

JRC SCIENCE FOR POLICY REPORT

Revision of the EU Green Public Procurement (GPP) Criteria for Computers and Monitors (and extension to Smartphones)

*Technical Report v3.0:
Final Criteria*

Alfieri Felice, Sanfélix Javier, Bernad Beltrán David, Spiliotopoulos Christoforos (JRC Dir. B – Growth and Innovation)

Graulich Kathrin, Moch Katja, Quack Dietlinde (Oeko-Institut e.V.)

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Contact information

Name: JRC Directorate B – Growth and Innovation
Address: C/ Inca Garcilaso, s/n
Email: JRC-B5-GPP-COMPUTERS@ec.europa.eu
Tel.: +34 954 48 8293

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List of acronyms

AC	Award criterion
AHWG	Ad Hoc Working Group
B2B	Business to Business
AHWG	Ad Hoc Working Group
BBP	Benzyl Butyl Phthalate
CPC	Contract Performance Clause
CPU	Central Processing Unit
CRM	Critical Raw Materials
DaaS	Device as a Service
DBP	Dibutyl phthalate
DEHP	Bis(2-ethylhexyl) phthalate
DIBP	Diisobutyl phthalate
EMI	Electromagnetic Interference
EoL	End of Life
EPS	External Power Supply
ESD	Electrostatic Discharge
GHG	Greenhouse Gas
GPP	Green Public Procurement
GWP	Global Warming Potential
HDD	Hard Disk Drive
HDMI	High-Definition Multimedia Interface
IC	Integrated Circuit
ICT	Information and Communications Technology
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
LCD	Liquid Crystal Display
ODD	Optical Disc Drive
OEM	Original Equipment Manufacturer
PBB	Polybrominated biphenyls
PBDE	Polybrominated diphenyl ethers
PC	Personal Computer
PCB	Printed Circuit Board
PCF	Product Carbon Footprint
PCC	Post-Consumer Recycled Content
PD	Power Delivery
PPM	Parts Per Million
PMMA	Poly(methyl methacrylate)
PSU	Power Supply Unit

RAM	Random Access Memory
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RoHS	Restriction of Hazardous Substances Directive
SC	Selection criteria
SCIP	Substances of Concern in Products
SoC	State of Charge
SoH	State of Health
SME	Small to Medium-Sized Enterprise
SSD	Solid-state Drive
SVHC	Substance of Very High Concern
TS	Technical specification
UPA	Universal power adapter
USB	Universal Serial Bus
VGA	Video Graphics Array

Abstract

This report is the final science for policy report supporting the revision of the EU Green Public Procurement (GPP) Criteria for Computers and Monitors, and the extension of these criteria to Smartphones.

These EU GPP Criteria aim at helping public authorities to ensure that ICT equipment and services are procured in such a way that they deliver environmental improvements that contribute to European policy objectives for energy, climate change and resource efficiency, as well as reducing life cycle costs. The revision process has taken into account market and technical developments as well as the experience gained by stakeholders in the application of the previous version of criteria.

These criteria for computers, monitors, tablets and smartphones focus on the most significant environmental impacts during their life cycle, which have been divided into four distinct areas: product lifetime extension; energy consumption; hazardous substances; end-of-life management. This set of criteria also includes a further category of criteria that apply to separate procurements for refurbished/remanufactured devices and related services.

For each area of focus, one or more criteria are provided, accompanied by the background technical rationale and a summary of the stakeholder contributions that support the final version of each criterion. Procurers can apply the criteria and engage tenderers to reduce the life cycle environmental impacts of their activities, focusing on those areas presenting the most improvement opportunities from cost and market perspectives and for which performance can be verified. The identified procurement processes and final green criteria are also described in a separate document, published as a Staff Working Document of the Commission: SWD(2021) 57 final. Together these two documents aim to provide public authorities with orientation on how to effectively integrate these EU GPP criteria into their procurement processes.

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1 Introduction

This document is intended to provide the background information for the revision of the EU Green Public Procurement (GPP) criteria for Computers and Displays. The new proposed title of the Staff Working Document is **EU Green Public Procurement (GPP) Criteria for Computers, Monitors, Tablets and Smartphones**.

The study has been carried out by the Joint Research Centre (JRC) with technical support from the consulting firm Oeko-Institut. The work has been developed for the European Commission's Directorate-General for Environment. EU GPP criteria aim at assisting public authorities with the purchase of products, services and works with reduced environmental impacts.

The use of the criteria is voluntary. The criteria are formulated in such a way that, if deemed appropriate by the individual authority, they can be integrated into its tender documents.

There are four main types of GPP criteria:

a. Selection criteria (SC) assess the suitability of an economic operator to carry out a contract and may relate to:

- (a) suitability to pursue the professional activity;
- (b) economic and financial standing;
- (c) technical and professional ability.

b. Technical specifications (TS), the required characteristics of a product or a service including requirements relevant to the product at any stage of the life cycle of the supply or service and conformity assessment procedures;

c. Award criteria (AC), qualitative criteria with a weighted scoring which are chosen to determine the most economically advantageous tender. The criteria are linked to the subject matter of the public contract in question and may comprise, for instance:

- environmental performance characteristics, including technical merit, functional and other innovative characteristics;
- organisation, qualification and experience of staff assigned to perform the contract, where the quality of the staff assigned can have a significant impact on the level of performance of the contract; or
- after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion.

Award criteria shall be considered to be linked to the subject matter of the public contract where they relate to the works, supplies or services to be provided under that contract in any respect and at any stage of their life cycle, including factors involved in:

- (a) the specific process of production, provision or trading of those works, supplies or services; or
- (b) a specific process for another stage of their life cycle, even where such factors do not form part of their material substance.

d. Contract performance clauses (CPC), special conditions laid down that relate to the performance of a contract and how it shall be carried out and monitored, provided that they are linked to the subject matter of the contract.

For each set of criteria there is a choice between two ambition levels:

- The **core criteria** are designed to allow for easy application of GPP, focussing on the key area(s) of environmental performance of a product and aimed at keeping administrative costs for companies to a minimum.
- The **comprehensive criteria** take into account more aspects or higher levels of environmental performance, for use by authorities that want to go further in supporting environmental and innovation goals.

1.1 The criteria revision process and evidence base

The main purpose of this document is to present the third draft of the criteria developed, taking into account the background technical analysis presented in the preliminary report produced by Oeko-Institut and addressing key aspects of this product group:

- market development since the last update;
- application of current GPP criteria;
- technical aspects (including existing GPP criteria, legal provisions and voluntary approaches).

A general questionnaire about scope was sent out to a wide range of stakeholders in May 2019. The target groups were government, industry, service providers, NGOs, academics and public procurers. The input provided were incorporated into the first draft report and, together with the outcome of the preliminary report, were the basis for the proposed revised criteria and for continuing the consultation with the stakeholders.

The second draft report was the outcome of the 1st AHWG meeting which took place on 11 December 2019 in Seville (Spain) and the following commenting period that took place until 3 February 2020. This revision included guidance for the applicability of the criteria to different product groups and prioritisation (Chapter 3.1) and guidance on the use of labels as means of proof (Chapter 3.2). Moreover, the order of the criteria area has been changed to better reflect the priority areas identified.

A written consultation took place from 24 June to 14 August 2020. Based on the comments received, this third (final) version of the technical report has been drafted.

In order to simplify and reduce the text and reduce the risk of making the criteria text obsolete, the list of applicable ecolabels has been summarised in Section 3.2 and removed from the criteria text boxes.

1.2 Scope definition

The previous version of the EU GPP criteria for computers and monitors (2016)¹ had the following products under their scope:

Stationary computers

- Desktop Computers (including Integrated Desktop Computers and Thin Clients)
- Small-scale Servers
- Workstations

Display devices

- Computer Monitors

Portable computers

- Notebook Computers (including subnotebooks)
- Two-In-One Notebooks
- Tablet Computers
- Portable All-In-One Computers
- Mobile Thin Clients

1.2.1 Stakeholder feedback

In the initial phase of the revision process, stakeholders were asked through a questionnaire (May 2019) to provide feedback on whether the current scope reflects computer and monitor equipment procurement priorities. Many of the respondents agreed that the scope covers the needs, although some comments asking for clarifications and/or the possibility to adapt the scope were received:

- Small-scale servers should be addressed in the server-related GPP (i.e. devices installed in a data centre or server room).
- The terminology for portable computers should be revised
- Most All-In-One Computers are stationary and not part of the portable segment.
- Smartphones could be a part of the GPP criteria for computers.
- Display devices should include projectors and large-format displays.

Some stakeholders also suggested that a more harmonised approach could help the procurers in the implementation of GPP criteria. Additional clarifications on the scope were suggested during the first written consultation, including the differentiation between mobile and stationary workstations.

1.2.2 Revised scope proposal

The preliminary analysis carried out at the beginning of this revision process highlighted a substantial overlap between criteria applicable for portable devices as smartphones, tablets and notebooks. Moreover, the analysis of environmental impacts (see Section 1.4) shows very similar hotspots related to the life cycle of these products. Based on this evidence and taking into account the feedbacks received by the stakeholders (see section 1.2.1) the extension of the criteria scope to smartphone has been agreed with DG ENV, The following scope was proposed and agreed by stakeholders at the first AHWG meeting (Table 1):

¹ http://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/contentype/product_group_documents/1581682454/EU_GPP_criteria_for_computers_and_monitors.pdf

Table 1. Proposed revised scope of the GPP criteria for ICT devices

Proposed revised scope of the GPP criteria (second proposal)
<p>Stationary ICT devices</p> <ul style="list-style-type: none"> • Computers <ul style="list-style-type: none"> • Desktop computers • Integrated desktop computers • Desktop thin clients • Desktop workstations (or workstations) • Computer displays <p>Mobile ICT devices</p> <ul style="list-style-type: none"> • Portable computers <ul style="list-style-type: none"> • Notebook computers • Two-in-one notebooks • Mobile thin Clients • Mobile workstations • Tablets • Smartphones

The following definitions are applied according to Commission Regulation N° 617/2013 of 26 June 2013 with regard to ecodesign requirements for computers and computer servers:

- **‘Desktop computer’** means a computer where the main unit is intended to be located in a permanent location and is not designed for portability and which is designed for use with an external display and external peripherals such as a keyboard and mouse.
- **‘All-in-one computer’ (or integrated desktop computer)** means a computer in which the computer and the display function as a single unit, which receives its AC power through a single cable. Integrated desktop computers come in one of two possible forms: (1) a product where the display and the computer are physically combined into a single unit; or (2) a product where the display is separated from the computer but it is connected to the main chassis by a direct current (DC) power cord. An integrated desktop computer is intended to be located in a permanent location and is not designed for portability. Integrated desktop computers are not primarily designed for the display and reception of audiovisual signals.
- **‘Desktop thin client’** means a computer that relies on a connection to remote computing resources (e.g. servers) to obtain primary functionality and has no rotational storage media integral to the product. The main unit of a desktop thin client must be intended for use in a permanent location (e.g. on a desk) and not for portability. Desktop thin clients can output information to either an external or, where included with the product, an internal display.
- **‘Workstation’** means a high-performance, single-user computer primarily used for graphics, Computer-Aided Design, software development, financial and scientific applications among other compute intensive tasks.
- **‘Notebook computer’** means a computer designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an AC power source.
- **‘Mobile thin client’** means a type of notebook computer that relies on a connection to remote computing resources (e.g. computer server, remote workstation) to obtain primary functionality and has no rotational storage media integral to the product.

The following definition is applied according to Commission Regulation (EU) 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays:

- **‘Computer display’, ‘monitor’ or ‘computer monitor’** means an electronic display intended for one person for close viewing such as in a desk-based environment².

The scope of these EU GPP criteria covers a broader range of ICT products available on the market. Additional definitions applied are based on ecolabels (e.g. EU Ecolabel, TCO Certified Generation 8, EPEAT), on the Preparatory Study on the Review of Regulation 617/2013³ and the Ecodesign preparatory study on mobile phones, smartphones and tablets (Task 1)⁴. The following definitions apply:

- **‘Tablet Computer’** (often referred to as ‘slate computer’) means a mobile personal computer that meets the two following criteria:
 - (a) includes an integrated touch-sensitive display as the main input and output medium and relies on users’ activation of the touch-sensitive display for inputs;
 - (b) does not have an integrated physical keyboard, although a detached keyboard may be used as a separated input device.
- **‘Two-in-one notebook’** means a computer which resembles a traditional notebook computer but has a detachable display which can act as an independent slate/tablet when disconnected.
- **‘Smartphone’** is an electronic device used for long-range communication over a cellular network of specialised base stations known as cell sites. It must also have functionality similar to a wireless, portable computer that is primarily for battery mode usage and has a touchscreen interface. Connection to the mains via an external power supply is considered to be mainly for battery charging purposes and an onscreen virtual keyboard or a digital pen takes the place of a physical keyboard. A smartphone is furthermore characterised by an operating system, Wi-Fi connectivity, mobile use of internet services, and the ability to accept original and third-party software applications. A smartphone has an integrated touchscreen display with a diagonal size between 4 and 7 inches.

These product definitions are inclusive of any external peripherals (e.g. mouse, track pad, keyboard) and power supplies that can be supplied with the product.

The GPP criteria presented in this report are applicable to different procurement routes as described in Section 1.5. The scope of this proposal also covers the procurement of refurbished/remanufactured devices (see Section 2.5). Guidance for the applicability of the criteria to different product groups and prioritisation is presented in Section 3.1 of this report.

1.2.3 Policy context: the new Circular Economy Action Plan for a cleaner and more competitive Europe

Due to the relevance of the new EU policy initiatives launched after the first criteria proposal, this new section aims to provide a short summary of the policy context.

The new Circular Economy Action Plan⁵ (CEAP) of the European Commission foresees a ‘Circular Electronics Initiative’ mobilising existing and new instruments. In particular, the following actions are planned in the time period 2020-2022:

- New and/or revised **ecodesign measures** for electronics and ICT computers including mobile phones, tablets and computers in order to ensure that devices are designed for energy efficiency and durability, reparability, upgradability, maintenance, reuse and recycling.
- Focus on electronics and ICT as a priority sector for implementing the **‘right to repair’**, including a right to update obsolete software.

² Other categories of electronic displays under Commission Regulation EU 2019/2021 are not proposed under the scope of these criteria.

³ Preparatory study on the review of Regulation 617/2013 Computers and Computer Servers – Task 7 (2017) Viegand Maagoe and Vito. Available at <https://computerregulationreview.eu/documents>

⁴ Ecodesign preparatory study on mobile phones, smartphones and tablets Draft Task 1 Report Scope (definitions, standards and legislation). Available at <https://www.ecosmartphones.info/documents/>

⁵ COM(2020)98 A new Circular Economy Action Plan For a cleaner and more competitive Europe.

- Regulatory measures on **chargers for mobile phones** and similar devices, including the introduction of a **common charger**, improving the durability of charging cables, and incentives to **decouple the purchase of chargers from the purchase of new devices**.⁶
- Improving the collection and treatment of waste electrical and electronic equipment including by exploring options for an **EU-wide take-back scheme** to return or sell back old mobile phones, tablets and chargers.
- **Review of EU rules on restrictions of hazardous substances in electrical and electronic equipment** and provision of guidance to improve coherence with relevant legislation, including REACH and Ecodesign.

The CEAP also foresees initiatives enhancing the **sustainability of batteries**. A new legislative proposal builds on the evaluation of the Batteries Directive and the work of the Batteries Alliance⁷. Possible aspects that would be addressed are rules on recycled content, sustainability and transparency requirements, the carbon footprint of battery manufacturing, the ethical sourcing of raw materials and security of supply, and facilitating reuse, repurposing and recycling⁷.

Furthermore, a process for the definition of the EU Ecolabel Criteria for Electronic Displays has recently been finalised, covering also computer monitors in the scope. The EU Ecolabel Criteria for Electronic Displays⁸ were voted on in June 2020 and published in the Official Journal in November 2020.

Regarding smartphones and tablets, an Ecodesign preparatory study is assessing the feasibility of proposing Ecodesign and/or Energy Labelling requirements for these product groups⁹. A preparatory study on the review of Ecodesign Regulation 617/2013 for computers was also conducted between January 2017 and July 2018¹⁰. Related study documents are available at [Both studies are based on the Methodology for Ecodesign of Energy-related Products \(MEErP\) detailed on the methodology pages.](#)

1.2.4 Further background after the AHWG meeting and first stakeholder consultation

Overall, the stakeholders welcomed the scope expansion of the criteria to smartphones. In order to deal with the increased complexity of the criteria, stakeholders requested clarification on the applicability of the criteria to each product type and also to different procurement areas (e.g. device as a service) or to specific end use applications (e.g. in the case of rugged devices). It was also requested to better take into account differences between products. Clarifications were also asked for on the classification of workstations that can be both stationary and mobile. Some stakeholders expressed concern about the high number of criteria, asking for a reduction and to highlight the most relevant ones. Several stakeholders also requested clarifications on the use of specific labels as means of proof. Based on these comments, an additional section has been added at the end of this report to help the reader map the applicability of the criteria for the different products in the scope (Section 3.1) and to guide them on the use of labels as means of proof (Section 0).

In addition, some concern was expressed about the level of ambition, considering that some of the criteria could soon become mandatory requirements due to the revision of the Ecodesign implementing measure for computers¹¹ and, for this reason, it was suggested that the level of ambition in terms of environmental performance should be increased.

1.2.5 Further background after the second stakeholder consultation

Several stakeholders welcomed the simplifications introduced in the second revision and the applicability guidance in Chapter 3 of this report. However, it is pointed out that there are fewer award criteria and less use of the core and comprehensive levels, and this is not necessarily considered the best way of simplifying the criteria. Moreover, there is still the request for a reduction in the number of applicable criteria.

⁶ An impact assessment study on this topic was published in December 2019, focusing on mobile phones and potentially to be extended to other portable electronics <https://op.europa.eu/nl/publication-detail/-/publication/c6fadfea-4641-11ea-b81b-01aa75ed71a1>

⁷ https://ec.europa.eu/environment/waste/batteries/pdf/Proposal_for_a_Regulation_on_batteries_and_waste_batteries.pdf

⁸ Commission Decision (EU) 2020/1804 of 27 November 2020 establishing the EU Ecolabel criteria for electronic displays (notified under document C(2020) 8156) (Text with EEA relevance) C/2020/8156 OJ L 402, 1.12.2020, p. 73–88

⁹ <https://www.ecosmartphones.info/>

¹⁰ <https://computerregulationreview.eu/documents>

¹¹ Regulation (EU) No 617/2013 of 26 June 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for computers and computer servers. OJ L 175 of 27 June 2013

In general, stakeholders consider that the most relevant ecological criteria have been included. However, there are criteria areas deemed important and not within the scope, in particular social aspects in the supply chain, conflict minerals, but also critical raw materials (CRM) (see also the discussion in Section 2.4.1), recycled content (see Section 2.1.5) and energy in manufacturing (see Section 2.2). In particular, the inclusion of social aspects has been advocated by a wide group of stakeholders (i.e. manufacturers, NGOs, Member States) along the entire revision process. Although the development of social criteria is not within the scope of this EU GPP criteria revision process, relevant examples of socially responsible procurement criteria are provided by the Commission report “Making Socially Responsible Public Procurement work: 71 Good Practice Cases”¹². Four cases applicable to the ICT sector from three EU Member States are included in this collection of case studies. According to this analysis, ICT equipment has the particular difficulty of long, complex supply chains, which is a challenge for contracting authorities and suppliers alike when trying to ensure compliance and verification. Cases reported in this study show that a suite of measures exist, including Codes of Conduct, technical specifications, award criteria and contract performance clauses, all of which aim to increase transparency and to establish due diligence as standard practice.

Another general point raised by several Original Equipment Manufacturers (OEM) refers to the requirement for test reports/certificates from an accredited conformity assessment body (specifically ISO 17025¹³ accredited laboratories and testing bodies). The need for these is questioned and considered to add lead time and costs without environmental benefits. The JRC believes that accreditation enhances the reliability of test results provided by laboratories.

Moreover, the same Procurement Directive¹⁴ allows for some flexibility in the implementation of this requirement: Art. 44(2) *“contracting authorities shall accept other appropriate means of proof (such as a technical dossier of the manufacturer) where the economic operator concerned had no access to the certificates or test reports referred, or no possibility of obtaining them within the relevant time limits, provided that the lack of access is not attributable to the economic operator concerned and provided that the economic operator concerned thereby proves that the works, supplies or services provided by it meet the requirements or criteria set out in the criterion”*.

¹² Authors: Tepper P., McLennan A., Hirt R., Defranceschi P., ICLEI – Local Governments for Sustainability and Caimi V., Elu A, AEIDL. With the support of Public Procurement Analysis, Dialog Makarna and Social Economy Europe (2020). Making socially responsible public procurement work 71 good practice cases, ISBN 978-92-9202-958-6 doi: 10.2826/844552. Available at: <https://op.europa.eu/en/publication-detail/-/publication/69fc6007-a970-11ea-bb7a-01aa75ed71a1>

¹³ ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories

¹⁴ Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on Public Procurement

1.3 Market analysis

This section provides an overview of the market for desktop PCs, laptops, tablets and smartphones, as well as a forecast for the next few years at global level. Additional data and estimations were collected after the first stakeholder meeting, especially regarding the market contribution of the public sector, addressed in Section 1.3.3.

