembly of TVs should be avoided, or at least limited.
- Difficulties in the identification of the problem.
- Spare parts. Some parts of the circuit boards are difficult to find on the public market as spare parts.
- Lack of standardisation of LCD screens.

With regards to other Ecolabelling schemes, the majority of them request the availability of spare parts for a certain period of time after ceasing production.

For the final proposal, it was suggested focus on following aspects:

Design for repair:

- A number of spare parts (screen assembly and LCD backlight; stands; power and control circuit boards) which are not covered by Ecodesign, shall be accessible and exchangeable by the use of commercially available tools.
- Adhesives shall not be used to fix the back cover of the electronic display.
- Casing parts are free of electronic assemblies.

Repair manual: The applicant shall provide clear disassembly and repair instructions (e.g. hard or soft copy, video) and make them publicly available, to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for upgrades or repairs.

Repair service / information.

Information on recommended price of spare parts included.

Availability of spare parts 8 years for a number of spare parts (not covered by Ecodesign) and also for those covered by Ecodesign.

Commercial guarantee provision (3 years at no extra cost).

The revised EU Ecodesign Regulation sets the focus on provision of information and spare parts for repairers. However the proposed EU Ecolabel goes beyond setting additional requirements on the design of the display in order to be easily repaired and on the availability of relevant spare parts that are not covered by Ecodesign, in addition to the availability of information and offer of commercial guarantees at no additional cost.

- As a result of the Inter Service Consultation minor wording modifications have been introduced in the text. In addition, it has been included the following requirement: Information on repair, spare parts and commercial guarantee shall be provided in accessible formats for persons with disabilities upon request, in accordance with the accessibility requirements in Directive 2019/882 on the accessibility requirements for products and services.

3.4 Criterion 4 – End-of-life management

The research results of Task 3 and Task 4 also revealed that close attention should be paid to the end-of-life (EoL) management of televisions and external computer monitors to reduce the overall environmental impacts as secondary resources from recycling can substitute primary production.
In the existing criteria, requirements affecting the EoL management are spread across different discontinuous criteria. To illustrate the importance of EoL for external computer displays, for the revision it is proposed to cluster and rearrange the associated criteria, complementing them with some new proposals.

The different sub-requirements under the existing criteria 'recycled content' and 'design for disassembly' were rearranged and renamed as criteria 'material selection and material information to improve recyclability' and 'design for recycling'.

3.4.1 Criterion 4.1 – Material selection and information to improve recyclability

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Final proposal for criterion 4.1 Material selection and information to improve recyclability

(a) <u>Recyclability of plastics</u>:

   (i) Parts with a weight greater than 25 grams shall consist of a single polymer or a polymer blend or alloy that are recyclable;

   (ii) The presence of paints and coatings shall not significantly impact upon the resilience of plastic recyclate produced from these components upon recycling and when tested according to ISO 180 [1] or equivalent;

   (iii) Plastic enclosures shall not contain moulded-in or glue-on metal unless the metal inserts can be removed with commercially available tools.

   (iv) Casings, enclosures and bezels incorporating flame retardants shall be recyclable.

Note [1]: For the purposes of this criterion a significant impact is defined as a >25% reduction in the notched izod impact of a recycled resin as measured using ISO 180.

(b) <u>Information to facilitate recycling</u>:

b.1. Plastic parts with a mass greater than 25 grams shall be marked in accordance with ISO 11469 and ISO 1043, Sections 1 and 4. For plastic parts > 100 grams, the markings should be large enough and located in a visible position in order to be easily identified.

Exemptions specified in in Annex II of the Commission Regulation (EU) 2019/2021 (Section D, point 2) apply for this requirement.

b.2. Applicant shall make available to professional operators of the waste sector, in a website and free of charge, information relevant for dismantling and recovery. This should include at least: (a) a diagram of the product showing the location of the plastic components containing flame retardants; (b) the location of components containing the toxic or ecotoxic substances.

(c) <u>Recycled content</u>: The product shall contain on average a minimum 10% post-consumer recycled plastic, measured as a percentage of total plastic (by weight) in the product excluding Printed Wiring Boards. Where the recycled content is greater than 25% a declaration may be made in the text box accompanying the Ecolabel (see Criterion 6(b)). Products with a metal casing are exempt from this sub-criterion.

Assessment and verification: The applicant shall provide an exploded diagram of the electronic display in written or audio-visual format. This shall identify the plastic parts greater than 25 grams by their weight, their polymer composition, and their ISO 11469 and 1043 markings. The dimensions and positions of the marking shall be illustrated and, where exemptions apply, technical justifications provided.

Applicant shall provide the information relevant for dismantling and recovery available for professional operators and the website where is located.

The applicant shall verify recyclability by providing evidence that the plastics either individually or combined do not impact the technical properties of the resulting recycled plastics in such a way that they cannot be used again in electronic products. This could include:

- *A declaration from an experienced plastics recycler or permitted treatment operation in accordance with Article 23 of Directive 2008/98/EC ('the Waste Framework Directive');*
- *Test results from an independent laboratory or an experienced plastics recycler;*
- *Peer and industry reviewed technical literature applicable to Europe.*

The applicant shall provide third party verification and traceability for post-consumer recycled content. Certificate of recyclers pursuant to the EuCertPlast certification scheme or equivalent could be used to support verification.

Rationale of Proposed Criterion text

Consideration of the environmental effects from the (pre-) production stage and possible barriers for high-level recycling is crucial for any requirements for material selection, in line with the aim of the roadmap for a resource-efficient Europe. Meaningful criteria are needed to address these issues.

The criteria proposed covers the following main aspects:

Recyclability of plastics:

The study 'Disassembly analysis of slates: Design for repair and recycling evaluation' by Fraunhofer IZM (2013)[52] indicates on the basis of an interview with a recycler that plastics are separated into white (including light grey) plastics, which are of significantly higher recycling value, and black plastics. Metal foils attached to plastic parts reduce the value of the plastics fraction, and might be given to an additional shredding process for separation. Coating and plastic parts attached to bulk

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[52]   Cf.   http://www.izm.fraunhofer.de/content/dam/izm/de/documents/News-Events/News/2013/urn_nbn_de_0011-n-255111-18-1.pdf

plastic parts reduce the value of the plastic fractions PC/ABS, white mixed plastics and black mixed plastics from the perspective of the dismantler. This means that mono-material plastic housing parts without coatings, inserted metal windings, and metal shields attached are better to recycle than composite materials.

Initially, the requirement on a variety of plastics was proposed to limit the use of a maximum of four types of plastics used in plastic parts with a mass greater than 25 grams in the overall product. With regards to coatings, it was proposed to limit the use of coatings and/or metal inlays.