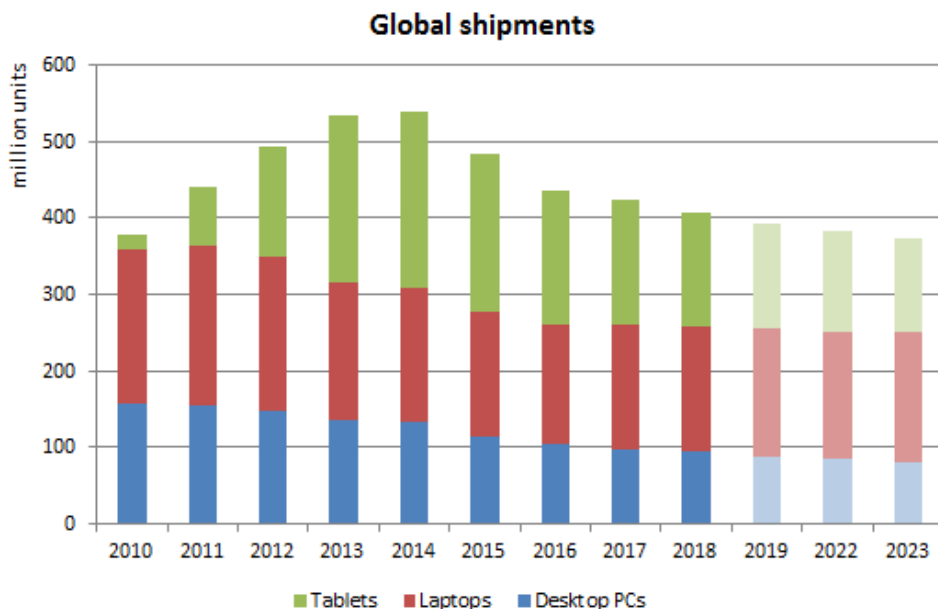
It is important to highlight that the market trends and forecast presented below are based on data collected pre-COVID-19. During the current COVID-19 pandemic, consumers, businesses and public administrations have had to adapt quickly to a “new normal”. ICT has helped in many areas, from smart working to distance learning, remote asset control, and automation. ICT products represent a way to help both businesses and society respond to this crisis. On the other hand, the economic crisis caused by COVID-19 has created a challenging environment for businesses, citizens and public administrations to invest in ICT products and services.

1.3.1 Current status and forecast for desktop PCs, laptops and tablets

The desktop PC, laptop and tablet market is generally considered a stable, high-turnover market, with over 400 million units sold globally in 2018. Despite this high level, the market has shown regressive sales numbers in recent years (2014-2018), also known as a 'declining plateau' in sales (Figure 1). In particular, desktop PCs have shown a significant decline in the period 2010-2018 and are expected to have a similar pattern up to 2023. Laptops have shown a slower decline in the same period, although this product range has potential for improvement up to 2023, mainly due to the growing market of the 'ultramobile' products: notebooks with 4"-7" screens. Tablets, which peaked in 2014 with 230 million units sold, have shown an even faster decline since then, expecting to have a similar pattern up to 2023.

Estimates for 2020 indicate that laptops will still dominate the market with 44% of the total, with tablets still strong in the market with 29% despite regressive sales. Desktop PCs –including integrated PCs, thin clients and workstations– will account for the remaining 27% of the market (Figure 2). These numbers are not expected to change significantly between 2020 and 2030¹⁵.

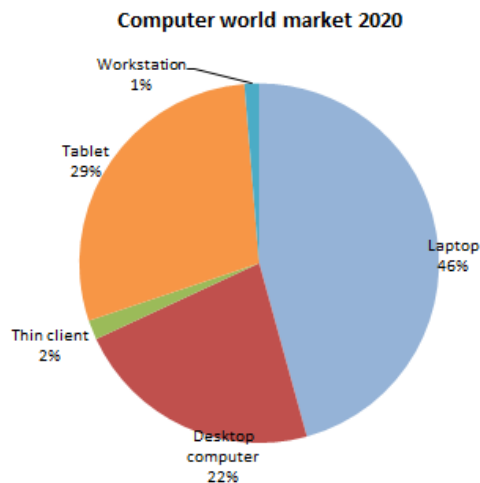
Figure 1. Global shipments 2010-2018 and estimates for 2019, 2022 and 2023¹⁶



¹⁵Preparatory study on the review of Regulation 617/2013 Computers and Computer Servers – Task 7 (2017) Viegand Maagoe and Vito. <https://computerregulationreview.eu/documents>

¹⁶<https://www.statista.com/statistics/272595/global-shipments-forecast-for-tablets-laptops-and-desktop-pcs/> (accessed on June 2019)

Figure 2. Global computer market 2020¹⁷

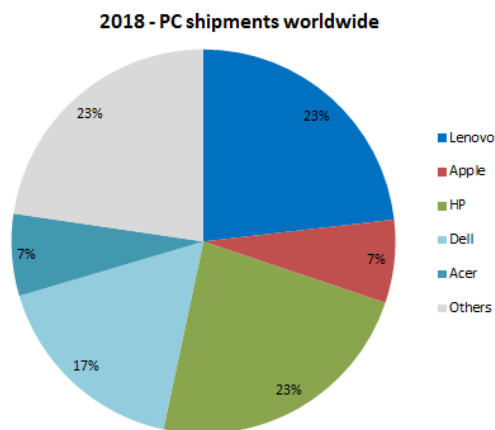


The regressive market trend for PCs, laptops and tablets is mostly explained by shifting consumer demands and technology overlap. Consumers have adopted smartphones for applications previously provided by larger computer types. At the same time, tablet consumers seem to be moving either towards 'ultramobile' laptops, which are constantly being made smaller and lighter, or to smartphones, which show a constant increase in screen size and functionality. It is expected that the demand for PCs will remain strong in business applications and show a faster decline in private uses, whereas laptops and tablets will remain a stronger market in private applications.

The main desktop PC vendors in 2018 were Lenovo and HP, both with 23% of the market, followed by Dell (17%), Apple and Acer (7% each) (Figure 3). A clear market trend seems to be the consolidation of big manufacturers, with Lenovo, HP and Dell showing a significant growth tendency over the past few years; together with a decrease in sales for PC makers that are not part of the top three (Bott, 2019).

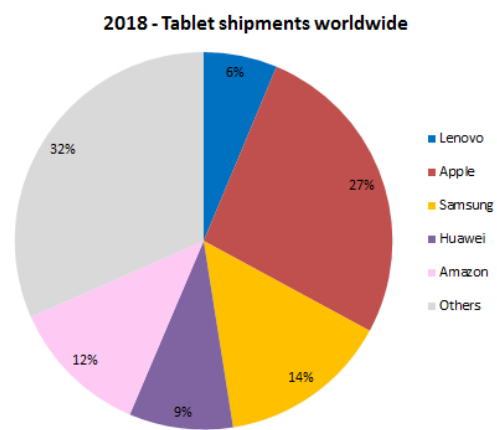
In tablets, the market is led by Apple (27%), followed by Samsung (14%), Amazon (12%) and Huawei (9%) (Figure 4). It is worth noting that Lenovo leads the desktop PC market with 23% but also accounts for 6% of the tablets market. A similar situation occurs with Apple, which accounts for 7% of the desktop PC market and leads the tablets market with significant distance to its competitors.

Figure 3. PC shipments by vendor 2018



Source: (Statista, 2019b)

Figure 4. Tablet shipments by vendor 2018



Source: (Statista, 2019c)

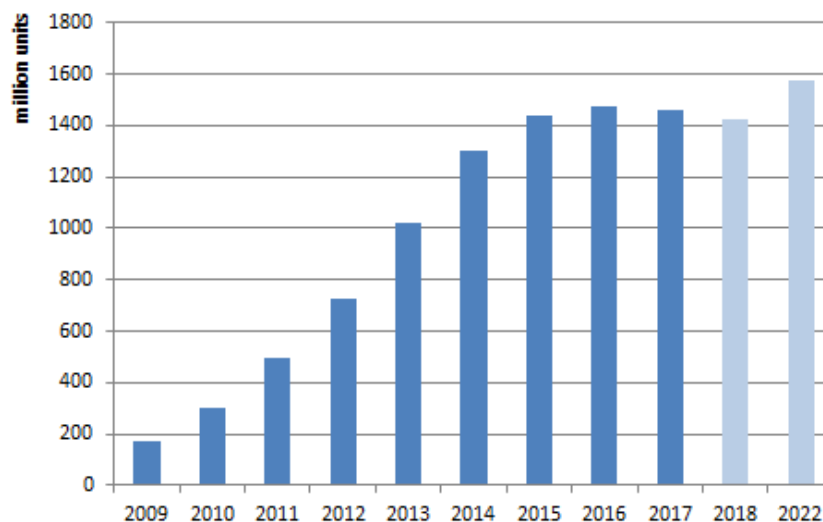
¹⁷ Preparatory study on the review of Regulation 617/2013 Computers and Computer Servers – Task 7 (2017) Viegand Maagoe and Vito. <https://computerregulationreview.eu/documents>

1.3.2 Current status and forecast for smartphones

The smartphones market is very strong, with more than 1.4 billion units shipped in 2018 (Figure 5). The total number of smartphone users was estimated to be around 2.5 billion in 2018. This market showed a fast growth between 2010 and 2015, with a declining plateau from then up to 2019, similar to the one observed with the computers market¹⁸. Potential reasons for this decline are:

- slowing down of technological innovation (less incentive for consumers to have the latest model);
- market saturation (90-100% in developed markets);
- elongation of replacement cycles (due to durability, waterproofing and battery life improvements);
- growth deceleration in some developing economies (e.g. China).

Figure 5. Smartphone shipments worldwide 2010-2017 and estimates for 2018 and 2022¹⁹



From 2019 onwards, with the progressive equipping of developing countries and the introduction of innovative technologies such as 5G (0.5% of total smartphones that year), shipments are expected to grow again to over 1.5 billion units in 2023 (when 5G is expected to account for 26.3% of the total).

In terms of smartphone vendors, the market is led by Samsung (19%), followed by Apple and Huawei (14% each) according to data from 2018. It is worth mentioning that Huawei was the only manufacturer which showed growth in 2019²⁰. OEMs that are relatively unknown in Europe and the USA such as Xiaomi, Oppo and Vivo are huge brands in China, globally achieving 23% combined (Figure 6).

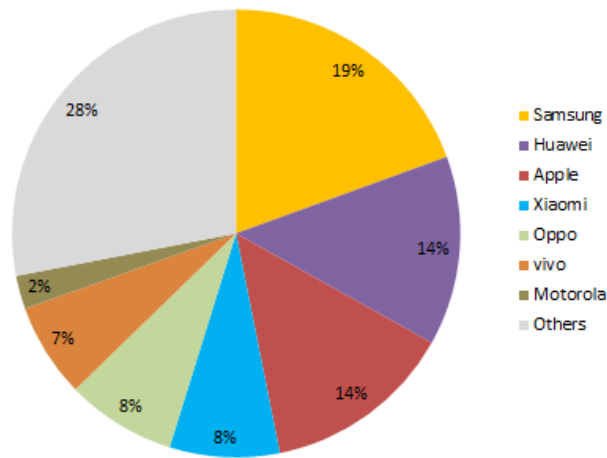
¹⁸ Swearingen, 2018. We're no longer in smartphone plateau. We're in the smartphone decline. New York Intelligencer. <http://nymag.com/intelligencer/2018/12/global-u-s-growth-in-smartphone-growth-starts-to-decline.html> (accessed on October 2019).

¹⁹ Statista, 2018. Number of smartphone users worldwide from 2014 to 2020 (in billions), <https://www.statista.com/statistics/263441/global-smartphone-shipments-forecast/> (accessed on June 2019)

²⁰ IDC, 2019. Smartphone shipments experience deeper decline in Q1 with a clear shakeup among the market leaders. <https://www.idc.com/getdoc.jsp?containerId=prUS45042319> (accessed on June 2019)

Figure 6. Smartphone shipments worldwide by vendor Q1 2018²¹

2018 - Smartphone shipments worldwide



Considering PCs, tablets and smartphones combined, Apple seems to be the only brand with a significant presence in every market (7%, 27% and 14%, respectively). Samsung is a big actor both in tablets (14%) and smartphones (19%), similarly to Huawei (9% and 14%, respectively).

1.3.3 Contribution of the public sector in the EU market

The total value of reported ICT public procurement contracts in the EU was estimated to be about EUR 50.3 billion in 2011²². According to this study, service contracts represent 60% of the ICT total contract value, while only 25% is spent on supplies. Estimations of the public market value for ICT in 2019 were shared by Bechtel during the consultation process (Table 2 below). In the countries analysed the ICT public expenditure per person varies from around EUR 90 for the UK and Spain up to more than EUR 200 for France and Ireland.

Table 2. Estimated ICT market value in different EU and non-EU countries (estimations shared by Bechtel AG)

Country	Overall ICT market value (in million €)	Estimation for public sector (in million €)	Ratio public to total	Population (million)	Public spend on ICT per head (in € / person)
UK	15,318	6,000	39%	67	90.12
Switzerland	29,354	1,300	4%	8.5	152.18
Spain	48,199	4,000	8%	46	87.50
France	60,900	17,400	162%	66	264.77
Belgium	20,029	2,000	10%	11.5	171.79
Ireland	8,860	1,000	11%	4.7	210.35
Netherlands	41,035	3,000	7%	17	174.49
Austria	13,496	1,200	9%	8.8	136.22

²¹ IDC, 2019. Smartphone shipments experience deeper decline in Q1 with a clear shakeup among the market leaders. <https://www.idc.com/getdoc.jsp?containerId=prUS45042319> (accessed on June 2019)

²² DG Communications Networks, Content & Technology (2011). Quantifying public procurement of R&D of ICT solutions in Europe SMART 2011/0036 estimates, ISBN 978-92-79-40167-1 DOI 10.2759/76021

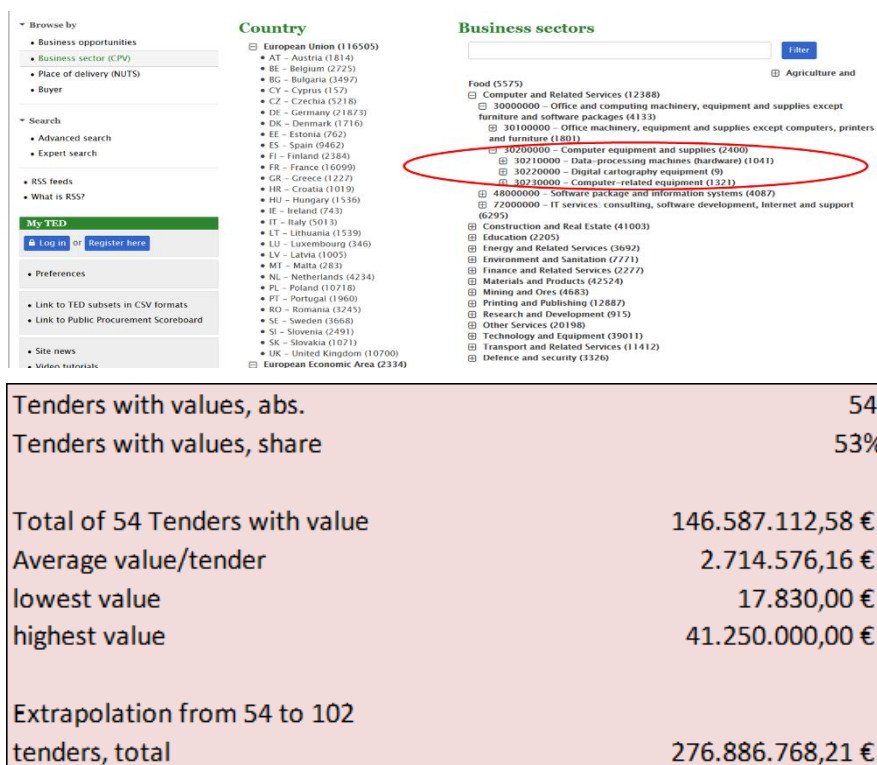
In the framework of this study for the revision of the EU GPP criteria for computers and monitors, the contract notices available on the Tenders Electronic Daily (TED) website²³ were screened from mid-May to mid-June 2019 (NB. Above: business sectors analysed. Below: calculation of the estimated value.

). The tenders classified under the Common Procurement Vocabulary (CPV) 30200000 'Computer equipment and supplies' were analysed. Among the 102 tenders identified, only 54 reported their economic value. The value of the remaining tenders has been estimated according to the average value of the contracts identified. A total of EUR 277 million has been calculated as the economic value for the tenders related to computer equipment and supplies in Europe in this period of time (mid-May to mid-June 2019).

However, this estimation clearly represents only a small fraction of the budget that EU public authorities allocate to the procurement of ICT products and services as 1) the obligation to publish the tender on the TED website is only for procurements above a certain financial threshold and 2) a relevant share of the budget is dedicated to ICT services (CPV 72000000) and software (CPV 48000000) that are not included in this estimation.

Overall, the relevance of the public sector in the EU ICT market and the potentially important impact of GPP in driving the change toward a greener ICT sector is clear.

Figure 7. Analysis of tenders in the period mid-May to mid-June 2019



NB. Above: business sectors analysed. Below: calculation of the estimated value.

²³ <https://ted.europa.eu/>

1.4 Environmental impact analysis

In this section, the main environmental impacts of ICT devices under the scope of this revision are outlined. The focus is on broadly understood and reported impact categories such as global warming potential or energy consumption, although other categories might be referenced if relevant. The aim of this section is to serve as a basis for the subsequent definition of GPP criteria. In terms of relative contribution to life cycle GHG emissions, a study from the McMaster University (Canada)²⁴ provides a comparison of different ICT product categories.

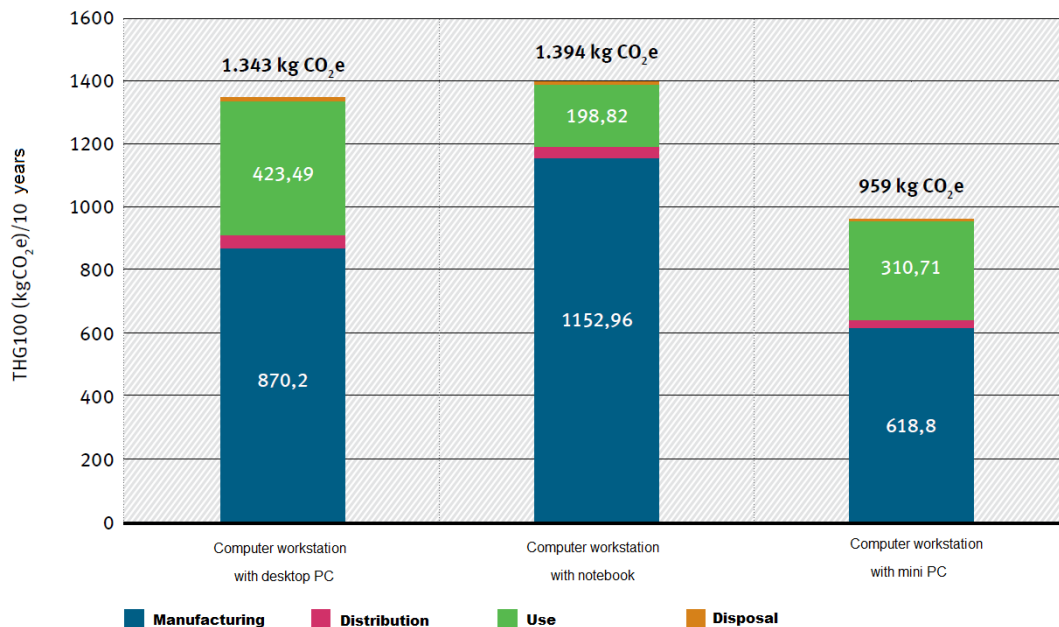
A key finding of the study was the increasing contribution of smartphones to the total ICT footprint. The authors found that by 2020 the relative contribution of smartphones will surpass the impact (in terms of global warming potential and energy consumption) of desktop computers, laptops and displays, due to the increasing number of smartphones on the market.

As a general conclusion, similar environmental patterns have been identified for the different ICT end-user devices, and therefore similar strategies may be implemented to reduce their environmental impact, prioritising their lifetime extension and circularity.

1.4.1 Desktop computers and notebooks

When assessing the environmental impacts of desktop computers and laptops, there is a general consensus among researchers conducting Life Cycle Assessment (LCA) studies: the life cycle stages with the most significant impacts are manufacturing and use, particularly when analysing energy consumption and global warming potential²⁵, although the relative importance of these two differs between product types (i.e. desktop computers and notebooks). Looking at Figure 8 it appears that the dominant contributor to greenhouse potential impact is the manufacturing stage.

Figure 8. Comparison of the total greenhouse gas potential (THG100) of the three types of computer workstation (values rounded, without recycling credits)²⁶



²⁴ Belkhir L, Elmelig A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & recommendations. *Journal of Cleaner Production* 177 (2018) 448-463

²⁵ Arushanyan et al. (2014) Lessons learned. Review of LCAs for ICT products and services. *Computers in Industry*.