With regards to the use of flame retardants, EN 60065/A11 requires that TV sets comply with the external ignition (candle flame) requirements by passing the necessary tests as per TS 62441. According to TS 62441, the candle flame accessible area of television housing is considered to comply if it meets any of the requirements below:

     a)   The total mass of the combustible materials located at the outer surface does not exceed 300 g.

     b)   The combustible material used in candle flame accessible areas is made of V-1 class material.

     c)   The combustible materials used in candle flame accessible areas do not exhibit flaming for more than 3 minutes.

This means that, for televisions' plastic housings, compliance is generally achieved by using flame retardants (FRs). Research by Peeters et al.[53] has highlighted the importance of considering the flame retardants incorporated into plastic components, particularly casings and enclosures, as these are added to the polymer to provide fire protection.

The JRC-IES deveoped a report on material efficiency for product policy support focused on computers and television product groups[54]. With regard to recyclability of plastic parts, they mentioned that the scientific literature largely discussed the relevance of considering the recyclability of plastic parts in WEEE. They highlighted Peeters et al. (2014)[53] where the authors discussed the compatibility for the recycling of different mixtures of plastics in televisions (including flame retardants and different enclosures). According to the authors, plastic fractions with high purity are needed to obtain high-quality recyclates, so efforts to improve identification and separation such as labelling will improve recycling rates.

The report remarked that compatibility for recycling should also be extended to other materials assembled/attached to plastic parts. The use of materials with distinct physical properties could facilitate their separation. For example, replacing stainless steel inserts in aluminium components with aluminium inserts or with steel inserts (separable by high-efficiency magnetic separators) could improve their recyclability.

The ENFIRO project highlighted the importance of retaining the functional value of FRs by increasing recycling. A further issue highlighted by the US EPA's study of flame retardants in Printed Circuit Boards[55] relates to aluminium oxide arising from aluminium FR additives. Their high loading in PCB materials together with their insolubility in furnace slag means that if they arose in larger quantities

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[53] Peeters.J.R, Vanegas.P, Tange.L, Van Houwelingen.J and J.R.Duflou, *Closed loop recycling of plastics containing Flame Retardants*, Journal of Resources, Conservation and Recycling, 84 (2014) p-35-43.

[54] http://publications.jrc.ec.europa.eu/repository/bitstream/JRC100785/lb-na-27793-en-n%20(final).pdf

[55] Chem Sec, *Leading Electronics companies and Environmental organisations urge EU to restrict more hazardous substances in electronic products in 2015 to avoid more global dioxin formation*, 19th May 2010, http://www.chemsec.org/images/stories/publications/ChemSec_publications/ RoHS_restrictions_Company__NGO_alliance.pdf

in waste PCBs smelters would need to use more energy. The potential for this trade-off to occur was confirmed from discussions with an FR specialist involved with the ENFIRO project.

The successful US ecolabel EPEAT (IEEE 1680.1 standard for the environmental assessment of computer products [56]) includes:

- *a requirement relating to the avoidance of paints or coatings that are incompatible with recycling;*

- *an optional criterion that plastic enclosures shall not contain moulded-in or glue-on metal unless the metal inserts can be easily removed;*

- *only one plastic material shall be used in each plastic enclosure part greater than 100 g.*

'Paints and coatings on plastic parts are proven to be compatible with recycling processes if they do not significantly impact the physical/mechanical properties of the recycled resin. Significant impact is defined as >25g reduction in notched Izod impact at room temperature as measured using ASTM D256-05.'

Alternatively, the term 'recyclable' is also used in relation to materials and components and is defined as:

'Materials or components that can be removed or recovered from the whole product or package and put back into productive use as a material, not including energy recovery, using standard technologies, or as otherwise demonstrated.'

With this in mind, it was proposed to reflect the EPEAT criterion that addresses the compatibility for recycling of plastics with coatings/paints and the ease of removal of moulded-in or glued-on metal inserts.

The recyclability of casings, enclosures and bezels that incorporate flame retardants was suggested to be verified and, furthermore, the use of aluminium-based FRs with a high loading in PCB base materials was proposed not to be permitted because more energy is required to smelt them in the end-of-life phase.

In order to address concerns relating to the definitions of 'compatibility with recycling' or 'recyclable', greater flexibility was proposed in the assessment and verification, again reflecting EPEAT, with three different options based on (i) declarations from recyclers, (ii) test results and/or (iii) technical literature relevant to the EU market.

<u>Material information to facilitate recycling</u>:

Although some stakeholders claimed during the revision that plastic marking has little influence on recycling practices, other stakeholders reported that recyclers do use this information for their sorting activities.

In 2013, EFRA finalised a pilot project [57] on the recycling of plastics containing flame retardants from LCD televisions. Some of the main reasons for the low plastics recycling rate in Europe identified were the lack of information on the polymer type, the FR applied and the huge variety of different plastic types used, among others.

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[56] IEEE Computer Society, *Standard for Environmental Assessment of personal computer products*, IEEE Std 1680.1-2009, 5th March 2010.

[57] EFRA 2013. Recycling of Plastics from LCD Television Sets.Pilot project on mechanical plastics recycling from post-consumer flat panel display-LCDs.

As marking is widely established in practice, it was suggested to include a requirement on marking. Exemptions were included for cases where technical limitations result in marking not being feasible. A technical justification shall be provided where an exemption applies. In addition, it is proposed that the CAS number of any flame retardant incorporated in the plastic is marked according to the suggested notation.

Reference to following standards was included:

- ISO 11469 Plastics -- Generic identification and marking of plastics products;
- ISO 1043-1 Plastics -- Symbols and abbreviated terms -- Part 1: Basic polymers and their special characteristics;
- ISO 1043-4 Plastics -- Symbols and abbreviated terms -- Part 4: Flame retardants.

-Material information to facilitate recycling **(marking)** proposed is considered to be more stringent than the revised Ecodesign which applies to parts above 50 g while the EU Ecolabel proposal applies to parts above 25 g.

-In addition the criterion includes a requirement on **availability of information relevant for dismantling and recovery.**

Recycled content:

The suggested requirement applies to all plastic parts and structural elements > 25 grams. A threshold of 10% was included because there are still practical problems, even for front-runner manufacturers, in consistently meeting a higher requirement. Instead it was proposed, following the example of cotton content claims in the textile product group, where a higher content can be demonstrated, that there is an option to display this in Box 2 next to the EU Ecolabel. This would provide a benefit to manufacturers wishing to work towards a high recycled content, without placing an overall burden which could reduce the selectivity of the EU Ecolabel.

Concerns were raised about the verification of recycled content. It was proposed that third party verification is required for recycled polymer content and certificate of recyclers pursuant to the EuCertPlast certification scheme or equivalent could be used to support verification.