²⁶ Prakash et al. (2016) Computer am Arbeitsplatz: Wirtschaftlichkeit und Umweltschutz - Ratgeber für Verwaltungen. Umweltbundesamt

Focusing on the manufacture of specific components, those with the highest contribution in computers are printed circuit boards (PCBs), due to the high amount of energy required for producing the active components (semiconductors) as well as the impact caused by the mining and processing of minerals such as gold.

Production of PCBs and integrated circuits (ICs) is known as a process with substantial energy and resource use, considered among the highest environmental impacts per mass of unit. Generally, the higher the performance of a computer in terms of processing capacity or memory, the larger the content of PCBs and ICs. Therefore, measures aimed at helping organisations make the right choice in terms of the performance of ICT equipment that they purchase will have a significant positive impact on their overall footprint.

From an environmental perspective, another relevant component of desktop computers is the monitor. Considering the whole life cycle impact of an average desktop computer, manufacturing of the monitor can account for 26% of total GHG life cycle emissions. If we consider the impact of the use phase of the monitor, that adds to a combined 33% of life cycle emissions²⁷.

Still related to the use phase, it is worth introducing the concept of 'rebound effect', which can be defined as an indirect, non-intended negative consequence of a specific strategic decision. For example, making use of very energy-efficient equipment does not guarantee that the net emissions of an organisation will be lower. For example, a typical rebound effect could be that procuring highly efficient computers and monitors might mean that the organisations take less care about shutting down computers and monitors at the end of the working day.

Overprovisioning can also be a cause of negative environmental effects. For example, if an organisation decides to purchase more ICT equipment than it actually needs (or with a processing capacity / memory much higher than needed), it would result in a higher net environmental impact. It is therefore important that the devices purchased (and used) are fit-for-purpose for their activities or that the number of devices they acquire does not exceed their actual needs. The net "worst-case" effect of user-determined factors is the high-power multi-display system (see Figure 9). A system such as this could increase the energy consumption even with highly efficient devices²⁸.

Figure 9. Multi-display use



Another life cycle stage frequently considered in LCA studies is the end of life, and it usually highlights the potential positive benefit of reusing and recycling strategies. Specifically on reuse, a study²⁹ highlights the potential benefit of using laptops in a secondary application, resulting in a 40% reduction in GHG emissions. Another study³⁰ points in the same direction with regards to lifetime extension of laptops: increasing it from 3 to 5 years can reduce an organisation's GHG emissions by 37%.

Transport and logistics stages seem to have the lowest environmental impact for these types of products. These stages are generally affected by the size and mass of items to be transported. Therefore, simplification and light-weighting of packaging elements will have a positive (but limited) contribution to the life cycle impact of ICT products.

²⁷ Andrae (2013) Comparative LCA of physical and virtual desktops. *Journal of Green Engineering*.

²⁸ Nathaniel Mills & Evan Mills (2016). Taming the energy use of gaming computers. *Energy Efficiency* (2016) 9:321–338. DOI 10.1007/s12053-015-9371-1

²⁹ André et al. (2019) Resource and environmental impacts of using second-hand laptop computers: A case study of commercial reuse. *Waste Management*

³⁰ The shift project (2019) Lean ICT – Towards digital sobriety

Several LCA studies indicate the environmental benefits of laptop reuse and second-hand laptops provided by a real commercial reuse company, instead of new ones.^{31,32}

1.4.2 Tablets

In the case of tablets, a similar pattern to computers can be observed. Most of the impact happens in the manufacturing stage, with a considerably lower burden associated with the use stage³³. As in the case of computers, PCBs and ICs are responsible for the majority of the embodied GHG emissions in tablets, even taking into account that these components represent a small percentage of their mass. The overall impact of product casings is generally small unless it includes energy-intensive materials such as magnesium.

The tablets market has evolved over the years towards smaller, even more portable devices, which are actually hybrids between smartphones and tablets –products also known as 'phablets'. Studies indicate that phablets have a lower environmental impact than tablets, although the distribution of impact among life cycle stages is similar, the main ones being the manufacturing and use stages³⁴.

Displays also have a significant contribution due to the high amount of energy needed to produce them. It is worth noting that GHG emissions of displays usually correlate with size³⁴. Size is therefore a relevant factor to consider when evaluating the environmental impact of devices. Studies point out that, generally, the lower the size and mass of the device, the lower its footprint. Similarly, the impact of mobile devices such as tablets or phablets is very small compared to laptops or desktop PCs. This brings to the table the concept of right-sizing. If the main tasks to be performed with a device can be satisfactorily done with a mobile device, from a GHG emissions perspective it is worth acquiring a tablet (or a notebook) rather than a desktop PC. Often consumers own both types of appliances, creating a rebound effect.

In terms of technology, it has been observed that modern devices have fewer ICs and PCBs, a consequence of higher levels of on-chip integration enabled by Moore's law. Considering that these are the components with the highest impact, this suggests that if an organisation does need to purchase new ICT equipment, from the environmental perspective it is worth investing in modern devices³⁵.

Accessories such as chargers and cables are an important aspect to consider in mobile devices. Standardisation and interoperability can allow the implementation of strategies to reduce the redundancies of these accessories (e.g. the same charger/cable used for different equipment or reused at the end of life of the equipment).

1.4.3 Smartphones

Considering GWP as a relevant indicator, the most significant environmental impact of smartphones happens in the manufacturing stage: 75% of total impact for a common smartphone in 2015. In terms of specific components, the largest contribution is from the ICs, which account for 58% of the total life cycle impact³⁶. Another component with a significant contribution to GWP is the display, with 6% of the total impact. As with tablets, devices with larger displays tend to have a higher environmental burden. From an organisational perspective, making the right choices in terms of smartphone capabilities and display size can help to reduce the overall environmental footprint.

In terms of the use phase, studies indicate that using the phone with an average frequency over a period of 3 years accounts for 13% of the total contribution to GWP³⁶. Moreover, current usage trends, with an ever-increasing use of applications, cause a net growth in energy use: although modern smartphones have

³¹ André H, Ljunggren Söderman M, Nordelöf A, (2019) Resource and environmental impacts of using second-hand laptop computers: A case study of commercial reuse. *Waste Management* 88 (2019) 268–279

³² Prakash, S., Kohler, A., Liu, R., Stobbe, L., Proske, M., Schischke, K., IEEE, 2016. Paradigm Shift in Green IT – Extending the Life-Times of Computers in the Public Authorities in Germany. 2016 *Electronics Goes Green 2016+* (Egg), 7.

³³ Apple, (2019) iPad Air Product Environmental Report. Available at: https://www.apple.com/environment/pdf/products/ipad/iPadAir_PER_Mar2019.pdf (Accessed on October 2019)

³⁴ Stutz (2011) Carbon Footprint of the Dell Streat Tablet. Available at: <http://i.dell.com/sites/content/corporate/corp-comm/en/Documents/dell-carbon-footprint-streak.pdf> (Accessed on October 2019)

³⁵ Teehan et al. (2013) Comparing embodied Greenhouse Gas Emissions of modern computing and electronics products. *Environmental Science & Technology*. 47(9) DOI: 10.1021/es303012r

³⁶ Ercan et al. (2016) Life cycle Assessment of a Smartphone. *Proceedings of ICT for Sustainability 2016*. <https://doi.org/10.2991/ict4s-16.2016.15>

batteries with larger capacities, they are recharged equally or even more often due to this intensive use of applications³⁰.

An important aspect to take into account in smartphones is the potential impact of the infrastructure needed. The functioning of these devices relies heavily on internet connection and therefore needs a complex infrastructure to work: servers to store data generated and networks to be able to transfer it. When quantifying the environmental burden of smartphones, the additional impact of infrastructure needs to be accounted for as well. As a general figure, a study³⁷ suggests that one server is required for every 400 smartphones. In that study, it is highlighted that the footprint of a smartphone may be doubled if the impact of the associated infrastructure is properly accounted for. This argument on network infrastructure is also valid for desktop computers, notebooks and tablets, where more and more data is stored and processed in the Cloud. Organisations have to take this into account when making decisions regarding acquisition of ICT equipment/services: the impact of the devices comes with an additional impact on 'hidden' infrastructure.

Redundancy of devices is another aspect contributing to the impact of ICT equipment like smartphones. Initiatives which consist of combining personal and professional uses in the same terminal (using smartphones with two SIM cards) can help to reduce the GHG emissions of an organisation. Studies indicate that increasing these initiatives can help cut their emissions³⁰.

Although replacement cycles are lengthening, consumers still tend to switch their smartphones for newer models even if the former ones are still in good condition. This is also driven by the fact that new versions of operating systems are often not compatible with older generation smartphones, causing poorer performance and a reduction in the useful capacity of the battery. These quick replacement cycles lead to an inefficient use of resources, since materials and energy invested in manufacturing devices are not fully exploited. Some might argue that faster replacement cycles of smartphones might be beneficial, as society might benefit from energy efficiency improvements of new-generation mobile phones. However, certain studies highlight that, even assuming 20% improvements in phone efficiency every 4 years, after 10 years of life, it would still be more sustainable to use an old phone³⁸. Similar findings, but on a larger scale, were obtained for notebooks, where even if a new notebook uses around 10% less energy than an old one, it would have to remain in service for around 80 years in order to compensate for the energy consumed in its manufacture²⁶. Annual efficiency improvement has to be very high to justify new ICT equipment for environmental reasons. It is paramount to encourage activities which enable extension of the lifetime of ICT devices. In the case of smartphones, it has been estimated that increasing their lifetime from 2.5 to 3.5 years allows GHG emissions to be reduced by 26%³⁰.

It is also important to highlight the intensive use of rare metals in smartphones (as well as in notebooks and tablets): Indium in touchscreens and displays; cobalt and lithium in batteries; gold, silver, platinum, tantalum, tungsten and copper in electronic boards; etc. There are several environmental issues potentially related to the use of rare metals. Most of them are produced in highly unstable countries or monopolistically by superpowers (supply risks and pressure on prices) which classifies them as Critical Raw Materials (CRM). They are also a source of soil pollution and ecosystem disturbance during extraction (it has been estimated that it is necessary to disturb 40 times more volume of an ecosystem than the volume of the actual device). They tend to generate large amounts of GHG emissions and some of them also have a large contribution in other impact categories such as Human Toxicity, Ecosystem Toxicity, Abiotic Depletion Potential and Eutrophication.

Appropriate end-of-life initiatives aimed at the recovery of those valuable materials have the ability to significantly reduce the impact caused by those minerals. In the case of smartphones, consumers tend to store them for long periods of time before deciding what to do with them at end of life. This might have a positive effect as they are diverted from negative waste management options such as landfilling, as long as the devices are safely stored in consumers' properties. However, it has been demonstrated that retention of the devices for an extended period after their use reduces their value to any secondary markets³⁷. Therefore, it is important to encourage initiatives to recover valuable materials from smartphones, and other ICT equipment, as soon as the devices have concluded their useful life.

In general, dealing with ICT equipment appropriately at end of life can have a significant beneficial effect on impact categories besides GWP, such as human toxicity or freshwater ecotoxicity. Computers, tablets and

³⁷ Suckling et al. (2015) Redefining scope: the true environmental impact of smartphones? *International Journal of Life Cycle Assessment*, Volume 20, pages1181–1196(2015)

³⁸ Frey et al. (2006) Ecological footprint analysis applied to mobile phones. Massachusetts Institute of Technology and Yale University.

smartphones have several valuable materials that can be recovered at end of life, diverted from landfills and used again in other devices. The glass of LCD screens can be recycled. Aluminium alloys and plastics in casings can be sorted, shredded and recycled. PCBs can be manually sorted, their precious metals recycled and their plastics incinerated with energy recovery. If easily detachable, batteries can be manually sorted and their constituent components recycled. Avoiding the use of chemicals that could influence the ability to recycle components of ICT equipment is also an aspect to consider. A study³⁹ points out that, considering freshwater ecotoxicity, up to 30% improvements can be achieved by recovering a significant amount of valuable materials at end of life. This improvement is up to 90% when considering human toxicity.

³⁹ Arduin (2017) Life cycle assessment of end of life scenarios. Tablet case study. Sixteenth International Waste Management and Landfill Symposium. Proceedings Sardinia 2017

1.5 Procurement routes

When public organisations procure stationary and/or mobile ICT equipment and/or services, these typically fit within one of the following routes:

- Purchase of devices only; in these cases the public organisation should have a dedicated ICT team which deals with the issues related to the purchased products (e.g. maintenance, repair, upgrade).
- Purchase of devices and ICT services; in these cases the public organisation outsources the ICT services associated with the usage of the purchased devices (e.g. maintenance, repair, upgrade).
- Purchase of Devices as a Service (DaaS); in these cases the public organisation pays a periodical subscription fee to lease endpoint hardware and management services from the tenderer.

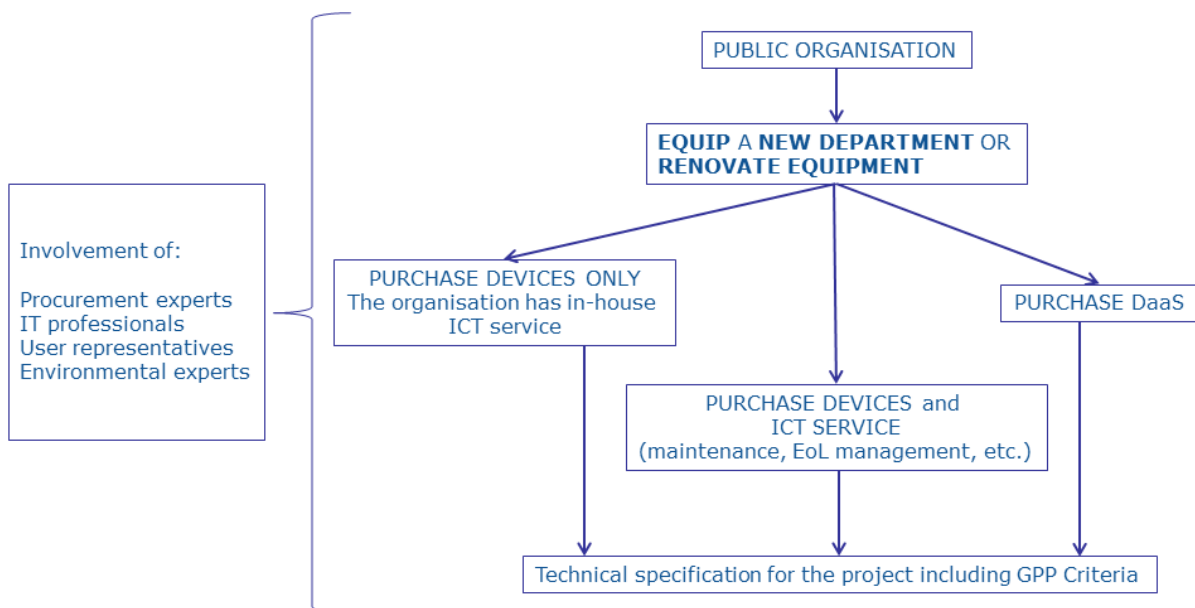
The procurement routes should be defined based on the procurement needs of public organisations. Figure 10 illustrates some examples of the assumed routes based on current knowledge of the market.

Although the procurement of “refurbished” (also called “reconditioned”) and remanufactured products is currently not a common procurement route in the public sector, Section 2.5 of this report presents possible green criteria applicable to this procurement route.

In the context of this report, the IEEE Std 1680.1:2018 definition of refurbishment is applied: “the process by which a used electronic product or component is restored to a defined condition in function and form that is comparable to, or better than, a new unit, while not significantly changing the unit’s composition and design”.

The term remanufacturing, instead, indicates a treatment or modification of a product, or parts of a product, in industrial processes to restore it to original as new condition and performance, or better⁴⁰ (Cordella et al., 2019; BS8887-2:2009) and, from the customer’s viewpoint, the remanufactured products can be considered to be the same as the new products. It means that any subsequent warranty is generally at least equal to that of new products.

Figure 10. Possible procurement routes identified for public organisations



⁴⁰ Cordella et al. (2019) Improving material efficiency in the life cycle of products: a review of EU Ecolabel criteria. The International Journal of Life Cycle Assessment · March 2019. DOI: 10.1007/s11367-019-01608-8

2 CRITERIA AREAS AND PROPOSALS

The order of the criteria area has been revised compared to the SWD(2016) 346 final⁴¹ and the related technical report⁴². The aim is to better highlight criteria aiming to extend the product lifetime, which can provide both environmental and life cycle cost benefits.

2.1 Criteria area 1 – Product lifetime extension

2.1.1 Criterion 1.1 – Reparability, Reusability and Upgradeability

Compared to the current set of criteria (GPP 2016), the following criteria are proposed to be removed:

- The TS on the ease of replacement for rechargeable batteries as this is covered by the criterion on a more general level of design for reparability.
- The AC on cost competitiveness of spare parts as this aspect should be considered as an element of the Life Cycle Costing calculation and not as a quality aspect.
- The AC on longer warranty as this has to be defined according to the public administration's needs and should be clearly specified in the tender.
- The ACs on tablet and all-in-one notebook memory and storage as this aspect is already covered in the design for reparability criterion and the current criterion could, in some way, restrict the market.

Moreover, the criterion on warranty and service agreement has been reformulated to focus more specifically on service agreements associated with the procurement of equipment or Device as a Service (DaaS) business models; a related CPC is also proposed in order to ensure reporting on the compliance with the service agreement.

New technical specifications have been proposed in order to increase the reusability of products on the provision of software for secure data erasure.

The following table compares the existing GPP criteria with the new proposals.

Table 3. Reparability, reusability and upgradeability - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
TS4. Warranty and service agreements	TS1. Provision of an extended service agreement + TS3. Manufacturer's warranty
TSS(a). Continued availability of spare parts	TS2. Continued availability of spare parts
TSS(b). Design for reparability	TS4. Design for reparability
TSS(c). Ease of replacement for rechargeable batteries	
	New! TS5. Functionality for secure data deletion
AC2. Cost competitiveness of spare parts	
AC3. Longer warranties and services agreements	
AC4. Tablet and all-in-one notebook memory and storage	
	CPC1. Service agreement

⁴¹ SWD(2016) 346 Final COMMISSION STAFF WORKING DOCUMENT EU GPP Criteria for Computers and Monitors

⁴² Dodd,N. Vidal-Abarca Garrido,C, Gama Caldas,M, Graulich,K, Bunke,D, Groß,R, Liu,R, Manhart,A, and Prakash,S, 2016. Revision of the EU Green Public Procurement (GPP) Criteria for Computers and Monitors. Technical report: final criteria; EUR 28199 EN; doi:10.2791/027791

Summary of the main changes after the first stakeholder consultation

The main changes introduced are related to the classification of criteria into core and comprehensive levels: criteria on service agreement (TS1), manufacturer warranty (TS3) and availability of spare parts (TS2) were modified to provide more flexibility in terms of threshold applied. Criterion TS4 on design for reparability was split in two: a core level generally ensuring that repair is not prevented and a comprehensive level where disassembly can be carried out using basic tools. Clarifications on the use of ecolabels as proof of compliance are introduced for all the criteria. The proposal for refurbished/remanufactured products is moved to Section 2.5. More details of the changes implemented are provided in Section 2.1.1.4.

Summary of the main changes after the second stakeholder consultation

The criteria TS1, TS2 and TS3 have been split into core and comprehensive levels in order to provide different levels of ambition. The minimum length of warranty and service agreement has been set at 3 years, for the comprehensive level. Provision of information on price for original or compatible spare parts and indicative labour costs for their replacement has been added to TS2. Regarding TS5, it has been clarified that functionality for secure data deletion is applicable to the private data only, and instructions can also be provided via a web link.

The following table shows the criteria as revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
Subject Matter:	
Service agreement associated to the supply of the ICT equipment.	
TECHNICAL SPECIFICATIONS	
<p>TS1. Provision of an extended services agreement</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS28.</i></p> <p>The tenderer must provide X years [<i>minimum 2, to be defined</i>] of services as detailed in the Service Level Requirements document (see explanatory note below).</p> <p>Verification:</p> <p>The tenderer must provide a written declaration that the products supplied will be warrantied in conformity with the contract specifications and the related service level agreement.</p>	<p>TS1. Provision of an extended services agreement</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS28.</i></p> <p>The tenderer must provide X years [<i>minimum 3, to be defined</i>] of services as detailed in the Service Level Requirements document (see explanatory note below).</p> <p>Verification:</p> <p>The tenderer must provide a written declaration that the products supplied will be warrantied in conformity with the contract specifications and the related service level agreement.</p>
<p>Explanatory note: Examples of service level requirements</p> <p>A Service Level Requirements document describes how the service should be delivered to the customer. Examples of possible service level requirements to be included are listed below:</p> <ul style="list-style-type: none"> • Access to the manufacturer's warranty: register the manufacturer's warranty; manage any documentation or proof required to invoke the manufacturer's warranty; invoke the manufacturer's warranty on behalf of a public administration (during the manufacturer's warranty); follow up with the manufacturer to ensure that the terms of the manufacturer's warranty are met. • Pick-up and return: pick up the product(s) from a specified location on the public administration's premises and return it/them to a specific location on the public administration's premises (alternative options for convenient return of products can also be specified). • Management of failures: provide an efficient single point of contact for technical issues and escalations of problems, a person responsible for following the progress of the case, reports on progress, transparent access to a warranty database (whoever manages this warranty data) to verify warranty status, and incident status for open incidents. 	

- Access to diagnostic and repair tools: access to all technical tools necessary to perform hardware diagnostics and corrections; access to any technical training required to become a certified repair technician; possibility, through non-exclusivity, to become a certified technical partner (perform warranty repairs).
- Battery coverage: the service explicitly covers battery defects for applicable products with rechargeable batteries, such as failure to charge or a faulty battery connection. A progressive drop in battery capacity due to usage must not be considered a defect unless it is covered by the battery replacement policy in the bullet below.
- Battery replacement policy: the service covers the replacement of batteries that do not fulfil minimum performance conditions related to endurance in terms of number of cycles.
- Provision of failure statistics: provision of high-level, aggregated, anonymous and non-traceable statistics on incident types (nature and quantity), problems and diagnostics concerning the products within the scope of the contract.
- Incident management/problem management/preventive maintenance: this service includes all the operations necessary to maintain the ICT products in perfect working order, or to restore a defective product or one of its components to perfect working order, including incident management, problem management and preventive maintenance. Preventive maintenance during the warranty period includes ensuring OS (operating system) and security updates for the duration of the contract.
- Upgrading: a scan for upgrading possibilities and needs can take place after a certain period (e.g. 3 years) and cover performance aspects like CPU/Memory/Disk.
- Repair/replacement activities: repair or replace any products which become damaged or defective in the course of normal use during the extended warranty period with products which have identical or better performance characteristics. Breakdowns related to firmware are also covered. If part of an item is replaced, the replacement part must be covered by the same level and duration of extended warranty as the part that has been replaced. The extended warranty applies to both hardware and software, unless explicitly agreed otherwise.

<p>TS2 Continued availability of spare parts</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>This criterion is not relevant if the availability of spare parts is already ensured under TS1.</i></p> <p>The tenderer must guarantee the availability of spare parts (critical components), including as a minimum⁴³ those identified in criterion TS4, for X years [<i>minimum 2, to be defined</i>] from the date of purchase.</p> <p>The spare parts/replacement components can be:</p> <ul style="list-style-type: none"> • a like-for-like used part; • a new or used OEM (original equipment manufacturer) part that conforms to specifications; • an after sales (third-party) part that conforms to specifications. <p>All critical components identified must be:</p> <ul style="list-style-type: none"> • available to be purchased; • or replaced by a service network for repair and maintenance. <p>The tenderer must provide a price list for original or compatible spare parts and indicative labour costs for their replacement, including rechargeable batteries (if applicable).</p> <p>Verification:</p> <p>The tenderer must provide a declaration that the requested spare parts will be available for X years [<i>minimum 2, to be defined</i>] for each model provided.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	<p>TS2 Continued availability of spare parts</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>This criterion is not relevant if the availability of spare parts is already ensured under TS1.</i></p> <p>The tenderer must guarantee the availability of spare parts (critical components), including as a minimum⁴³ those identified in criterion TS4, for X years [<i>minimum 3, to be defined</i>] from the date of purchase.</p> <p>The spare parts/replacement components can be:</p> <ul style="list-style-type: none"> • a like-for-like used part; • a new or used OEM part that conforms to specifications; • an after sales (third-party) part that conforms to specifications. <p>All critical components identified must be:</p> <ul style="list-style-type: none"> • available to be purchased; • or replaced by a service network for repair and maintenance. <p>The tenderer must provide a price list for original or compatible spare parts and indicative labour costs for their replacement, including rechargeable batteries (if applicable).</p> <p>Verification:</p> <p>The tenderer must provide a declaration that the requested spare parts will be available for X years [<i>minimum 3, to be defined</i>] for each model provided.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Subject Matter:</p>	

⁴³ Additional critical components could be identified by the contracting authority at the tendering stage.

Supply of ICT equipment	
TECHNICAL SPECIFICATIONS	
<p>TS3 Manufacturer's warranty</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS24.</i></p> <p>The tenderer must provide products covered by X years [<i>minimum 2, to be defined</i>] of the manufacturer's warranty.</p> <p>Verification:</p> <p>The tenderer must provide written evidence of the manufacturer's warranty. Equipment holding a Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	<p>TS3 Manufacturer's warranty</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS24.</i></p> <p>The tenderer must provide products covered by X years [<i>minimum 3, to be defined</i>] of the manufacturer's warranty.</p> <p>Verification:</p> <p>The tenderer must provide written evidence of the manufacturer's warranty. Equipment holding a Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>TS4 Design for reparability</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p>The tenderer must ensure that joining or sealing techniques for the products supplied do not prevent the repair and replacement of the parts (critical components) listed below:</p> <ul style="list-style-type: none"> • Notebooks: Battery, Display panel/Display assembly, Storage (SSD, HDD, RAM), External/internal PSU, Keyboard, System/motherboard • Desktops: CPU, GPU (PCIe), External/internal PSU, Storage (SSD, HDD, ODD, RAM), System/motherboard • All-in-one PCs: External/internal PSU, Storage (SSD, HDD, ODD, RAM), System/motherboard • Tablets: Battery, Display panel/Display assembly, External/internal PSU • Smartphones: Battery, Display panel/Display assembly, Charger • Computer displays: Connectivity cables, Power cables, External PSU <p>Note 1: On-board soldered CPUs are excluded from the critical component list.</p> <p>Note 2: A list of mandatory replaceable components for computer displays is set out in Annex II (D. Material efficiency requirements. Point 5. A) of Regulation (EU) 2019/2021.</p> <p>Instructions on how to replace the parts must be provided with a service/repair manual. The manual must include security measures to ensure safe repair, an exploded diagram of the device illustrating the parts that can be accessed and replaced (which could also be provided in the form of a tutorial video), and the tools required. The service/repair manual must be available online, free of charge.</p> <p>Verification:</p> <p>The tenderer must provide:</p> <ul style="list-style-type: none"> • A statement that the applicable parts are replaceable by the end-user and/or a technician. • The service/repair manual with instructions on how to replace the parts through a direct link to the document on the manufacturer's website. • Repair information according to EN 45559:2019 – Methods for providing information relating to material efficiency aspects of 	<p>TS4 Design for reparability</p> <p><i>Applicable to all categories of devices except refurbished/remanufactured devices.</i></p> <p>The tenderer must ensure that the following parts (critical components) are easily accessible, repairable and replaceable by the use of commercially available tools (class A, B or C, as defined according to EN 45554:2020 – see the explanatory note below):</p> <ul style="list-style-type: none"> • Notebooks: Battery, Display panel/Display assembly, Storage (SSD, HDD, RAM), External/internal PSU, Keyboard, System/motherboard • Desktops: CPU, GPU (PCIe), External/internal PSU, Storage (SSD, HDD, ODD, RAM), System/motherboard • All-in-one PCs: External/internal PSU, Storage (SSD, HDD, ODD, RAM), System/motherboard • Tablets: Battery, Display panel/Display assembly, External/internal PSU • Smartphones: Battery, Display panel/Display assembly, Charger • Computer displays: Screen assembly and LED backlight, power and control circuit boards <p>Note 1: On-board soldered CPUs are excluded from the critical component list.</p> <p>Note 2: A list of mandatory replaceable components for computer displays is set out in Annex II (D. Material efficiency requirements. Point 5. A) of Regulation (EU) 2019/2021.</p> <p>Instructions on how to replace the parts must be provided with a service/repair manual. The manual must include security measures to ensure safe repair, an exploded diagram of the device illustrating the parts that can be accessed and replaced (which could also be provided in the form of a tutorial video), and the tools required. The service/repair manual must be available online, free of charge.</p> <p>Verification:</p> <p>The tenderer must provide:</p> <ul style="list-style-type: none"> • A statement that the applicable parts are replaceable by the end-user and/or a technician. • The service/repair manual with instructions on how to replace the parts through a direct link to the document on the manufacturer's website. • Repair information must be provided according to EN 45559:2019 –Methods for providing information relating to

<p>energy-related products⁴⁴.</p> <p>Equipment holding a Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	<p>material efficiency aspects of energy-related products⁴⁵.</p> <p>Equipment holding a Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Classification of tools according to EN45554:2020</p> <p>According to EN 45554:2020, a part is replaceable by Class A tools if the disassembly is feasible with:</p> <ul style="list-style-type: none"> ○ The use of no tools; ○ A tool, or a set of tools supplied with the product or with the spare part; ○ Basic tools as listed in Table A.3 of the standard: Screwdriver for slotted heads, cross recess or for hexalobular recess heads (ISO2380, ISO8764, ISO10664); Hexagon socket key (ISO2936); Combination wrench (ISO7738); Combination pliers (ISO5746); Half round nose pliers (ISO5745); Diagonal cutters (ISO5749); Multigrip pliers (multiple slip joint pliers) (ISO8976); Locking pliers; Combination pliers for wire stripping and terminal crimping; Prying lever; Tweezers; Hammer, steel head (ISO15601); Utility knife (cutter) with snap-off blades; Multimeter; Voltage tester; Soldering iron; Hot glue gun; Magnifying glass. <p>A part is replaceable by a Class B tool if the disassembly is feasible with a product-specific tool that is listed as part of a method to assess whether a product can be repaired, upgraded and re-used (in the absence of a method defining product-specific tools, this category is void).</p> <p>A part is replaceable by a Class C tool if the disassembly is not feasible by the use of basic or product-specific tools as defined above, but can be carried out without the use of any proprietary tools.</p>	
<p>TSS Functionality for secure data deletion</p> <p><i>Applicable to all the categories of devices except computer displays and refurbished / remanufactured devices</i></p> <p>Functionality for secure data deletion must be made available for the deletion of user data contained in all data storage devices of the product (see also explanatory note). Instructions on how to use this functionality, the techniques used and the supported secure data deletion standard(s) must be provided in the user manual and/or by a web link to the manufacturer's webpage.</p> <p>Verification:</p> <p>The tenderer must provide specifications of the data erasure functionality provided with the product. Relevant reference for compliance can be the NIST 800-88 Revision 1 guidelines, for the level of "Clear", or equivalent.</p> <p>Equipment holding relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	
<p>EXPLANATORY NOTE</p> <p>A functionality for secure data deletion could be implemented by means of technical solutions such as, but not limited to:</p> <ul style="list-style-type: none"> • a functionality implemented in firmware, typically in the Basic Input/Output System (BIOS), • a functionality implemented in the software included in a self-contained bootable environment provided in a bootable compact disc, • digital versatile disc or universal serial bus memory storage device included with the product, or in software installable in the supported operating systems provided with the product. 	
<p>CONTRACT PERFORMANCE CLAUSES</p>	
<p>CPC1 Service Agreement</p> <p><i>To be used in conjunction with the TS1 on provision of extended service agreement.</i></p> <p>The tenderer must provide periodical [<i>monthly / annually</i>] reporting on its compliance with all the metrics, Key Performance Indicators and other indicators defined by the Service Level Agreement</p>	
<p>Explanatory note: Examples of Key Performance Indicators</p> <ul style="list-style-type: none"> • Aggregate KPI 1 – Incident solved: number of incidents resolved within the incident resolution time during a month / total number of incidents opened during the given month or opened during a previous month and still pending. Monthly target: ≥90%. • Aggregate KPI 2 – Commitment to repair as first remedy: number of incidents resolved within a product repair or upgrade / number of 	

⁴⁵ According to EN 45559:2019, for end-users, the information to be provided shall be simple, clear and intuitive, easily accessed, visible and readable, and shall be provided in the official languages where the product is sold. Where possible, symbols may replace or support the use of long or complex texts. The communication method should be assessed (if possible) prior to applying it to end-users, and the findings of any existing studies in this area taken into account.

2.1.1.1 Initial background and rationale for the proposed criteria

Provision of an Extended Services Agreement

A service agreement can be beneficial from an environmental point of view whenever it contributes to extending the product lifetime. A service agreement should not be considered a way to effectively replace non-functioning products, but instead it should be considered a tool to efficiently manage the ICT fleet in the public administration. For this reason, a service agreement should include warranty services. Requirements on efficient diagnosis and management of the failures, access to the manufacturer's warranty, maintenance and preventive actions should be part of a service agreement covering the expected ICT asset life.

For the revision of the GPP criteria, it has to be considered that in practice service level requirements vary widely. The criteria have been split into two TS:

- One technical specification requiring the provision of services reflecting common available service models covering both hardware and software support. Environmental benefits can be amplified in the case of "commitment to repair as first remedy", as reported in the Repair Scoring System study of the JRC⁴⁶.
- A second technical specification requiring the provision of products with a manufacturer's warranty.

A contract performance clause (CPC1) is proposed to be added in order to lay down specific requirements relating to the monitoring and periodic reporting of the quality of the service contract, in particular regarding aspects such as the number of incidents solved and percentage of incidents resolved with product repair.

The length of a service agreement period should be based on the expected useful life / duration of the procurement cycle. Useful life can be different between product categories and can also be affected by aspects like procurement and technical needs and budget availability. Moreover, the length of the service agreement is not necessarily linked to the useful lifetime of the product as a separate tender for support, maintenance and repair could be launched periodically and ensure continuity of the service.

It is proposed to keep 2 years as the minimum duration for a service agreement (core level), while the duration may be longer based on the specific needs and context.

Manufacturer's warranty

The manufacturer's warranty has been included in the revised GPP requirements but separated from the service criterion. The main reason for splitting these aspects is because bidders in public procurement processes for IT services/products are often service providers and they are not the manufacturers (OEMs) of the IT equipment delivered.

Among the ecolabels analysed, only TCO Certified applies requirements on warranties (for at least 1 year) provided by the manufacturer. This means that current EU GPP criteria are far stricter by requiring at least a product warranty of 2 years (core criteria) or 3 years (comprehensive criteria), with the possibility to acknowledge extended warranties with additional points for each additional year of warranty beyond the minimum technical specification through applying award criteria. Furthermore, the current comprehensive GPP award criteria include extra points if rechargeable battery replacement is provided free of charge within the first 3 years in the event of capacity loss of more than 50%. However, according to some feedback from the stakeholder consultation, the 3-year warranty was considered to be very challenging whereas the 2-year requirement was considered reasonable in the EU context. The current EU GPP criteria do not specify the coverage of the warranty, i.e. which components should be included (besides battery defects) or may not be excluded.

For comparison, the reparability scoring system study⁴⁶ proposes assignment of a score based on the availability and duration of a "commercial guarantee" (warranty) for the entire product (i.e. not only specific components) offered by the guarantor, and including a "commitment to free repair as first remedy" in case of failure and a "commitment to upgrade the product periodically". The points are modulated proportionally between 0 points if fulfilling only the minimum legal requirements of 2 years and maximum 1 point for a commercial guarantee covering a period post-sale of at least 10 years.

⁴⁶See http://publications.jrc.ec.europa.eu/repository/bitstream/JRC114337/jrc114337_report_repair_scoring_system_final_report_v3.2_pubsy_clean.pdf

Spare parts

Besides EU GPP, most of the EU Ecolabel schemes analysed have applied criteria for the availability of spare parts. EU GPP and Green Product Mark require a duration of at least 3 years availability. Comprehensive EU GPP criteria, as well as Blue Angel, even request that the availability of spare parts is guaranteed for at least 5 years, which specifically includes rechargeable batteries if applicable. However, they differ with regard to the starting point: For EU GPP the time counts from the date of purchase, whereas for Blue Angel it is following the end of production of the labelled product which might result in less or more than 5 years after purchasing the product.

EPEAT, based on the IEEE standard, does not require a minimum time span for the availability of spare parts but manufacturers shall declare if spare parts are available at all and, if so, the length of time the spare parts are available after the end of production, as well as a list of available spare parts. However, the time span is indirectly addressed in the optional IEEE criteria on 'product upgradeability and reparability', where it says that for these listed components 'the manufacturer, authorized service providers or other service providers offer upgrades, repair or replacement to purchasers for 5 years after the point of sale'.

There is also a difference in the definition of spare parts: whereas Green Product Mark does not specify spare parts at all, Blue Angel provides a rather general definition, delimiting them from 'other parts which normally exceed the life of the product' that are not to be considered spare parts. EU GPP criteria and TCO provide a specific list of components for different product types that fall under the criterion of spare parts availability.

Only EU GPP criteria and Blue Angel address costs of spare parts. While Blue Angel requirements state that spare parts must be offered at reasonable cost without defining this more specifically, EU GPP award criteria include the provision of a price list for a defined set of component parts including the requirement for indicative labour costs for replacements; points could then be awarded for the most cost-competitive offers.

In comparison, the reparability scoring system proposes a pass/fail requirement for reparability of laptops a minimum period of 4 years after placing the last unit of the model on the market, with a dedicated list of components. Also, the price of spare parts (although not the repair labour costs) has to be disclosed. If spare parts availability is extended to 7 years, a better rating class can be achieved.

Requirements on spare parts are included in the adopted EU Ecodesign Regulation on electronic displays⁴⁷ (which applies from March 2021), with a minimum period of 7 years after placing the last unit of the model on the market, specifying a dedicated list of spare parts. It can be expected that the revised EU Ecodesign Regulation on computers could also include requirements on spare parts.

For the revision of the GPP criteria, it is proposed to keep criteria on spare parts availability. With regard to the requirements on the cost competitiveness of spare parts, according to stakeholder feedback it seems to be very difficult to include the cost of the spare parts in the financial model or criteria besides for example costs of accessories (e.g. power cable, batteries); spare parts are often included in the maintenance services; manufacturers or IT service providers increasingly offer 'Device / Hardware / PC as a Service' models which include maintenance and repairs (if necessary) as well and thus dedicated costs of spare parts are not relevant, but rather the total cost of ownership. Against this background, the provision of indicative labour costs for replacements also seems to be debatable. It is thus proposed to remove this award criterion.

Reparable / replaceable components

For the revision of the GPP criteria, it is proposed to keep the criterion on design for reparability. Based on the comments received and the analyses of other different schemes, the list of parts to be easily accessible and replaceable, as well as the description of tools to be used, might be revised. For example, according to stakeholder feedback, the list of critical parts for displays is considered too strict as display panels are difficult to repair. It is proposed to apply the same list of parts proposed by TCO Certified for the different product groups.

The current EU GPP criteria, EPEAT/IEEE and TCO Certified, as well as the EU Ecodesign Regulation on displays, have criteria addressing the design for reparability in the sense that certain defined components have to be easily accessible, repairable and/or replaceable. For EPEAT/IEEE, this criterion is optional, i.e. optional points can be awarded depending on the number of hardware features from the list that are upgradeable, repairable

⁴⁷ Commission Regulation (EU) 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays

or replaceable (for example, for desktop computers minimum 7 features; for displays minimum 2 features to reach one additional point).

All the cited schemes specify the tools that may be used for the reparability, however in different ways:

- EU GPP criteria require that the components shall be easily accessible and replaceable 'by the use of universal tools (i.e. screwdriver, spatula, plier or tweezers)'.
- TCO requires in their 'products and sustainability information' criteria that information shall be provided if the replacement of the listed critical parts 'is possible without the use of heat or other tools than those intended to turn, slotted (ISO 2380), cross-recessed (Philips® and Pozidriv®, ISO 8764), or hexalobular recess heads (Torx®, ISO 10664)'.
- IEEE criteria require 'without soldering or de-soldering, using only commonly available tools', however not further defining these tools.
- The EU Ecodesign Regulation for electronic displays requires that 'the spare parts can be replaced with the use of commonly available tools and without permanent damage to the appliance'.
- The study on the Reparability Scoring System provides comprehensive lists of tools for the repair of laptops, differentiating between basic and other commercially available tools. Below is the list of basic tools for laptops⁴⁸:
 - Basic tools: Screwdriver for slotted heads, cross recess or for hexalobular recess heads (ISO2380, ISO8764, ISO10664); Hexagon socket key (ISO2936); Combination wrench (ISO7738); Combination pliers (ISO5746); Half round nose pliers (ISO5745); Diagonal cutters (ISO5749); Multigrip pliers (multiple slip joint pliers) (ISO8976); Locking pliers; Combination pliers for wire stripping & terminal crimping; Prying lever; Tweezers; Hammer, steel head (ISO15601); Utility knife (cutter) with snap-off blades; Multimeter; Voltage tester; Soldering iron; Hot glue gun; Magnifying glass; Additional basic tools have been selected based on the preliminary results of the study on material efficiency of smartphones⁴⁹ and are mainly applied for the repair of tablets and smartphones. It includes:
 - spudgers: tools that have a wide flat-head screwdriver-like end that extends as a wedge, used to separate pressure-fit plastic components without causing damage during separation;
 - different types of screwdrivers (e.g. Phillips, Flathead, Torx, Torx Security, Pentalobe);
 - plastic triangle opening tool: this type of tool is triangular in shape, with each corner offering prying abilities;
 - magnifier (or magnifying glass);
 - suction cup.