Products with metal casings are excluded from the recycled content requirement because the quantity of plastic remaining would be too low for the sub-criterion to be practical.

3.4.2   Criterion 4.2 – Design for dismantling and recycling

<table>
<tr><td>Final proposal for criterion 4.2. – Design for dismantling and recycling</td></tr>
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(a) For the following target parts, as relevant to the product, a manual dismantling shall be carried out by one person (i.e. not more than one snap-on connection has to be loosened at the same time) using widely used commercially available tools (i.e. pliers, screw-drivers, cutters and hammers as defined by ISO 5742, ISO 1174, ISO 15601):

   (i) Printed Wiring Boards >10 cm²

   (ii) Thin Film Transistor (TFT) unit >100 cm^2 and film conductors

   (iii) Polymethyl Methacrylate (PMMA) board light guide

(b) At least *one* of the following optional components (if applicable) shall also be possible to manually disassemble using common commercially available tools:

   (i) LED backlight units

   (ii) Speaker unit magnets (for display sizes greater than or equal to 25 inches)

   (iii) HDD drive (if applicable in the case of smart devices)

Assessment and verification: The applicant shall provide:

A test report detailing the dismantling sequence, including a detailed description of the specific dismantling steps, tools and procedures, for the components listed in (a) and the optional components selected from (b) as a minimum.

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Note:

* Dismantling step: An operation that finishes with the removal of a part or with a change of tool.

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</table>

Rationale of Proposed Criterion text

As laid out in the Task 4 report, manual dismantling is an important means of improving material recovery of precious and critical metals and thus reducing the overall impacts of televisions and external computer displays. This can be facilitated by appropriate design.

Identifying critical raw materials from an EU perspective

Under the EU Raw Materials Initiative, a working group has identified and listed the critical raw materials from a geopolitical and economic point of view[58]. The list is based on a time horizon of 10 years, so geological scarcity was not a central consideration; the increasing demand for products containing CRMs was cited instead as an important factor. Recyclability and the potential for substitution were also factors considered in the creation of the initial list.

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[58] European Commission, *Critical raw materials for the EU*, Report of the Ad Hoc Working Group on defining critical raw materials, DG Enterprise and Industry, 30th July 2010.

Table 4: Initial list of critical raw materials at EU level

Antimony	Indium
Beryllium	Magnesium
Cobalt	Niobium
Fluorspar	PGMs (Platinum Group Metals)[a]
Gallium	Rare earths[b]
Germanium	Tantalum
Graphite	Tungsten

Notes:

  a) *Platinum, palladium, iridium, rhodium, ruthenium and osmium.*

  b) *Yttrium, scandium, and the 'lanthanides' – lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium.*

Lithium and chromium were at the time of the initiative on the borderline of being identified as CRMs. It is understood that in the meantime their economic importance and supply risk may have shifted, bringing them within the definition of 'critical'.

Of direct relevance to the development of this EU Ecolabel criterion is the recommendation made within the 2010 report that policy actions are undertaken to *'make recycling of raw materials-containing products more efficient'* including *'mobilising end of life products with critical raw materials for proper collection'*. A specific recommendation is also made that:

> *'…overall material efficiency of critical raw materials should be achieved by…minimising raw material losses into residues from where they cannot be economically-recovered.'*

A number of bills of materials (BOMs) for electronic display products were identified and presented in the background report on Hazardous Substances published in September 2013[59]. Aside from metal and plastic associated with enclosures and the chassis, these did not identify CRM occurrence within product subcomponents. Literature was therefore reviewed in order to identify a bill of materials for CRMs. Indicative BOMs have been identified for a LED LCD PC monitor and a LED LCD TV based on analysis by Öko-Institut[60]. It can be seen from the BOM that CRMs are concentrated in a small number of main components, primarily the PCB and contacts and LED backlights.

Table 5: Indicative occurrence of high-value metals and CRMs in electronic displays

Metal	Content per LCD (LED backlit) [mg]		LCA hotspot	EU CRM	Occurrence in the product
	TV	Monitor			
Silver	580	520			PCB and contacts (100%)
Indium	260	82		☒	Internal coating on display (100%)
Gold	140	200			PCB and contacts (100%)

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[59] http://susproc.jrc.ec.europa.eu/televisions/docs/Task_Special_Hazardous_Substances_docx.pdf

[60] Öko-Institut, Recycling critical raw materials from waste electronic equipment, Commissioned by the North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection, 24th February 2012

Yttrium	4.8	3.20		☒	Background illumination (100%)
Palladium	44	40	☒	☒	PCB and contacts (100%)
Europium	0.09	0.06		☒	Background illumination (100%)
Cerium	0.30	0.2		☒	Background illumination (100%)
Gallium	4.90	3.30		☒	Background illumination (100%)
Gadolinium	2.30	1.50		☒	Background illumination (100%)

An industry survey conducted by WRAP suggested that, to a great extent, removal by manual treatment of circuit boards (88-94%), plastics incorporating brominated flame retardants (82%) and LCD displays (88%) already takes place, although it is not clear to what extent this can be taken to be representative of the picture across the EU.

Printed Circuit Boards (PCBs) – The main economic aim of recovering PCBs is to recover the copper, gold, silver and palladium. Currently, CRMs are primarily recovered from circuit boards at large metal refining facilities designed to handle complex streams of metal-containing wastes[61]. They can then be refined from copper alloys.

LCD/LED display units – Displays are usually recycled thermally in waste incineration plants or in the Waelz kiln process for steel mill dust. The organic components (liquid crystals, polarisation filters, resins) are generally shredded and may then be incinerated, and the glass along with the oxidised metals remains bound in an inert slag. The indium contained in the displays is generally lost through dissipation[62].

Several pilot and laboratory technologies have been already developed for indium[63] and rare earths[64] recovery. However, there are currently no large-scale recycling facilities for the separation and refining of indium from the display units and the rare earths from the background illumination. The very low indium content and lack of another significant metal to recover in each LCD unit makes the economics of recovery very challenging. However, with indium supplies being dependent on lead or tin extraction, there is the potential for exposure of the electronics sector to price volatility.

In view of the need to protect future supplies of indium, Germany is understood to be considering storage of dismantled display units for recycling at a later date. It has been postulated that some form of chemical leaching process might in the future be more promising than a smelting process.

The rare earth elements contained in the luminescent materials are currently not recycled. Up until now the luminescent materials and rare earth elements contained in display units, e.g. yttrium, europium, terbium, were sent to landfill following shredding. However, several mobile pilot plants are being developed to recover metals like copper, manganese, zinc, yttrium and indium from WEEE by hydrometallurgical processes.