The schemes analysed also require information to facilitate repair activities:

- EU GPP criteria: clear disassembly and repair instructions, e.g. hard or electronic copy, video; to be made available via hard copy or via the manufacturer's webpage.
- EPEAT: list of the hardware features that are upgradeable, repairable or replaceable and indicate, for each, whether it is upgradeable, repairable and/or replaceable.
- TCO Certified: service manual including step-by-step instructions and component descriptions for the disassembly/assembly. Instructions on how to replace the critical components must be available online throughout the whole lifetime of the certificate.
- The Ecodesign Regulation for displays has dedicated requirements related to the access to repair and maintenance information, however mainly targeted to professional repairers.
- The Reparability Scoring System for laptops proposes as pass/fail criteria that, for each priority part, information about the disassembly sequence has to be available to the target group of

⁴⁸ The applicability of this list is considered extendable also to desktop computers and computer displays.

⁴⁹ <https://susproc.jrc.ec.europa.eu/product-bureau/product-groups/426/documents>

repairers, where a description supported by illustrations of the steps needed to disassemble priority parts is needed. The description has to show that the disassembly is reversible by including the steps needed for the reassembly of priority parts.

Ensuring that batteries can be easily changed

Most of the ecolabel schemes analysed as well as the EU GPP criteria have dedicated requirements with regard to the replacement of the battery. All schemes require information, most of them instructions on how to remove the battery from the product; for the required IEEE criteria, however, the manufacturer-provided instructions shall only guide customers to have the battery replaced at a manufacturer-authorized service centre whereas the optional IEEE criteria shall include the method of attachment to the product, a description of how to remove the battery from the product as well as a list of the tools required for removal and, if they are not commonly available, how to obtain them.

Only EU GPP criteria prescribe that batteries shall not be glued or soldered into the products. Also, the comprehensive EU GPP criteria provide the most detail with regard to the number and kind of tools to be used for replacement. TCO only requires information if the battery can be replaced without tools. EPEAT/IEEE optional criteria require replacement either without tools or with commonly available tools, and without the use of external heat sources. Furthermore, EPEAT/IEEE optional criteria prescribe a maximum time (3 minutes) for the battery replacement by one person.

None of the schemes explicitly require that the battery shall be replaceable by the end-user; only Blue Angel says that replacement shall be possible without the need for expert knowledge. TCO criteria on battery replacement are oriented towards the end-user and/or technician.

Green Product Mark criteria are aligned to the required EPEAT/IEEE 'battery replacement and information' criteria. Only the verification method differs slightly. Green Product Mark differentiates between batteries being user-replaceable, where for example the disassembly steps might demonstrate that the batteries are replaceable, and batteries that are not user-replaceable, where manufacturer-provided instructions shall be given guiding consumers to have the battery replaced at a manufacturer-authorized service centre.

Current EU GPP criteria are strict with regard to prohibiting the gluing or soldering of batteries into portable products at all; however, feedback from some stakeholders suggest they are too restrictive as many products using adhesive can still be replaced by a certified technician. Blue Angel and TCO Certified go beyond GPP criteria by also addressing end-users as a potential target group for battery replacements. On the other hand, procurement authorities often have contracts with IT service providers so that the battery replacement is under the responsibility of the tenderer, service provider and/or manufacturers.

TCO Certified criteria related to instructions on how to replace the battery are the most detailed and ambitious as they must be available for anyone to read, free of charge, online for the whole lifetime of the certificate.

For this revision of the proposed criteria this aspect is considered to be covered under the "Design for reparability" criterion for critical components.

Secure data deletion

Data deletion aims to facilitate both the reparability/reusability of the whole product without the risk of transfer of any sensitive and personal data in reused equipment. As defined in Ecodesign Commission Regulation (EU) 2019/424, 'secure data deletion' means the effective erasure of all traces of existing data from a data storage device, overwriting the data completely in such a way that access to the original data, or parts of them, becomes infeasible for a given level of effort.

Different methods used for data deletion are appropriate for different types of memories. Data deletion of HDD and SSD is declared by some manufacturers (e.g. HP Secure Erase) (HP 2018) to be compliant with specific standards (e.g. Guidelines for Media Sanitization by NIST (2014)). Secure data deletion tools should be built-in (or as a second option made available on request) and should permanently delete all user data without compromising the functionality of the device for further use. According to the CEN-CENELEC standard on reparability of energy-related products (EN45554:2020), simplified transfer of data from an old to a new product should also be made available via installed or downloadable tools such as applications, cloud-based services or instructions detailing a manual process.

Minimum capacity

EU GPP award criteria as well as several ecolabel schemes have rather different criteria on upgradeability, capacity expansion or standardised interfaces. The comprehensive award criteria of the current EU GPP criteria foresee certain requirements for the RAM (minimum capacity or the potential to upgrade it) as well as the potential to upgrade the mass storage. However, according to stakeholder feedback, the criterion on minimum RAM capacity restricts the market, and some Operating Systems require less RAM (only 2 to 4 GB).

For the revision of the GPP criteria, it is proposed to remove this criterion. The potential to replace and upgrade the RAM is already covered by the requirements on design for reparability (TS4).

2.1.1.2 Initial background and rationale for the proposed verification

Provision of an extended manufacturer guarantee and service agreement

At the tendering stage a written declaration from the tenderer that the products supplied will be covered by a warranty in conformity with the contract specifications and the related service level agreement could be sufficient. However, the implementation of this criterion should be ensured by contract performance conditions aiming at the monitoring and achievement of specific KPIs.

Spare parts

Also in this case, at the tender stage a declaration that critical components will be available is deemed to be sufficient. As the tenderer is in many cases an IT service provider (and not the manufacturer of the availability of spare parts should be ensured by the use of labelled products covering requirements on the availability of spare parts.

Reparable / replaceable components

The verification should be based on the provision of product manual/instructions showing how to replace the parts. In order to ensure that the repair/replacement can be carried out by an independent repairer (e.g. the ICT team in the organisation or a third-party service provider) a service manual should be publicly available. A direct link to the document on the manufacturer's website should be used to prove that repair instructions are publicly available.

Also in this case, as the tenderer is in many cases is an IT service provider (and not the manufacturer of the IT equipment), the compliance could be ensured through the use of labelled products (e.g. TCO Certified Generation 8).

Data deletion

It is requested to provide information about the software for the data deletion. A relevant reference is the NIST 800-88 Revision 1 guidelines.

2.1.1.3 Summary of stakeholder answers from the initial survey

Warranty and service agreements

It was highlighted that the mandatory manufacturer guarantee under B2B is 6 months. Some public procurers reported having applied 36 months warranty as a requirement and that suppliers currently provide 3 years warranty in the Nordic countries. According to some respondents, the 3-year warranty is considered very challenging and not covered by 30-50% of the market. Instead, 2 years is considered reasonable in the EU context. It was remarked by some respondents that the mandatory warranty has to explicitly cover the battery. Another stakeholder suggested including helpdesk support that would also include software.

Maintenance services are reported to be requested for an additional 2, 3 or 4 years including repair and pick-up. It is also requested to include clarification on what exactly a service should include. Moreover, it is also highlighted that service agreements and warranties could be offered by a third party and not be dependent on manufacturers.

According to a stakeholder, extending a warranty is considered something that can be requested (technical specification) rather than being used as an award criterion. On the other hand, changing to a third party for warranty/service after 2/3 years is also considered a valid option. Many SMEs will be able to fulfil this, while they probably cannot respond to the initial tender.

Continued availability of spare parts

This criterion is reported to be applied in public tenders and fulfilled by written guarantee. Most of the time the tenderer does not correspond with the manufacturer, as the contract is carried out by an IT service provider. In this case, the tenderer is not the organisation in charge of managing the availability of spare parts and it is suggested to ensure the availability of spare parts through the use of labelled products. The 3-year period is deemed reasonable by several respondents, although more ambitious examples are reported in Finland (5 years).

Design for reparability

This criterion has also been applied. The TCO Generation 8 label is reported as a possible verification method, ensuring a free, available manual. The list of critical components for displays is considered too strict as display panels are difficult to repair.

Some trade-offs with warranties and service agreements were also highlighted. Manufacturers do not allow a non-technical person to assemble any laptop or device. The repairs should be handled only by certified repair centres (during the warranty period) to avoid voiding the manufacturer's warranty.

Ease of replacement for rechargeable batteries

In this case too, some stakeholders suggested better separating the responsibility of the tenderer, service providers and manufacturers. Some stakeholders commented that this was impossible to adopt as many products have the battery soldered and it can only be replaced by an authorised technician. Others have reported having applied this criterion with success.

In some cases, tenderers asked for additional batteries but without a repair service or user instructions. It is recommended that instructions or additional services for repairs and replacement are requested. Some respondents considered this requirement irrelevant as it disqualifies some products with highly durable batteries already included.

Cost competitiveness of spare parts

It was found very difficult to include the cost of the spare parts in the financial model / criteria. Costs of accessories (e.g. power cable, batteries) are included in some tenders. It has to be considered that in some procurement routes the purchasing entities do not repair the devices themselves / buy spare parts but purchase maintenance services. Spare parts are included in the maintenance services and thus their cost is not relevant. Some manufacturers suggested removing this criterion as often large companies provide PCs as a Service (PCaaS) solutions that offer PC life cycle services including deployment, security, support and asset recovery. Total cost of ownership needs to be considered in this case.

Tablet and all-in-one notebook memory and storage

Respondents consider that this criterion restricts the market. They also commented that some Operating Systems require less RAM (2-4 GB).

2.1.1.4 Further background after the AHWG meeting and first stakeholder consultation

Provision of an extended service agreement and manufacturer's warranty

The stakeholders provided different opinions on the length of the warranty. Some stakeholders suggest longer periods, with a minimum warranty aligned with the B2C market. Others consider that shorter periods should be applied in the B2B context. Moreover, some stakeholders requested that aspects related to software renewal should be better integrated into the service agreement and that priority of repair strategy should be more strongly supported.

In this new revision the criterion on extended service agreement has been modified as follows:

- The minimum duration of a service agreement (core level) is kept at 2 years. The length of the service agreement is kept open. The intention is to indicate that the service agreement duration should be tailored to the needs of the tenderers (e.g. procurers' needs, technological choices, budget availability).
- It is clarified that preventive maintenance during the warranty period should include ensuring OS and security updates for the duration of the contract.
- It is also proposed to add in the explanatory note on possible services agreement a periodical scan for upgrade possibilities.

Manufacturer's warranty

Regarding the criterion on manufacturer's warranty the same approach is proposed, i.e. 2 years as the core criterion, and with the option to define a longer period). In principle, if a service for the maintenance and repair of the product is included in the tender according to TS1, it is not necessary to request also the manufacturer's warranty according to TS2, as the maintenance and repair of the product is already ensured by the tenderer. However, the two criteria are not considered mutually exclusive.

Continued availability of spare parts

Some manufacturers suggested referring to the date of the end of production for this criterion; however, this is rejected as the date of purchase must be considered as the reference. This aspect is something to be regulated using a different policy tool (i.e. Ecodesign implementing measures). Moreover, public authorities should request a length of time for spare parts availability based on their own needs: in the event that the replacement policy for computers is 5 years, it would probably be appropriate to ask for an availability of spare parts for 4 to 5 years. Moreover, the tenderer (which can be different from the manufacturer) will be responsible for ensuring the spare parts availability.

Design for reparability

Some manufacturers suggested excluding soldered CPUs from the list of critical components. Moreover, it was requested to include additional components such as ports and connectors that are reported as a common failure point for tablets. An alternative wording that is considered applicable for a core criterion was suggested for this criterion. As suggested by some stakeholders, a note is now added on the exclusion of soldered CPUs from the list of critical components. Based on the different views expressed by the stakeholders, the criterion was split between a core (not referring to any specific list of tools) and comprehensive (referring to basic tools as defined by the EN45554:2020) level.

Refurbished products

Deleted here and included as "Criteria area 5 – Criteria proposals for refurbished/remanufactured products" (see Section 2.5).

Functionality for secure data deletion

This criterion on functionalities for secure data deletion is fully supported and it is proposed to be included as a core criterion.

2.1.1.5 Further background after the second stakeholder consultation

Provision of an extended service agreement

Several stakeholders suggested splitting this into core and comprehensive levels, pointing out that the comprehensive level (longer service agreements) is generally applicable to high-end products. Regarding the service level, it is commented that commitment to repair/upgrade should be compatible with costs and time (as for the first criteria proposal). A minimum 2-year service length is proposed for the core level and a minimum of 3 years is proposed for the comprehensive level. The JRC wants to point out that these are considered minimum thresholds to be adapted based on the type of device to be procured and based on the needs of the procurer.

Manufacturer's warranty

For this criterion it is also proposed to keep a differentiation between core and comprehensive levels. A minimum 2-year warranty is proposed for the core level and a minimum of 3 years is proposed for the comprehensive level. The JRC wants to point out that these are considered minimum thresholds to be adapted based on the type of device to be procured and based on the needs of the procurer.

Continued availability of spare parts

It is suggested to distinguish between a core and a comprehensive level and to use, as a reference time, not only the date of purchase (from a supplier) but also the date of end of production. The JRC considers that the date of end of production, despite being highly relevant in the Ecodesign Directive context, is less relevant in a public procurement process, where the service provider (and not the manufacturer) is requested to ensure the availability of spare parts for the duration of the service contract, independently from the date of end of production.

Another stakeholder suggested aligning the criterion, at least for computer displays, with the requirements under Commission Regulation (EU) 2019/2021 on availability of spare parts after the end of production (7 years). Also, in this case the JRC considers that the criterion should ensure the availability of spare parts during the service contract, which is generally shorter than 7 years, and to adapt this requirement to the type of device and to the ICT equipment replacement strategy established in the organisation.

It is also suggested to consider the cost of spare parts in this criterion. The JRC amended the criterion to propose that the tenderer shall provide a price list for original or compatible spare parts and indicative labour costs for their replacement.

Ecolabels, such as EPEAT, are also suggested as a reference for verification. The JRC considers that compliance of products with Ecolabels can ensure transparency in terms of available parts from the manufacturers. However, this criterion is meant to be linked to the service contract and not to the specific characteristics of the product.

Design for reparability

The expansion of the list of replaceable components for notebooks is suggested, as is the alignment of the replacement components for displays with Commission Regulation (EU) 2019/2021. Based on the comments received, a note has been added to highlight the mandatory criteria included in the new Ecodesign Regulation for electronic displays.

OEM representatives consider that the EN45554 list of basic tools (class A) contains a very limited list of household tools and it is not suitable for the repair of high-tech products such as those covered by this specification. The list of acceptable tools for the comprehensive criterion has been extended to Class B and Class C, as defined under EN45554:2020, including all the applicable non-proprietary tools.

Moreover, the list of repairable components for computer monitors (comprehensive level) has been aligned with the reparability criterion under the EU Ecolabel for Electronic Displays.

Functionality for secure data deletion

A stakeholder suggested clarifying that secure data deletion must be possible for all sensitive, private data only and functionality for secure data deletion must be made available for the deletion of user data contained in all data storage devices of the product

Another stakeholder suggested removing the requirement to provide secure data deletion only in the user manual and to reword it as follows: "the techniques used and the supported secure data deletion standard(s) must be provided in the user manual or manufacturer's website".

Member States consider that the possibility of secure data deletion is fundamental to promote reconditioning of IT products. On the other hand, the need for security for data deletion varies greatly on the basis of different types of device and different types of tenderers (e.g. governmental agencies vs schools). In order to simplify the GPP requirements, it is preferable to move this criterion into the "award criteria" to be included only by those tenderers that consider it an added value.

2.1.2 Criterion 1.2 – Rechargeable battery life and endurance

In addition to the endurance requirements for batteries, an information criterion has been proposed on the correct management of the battery and measurement of its state of health, and new software-related criteria aiming to ensure the correct management of the batteries. A wider technical specification on minimum requirements in terms of the electrical performance of the battery has also been proposed.

The following table compares the existing GPP criteria with the new proposals.

Table 4. Rechargeable battery life and endurance - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
	New! TS6. Rechargeable battery endurance
	New! TS7. Minimum requirements on the electrical performance
	New! TS8. Information on battery state of health
	New! TS9. Battery protection software
	New! TS10. Intelligent charging
ACS. Rechargeable battery life and endurance	AC1. Further rechargeable battery endurance

Summary of the main changes after the first stakeholder consultation

The main focus of this revision is to find the most appropriate solution for the selection of a threshold for TS6. Clarifications on definitions and the applicability of the standard are also provided and on the use of ecolabels as proof of compliance. A more clear distinction between the core and comprehensive levels for TS13 is also proposed.

Summary of the main changes after the second stakeholder consultation

Only minor changes have been applied. Regarding the use of accredited laboratories for TS10 and TS11, this is considered an important element of quality assurance and it has been kept in this final proposal. The availability of accredited test laboratories has been confirmed by interviews with experts in the sector. A minor change was introduced in TS13 (core level): the tenderer must provide the equipment with a pre-installed battery protection software but is not requested to provide it as the default setting. The comprehensive criterion on Battery Protection Software has been turned into a different criterion (Intelligent Charging) to better reflect the scope of this criterion.

The following table shows the criteria as revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS6 Rechargeable battery endurance</p> <p><i>Applicable to portable devices (portable computers, tablets and smartphones).</i></p> <p><i>For refurbished/remanufactured devices, see criteria TS25 and TS26.</i></p>	<p>TS6 Rechargeable battery endurance</p> <p><i>Applicable to mobile devices (notebooks / tablets and smartphones)</i></p> <p><i>For refurbished/remanufactured devices, see criteria TS25 and TS26.</i></p>

<p>The tested State of Health of the battery after 300 cycles must be $\geq 80\%$.</p> <p>Tests must be carried out according to the standard IEC EN 61960-3:2017. See the explanatory note below for the definitions.</p> <p>Verification:</p> <p>Tenderers must provide test results obtained by accredited ISO17025 test bodies according to the IEC EN 61960-3:2017 standard or equivalent. Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	<p>The tested State of Health of the battery must be:</p> <ul style="list-style-type: none"> • $\geq 90\%$ after 300 cycles⁵⁰, or • $\geq 80\%$ after 500 cycles. <p>Tests must be carried out according to the standard IEC EN 61960-3:2017 or equivalent. See the explanatory note below for the definitions</p> <p>Verification:</p> <p>Tenderers must provide test results obtained by accredited ISO17025 test bodies according to the IEC EN 61960-3:2017 standard.</p> <p>Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Definition of State of Health (SoH)</p> <p>State of Health: Current full charge capacity (in mAh) expressed as a percentage of the design capacity (rated capacity).</p>	
	<p>TS7 Minimum requirements on the electrical performance</p> <p><i>Applicable to mobile devices (notebooks / tablets and smartphones)</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS27.</i></p> <p>The battery must be compliant with the electrical test acceptance criteria according to the standard IEC EN 61960-3:2017 (see details in the Annex I of this document).</p> <p>Verification:</p> <p>Tenderers must provide test results obtained by accredited ISO17025 test bodies according to EC EN 61960-3:2017.</p>
<p>TS8 Information on battery state of health</p> <p><i>(same for core and comprehensive criteria)</i></p> <p><i>Applicable to portable devices (portable computers, tablets and smartphones).</i></p> <p><i>For refurbished/remanufactured devices, see criterion TS26.</i></p> <p>The tenderer must provide the equipment with pre-installed software to determine and monitor the status of the battery/accumulator and allow for the reading of the battery or accumulator's 'state of health' and 'state of charge', as well as the number of 'full charge cycles' already performed from the battery/accumulator and to display these data for the user. See the explanatory note below for the definitions.</p> <p>The software must also provide tips for users to maximise battery lifespan.</p> <p>Verification:</p> <p>The tenderer must provide the specifications and version of the software.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	
<p>Explanatory note: Definition of charge cycle, State of Charge (SoC) and State of Health (SoH)</p> <ul style="list-style-type: none"> • Charge Cycle: One charge cycle is completed when the battery is fully charged from 0% up to 100% and then discharged back down to 0%. This could be performed by partially charging-discharging the battery multiple times on different SoC levels as long as the total amount of charge-discharge percentage is approximately equal to the nominal capacity. • State of Charge: The remaining battery capacity expressed as a percentage of full charge capacity (SBS-IF, 1998). • State of Health: Current full charge capacity (in mAh) expressed as a percentage of the design capacity (rated capacity). 	
<p>TS9 Battery protection software</p>	

⁵⁰ Please note that the testing threshold of 300 cycles does not represent the expected endurance, but is a proxy for much longer endurance (e.g. >500 cycles)

(same for core and comprehensive criteria)

Applicable to portable computers.

The tenderer must provide the equipment with pre-installed software to enable a limit on the battery State of Charge (SoC) when the computer is used systematically in grid operation (e.g. to a value $\leq 80\%$ SoC).

Verification:

The tenderer must provide a written declaration that the products supplied have pre-installed software with the requested features. The specifications and version of the software must also be provided.

Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

TS10 Intelligent Charging

Applicable to tablets and smartphones.

The tenderer must provide the equipment with a pre-installed battery management system that includes intelligent charging software able to identify the user's regular charging habits/pattern, stop the charging process before it reaches 100% (e.g. at 80%), and fully charge the device only when needed by the user.