LED backlights – The CRMs and rare earth metals used in the manufacture of LED backlight units are related to doping and luminescence. They can include indium, gallium, cerium, europium, yttrium

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[61] Van Kamp.M and A, Vasseur, *Raw materials sustainability: Collaborating towards a better world*, Presentation to the Future Circular Materials Expo, Sweden, 2013
[62] See Öko-Institut (2012).
[63] Kye-Sung Park, Wakao Sato, Guido Grause, Tomohito Kameda, Toshiaki Yoshioka. *Recovery of indium from In_2O_3 and liquid crystal display powder via a chloride volatilization process using polyvinyl chloride.* Thermochimica Acta 2009.
[64] See HydroWEEE projects.

and gadolinium. The weight per substance typically amounts to only μg's per LED. There is no current reliable information on the potential to recycle LED chips.

PMMA display light guide -The plastic light guides within a LCD display constitute a large proportion of the plastic used in a TFT display. In particular, the PMMA light guide has been identified as a subcomponent that is readily identified and which is readily recyclable according to IEC 62635. The JRC-IES identified that, without prior manual separation, the PMMA light guide would be dispersed among other shredded fractions. This would cause the contamination and consequent downcycling of the recyclates. On the other hand, PMMA sorted from other fractions before shredding can be recycled for the production of new boards with the same quality.

Against this background, for this final proposal two main requirements have been proposed:

1) Manual dismantling with commercially available tools of most relevant components in terms of LCA hotspots, CRM/REE occurrence and market potential identified:

- Printed Wiring Boards >10 cm^2;
- Thin Film Transistor (TFT) unit >100 cm^2 and film conductors;
- Polymethyl methacrylate (PMMA) board light guide.

2) Manual dismantling with commercially available tools of *one* additional component among ((i) LED backlight units, (ii) speaker unit magnets (for display sizes greater than or equal to 25 inches) or (iii) HDD drive (if applicable in the case of smart devices)), which have been identified as more challenging to extract.

3.5   Criterion 5 – Corporate responsibility

Within the hotspot analysis for televisions and external computer displays, some additional issues concerning environmental as well as social impacts were identified. Within this context it has been discussed whether the revision of the EU Ecolabel for electronic displays should also introduce new requirements on corporate responsibility, meaning that they cannot be implemented and verified at product level but need to be implemented instead at production level, possibly already during production stages not carried out by the applicant him/herself.

3.5.1   Criterion 5.1 – Labour conditions during manufacture

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Having regard to the International Labour Organisation's (ILO) Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, the UN Global Compact (Pillar 2), the UN Guiding Principles on Business and Human Rights and the OECD Guidelines for Multi-National Enterprises, the applicant shall obtain third party verification supported by site audits that the applicable principles included in the ILO fundamental conventions and the supplementary provisions below identified have been respected at the final assembly plant(s) for the product.

Fundamental conventions of the ILO:

(a) **Child Labour**:

  (i) Minimum Age Convention, 1973 (No 138)

  (ii) Worst Forms of Child Labour Convention, 1999 (No 182)

(b) **Forced and Compulsory Labour**:

  (i) Forced Labour Convention, 1930 (No 29) and 2014 Protocol to the Forced Labour Convention

  (ii) Abolition of Forced Labour Convention, 1957 (No 105)

(c) **Freedom of Association and Right to Collective Bargaining**:

  (i) Freedom of Association and Protection of the Right to Organise Convention, 1948 (No 87)

  (ii) Right to Organise and Collective Bargaining Convention, 1949 (No 98)

(d) **Discrimination**:

  (i) Equal Remuneration Convention, 1951 (No 100)

  (ii) Discrimination (Employment and Occupation) Convention (No 111)

Supplementary provisions:

(a) **Working Hours**:

  (i) ILO Hours of Work (Industry) Convention, 1919 (No 1)

(b) **Remuneration**:

  (i) ILO Minimum Wage Fixing Convention, 1970 (No 131)

  (ii) Living wage: The applicant shall ensure that wages (excluding any taxes, bonuses, allowances, or overtime wages) paid for a normal work week
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</table>

(not exceeding 48 hours) shall be sufficient to afford basic needs (housing, energy, nutrition, clothing, health care, education, potable water, childcare, and transportation) of worker and of a family of four people, and to provide some discretionary income. Implementation should be audited with reference to SA8000[65] guidance on "Remuneration".

(c) **Health & Safety:**

(i) ILO Safety in the use of chemicals at work Convention, 1990 (No.170)

(ii) ILO Occupational Safety and Health Convention, 1981 (No.155)

In locations where the right to freedom of association and collective bargaining are restricted under law, the company will not restrict workers from developing alternative mechanisms to express their grievances and protect their rights regarding working conditions and terms of employment, and shall recognise legitimate employee associations with whom it can enter into dialogue about workplace issues.

The audit process shall include consultation with external industry independent organisation stakeholders in local areas around sites, including trade unions, community organisations, NGOs and labour experts. Meaningful consultations shall take place with at least two stakeholders from two different subgroups.

During the validity period of the EU Ecolabel, the applicant shall publish aggregated results and key findings from the audits (including details on (a) how many and how serious violations of each labour rights and OHS standard; (b) strategy for remediation – where remediation includes prevention per UNGP concept; (c) assessment of root causes of persistent violations resulting from stakeholder consultation – who was consulted, what issues were raised, how did this influence the corrective action plan), online in order to provide evidence of their performance to interested consumers.

<u>Assessment and verification</u>: the applicant show compliance with these requirements by providing copies of the most recent version of their code of conduct which must be consistent with the provisions specified above and supporting audit reports for each final product assembly plant for the model(s) to be ecolabelled, together with a web link to where online publication of the results and findings can be found.

Third party site audits shall be carried out by auditors qualified to assess the compliance of the industry manufacturing sites with social standards or codes of conduct or, in countries where ILO Labour Inspection Convention, 1947 (No 81) has been ratified and ILO supervision indicates that the national labour inspection system is effective and the scope of the inspection system covers the areas listed above[66], by labour inspector(s) appointed by a public authority.

Valid certifications from third party schemes or inspection processes that audit compliance with the applicable principles of the listed fundamental ILO Conventions and the supplementary provisions on working hours, remuneration and health &

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[65] Social Accountability International, *Social Accountability 8000 International Standard,* http://www.sa-intl.org

[66] See ILO NORMLEX (http://www.ilo.org/dyn/normlex/en) and supporting guidance in the User Manual.

> *safety and consultation with external stakeholders, shall be accepted. These*
> *certifications shall be not more than 12 months old.*

Rationale of Proposed Criterion text

The are no social requirements under the existing criteria in force. However, the EU Ecolabel Regulation allows the inclusion of social requirements, where relevant.

The criteria has been harmonised as far as possible with TCO generation 8 for displays. The following information summarises the main elements and rationale behind the final proposal:

Addressing key social hot spots and providing the right level of assurance

According to expert judgement, a basic linkage to the underlying principles of the eight fundamental ILO labour conventions and (often weaker) national labour laws would not be sufficient enough to address the social hotspots specific to computer and display manufacturing processes. Thus, as minimum criteria, the underlying principles of the eight ILO fundamental conventions should be supplemented by provisions in the underlying principles of further ILO conventions addressing working hours, remuneration and health and safety.

Reference to the underlying principles is important to emphasise in the criterion text, because ILO conventions are intended to be ratified at national level, whereas for social auditing they are used as a reference at factory or company level.

In terms of remuneration, ILO's Minimum Wage Fixing Convention 131 (1970) specifies in Article 3 (a) and (b) that the following two elements are taken into consideration in determining the minimum wage:

- the needs of workers and their families taking into account the general level of wages in the country, the cost of living, social security benefits, and the relative living standards of other social groups;

- economic factors, including the requirements of economic development, levels of productivity, and the desirability of attaining and maintaining a high level of employment.

According to SA8000[67], in most countries these two considerations are at odds and may not be weighted equally in the determination of the minimum wage. These wages also frequently do not reflect inflation and other factors that affect actual standards of living.

Lack of enforcement of even these minimal rates of pay is common, forcing workers to work excessive overtime just to earn the legal minimum wage. For this reason, the proposed EU Ecolabel criteria include an additional requirement on the 'living wage' being sufficient to meet the basic needs of personnel and to provide some discretionary income. For a definition of 'living wages', interpretations, implementation, auditing and evidence of compliance, reference is made to the SA8000 Consolidated Guidance on Remuneration[68].

Defining the scope of the criteria proposal

The social requirements are proposed only to address first-tier suppliers (final product assembly). This is due to the fact that first-tier suppliers (contract manufacturers) increasingly act vertically within the supply chain from purchase to final assembly. Moreover, social aspects

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[67] Source: http://www.sa-intl.org/_data/n_0001/resources/live/SA8000Remuneration.pdf
[68] See http://www.sa-intl.org/_data/n_0001/resources/live/SA8000Remuneration.pdf

regarding hotspots of raw materials extraction will be addressed more specifically by criterion 'Use of conflict-free minerals'.

For most manufacturers, the final assembly of their ICT products takes place at a limited number of contract manufacturers. Providing a list of first-tier suppliers summing up to at least 90% of procurement expenditure for final assembly (see for example Apple's information on suppliers[69]) would help the competent bodies to cross-check with the availability of independent audit reports as also being required for verification. Online publication of audit reports would improve the overall transparency of the ICT supply chain.

Addressing perceived weaknesses with the industry Code of Conduct

Feedback from industry stakeholders requested alignment with the Electronic Industry Citizenship Coalition's (EICC) Code of Conduct. Although the EICC CoC provides a positive framework for action on social issues by manufacturers, it raises a number of concerns:

o The labour standards are not based on the fundamental ILO labour conventions but rather on the national laws which might be weaker in some countries.

o The Freedom of Association and Right to Collective Bargaining requirements fall behind the Core ILO and SA8000 standards.

o Moreover, the CoC only implies regional minimum wages and not wages sufficient to meet basic needs ('living wages').

o Rights relating to employment security are not addressed.

o Monitoring is mainly based on self-evaluation and, in the monitoring process, no independent trade unions or labour rights organisations are included. Controls of the self-evaluation of suppliers only take place on a random basis. Although the EICC has a 'Validated Audit Process' (VAP), it is not a requirement.

Whilst it is not proposed to explicitly refer to labour conditions in the assessment and verification text, as all qualified social auditors should be encouraged in order to support implementation of the Ecolabel, the intention is to recognise third party auditing by accredited SAAS (SA8000) and EICC VAP auditors. This is considered to provide greater scope for applicants who are members of the EICC to comply with the criterion, albeit with stricter additional requirements relating to the audit process, ILO coverage and minimum/living wages.

Although the SA8000 audit process focuses in a similar way to the EICC VAP audit process on interviews with the employer and workforce, it also identifies consultation with external stakeholders as being important. The SA8000 audit guidance describes how stakeholders shall be involved prior to the audit process[70]:

'The interested stakeholders to be consulted include: workers, trade unions, research institutions, NGOs, community organisations, and labor experts. The groups being consulted may be asked if any facility in the area has particular problems and/or for comments on a list of facilities including the audited facility, but auditors should not identify the applicant facility prior to certification.'

This wider engagement is intended to assist auditors to 'build up a picture of working conditions at the enterprises in advance of the verification process'. The guidance specifically refers to the convening of meetings of local groups.

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[69] Cf. http://www.apple.com/supplier-responsibility/our-suppliers/ and http://images.apple.com/supplier-responsibility/pdf/Apple_Supplier_List_2014.pdf
[70] Social Accountability International (2004) *Guidance document for Social Accountability 8000.*

Cross-checking the provisions and safeguards against 'scandals'

Early in the revision process a case cited of a social criterion 'scandal' involved Samsung, who in May 2013 were awarded TCO certification for a Galaxy S4 smartphone model[71]. The scandal appears from NGO announcements to have related to the handling of chemicals (occupational health and safety) and workers' rights (Freedom of Association).

A cross-check of the provisions within the criterion proposal was made with the aim of ensuring that the issues raised in the cited Samsung case are addressed. The industry EICC code of conduct, TCO and SA8000 were also checked. This exercise highlighted that health and safety issues were not directly addressed within the criterion proposal, with chemical handling having been identified as a specific issue in the case of Samsung.

ILO Conventions 'Occupational Safety and Health' (No 155) and 'Safety in the use of chemicals at work' (No 170) were identified as being relevant for the purposes of auditing. Convention No 155 has already been adopted for the EU Ecolabel for Textiles. Convention No 170 specifically addresses chemical handling and risk assessment in the workplace. Both provisions are specifically referenced in the consolidated guidance for the SA8000 standard[72].

How to address countries where collective bargaining is illegal

A cross-check of the TCO criterion also highlighted a point raised in early discussions relating to countries where the right to freedom of association and collective bargaining via unions is restricted or banned, such as in China. The TCO social audit requirement 'Mandate A.7.1' states that *'in situations where the right to freedom of association and collective bargaining are restricted under law, workers shall be permitted to freely elect their own representatives'.* The alternative text proposed originates from UN guidance on implementation of the Global Compact[73], which states that *'the company shall recognise legitimate employee associations with whom it can enter into dialogue about workplace issues'.*

The proposal to address labour conditions during manufacturing reflects the significance of social issues in the computer/display manufacturing supply chain. This is evidenced by the investment made by industry to address working conditions through an industry Code of Conduct. In this respect, high-level reference is made in both the Act and the Annex criteria to a number of reference documents, namely:

- the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy;

- the UN Global Compact (Pillar 2);

- the UN Guiding Principles on Business and Human Rights; and

- the OECD Guidelines for Multinational Enterprises.