Verification:

The tenderer must provide a written declaration that the products supplied have pre-installed software with the requested features. The specifications and version of the software must also be provided.

Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

AWARD CRITERIA

AC1 Further rechargeable battery endurance

Applicable to portable devices (portable computers, tablets and smartphones).

For refurbished/remanufactured devices, see criterion AC11.

Additional points will be awarded if the battery endurance is greater than 500 cycles (with $\geq 80\%$ capacity retention of the initial rated capacity) proportionally to the additional number of cycles ensured.

Verification:

Tests must be carried out according to the standard IEC EN 61960-3:2017. Tenderers must provide test results obtained by accredited ISO17025 test bodies.

2.1.2.1 Initial background and rationale for the proposed criteria

Battery life endurance

One important reason why mobile ICT products are discarded or replaced is the short life of the main batteries installed in portable ICT products. Even when the batteries are replaced and the entire product is not discarded, this could generate environmental impacts related to the end-of-life management of worn-out batteries and additional operational costs for the public administration. For this reason, the endurance requirement for batteries is kept.

Different criteria on batteries' capacity retentions and durability in cycles are applied so far in various ecolabel schemes and this revision can be an opportunity to harmonise the EU GPP approach with these labels, to also allow the use of the existing ecolabel certification as a verification method.

Relevant parameters used to define the battery life endurance are:

- - State of Charge (SoC): Currently available capacity (in mAh) expressed as a percentage of the capacity at full charge (full charge capacity);
- - State of Health (SoH): Current full charge capacity (in mAh) expressed as a percentage of the design capacity (rated capacity).

In some cases, State of Charge is also used to indicate State of Health; however, State of Health (SoH) is considered the most appropriate term.

Regarding applicable thresholds, 300 cycles at 80% SoH can be considered as a possible minimum requirement for mobile IT equipment. However, data collected by TCO Certified suggest that most of the certified products have batteries ensuring a SoH higher than 80% after 300 cycles⁵¹. Even though 300 cycles does not reflect the expected longevity of the battery, it could still be a practical way to exclude the worst performing products from tenders, without increasing verification costs for manufacturers.

For the comprehensive criteria, the following option for the threshold was proposed in the first draft revision:

- 500 cycles (with ≥80% SoC) respectively (as for the current GPP criteria).

Moreover, some notebooks and tablets listed in the EPEAT database fulfil an optional criteria based on the capacity retention (≥65% SoC) after 1000 cycles. Some manufacturers (e.g. Apple) claim for its notebooks and tablets battery charge capacity at 1000 complete charge/discharge cycles. However, the EPEAT criterion does not request that tests on battery endurance are carried out by ISO 17025 accredited laboratories. This is instead requested under ecolabels such as Blue Angel, Nordic Ecolabelling and TCO Certified.

The main technical reference for lithium battery endurance is the standard IEC EN 61960:3-2017. This standard requires testing the battery at a specific current rate 0.2 It A⁵² for the number of cycles until a capacity retention > 60% is reached or, as an accelerated test option, testing at 0.5 It A⁵³ the capacity retention at 300 cycles. However, in terms of charging profile, this test method allows more flexibility. In terms of performance, this standard also covers other electrical tests of batteries/cells including their rated capacity, performance at low temperature and fast discharge rate, capacity retention after storage and the effect of electrostatic discharges. These tests are able to capture other relevant performance aspects of the battery and the different degradation mechanisms, compared to the simple charging/discharging cycles of the endurance tests.

Table 5. Electrical tests and acceptance criteria covered by IEC EN 61960:3-2017

Parameter	Description	Battery Acceptance Criteria
Discharge performance at 20 °C (rated capacity)	This test verifies the rated capacity of the battery.	100% of the rated capacity (C5 Ah) ⁵⁴
Discharge performance at -20 °C (rated capacity)	This test determines the capacity of the battery at low temperatures.	30% of the rated capacity (C5 Ah)
High rate discharge performance at 20 °C	This test determines the capacity of the battery when discharged at a high rate. This test is not required if the battery is not designed to be used at this rate (1 ItA).	60% of the rated capacity (C5 Ah)
Charge (capacity) retention and recovery	This test determines firstly the capacity which a battery retain after storage for an extended period of time (28 days) and secondly the capacity that can be recovered by a subsequent recharge.	60% of the rated capacity (C5 Ah)
Charge (capacity) retention after long-term storage	This test determines the capacity of a battery after extended storage (90 days) at 50% state of charge, followed by a subsequent charge.	85% of the rated capacity (C5 Ah)

⁵¹Based on anonymised statistics provided by TCO (mid-2019).

⁵² It basically means that the battery is tested with a discharging cycle of around 5 hours.

⁵³ It corresponds to an accelerated test condition where the discharging cycle takes place in 2 hours.

⁵⁴ Amount of electricity declared by the manufacturer that a cell can deliver in a 5-hour period.

Endurance in cycles	This test determines the number of charge/discharge cycles which a battery can endure before its capacity has been significantly depleted.	60% of the rated capacity (C5 Ah) after 300 cycles
Electrostatic discharge	This test is to evaluate the ability of a battery to withstand electrostatic discharge.	Operational

Information on battery state of health

In support to the endurance requirement for batteries, it is proposed to include a software-related requirement. This would facilitate the correct monitoring and implementation of the replacement policy for the mobile equipment fleet of a public administration.

Blue Angel requires the existence of software determining the battery/accumulator status and allowing the reading of the battery's/accumulator's "state of health", "state of charge", as well as the number of full charge cycles already performed by the battery/accumulator and to display these data for the user.

User behaviour is also an important factor in prolonging the battery lifespan. Factors that can be controlled by the final user include:

- ensuring the computer is well ventilated and does not overheat;
- power management settings are used when unplugged and partial charging systems are used where available;
- correct storage of the battery during long periods of disuse.

It is considered important that the tenderer provides guidance to users on how to maximise battery life. The provision of this information on battery health can drive user behaviour toward prolonging battery life and can be also relevant in the event of reuse of the device.

Battery protection software

The wearing out of batteries can be limited by the use of specific protection software. 'Intelligent charging' was already identified by stakeholders as an important feature in the previous revision.

The preparatory study on the revision of the EU Ecodesign Regulation for computers proposes criteria with regard to a 'Battery optimisation built-in functionality': Manufacturers shall provide pre-installed software to enable a limit on the battery state of charge (SoC) when the computer is used systematically in grid operation. This functionality shall prevent the battery to be loaded at full charge. The manufacturer shall inform the user of the existence and the benefits of using such a functionality.

Furthermore, as included in the Blue Angel criteria, a required Battery/Accumulator Protection Software shall be able to limit the battery's/accumulator's charge to a value smaller to the maximum amount of usable electricity (e.g. 80% of full charge capacity) to extend the battery's life.

In the case of smartphones and tables the overnight charging duration is often unnecessarily long, the battery is subjected to a high average state of charge (SoC), which accelerates battery aging. Therefore, intelligent charging systems (also called smart charging) over the duration of the night can provide protection against aging^{55,56,57}.

2.1.2.2 Initial background for the proposed verification

All schemes refer to standard IEC 61960 or the related EN 61960 / DIN EN 61960 standards. IEC 61960-3:2017 specifies performance tests, designations, markings, dimensions and other requirements for secondary lithium single cells and batteries for portable applications.

⁵⁵ http://emareq.de/publication/smart2_charger/

⁵⁶ <https://support.apple.com/en-us/HT210512>

⁵⁷ <https://www.huaweicentral.com/smart-charging-mode-emui-feature-march-2020/>

2.1.2.3 Summary of stakeholder answers from the initial survey

This criterion is adopted and adapted in tenders according to the respondents. Different thresholds are reported to be applied by different labels. Simplification of the testing and verification procedure is also suggested.

2.1.2.4 Further background after the AHWG meeting and first stakeholder consultation

Rechargeable battery endurance

The comments received are mainly related to the threshold selection in terms of number of cycles with some stakeholders suggesting increasing the threshold to 500 or more cycles and other stakeholders considering that 300-cycle testing represents the only available reliable data provided by battery manufacturers. The proposal of this revision is to keep requiring the 300-cycle testing according to EN 61960 as this test represents a standardised reference and is widely applied by industry. The battery must ensure 80% SoH after 300 cycles as the core criterion. For the comprehensive criterion, as an alternative to more than 500 cycles with 80% SoH, a threshold of 90% SoH after 300 cycles is proposed. Some clarifications on definitions and the applicability of the standard are also provided. In particular, the definitions of State of Charge and State of Health have been improved/corrected and added in an explanatory note.

It was also commented that IEC 61960 does not allow for charging that emulates the charging profile of the product. However, the JRC considers that this is already allowed by the IEC standard: according to the IEC 61960-3: 2017 (Section 7.2), cells shall be charged, at an ambient temperature of 20 ± 5 °C, using the method declared by the manufacturer.

Also, the reference to ISO 17025 accredited test bodies was questioned. It was also mentioned that requiring certified test bodies adds lead time and cost, without real environmental gain. The JRC considers that the involvement of accredited test bodies is beneficial in terms of quality assurance of the test results and the procurement process can benefit from it.

Minimum requirements on the electrical performance

Regarding this criterion it was requested to clarify which tests and thresholds are associated with it. The list of tests is added in Annex I to this document.

Information of battery state of health

According to a manufacturer, the total number of cycle counts is not relevant information for the user. As the battery lifespan in terms of total cycles depends on the battery type and appliance, the pure number of cycle counts reached does not provide useful information on the remaining lifetime of the battery or the capacity retention left. The state of health and state of charge provide better information. The JRC does not agree as this information on number of cycles allows procurers to monitor the degradation trends and mechanism of batteries used for the ICT fleet.

Battery protection software

It is unclear how the "core criteria" is different from the "comprehensive criteria" in this case. Both require pre-installed software that enables the user to prevent the battery from being fully charged. In this second proposal it is clarified that the criteria are basically the same. The two levels, core and comprehensive, aim to highlight the difference in terms of the relevance of the applicability of this criterion to different product groups. The criterion is considered core for notebooks expected to be used as workstations and comprehensive for the other mobile ICT products not intended to be used plugged into the grid. Reference to intelligent charging systems software able to identify use patterns is also suggested. Intelligent charging software that identifies the user's regular charging behaviour could allow the 80% charge capacity to be exceeded at specific moments of the day/week.

2.1.2.5 Further background after the second stakeholder consultation

Rechargeable battery endurance

According to the comments and feedback received, it is clear that manufacturers are currently testing the endurance of their batteries only up to the 300 cycles (minimum endurance target introduced by IEC 61690-3). According to some manufacturers, extending the test to 500 cycles can be very expensive and time-consuming, as the test could last, in some cases, more than 4 months. Test reports requested as proof of compliance by TCO Certified also cover the first 300 cycles. Some NGOs consider this threshold, applied in both the core and comprehensive criteria, too low, considering the development of the market and the importance of encouraging long-lasting batteries. Based on the comments received, the JRC pointed out that the length of the battery testing (300 cycles) does not correspond to the lifetime expectation/request, but represents a good proxy for a longer endurance.

OEMs also suggested to delete the provision of accredited test bodies (ISO17025), only keeping the provision of performing tests in accordance with international standards. The OEMs consider that the requirement for laboratory accreditation makes it more difficult to provide a timely response to tenders. However, the JRC considers that the involvement of accredited test bodies is beneficial in terms of quality assurance of the test results and the procurement process can benefit from it. Moreover, this requirement is already included in the testing requirements of several Ecolabel programmes, including TCO Certified, Blue Angel, and Nordic Swan, and applied by several OEMs for labelling. A list of laboratories recognised by the IEC as fully compliant with the requirements of ISO/IEC 17025 is available at: https://www.iecee.org/dyn/www/?p=106:57:0:::FSP_STD_ID:29603

In terms of costs, tests from accredited laboratories can typically vary, based on the complexity and comprehensiveness of the test, in a range between EUR 5 000 and EUR 10 000 according to information provided by an expert.

Minimum requirements on the electrical performance

A stakeholder considers that this criterion is unnecessary if compliance with the technical standard is mandatory in order for manufacturers to market their products. According to the information collected by the JRC, this standard is not mandatory at the moment.

Information of battery state of health

No further comments received.

Battery protection software

According to an OEM, a requirement to stop charging before it reaches 100% could result in a poor customer experience, and for this reason it is not recommended as the default setting, but it is recommended only to make the option available. Regarding the verification, an OEM considers that the procurer might not be able to control the specifications of the software. The written declaration that the products supplied have pre-installed software with the requested features is suggested as verification requirement.

2.1.3 Criterion 1.3 – Mobile equipment durability testing

The scope of the criteria is to expand the scope of the criteria included in the EU GPP criteria (2016) to all the categories of mobile equipment, including laptops, tablets and smartphones. A core technical specification aims to ensure that the product is able to withstand drops. Comprehensive criteria are proposed to cover a broader spectrum of stresses. A new criterion on ingress protection from dust and water is proposed to be included, with a special focus on equipment used for outdoor working activities or other harsh usage environments and conditions. The criterion on durability tests for SSD has been removed as this aspect is considered to be covered by the durability testing of the entire device.

The following table compares the existing GPP criteria with the new proposals.

Table 6. Mobile equipment durability testing - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
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	New! TS11. Drop testing
	New! TS12. Temperature stress
	New! TS13. Ingress protection level
AC7. Notebook computer drives	AC2. Mobile equipment durability testing
AC8. Notebook durability testing	New! AC3. Ingress protection level – Semi-rugged and rugged devices

Summary of the main changes after the first stakeholder consultation

Minor changes were made such as adding the reference to an alternative test procedure and to the ecolabels that can be used to demonstrate compliance.

Summary of the main changes after the second stakeholder consultation

The criteria has been updated adding a reference to the new version of MIL-STD-810 (version H) that has replaced version G. It is proposed to include a transition period and accept MIL-STD-810 version G test results until the end of 2021. Clarifications on the applicability of TS13 have been introduced: rugged and semi-rugged devices expected to be used for outdoor working activities or other harsh usage environments and conditions

The following table shows the criteria as revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	

<p>TS11 Drop testing</p> <p><i>same for core and comprehensive criteria)</i></p> <p><i>Applicable to portable devices (portable computers, tablets and smartphones).</i></p> <p>The equipment must be tested according to the following standards:</p> <ul style="list-style-type: none"> • IEC 60068 Part 2-31: Ec (Freefall, procedure 1), or • MIL-STD-810H - Method 516.8 – Shock (Procedure IV) with a drop height of 45 cm. <p><i>Note: Tests carried out according to the corresponding method in the previous version of the Military Standard 'MIL-STD-810G' can be accepted until the end of 2021 (see Annex II for details).</i></p> <p>Functional performance requirements in Annex II of this document must be met by the equipment after exposure to the drop test.</p> <p>Alternatively, the device must be provided with cover and protection cases tested for, or designed according to, a robustness standard such as US MIL-STD-810 or equivalent test procedures.</p> <p>Verification:</p> <p>The tenderer must provide test reports showing that the model has been tested and has met the functional performance requirements for durability.</p> <p>Testing must be carried out by a test facility accredited according to ISO 17025.</p> <p>Existing tests for the product, carried out to the same or a stricter specification, will be accepted without the need to retest.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	
	<p>TS12: Temperature Stress</p> <p><i>Applicable to portable devices (portable computers, tablets and smartphones).</i></p> <p>The equipment must be tested according to the following standards:</p> <ul style="list-style-type: none"> • IEC 60068 Part 2-1: A Cold Part 2-2: B Dry Heat, or • MIL-STD-810H Method 501.7 - High temperature - Basic Hot (A2) and Method 502.7 - Low temperature - Basic Cold (C1), <p>with the modified storage/operational temperatures described in Annex II.</p> <p>Functional performance requirements in Annex II of this document must be met by the equipment after exposure to the temperature stress tests.</p> <p><i>Note: Tests carried out according to the corresponding method in the previous version of the Military Standard 'MIL-STD-810G' can be accepted until the end of 2021 (see Annex II for details).</i></p> <p>Verification:</p> <p>The tenderer must provide test reports showing that the model has been tested and has met the functional performance requirements for temperature stress. Testing must be carried out by a test facility accredited according to ISO 17025. Existing tests for the product, carried out to the same or a stricter specification, will be accepted without the need to retest.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>

	<p>TS13 Ingress protection level – Semi Rugged and Rugged Devices</p> <p><i>Applicable to portable devices (portable computers, tablets and smartphones).</i></p> <p><i>To be included where the expected use is for outdoor working activities or other harsh usage environments and conditions.</i></p> <p>The equipment delivered as part of the contract must have passed durability tests carried out according to:</p> <ul style="list-style-type: none"> • IEC/EN 60529:2013, Degrees of Protection Provided by Enclosures (IP Code), or • MIL-STD-810H 510.7 – Procedure I – Sand and Dust – Blowing Dust and MIL-STD-810H 506.6 – Procedure I Rain. <p>Functional performance requirements in Annex II of this document must be met by the equipment after exposure to the stress tests.</p> <p>The degree of protection provided by enclosures must be classified as level IP54 or higher.</p> <p><i>Note: Tests carried out according to the corresponding method in the previous version of the Military Standard 'MIL-STD-810G' can be accepted until the end of 2021 (see Annex II for details).</i></p> <p>Verification:</p> <p>The tenderer must provide test reports showing that the model has been tested and has met the functional performance requirements for the ingress protection level. Testing must be carried out by a test facility accredited according to ISO 17025.</p> <p>Existing tests for the product, carried out to the same or a stricter specification, will be accepted without the need to retest.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Degree of protection for IEC/EN 60529:2013</p> <ul style="list-style-type: none"> • Degree of protection against solid foreign objects indicated by the first characteristic numeral: <ul style="list-style-type: none"> • IP5x - Ingress of dust is not totally prevented, but dust must not penetrate in such a quantity as to interfere with satisfactory operation of the apparatus or to impair safety; • IP6x - No ingress of dust; complete protection against contact. • Degree of protection against water indicated by the second characteristic numeral: <ul style="list-style-type: none"> • IPx4 - Water splashed against the enclosure from any direction must have no harmful effects; • IPx5 - Water is projected in jets against the enclosure from any direction with no harmful effects; • IPx6 - Water is projected in powerful jets against the enclosure from any direction with no harmful effects; • IPx7 - Ingress of water in quantities causing harmful effects must not be possible when the enclosure is temporarily immersed in water under standardised conditions of pressure and time; • IPx8 - Ingress of water in quantities causing harmful effects must not be possible when the enclosure is continuously immersed in water under conditions which must be agreed between the manufacturer and user but which are more severe than for numeral 7. 	

AWARD CRITERIA

AC2: Mobile equipment durability testing

(same for core and comprehensive criteria)

Applicable to portable devices (portable computers, tablets and smartphones).

The applicable tests must be specified in the tender to reflect the conditions of use defined for the product.

Points will be awarded for offers including products that have passed durability tests carried out according to IEC 60068, US MIL-810 or equivalent.

A maximum of x points [to be specified] may be awarded for:

- Accidental drop (x points)
- Resistance to shock (x points)
- Resistance to vibration (x points)
- Screen resilience (x points)
- Temperature stress (x points)

Functional performance requirements and test specifications are provided in Annex II of the criteria document.

Verification:

The tenderer must provide test reports showing that the model has been tested and has met the functional performance requirements for durability.

Testing must be carried out by a test facility accredited according to ISO 17025.

Existing tests for the product, carried out to the same or a stricter specification, will be accepted without the need to retest.

Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

AC3: Ingress Protection Level – Semi Rugged and Rugged Devices

Applicable to mobile devices (portable computers, tablets and smartphones).

To be included where the expected use is for outdoor working activities or other harsh usage environments and conditions.

Points will be awarded if the products demonstrate that they have reached the following IP Protection Level according to IEC/EN 60529:2013:

- IP65 – 0.25 X points
- IP66 – 0.5 X points
- IP67 – 0.75 X points
- IP68 – X points

Verification:

The tenderer must provide test reports showing that the model has been tested and has met the functional performance requirements for the ingress protection level.

Testing must be carried out by a test facility accredited according to ISO 17025.

Existing tests for the product, carried out to the same or a stricter specification, will be accepted without the need to retest.

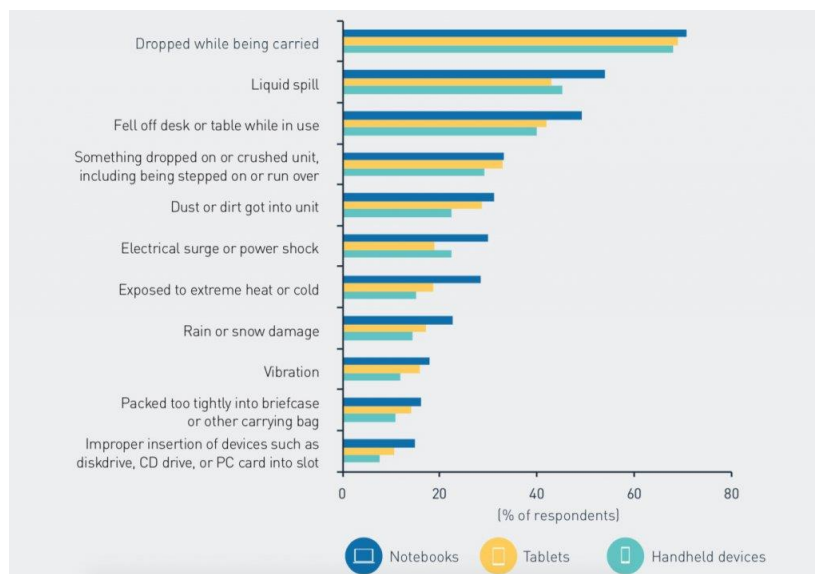
Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

2.1.3.1 Initial background and rationale for the proposed criteria

Options to improve the durability performance of laptops and other mobile equipment may be related to the procurement of products that ensure a resistance to drops and other physical stresses such as water contact, dust and extreme temperatures.