The proposal seeks to provide a minimum acceptable level of assurance based on third party auditing of final assembly sites. Auditing would be carried out against the underlying principles of ILO fundamental conventions, which are commonly used a reference for social auditing. Specific additional ILO conventions and points for verification relating to working hours, remuneration and health and safety have been added, reflecting 'hotspot' social issues for

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[71] Uncited press release, *Global health and justice groups demand that TCO withdraw its sustainability certification award for Samsung's S4 smartphone.* http://www.amrc.org.hk/system/files/Global%20health%20and%20justice%20groups%20demand%20that%20TCO%20withdraw%20Samsung%20certification.pdf

[72] Social Accountability International, *Social Accountability 8000 International Standard,* http://www.sa-intl.org

[73] Castan Centre for Human Rights Law and the International Business Leaders Forum (2008) *Human rights translated: A business reference guide,* Office of the United Nations High Commissioner for Human Rights.

computer/display manufacturing. A clause has also been included recognising that in some countries, such as China, some flexibility is required because of laws restricting unions.

The form of verification addresses two key identified weaknesses of the industry Code of Conduct. Firstly, third party auditing is a requirement so as to ensure impartiality. Secondly, the stakeholders involved in the audit process have been expanded beyond the workforce so as to better detect possible breaches of the requirements, reflecting best practice from SA8000.

The use of auditors qualified to assess compliance of the electronics supply chain is promoted, with the intention to recognise accreditations such as those provided by SAAS (the accreditation body for SA8000) and the EICC. It is considered important to support the industry's EICC initiative within the frame of the criterion proposal.

3.5.2 Criterion 5.2 – Sourcing of 'conflict-free minerals'

The applicant shall support the responsible sourcing of tin, tantalum, tungsten and their ores and gold from conflict-affected and high-risk areas by:

(i) conducting due diligence in line with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, by reporting on all details defined by the Guidance; and

(ii) promoting responsible mineral production and trade within conflict-affected and high-risk areas for the identified minerals used in components of the product in accordance with OECD.

__Assessment and verification__: The applicant shall declare the compliance with these requirements together with the following supporting information:

- *A report describing their due diligence activities along the supply chain for the four minerals identified. Supporting documents such as certifications of conformity issued by the European Union's scheme shall also be accepted.*

- *Identification of component(s) which contain the identified minerals, and their supplier(s), as well as the supply chain system or project used for responsible sourcing.*

Rationale of Proposed Criterion text

Displays contain a wide range of scarce resources which are largely mined in the Democratic Republic of the Congo, a conflict region, and according to sources under dangerous conditions, without sufficient maintenance of health and safety standards, and in some cases by children.

However, instead of a criterion to exclude the use of conflict minerals, bearing in mind the potential impact of a de facto embargo of minerals from a whole region that is economically and socially dependent on the mining industry, for the EU Ecolabel revision a process-oriented approach has been proposed to stimulate sustainable sourcing.

Responsible sourcing projects can be specified geographically by defining activities carried out within or on the fringes of the resource-conflict hotspot (the eastern parts of the Democratic Republic of the Congo) and by their compliance with the *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas,* which was specifically tailored to the responsible sourcing of tin, tantalum, tungsten and gold.

The activity in this area was stimulated by the US Dodd-Frank Act which requires disclosure of the source of metals. Example projects on the ground include those working to establish traceability systems at a general level, such as the Public-Private Alliance for a responsible minerals trade and Solutions for Hope, the Responsible Mineral Initiative[74] and those focused on specific minerals, such as the Conflict-free tin initiative, the Tin Source Initiative and the Tantalum Initiative. Front-runner companies are amongst the active members of these projects.

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[74] http://www.responsiblemineralsinitiative.org/

Towards an integrated EU approach

At the AHWG2, DG Trade outlined work by the Commission to address the conflict-free sourcing of materials for end-products containing tin, tantalum, tungsten and gold. The proposed approach is outlined in Joint Communication JOIN(2014)8 [75] which includes proposals for public procurement guidance.

Although the Communication highlights the significance of the OECD's Due Diligence guidance as a framework for action it cites fragmented compliance efforts, including a wide range of public and private initiatives, as well as the limited incentives to act, as barriers to further progress. Moreover, membership of existing projects supposes a substantial investment of time and resources which may be a barrier to smaller manufacturers.

A draft Regulation is proposed which would introduce a requirement for due diligence along the supply chain for EU importers, reflecting the approach promoted by the OECD. It describes a responsible importer due diligence self-certification requirement linked to the establishment of a list of responsible smelters and refiners. However, implementation will take some time so any Ecolabel criteria must therefore be pragmatic in the form of assessment and verification.

The Commission also proposed to broaden the geographical scope of conflict areas adopted under the Dodd-Frank Act to any '*areas in a state of armed conflict, fragile post-conflict as well as areas witnessing weak or non-existing governance and security, such as failed states, and widespread and systematic violations of international law, including human rights abuses*.'

The proposed criterion takes a proactive approach to the sourcing of tin, tantalum, tungsten and their ores and gold from conflict-affected and high-risk areas. This reflects the approach already taken by leading manufacturers, which rather than boycotting such areas seeks to support an improvement in working conditions.

The requirements and verification have been aligned with the OECD's guidance on due diligence, with anticipation of the EU's certification scheme for conflict-free smelters which will introduce a third party verified supply chain conformity scheme. They also require applicants to demonstrate how they promote the sourcing of conflict-free minerals by providing verification of action for at least one mineral related to at least one component. This is deliberately flexible as it does not require applicants to join traceability projects. They can verify compliance at either:

- final product level, as members of traceability projects;

- by contracting final assemblers that are members of traceability projects; or

- by specifying sub-assemblies or components manufacture by suppliers who are members of traceability projects.

In this way, supply chain activity in conflict-affected and high-risk areas will be supported, helping the development of traceability to improvement initiatives on the ground and demand for conflict-free minerals.

Additional evidence of manufacturers/suppliers that are part of conflict-free sourcing initiatives has been gathered:

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[75] Joint Communication to the European Parliament and the Council on *Responsible sourcing of minerals originating in conflict-affected and high-risk areas: Towards an integrated EU approach*, JOIN(2014)8

- LG Electronics[76] is a member of the Responsible Minerals Initiative (RMI). The RMI provides its members with the most up-to-date information on conflict-free smelters and refiners, and tools for conducting due diligence. The RMI also operates the Responsible Minerals Assurance Process (RMAP), a programme that uses third party independent auditors to verify that participating smelters and refiners have adequate policies and due diligence processes in place to trace the origins of the minerals that they process and assess whether they were obtained from conflict-free sources.

- Samsung Electronics[77] has banned the use of conflict minerals that are mined unethically in conflict areas in 10 African countries, including the Democratic Republic of the Congo. To establish a conflict-free system, it has implemented a process of due diligence for conflict minerals in line with the 'OECD Due Diligence Guidance'. Additionally, it encourages suppliers to partner with smelters certified by the RMAP (Responsible Minerals Assurance Process), and require uncertified smelters in its supply chain to become certified by the RMAP.

NVIDIA[78] is committed to operating in a socially responsible manner and to implementing due diligence practices designed to determine whether minerals from the Democratic Republic of the Congo (DRC) and adjoining countries, including gold, tantalum, tungsten and tin (3TG), used in its products are 'conflict-free'. NVIDIA's due diligence process aligns with the Organisation for Economic Co-operation and Development (OECD) framework. NVIDIA established an internal management system, centered around a conflict minerals team with representatives from operations, legal, sales and marketing, and requested all 3TG suppliers to complete the Conflict Minerals Reporting Template (CMRT). To improve the collection, validation and analysis of its conflict minerals programme, it leverages a third party supplier management solution. It is an active member of the Conflict-Free Sourcing Initiative (CFSI) and the Public Private Alliance (PPA) for Responsible Minerals Trade to support initiatives targeted at improving the traceability of conflict minerals in the DRC.

Against this background, it is considered that the proposed criterion is achievable.

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[76] https://www.lg.com/global/sustainability/business-partner/conflict-minerals
[77] https://www.samsung.com/levant/aboutsamsung/sustainability/supply-chain/
[78] https://www.nvidia.com/object/conflict-minerals-program.html

3.6   Criterion 6 – Information criteria

3.6.1   Criterion 6.1 – User instructions

Final proposal for criterion 6.1 – User instructions

The electronic display shall be sold with relevant user information that provides advice on its proper environmental use. The information shall be located in a single, easy-to-find place in the user instructions as well as on the manufacturer's website. The information shall include, as a minimum, the following information (when applicable):

(a)   Energy consumption: Energy Efficiency Class according to Energy Labelling of electronic displays(*). The maximum power demand in each operating mode. In addition, instructions shall be provided on how to use the device's energy saving mode and Information that energy efficiency cuts energy consumption and thus saves money by reducing electricity bills.

(b)   The following indications on how to reduce power consumption:

  (i) Turning the product off at its mains supply, un-plugging it, or using the hard off-switch (where one is fitted) will cut energy use to (near) zero;

  (ii) Putting the product into standby mode will reduce energy consumption, but will still draw some power;

  (iii)Note that screen savers (computer monitors) can stop displays from powering down into a lower power mode when not in use. Ensuring that screen savers are not activated on displays can therefore reduce energy use;

  (iv)Note that a Quick Start Function might cause increased power consumption;

  (v) Note that integrated functions, such as a receiver for digital signals (e.g. DVB-T) or hard disk recorders may help reducing power consumption if, as a result, an external device becomes redundant.

(c)   Network connectivity: Information on how to deactivate networking functions

(d)   The position of the hard off-switch.

(e)   Information that extension of the product's lifetime reduces the overall environmental impacts.

(f)   The following indications on how to prolong the lifetime of the product:

  (i) Clear disassembly and repair to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for repairs.

  (ii) Information to let the user know where to go to obtain professional repairs and servicing of the product, including contact details as appropriate.

(g)   End-of-life instructions for the proper disposal of the product at civic amenity sites or through retailer take-back schemes as applicable, which shall comply with Directive 2012/19/EU of the European Parliament and of the Council.

Rationale of Proposed Criterion text

Consumer information for televisions and external computer displays have been integrated into one criterion. In addition, following aspects have been addressed and reflected in the criterion:

- information on newer functions and modes (manual/automatic brightness control, quick start mode, active standby for networked products) was included.
- the product group was changed to 'electronic display';
- a requirement on network connectivity was added;
- the provision of a list of available spare parts with current prices was deleted as this was not seen as practicable by stakeholders;
- a sub-criterion on repair manuals was specified regarding print versions with additional advice to prefer online versions of to save resources;
- the assessment/verification was amended by the provision of a copy and/or link to the user instructions.

3.6.2   Criterion 6.2 – Information appearing on the EU Ecolabel

> **Final proposal for criterion 6.2 – Information appearing on the Ecolabel**
>
> The optional label with text box shall contain three of the following texts:
>
> (a) high energy efficiency;
>
> (b) restriction of hazardous substances;
>
> (c) designed to be easy to repair and recycle;
>
> (d) contains xy% post-consumer recycled plastic (only when greater than 25% as a percentage of the total plastic).
>
> The guidelines for the use of the optional label with text box can be found in the 'Guidelines for use of the Ecolabel logo' on the website:
>
> http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf
>
> **Assessment and verification**: *The applicant shall provide a sample of the product label or an artwork of the packaging where the EU Ecolabel is placed, together with a declaration of compliance with this criterion.*

Rationale of Proposed Criterion text

Initially, changes were made to existing criteria in force:

- To have an explicit focus on extended lifetime (formerly repair and upgrading).
- For televisions: addition of mercury-free backlights.

During the revision, the major proposed changes were:

- The 'mercury-free' claim has been deleted and a more general claim in accordance with criteria on hazardous substances has been introduced.
- Inclusion of criteria addressing plastic recycled content claims. Following the example of cotton content claims in the textile product group, where a higher content can be demonstrated there is an option to display this in Box 2 next to the Ecolabel. This would provide a benefit to manufacturers wishing to work towards a high recycled content, without placing an overall burden which could reduce the selectivity of the Ecolabel.

4   MAIN CHANGES TO CRITERIA COMPARED TO PREVIOUS CRITERIA

This section consists of a summary of the main general changes proposed for the revised criteria and potential implications for current licence-holders and possible applicants.

Currently, EU Ecolabel criteria exist for televisions (Commission Decision 2009/300/EC) while external computer displays was part of the criteria set for personal computers (Commission Decision 2011/337/EU) already expired in august 2017.

Table 6: EU Ecolabel criteria for external computer displays and televisions .