According to an IDC study (2016)⁵⁸ among 800 United States organisations, the mobile equipment failure rate is in general very high: for notebooks it is 18% (average of company notebooks requiring repair of some kind, during a year). The rate of failure increases each year a device is in use, ranging from 11% failing the first year to more than 20% failing by year five. According to this study, among the top ways end-users damage devices, by far and away the top reason across categories was simply dropping the device while carrying it, or it falling from the desk. Other relevant reasons are water/dust ingress, temperature stress, vibration and power shock.

Figure 11. Damage to mobile equipment in organisations reported by the IDC study (2016)



Risks of physical stress for the equipment are also linked to the work environment, with higher levels of stress expected for products used in outdoor environment.

Drop and temperature stress tests

Only the current EU GPP award criteria (comprehensive) and TCO Certified include requirements on durability tests for notebooks and tablets, both referring to test procedures as specified in US MIL-STD-810G or IEC 60068.

TCO Certified Generation 8 requires a drop test as well as a temperature stress test (high and low temperature) for mobile ICT devices such as notebooks, smartphones and tablets; in addition to a drop and temperature stress test, the current EU GPP criteria for Computers and Monitors (2016) further entail resistance to shock and vibration as well as screen resilience. Additionally, EU GPP has dedicated durability criteria for computer drives.

The detailed conditions of the drop and temperature tests slightly differ with stricter requirements for EU GPP; see Table 7.

Test conditions for temperature tests: according to EU GPP criteria, the notebook shall be subjected to a minimum of four 24-hour exposure cycles in a test chamber. TCO test cycles are ≥ 48 h for storage and ≥ 4 h for operational temperature.

⁵⁸ IDC (2016) International Data Corporation - White Paper Pay Now, Save Later: The Business Case for Rugged Devices, http://info.panasonic.com/rs/400-JUK127/images/IDC-report_pay-now-save-later_the-business-case-for-rugged-devices.pdf (accessed on 13 September 2018)

Table 7. Differences in test conditions of durability tests between EU GPP and TCO

	High temperatura	Low temperature	Drop test
EU GPP (2016)	The notebook shall be operational during a dry heat cycle at +40°C. The notebook shall be non-operational during a dry heat cycle between +35°C and +60°C.	The notebook shall be operational during a cold cycle at -25°C. The notebook shall be non-operational during a cold cycle at -50°C.	≥ 76 cm drop height onto a non-yielding surface. A minimum of one drop shall be made on each bottom side and each bottom corner.
TCO	Operational temperature for ≥ 4h: ≥ +40°C. Storage temperature for ≥ 48h: ≥ +60°C.	Operational temperature for ≥ 4h: ≤ -20°C. Storage temperature for ≥ 48h: ≤ -30°C.	≥ 45 cm drop height.

According to stakeholder feedback, the approach for the durability testing is generally supported. TCO Certified version 8 has set the drop test limit to 45 cm after discussions with the industry. TCO reports that, even at this level, there are premium products not able to pass this criterion and therefore that fail to certify according to TCO Certified Generation 8.

Furthermore, the analysis of voluntary approaches of front-running companies revealed that only a few companies seem to apply US MIL-STD-810 or IEC 60068 as regular product durability tests, either to appliances for professional use (see examples of HP, LG⁵⁹, Lenovo⁶⁰), or especially for ‘rugged’ appliances (see examples of Dell⁶¹ and Zebra Technologies⁶²). For the revision of the GPP criteria, it is proposed to harmonise test methods and thresholds introducing the TCO Certified conditions for temperature and drop tests as thresholds for the core criteria, whereas the more ambitious GPP criteria are proposed to be kept as award criteria. In this revision it is also better specified how to determine if a product passes or fails the test.

Ingress protection

This proposed criterion focuses on the resistance to water and dust ingress.

Liquid spillage on a detached keyboard (of desktops) results in relatively inexpensive replacements. In notebooks/laptops the liquids penetrate and damage expensive internal parts, including the motherboard and storage controllers: the repair is so expensive that generally the computer is disposed of⁶³.

Waterproof solutions for computers are possible, with increasing rates of protection of internal components. As a minimum, sealing can be implemented, so that just the relatively cheap notebook keyboard is replaced. Standard IEC 60529 classifies and rates the degree of Ingress Protection (IP) provided against dust, water, accidental contact, and intrusion through mechanical casings and electrical enclosures. The IP code consists of two digits, indicating the solid particle protection class and the liquid ingress protection class.

On the other hand, some manufacturers at least seem to use the IP marking standard for dust and water resistance for their products (more commonly for tablets and smartphones). When the equipment is expected to be used in a specific environment and activities where contact with dust and water is unavoidable, the procurement of at least an IP65-rated tablet or dustproof smartphone design can help protect the device and data against particle penetration and withstand the pressure of water jets. IP67 or IP68 could help protect from more severe conditions and risks related to water ingress and could be beneficial only for devices expected to be used under extreme conditions.

Moreover, stakeholder feedback suggested the use of internationally acknowledged standards (similar to MIL standard 810) with regard to the durability requirement for computer drives.

Finally, IP levels for dust and water are proposed to be included as further GPP criteria for tablets and smartphones mainly expected to be used in outdoor activities.

⁵⁹ <https://www.lg.com/sq/laptops/lg-14Z980-GAA5CA3>

⁶⁰ <https://www.lenovo.com/vw/en/solutions/smb/thinkpad-mil-spec-tested-extreme>

⁶¹ <https://www.dell.com/en-us/rugged/index.htm>

⁶² <https://www.zebra.com/gb/en/products/tablets/l10-series-xbook-xslate-xpad.html>

⁶³ Preparatory study on the Review of Regulation 617/2013 (Lot 3) Computers and Computer Servers

2.1.3.2 Comments from the initial GPP survey 2019

The approach for the durability testing was generally supported. Durability tests were also reported to be introduced by ecolabels such as TCO that has set the drop test limit to 45 cm after discussions with the industry.

It was suggested to better specify how to determine if a product passes or fails the test.

2.1.3.3 Further background after the AHWG meeting and first stakeholder consultation

Some stakeholders highlighted that some of the specifications proposed would only be beneficial for devices expected to be used under extreme conditions. Moreover, the requirement for test results from accredited test bodies is questioned by industry. The use of covers / protective cases is also suggested for tablets, considering the lower availability of products that have passed durability tests. The inclusion of different features in one single award criteria is also questioned. In this revision the criterion has been simplified and tests that are not linked to international standards (e.g. the screen resistance) have been removed.

2.1.3.4 Further background after second stakeholder consultation

Some stakeholders suggested referring to the new version of MIL-STD-810 (version H issued in 2019 and substituting version G). The new standard brings a number of changes in ruggedness testing. As an example, the transit drop test that was described in Method 516.6 Procedure IV in MIL-STD-810G is now included in Method 516.8 Procedure IV according to the new MIL-STD-810H and the default impact surface is now steel plate over concrete and no longer concrete. The revised criteria refer to the new version of the Military Standard; however, many products on the market have been tested according to MIL-STD-810G and for this reason a transition period is proposed, considering the MIL-STD-810G test results acceptable until the end of 2021.

Also for this group of criteria, some OEMs consider the requirements of tests carried out by accredited laboratories (ISO 17025) unnecessary and recommend to request testing for Ingress Protection only for rugged computers and rugged tablets as standard products may not be subject to such harsh environmental conditions. Regarding AC2, a stakeholder supports the reference to international standards but it is suggested to include fewer features in the criterion. In terms of costs, these tests are not expensive, with a drop test or temperature stress test costing an estimated EUR 1 000 or less, according to an expert consulted.

2.1.4 Criterion 1.4 (new!) – Interoperability and reusability of components

New criteria are proposed based on the use of standardised components aiming to increase the ICT equipment interoperability and reusability, in particular regarding connection cables and external power supply units. By using one standardised interface for charging and data transfer, fewer cables need to be manufactured and the reuse of chargers and data cables can increase, with a possible saving of resources by decoupling the procurement of chargers from the procurement of the ICT device.

The following table compares the existing GPP criteria with the new proposals.

Table 8. Interoperability and reusability of components - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
	New! TS14. Standardised port
	New! TS15. Standardised External Power Supply
	New! TS16. External Power Supply: Detachable cables
	New! TS17. Backward compatibility: Adapters
	New! AC4. ICT Equipment without accessories

Summary of the main changes after the first stakeholder consultation

Minor changes and clarifications were integrated in the criteria text.

Summary of the main changes after the second stakeholder consultation

Regarding criteria TS14 and TS15, in the event that the product does not have a standardised port, then an adapter must be available to be ordered at no additional cost (and not accompany the product “by default” as in the previous proposal). Based on the comment received about market readiness, it is proposed to transform the criterion TS “ICT Equipment without accessories” into an award criterion.

The following table shows the criteria as revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS14 Standardised port</p> <p><i>(same for core and comprehensive criteria)</i></p> <p><i>Applicable to all devices except computer displays and refurbished/remanufactured devices.</i></p> <p>The equipment delivered as part of the contract must carry at least one standardised USB Type-C™ receptacle (port) for data exchange that is backward compatible with USB 2.0 according to the standard IEC 62680-1-3:2018.</p> <p>If the product does not have a built-in USB Type-C™ receptacle, then an adapter must be available to be ordered at no additional cost.</p> <p>Verification:</p> <p>The tenderer must provide a product manual for each model provided, which must include an exploded diagram of the device illustrating the types of connectors used.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>	
<p>Explanatory note: Standardised USB Type-C™</p> <p>The USB Type-C™ receptacle is defined according to the standard IEC 62680-1-3:2018 - Universal serial bus interfaces for data and power - Part 1-3: Common components - USB Type-C™ Cable and Connector Specification.</p>	
	<p>TS15 Standardised External Power Supply</p> <p><i>Applicable to all portable devices with a power supply up to 100 W.</i></p> <p><i>For refurbished/remanufactured devices, see criterion AC12.</i></p> <p><i>This is not applicable to products with Qi (wireless) charging capability (e.g. for strong resistance to immersion in water or to dust), such as industrial computers.</i></p> <p>The equipment delivered as part of the contract must carry a USB Type-C™ standardised receptacle (port) for USB Power Delivery (PD) according to the standard EN/IEC 63002:2017.</p> <p>If the product does not have a built-in USB PD receptacle, then an adapter must be available to be ordered at no additional cost.</p> <p>Verification:</p> <p>The tenderer must provide a product manual for each model provided, which must include an exploded diagram of the device illustrating the types of receptacles used for power delivery.</p>
<p>Explanatory note: Standardised external power supply</p> <p>Interoperability guidelines for external power supplies are defined according to IEC 63002:2016 - Identification and communication interoperability method for external power supplies used with portable computing devices.</p>	

	<p>TS16 External Power Supply: Detachable Cables</p> <p><i>Applicable to all portable devices with a power supply up to 100 W except for refurbished/remanufactured devices.</i></p> <p><i>For refurbished/remanufactured devices, see criterion AC13.</i></p> <p>The External Power Supply (EPS) configuration must consist of a USB EPS with a detachable input cable (or one that is integrated in the EPS housing) and a detachable output cable to the ICT device</p> <p>Verification:</p> <p>The tenderer must provide product documentation for each model provided, which must include an exploded diagram of the device illustrating the main characteristics of the USB EPS.</p>
	<p>TS17 Backward compatibility: adapters</p> <p><i>Applicable to stationary and portable computers.</i></p> <p>The following adapters [to be selected from the list below] must be available to be procured separately:</p> <ul style="list-style-type: none"> • USB-C to USB Type-A • USB-C to VGA • USB-C to HDMI • USB-C to RJ45 (Ethernet Port) <p>Verification:</p> <p>The tenderer must provide a product specification and a price list for the adapters required.</p>
	<p>AC4 ICT Equipment without accessories</p> <p><i>Applicable to portable computers, tablets and smartphones.</i></p> <p>Additional points will be awarded if the following accessories are available to be procured separately:</p> <ul style="list-style-type: none"> • External Power Supply (EPS) • Headphones <p>Verification:</p> <p>The tenderer must provide a quotation for the model with and without these accessories and a separate quotation for each one of the accessories. The quotation should also outline the process for ordering the accessories.</p>

2.1.4.1 Initial background and rationale for the proposed criteria

Standardised interfaces

A new criterion is proposed on the use of standard interfaces. The proposal is based on the usage of USB-C interfaces as they have the advantage of being:

- Standardised: USB type-C electric receptacles are specified in IEC 62680-1-3:

Blue Angel has criteria on interfaces, on the one hand connectivity to external monitors, on the other hand the existence of two or more USB 3.0 or later ports. The latest TCO Certified Generation 8 criteria go even further and require computers to carry at least – built-in or delivered as a separate adapter – one USB type-C connector which is a universal connector with more pins, different design and performance compared to USB 3.0, which allows both charging and data transfer. According to the TCO criteria document, USB-C is designed

to be more robust and future-proof than existing USB interfaces, helping to prevent problems with failing ports and to decrease the need for different cables.

Standardised external power supply

A new proposal on the standardised USB type-C receptacles is included for External Power Supply (EPS) for computing devices up to 100 W. This proposal is in line with the new Circular Economy Action Plan⁶⁴ that foresees regulatory measures on chargers for mobile phones and similar devices, including the introduction of a common charger, improving the durability of charging cables, and incentives to decouple the purchase of chargers from the purchase of new devices (see AC21).

IEC 63002:20016 defines interoperability guidelines for external power supplies used with portable computing devices that implement the IEC 62680-1-2: Universal Serial Bus Power Delivery Specification with the IEC 62680-1-3: Universal Serial Bus Interfaces for data and power-Common Components- Type-C Cable and Connector Specification. This International Standard is applicable to EPS under 100 W for portable computing devices, with a focus on power delivery application for notebook computers, tablets, smartphones and other related multimedia devices. A broad market adoption of this International Standard is expected to make a significant contribution to the reusability of power supplies by building on the global market ecosystem of IEC 62680-compliant devices and facilitating interoperability across different product categories.

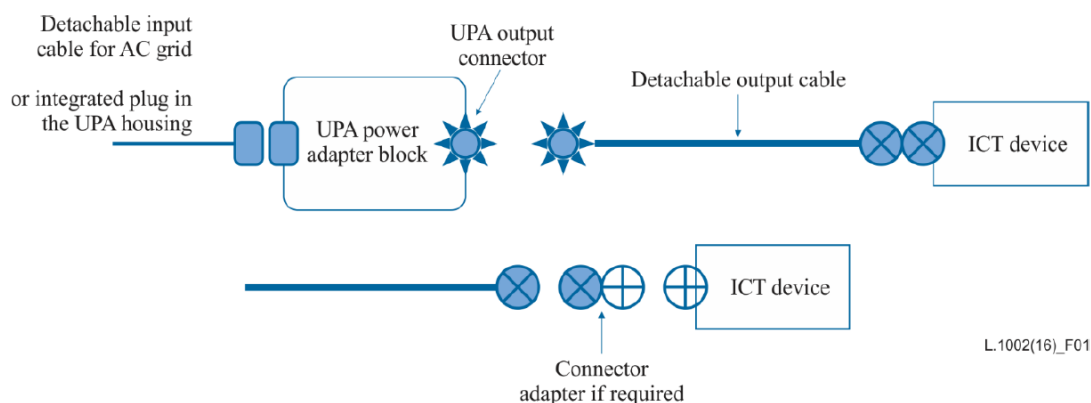
According to the ITU recommendations⁶⁵, the basic configuration of universal power adapter (UPA) solutions consists of a UPA with a detachable input cable (captive input can be a mains plug integrated in the adapter housing) and a detachable output cable to the ICT device.

The Green Product Mark requires the use of a standardised power supply to enable easy reuse of used power supplies.

External power supply with detachable cables

The recommendation ITU-T L.1002 (10/16) sets out technical specification for common EPS, designed for use with portable ICT devices, also referred to in the recommendation as Universal Power Adaptors (UPAs). The basic EPS configuration suggested by ITU-T L.1002 consists of an EPS with a detachable input cable⁶⁶ and a detachable output cable to the ICT device⁶⁷ (see Figure 12). A detachable DC cable is required as the DC cable is generally the weakest point of the portable power supply and the main point of failure. Adapters which have captive cables, in case of failure of the latter, require all the rest of the equipment and in particular its active part to be discarded, creating unnecessary e-waste and costs for users that could be a barrier for repair. Furthermore, the detachable cable enables more reuse and an increased lifetime of the power supply unit. The recommendation ITU-T L.1002 also suggests implementing the USB type-C connector for the interface of EPS, in order to support broad reusability and interoperability.

Figure 12. Basic Universal Power Adaptor (UPA) configurations and connection options (Source: ITU-T 2016)



⁶⁴ COM(2020) 98 final

⁶⁵ Recommendation ITU-T L.1002. External universal power adapter solutions for portable information and communication technology devices

⁶⁶ Detachable alternating current (AC) cable: A detachable cable used to connect the power adapter to the AC mains for powering through two connectors, one on the universal power adapter side and the other on the AC mains side.

⁶⁷ Detachable direct current (DC) cable: A detachable DC cable connects the power adapter to the ICT device for powering through two connectors, one on the universal power adapter side and the other on the ICT device side.

Backward compatibility: adapters

The main aim of this proposal is to ensure that the equipment is future-proof and, at the same time, the connectivity with older equipment and peripherals.

Hardware interfaces and connectors

Product manuals can serve to ensure that the products are compliant with the technical specification for USB-C cables and connectors. The USB-C connector is defined according to the standard IEC 62680-1-3:2018 - Universal serial bus interfaces for data and power - Part 1-3: Common components - USB Type-C™ Cable and Connector Specification. Labels currently ensuring the use of at list one USB Type-C connector are, among others, TCO Certified Generation 8 and Blue Angel.

Avoidance of unnecessary accessories

The use of standardised interfaces can make the reuse of accessories possible. As public organisations most probably have already spare chargers, cables or headphones, there is no reason to bill them for something they might not need.

2.1.4.2 Initial background for the proposed verification

The verification is mainly based on the demonstration of compliance with the defined standards, based on the technical specifications for the procured products.

2.1.4.3 Further background after the AHWG meeting and first stakeholder consultation

The feedback was generally positive. The possibility to provide adapters for USB type-C ports when this solution is not applied by the device was requested. Manufacturers also consider it complicated to adapt their supply chain in order to provide equipment without accessories. The JRC is aware that this measure requires a supply chain reorganisation that would need some effort to be implemented by the entire market; however, this is considered a relevant technical specification as public offices are often full of redundant chargers, cables and other accessories that are not requested during the procurement and that end up as waste without ever being used. The environmental and economic benefits of this measure are evident.

2.1.4.4 Further background after the second stakeholder consultation

Regarding TS17 (standardised ports), an OEM commented that if an adaptor has to be provided, then it could result in a lot of extra (unused) adaptors being shipped with products. If this is a core TS then it will have an unexpected cost impact for procurers who look at low-end products. It could also drive the use of more materials than needed.

It was suggested to change this criterion to comprehensive, adding an explanation that this is usually not provided with low-end products. It was suggested to allow the inclusion of adaptors to meet the requirement, but not to use this as a TS.

The JRC revised the criterion proposal: If the product does not have a built-in USB type-C receptacle, then an adapter must be available to be ordered at no additional cost (instead of being delivered with the product). Regarding the TS on the procurement of ICT equipment without accessories, OEMs strongly suggest using this as an award criterion since accessories or parts needed to get the product to function (such as EPS) are often bundled at the production site. In the short term, this criterion could result in the majority of products being unboxed in the Member State to remove for instance EPS and the box closed again for shipment to customers. According to some manufacturers, this criterion affects the supply chain and is expected to take some time to fully implement. It is suggested to change this to an award criterion.

2.1.5 Criterion 1.5 (new!) – Recycled content

Summary of the main changes after the first stakeholder consultation

In the first draft of this report a new technical specification (TS22) aiming to support the use of recycled plastic was proposed. However, the proposal of this criterion was withdrawn for following reasons:

- **Verification concerns:** The new standard EN 45557:2020⁶⁸ introduces horizontal principles for the calculation and verification of recycled content (w/w%) in energy-related products. Although some certification schemes have been developed for the recycled content certification (e.g. UL ECVP 2809 (3rd edition)⁶⁹, SCS Services Recycled Content Standard V7.0⁷⁰), their compliance with the EN 45557:2020 principles and with the Procurement Directive should be further verified.
- **Possible trade-offs:** The increase in recycled content (w/w%) could, in some cases, come with some trade-offs, such as an increase in the use of plastic to ensure the same performance. The mere measurement of the recycled content cannot consider this trade-off.
- **Comparability:** The use of this criterion is not appropriate to compare the environmental performance of products using plastic with products using alternative materials for casing (e.g. aluminium / magnesium alloy).
- **Relevance:** The criteria area Design for Recycling (see Section 2.4.1) already includes different criteria proposals aiming to facilitate the circularity of plastic components from WEEE. Moreover, the life cycle environmental impacts of ICT products are mainly associated with the manufacturing of electronics (e.g. PCB and ICs) and with the extraction and processing of precious metals used in these components⁷¹ and the environmental benefits are relatively smaller compared to other measures.