EU Ecolabel criteria for external computer displays (2011/337/EU) (expired in August 2018)	EU Ecolabel criteria for televisions (2009/300/EC)
Criterion 1 – Energy savings (specific for displays)	Criterion 1 – Energy savings
Criterion 2 – Power management	---
~~Criterion 3 – Internal power supplies~~	---
Criterion 4 – Mercury in fluorescent lamps	Criterion 2 – Mercury content of fluorescent lamps
Criterion 5 – Hazardous substances and mixtures	Criterion 5 – Heavy metals and flame retardants
Criterion 6 – Substances listed in accordance with Art. 59(1) of Regulation (EC) No 1907/2006	---
Criterion 7 – Plastic parts	---
~~Criterion 8 – Noise~~	---
Criterion 9 – Recycled content	---
Criterion 10 – User instructions	Criterion 6 – User instructions
Criterion 11 – User reparability	---
Criterion 12 – Design for disassembly	Criterion 4 – Design for disassembly
~~Criterion 13 – Lifetime extension~~	Criterion 3 – Lifetime extension
Criterion 14 – Packaging	---
Criterion 15 – Information appearing on the Ecolabel	Criterion 7 – Information appearing on the Ecolabel
NB: Crossed out lines: EU Ecolabel criteria for personal computers, explicitly not applied to external computer displays.	

During this revision, it was proposed to cover both product groups; thus common criteria for both televisions and external computer displays have been developed. In addition, the new Ecodesign and Energy Labelling Regulations cover also signage displays.
Therefore the **scope** of the new EU Ecolabel has been fully aligned to those tools and covers: **televisions, computer monitors and signage displays** and the **product group renamed as Electronic Displays.**
The requirements included in the new Ecodesign and Energy Labelling have been used as a baseline to build stricter requirements for the EU Ecolabel. The EU Ecolabel includes stricter energy efficiency requirements and addresses a number of other environmental issues not covered or partially covered by the other tools, for instance highly strict hazardous substances requirement in line with the EU Ecolabel Regulation or additional resource efficiency requirements in line with the Circular Economy Action Plans[79] . In addition, the EU Ecolabel Regulation allows the inclusion of social requirements, where relevant.

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[79] http://ec.europa.eu/environment/circular-economy/index_en.htm

The following table provides a view of how criteria has been clustered to certain thematic fields following the identified hotspots for televisions and external computer displays, within the new criteria set.

Table 7: New proposed criteria cluster and allocation of sub-criteria for the new EU Ecolabel criteria for electronic displays

New proposed criteria cluster	Proposed allocation of sub-criteria
1 Energy consumption	Criterion 1.1 – Energy savings
	Criterion 1.2 – Power management
2 Hazardous substances	Criterion 2.1 – Excluded or limited substances
	Criterion 2.2 – Activities to reduce supply chain fluorinated GHG emissions
3 Lifetime extension	Criterion 3 – Reparability and commercial guarantee
4 End-of-life management	Criterion 4.1 – Material selection and information to improve recyclability
	Criterion 4.2 – Design for dismantling and recycling
5 Corporate production / supply chain management	Criterion 5.1 – Labour conditions during manufacture
	Criterion 5.2 – Sourcing of 'conflict-free' minerals
6 Information	Criterion 6.1 – User instructions
	Criterion 6.2 – Information appearing on the EU Ecolabel

In relation to the criteria, there is a **general increase in the level of ambition proposed**, based mainly on the available technical evidence and information from other labelling schemes. Relating to the **energy criteria**, more efficient energy classes have been defined. In order to ensure high ambition level during the validity of this criteria, a **dynamic approach** has been proposed:

- Energy classes proposed before March 2021 correspond approximately to best 10% models in terms of energy efficiency according to available data.
- **After March 2021, EPREL database** could be used and then it is proposed to require one of the 2 top energy classes with registered models under the EPREL product database for a specific resolution and type of display (televisions, monitor or signage displays.

In addition, the compliance should be demonstrated every 2 years.

With regards the power cap, stricter values has been proposed (decreased to 64W) except for a UHD and signage displays were the existing value has been relaxed 125W in order to allow more screens above 55 inches to apply. Power management requirements have been extended compared to existing criteria in force.

Regarding the criteria dealing with **restricted substances**, the requirements have been modified taking into consideration changes in legislation and new evidence (e.g. chlorine-based plastics and DINP and DIDP in external power cables base on Nordic Swan). In addition, following the example of other labelling schemes, a new requirement on activities to reduce supply chain fluorinated greenhouse gas (GHG) emissions has been included.

With regard to criteria on **reparability**, the requirements have been widened. The existing requirements in force set the focus on the guarantee and availability of spare parts and the reference to easy disassembly is considered imprecise. The revised text includes additional requirements on the provision of information. With regards to the sub-requirement on design

for reparability, this has been further defined. While the new Ecodesign set the focus on the availability of a number of spare parts for 7 years, the new EU Ecolabel goes beyond the mandatory tool by setting 8 years availability of spare parts (not covered by Ecodesign) and also for those covered by Ecodesign, and by including criteria on design for repair, availability of repair manual and repair service information, provision of information on recommended price of spare parts and on commercial guarantee provision.

End-of-life management has been revised and extended. In addition to the marking of parts, the target parts have been further defined and the dismantling time has been included in line with EPEAT. In addition, manufacturers wishing to work towards a high recycled content are allowed to claim this (if above 25%) in the label.   In this area, the new EU Ecolabel goes beyond the mandatory Ecodesign requirements in a number of aspects. While the marking of plastics is required in Ecodesign for parts heavier than 50g, the EU Ecolabel requires the marking for smaller pieces (25g). In addition the EU Ecolabel includes requirements on recyclability and recycled content. Furthermore, regarding the dismantling, the mandatory Ecodesign requires the provision of dismantling while the EU Ecolabel requires an efficient dismantling of a number of components which are relevant in terms of CRM presence.

In addition,, the EU Ecolabel Regulation allows the inclusion of social requirements, where relevant. The revised criteria of the EU Ecolabel also includes **new criteria on labour conditions and on conflict-free mineral sourcing.**

Finally, the importance of correct use and disposal of electronic displays on life cycle impacts is also addressed by setting requirements on user instructions and consumer information. Main relevant change in criterion on **Information appearing on the EU Ecolabel** corresponds to the explicit focus on extended lifetime and the inclusion of criteria addressing plastic recycled content claims. This would provide a benefit to manufacturers wishing to work towards a high recycled content, without placing an overall burden which could reduce the selectivity of the Ecolabel.

In conclusion, the revised criteria set a higher ambition level, reflecting front runners' performance, and allow a broader spectrum of displays to be awarded the EU Ecolabel as a result of the changes in the scope.

5 TABLE OF COMMENTS

The table of comments received at the EUEB of February 2020 can be found at: https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/466/documents

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