Finally, the necessity expressed by the stakeholders to reduce the number of criteria and thus prioritise criteria with the highest environmental benefits and that are easiest to verify should be considered.

2.1.5.1 Initial background and rationale for the proposed criteria

So far, neither the EU Ecodesign Regulations nor the EU GPP criteria for computers and monitors include requirements on recycled plastic content. In contrast, EPEAT/IEEE, Blue Angel, Green Product Mark and TCO ecolabel schemes have criteria for the content of recycled and/or bio-based plastics.

TCO Certified version 8 requires information about the percentage of post-consumer recycled plastic; this percentage is expected to be published as one of the sustainability performance indicators of the product, which will also be printed on the certificate. Applicants for the TCO ecolabel have to fill out and provide a product declaration which inter alia includes as declared sustainability information the 'percentage of recycled plastic by weight of total weight of plastic parts'. Together with the application and product form to be delivered to TCO Development, a copy of the verification report(s) from a verifier approved by TCO has to be submitted. Other ecolabels like Green Product Mark and EPEAT (IEEE Standard)⁷² even require a minimum post-consumer recycled content (PCC):

- Green Product Mark: minimum 10% PCC.
- EPEAT (required): minimum 2% of any combination of post-consumer recycled plastic, IT equipment-derived post-consumer recycled plastic or bio-based plastic, measured as a percentage of the total amount of plastic (by weight) in the product. Several components might

⁶⁸ EN45557:2020 General method for assessing the proportion of recycled material content in energy-related products

⁶⁹ https://standardscatalog.ul.com/standards/en/standard_2809

⁷⁰ <https://www.scsglobalservices.com/services/recycled-content-certification>

⁷¹ Andrae A. (2016) Life-Cycle Assessment of Consumer Electronics - A review of methodological approaches. IEEE Consumer Electronic Magazine, Volume: 5, Issue 1, 51-60. DOI: 10.1109/MCE.2015.2484639

⁷² IEEE Std 1680.1™-2018. IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

be excluded from the calculation of percentage, differing between normal and 'ruggedised' devices.

- EPEAT optional criteria require or provide optional points for higher contents of post-consumer recycled plastic, IT equipment-derived post-consumer recycled plastic or bio-based plastic, depending on the product type.

According to the IEEE standard, verification of the post-consumer recycled plastic content (for the mandatory criterion) is based on self-declaration of the supplier only, i.e. by supplier letter(s) stating the percentage of applicable content(s) in plastic(s) supplied to the manufacturer or to the manufacturer's part supplier; documentation of calculation, including plastic part name(s) or other part identifiers and the total weight of their plastic content, as well as the weight of plastic content that is post-consumer, IT equipment-derived post-consumer, or bio-based, and, if excluding parts, a list of excluded parts and the reason for exclusion. In the case of the optional IEEE criteria, if supply is temporarily disrupted, the manufacturer shall provide information regarding the disruption, including the dates on which the impacted supply was disrupted and reinstated, the reason for the disruption, and information or attestations from suppliers, and steps the manufacturer is taking to reinstate supply, as relevant.

The analysis of voluntary approaches of companies presented in the Preliminary Report revealed that many ICT manufacturers already make efforts to achieve a certain percentage of post-consumer recycled content in their computer and monitor products and ecolabels and certification schemes already include relevant criteria on recycled content in plastic components.

However, based on the discussion above, it was proposed not to include any proposal for a criterion on post-consumer recycled content.

2.1.5.2 First criteria proposal: summary of the comments received and rationale for the revision

Stakeholders requested to better specify the recycled content thresholds based on product types. It was also suggested to give priority to stationary devices, as for mobile devices the use of recycled materials could come with trade-offs in terms of reliability. Moreover, it was requested to increase the level of ambition of this criterion.

The CPC is considered too complicated and it was suggested to remove it. The recycled content claim would be based on a mass balance approach as the use of recycled content could vary over time. At least some months of production data should be monitored to ensure that the claimed recycled content reflects long-term production. JRC can then propose that data collected would refer to the production period(s) prior to the procurement.

Some stakeholders also requested to consider bio-based plastic. However, the JRC considers that the inclusion of bio-based plastic would make the assessment at this stage still more complicated. Moreover, currently the use of bio-based plastics does not seem to be relevant for this product group.

One stakeholder appreciated the inclusion of a criterion on recycled plastic content, however had concerns about the verification, especially if this would rely on companies' own declarations only. The real percentage will only be an estimation; companies would have to apply a mass balance approach of their own processes.

2.1.5.3 Further background after the second stakeholder consultation

Several stakeholders disagree with the removal of this proposal, since they consider that there are sufficiently established labels addressing this topic and plastic has been addressed by several initiatives of the EU aiming at reducing its use.

The Commission is currently carrying out several studies and activities to develop more solid methodologies in this field. These include developing and assessing measures on recycled content in packaging and green public procurement for packaging and the development of a general method for the calculation, verification and reporting of recycled content in plastic. The JRC considers that these studies could possibly bring more methodological clarity.

In the absence of a common approach that establishes a chain of custody from the point at which the recycled content is known to the point where it becomes integrated in products, any instrument that carries value associated with the use of recycled content could potentially be vulnerable to a fraudulent declaration.

Moreover, there are promising technologies and methodologies, such as blockchain, that are emerging which could bring more transparency by facilitating tracking of materials through the supply chain from collection through to integration into materials and products, and through the point of sale.

2.2 Criteria area 2 – Energy consumption

The criteria proposal presented in this section keeps the focus on the energy consumption in the use phase, as already included in the current criteria. Several changes in the legal context occurred in the past 3 years and an update of the criteria is therefore necessary. The most important changes are:

- the expiration of the EU-US agreement on the Energy Star Programme in February 2018⁷³; and
- the adoption in 2019 of new regulations on ecodesign⁷⁴ and energy labelling⁷⁵ requirements for electronic displays.

The EU Energy Star programme followed an Agreement between the European Community (EU) and the Government of the US to coordinate the energy labelling of office equipment. It was managed by the European Commission and played an important role as an ecolabel for the procurement of energy-efficient products. The US partner was the Environmental Protection Agency, which started the scheme in the US in 1992. Due to the expiration of the Energy Star agreement, the technical specifications and award criteria referring to Energy Star need to be modified as it is no longer possible to directly refer to Energy Star as a required label (see additional discussion in Section 2.2.2.1).

Moreover, the proposed criteria on the energy efficiency of computer monitors have been modified according to the new Ecodesign and Energy Label legislation applicable to displays.

This revision includes the following new criteria proposals:

- A technical specification for the procurement and installation of highly efficient desktop thin client solutions, where ‘Desktop thin client’, according to Commission Regulation (EU) No 617/2013, means a computer that relies on a connection to remote computing resources (e.g. computer server, remote workstation) to obtain primary functionality and has no rotational storage media integral to the product. The main unit of a desktop thin client must be intended for use in a permanent location (e.g. on a desk) and not for portability. Desktop thin clients can output information to either an external or, where included with the product, internal display.

The following table compares the existing GPP criteria with the new proposals.

Table 9. Energy consumption - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
TS1. Minimum Energy Performance of Computers (based on Energy Star) <i>(core and comprehensive)</i>	TS18. Minimum Energy Performance of Computers (based on the IEC Standard 62623:2012) <i>(core and comprehensive)</i>
TS2. Minimum Energy Performance of Monitors (based on Energy Star) <i>(core and comprehensive)</i>	TS19. Minimum Energy Performance of Monitors (based on Energy Label) <i>(core and comprehensive)</i>
	New! TS20. Thin Client devices in a server-based network <i>(comprehensive)</i>
AC1. Improvement of energy consumption upon the specified Energy Star Standard <i>(core and comprehensive)</i>	AC5. Improvement in the energy consumption upon the specified Energy Consumption threshold for computers (based on the IEC Standard 62623:2012)
	AC6. Improvement in the energy consumption upon the specified Energy Consumption threshold for monitors (based on Energy Label)

⁷³ <https://ec.europa.eu/energy/en/energy-star>

⁷⁴ https://ec.europa.eu/energy/sites/ener/files/documents/c-2019-2122_1_en_act_part1_v7.pdf

⁷⁵ https://ec.europa.eu/info/law/better-regulation/initiative/1948/publication/4145543/attachment/090166e5c2464931_en

Summary of the main changes after the first stakeholder consultation

The energy thresholds for TS1 are aligned to thresholds applied for Energy Star 7.0 / 7.1 rather than still using the Energy Star 6.1 level⁷⁶. Minor changes were applied compared to the first draft proposal such as adding clarifications on the use of labels (TS1, TS3, AC1). Moreover, a change in the energy efficiency threshold for displays is proposed (from class E to class D as the entry level for the core criteria and from class D to class C for the comprehensive criteria). AC2 has been modified accordingly. The explanatory note for thin client computers has been moved into the Annex. Further background is available in Section 2.2.4.

Summary of the main changes after the second stakeholder consultation

TS18 and AC5 on minimum energy performance of monitors (comprehensive level) has been modified to ensure consistency with the new EU Ecolabel Criteria for Electronic Displays (Commission Decision (EU)2020/1804).

The following table shows the criteria as revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATIONS	
<p>TS18 Minimum energy performance for computers <i>(same for core and comprehensive criteria)</i> <i>Applicable to stationary and mobile computers.</i></p> <p>The calculated Typical Energy Consumption (E_{TEC}) for each piece of equipment delivered as part of the contract must be less than or equal to the Maximum E_{TEC} requirement, as described in Annex III of this document.</p> <p>Verification: Tenderers must report the Typical Energy Consumption (E_{TEC}) value, based on testing and calculations according to the IEC standard 62623:2012.</p> <p>Products holding a relevant Type I Ecolabel or a label from another labelling scheme fulfilling the specified requirements will be deemed to comply. Alternative test results obtained by accredited ISO17025 test bodies according to the IEC 62623:2012 standard are accepted as proof of compliance.</p>	
<p>TS19 Minimum energy performance of monitors <i>Applicable to computer displays.</i></p> <p>The Energy Efficiency Index for each model delivered as part of the contract must be in the range of Energy Classes A-D as set out in Annex II of Commission Delegated Regulation (EU) No 2019/2013⁷⁷.</p> <p>Verification: For each model delivered, the tenderer must provide the valid Energy Label issued according to the EU's Energy Labelling framework Regulation (2017/1369).</p> <p>Products labelled as Class A, B, C or D will be deemed to comply.</p>	<p>TS19 Minimum energy performance of monitors <i>Applicable to computer displays from 31 March 2021.</i></p> <p>The Energy Efficiency Index for each model delivered as part of the contract must be in the range of the following classes [A; D] <i>(to be defined by the contracting authority according to the methodology described in the explanatory note below).</i></p> <p>Verification: For each model delivered, tenderers must provide the valid Energy Label issued according to the EU's Energy Labelling framework Regulation (2017/1369).</p> <p>Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>

⁷⁶ Minor changes were introduced by the 7.1 amendment in comparison to the 7.0 version. Most notably, this amendment enables those products meeting the mobile workstation definition to utilise an adder to account for the additional utility and energy consumption of these products.

⁷⁷ Commission Delegated Regulation (EU) 2019/2013 of 11 March 2019 supplements Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of electronic displays and repeals Commission Delegated Regulation (EU) No 1062/2010 (Text with EEA relevance.)

Explanatory note: Definition of the requested energy classes

The contracting authority should refer to the top two EU energy classes available at the time of the tender, which include at least 25 registered monitor models under the European Product Database for Energy Labelling (EPREL).

As of 31 March 2021, computer monitor suppliers will register their devices in the EPREL Database, before selling them on the European market. Contracting authorities (and consumers) will be able to search the product database for energy labels and product information sheets, including the energy class.

The availability of devices with the requested performance and characteristics can be verified directly through the EPREL Database. Screen diagonal in cm and screen resolution in pixel are examples of the information included in the product information sheet.

TS20 Thin Client devices in a server-based network

Applicable to Thin Client computers.

This technical specification can be generally taken into consideration in a server-based working environment.

The equipment delivered as part of the contract must be classified as 'Thin Client'. The Typical Energy Consumption (E_{TEC}) for each piece of equipment delivered must be lower than the E_{TEC_MAX} for Thin Clients as calculated in Annex II.

Verification:

Tenderers must report the Typical Energy Consumption (E_{TEC}) value in kWh, based on testing and calculations according to the IEC Standard 62623:2012 and demonstrate compliance with the E_{TEC_MAX} threshold calculated in Annex II for Thin Clients.

Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

AWARD CRITERIA

AC5 Improvement in the energy consumption upon the specified Energy Consumption threshold for computers

(same for core and comprehensive criteria)

It is recommended to use this criterion in conjunction with criterion TS18 for desktop computers if the products are for graphic-intensive use.

Points will be awarded if the product is more energy-efficient than the E_{TEC_MAX} value required under criterion TS18.

A maximum of x points [to be specified] may be awarded. Points must be awarded in proportion to the improvement in energy efficiency as follows:

- Over 60% lower: x points
- 40-59% lower: 0.75x points
- 25-39% lower: 0.50x points
- 15-24% lower: 0.25x points

Verification:

Tenderers must report the Typical Energy Consumption (E_{TEC}) value, based on testing and calculations according to the IEC Standard 62623:2012. Typical Energy Consumption reported by a valid Energy Star Certificate can be used as proof of compliance.

AC6 Improvement in the energy consumption upon the specified Energy Consumption threshold for monitors

Applicable to computer displays.

To be used in conjunction with criterion TS19.

Points will be awarded if the product is in an energy class higher than D.

A maximum of x points [to be specified] may be awarded. Points must be awarded in proportion to the improvement in energy efficiency

AC6 Improvement in the energy consumption upon the specified Energy Consumption threshold for monitors

Applicable to computer displays.

To be used in conjunction with criterion TS19.

Points will be awarded if the equipment delivered as part of the contract is in the highest Energy Label class for registered models of monitors under the product database (EPREL Database) at the time of the tender [class X, to be defined by the contracting authority].

<i>class as follows:</i>			Verification: For each model delivered, tenderers must provide the valid Energy Label issued according to the EU's Energy Labelling framework Regulation (2017/1369).
Energy efficiency class	Energy Efficiency Index EEI	Points	
A	$EEI < 0.30$	x point	
B	$0.30 \leq EEI < 0.40$	0.66x points	
C	$0.40 \leq EEI < 0.50$	0.33x points	
Verification The tenderer must provide for each model delivered the valid Energy Label issued according to the EU's Energy Labelling framework Regulation (2017/1369).			

2.2.1 Background and rationale for the criteria revision

So far, EU GPP criteria for computers as well as monitors are aligned with the latest Energy Star requirements, referring to the exact versions in the GPP criteria document (Energy Star v6.1 for computers and v6.0 for monitors in the current version of the criteria).

However, due to the termination of the US-EU agreement in February 2018, different approaches are proposed for the criteria related to energy consumption.

2.2.1.1 Computer products

Ideally, the GPP criteria should be aligned with the foreseen EU Ecodesign approach. For computers, the revision of the Ecodesign criteria (Commission Regulation (EU) No 617/2013) is ongoing. The current Ecodesign and Energy Star approach is mainly based on the measurement of the Typical Energy Consumption (E_{TEC}) based on a combination of use profile under sleep and idle modes. IEC/EN 62623:2012 can be considered the main methodological reference for the measurement of the typical energy consumption of desktop and notebook computers. Thus, the proposed GPP criteria refer directly to this standard in order to calculate the 'Annual typical energy consumption (E_{TEC})' defined as the electricity consumed by a product over specified periods of time across defined power modes and states.

The IEC 62623:2012 standard does not set any pass/fail criteria for the E_{TEC} . Thresholds for the E_{TEC} are instead defined based on the energy performance thresholds defined in the Energy Star programme.

The current criteria proposal aims to find a balance between energy performance, material efficiency aspects (e.g. durability, reparability, recyclability) and the use of safer chemicals. For this reason, the simultaneous application of this technical specification together with other technical specifications on different aspects has to be duly considered in terms of trade-offs and risk of market restriction.

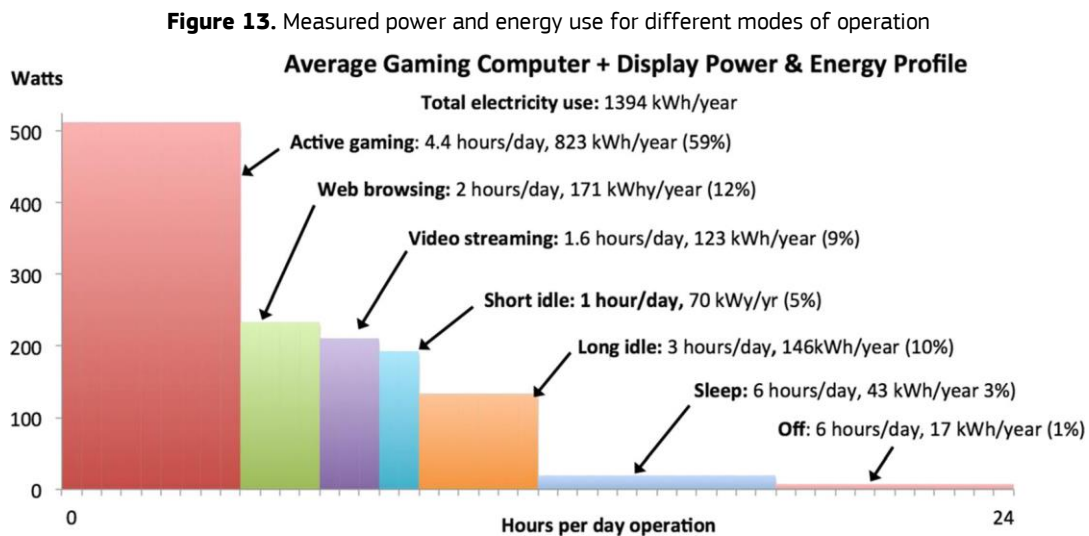
In the first revision, compliance with the Energy Star 7.0 thresholds was proposed as the comprehensive level and Energy Star 6.1 as the core level. At the time of publication of the first draft of the criteria (November 2019) there were around 1500 computer models compliant with the EU Energy Star version 7, with 850 models of notebooks and 260 desktop computers. In March 2020, there were already 98 more certified models with a total number of 946 notebooks and 298 desktop computers models compliant with Energy Star 7. In comparison, the EU products that were qualified under the EU-US Energy Star programme on the EU market and according to specification levels in force until 20 February 2018 (Computers specification 6.1) include around 5850 models, (around 2900 desktop computers). Based on the increasing uptake of Energy Star products on the market, it is finally proposed to use Energy Star thresholds based on Energy Star 7.1 for both core and comprehensive levels.

Moreover, a new Energy Star specification, the Version 8.0 specification for computers, finalised on 15 October 2019 is effective from 15 July 2020. Notebooks and thin clients are not impacted by this specification revision as criteria for these products were amended as part of Version 7.1. Energy Star 8.0-compliant products will be also considered compliant with the proposed criterion.

Energy Star versions 7.0, 7.1 and 8.0 for computers, limited to workstations, requires the measurement and disclosure of energy consumption under active state conditions. In particular, the workstations must be submitted for certification with the following information disclosed in full:

- i. LINPAC benchmark test results, compiler optimisations, and total energy consumed over the duration of the test; and
- ii. SPECviewperf benchmark test results, configuration options, total duration of the test, and total energy consumed over the duration of the test.

As shown in Figure 13, according to Mills and Mills (2016)⁷⁸, the active consumption for common office activities (including web browsing and video streaming) is comparable for most of the tasks, including video streaming and web browsing. Short idle power seems to be a good proxy for active consumption in an office working environment. Only activities that require high-speed performance of powerful graphic cards and CPUs (e.g. gaming) seem to notably increase the level of energy consumption when used at full load (see figure below).



2.2.1.2 Thin client solutions

Thin clients are simplified devices with fewer hardware components compared to traditional computer devices. In the thin client paradigm, most of the computation tasks associated with applications can be offloaded to a remote cloud server⁷⁹.

In the current GPP criteria the power-saving solutions are mainly based on the principle of procuring devices with the highest energy efficiency. On the other hand, power can be saved by assuring that a certain task is performed in the location where it will consume the least amount of energy.

In a systemic and strategic approach (instead of an individual product-level approach) it is worthwhile looking into the benefits of a thin client base network connected to a data centre / server room. The strategic approach depends on the office's requirements.

This option can generally be taken into consideration where a high number of personal workplaces has to be reached and where users do not need their computer to work on video, audio or graphic files but for normal office applications, databases, internet, etc. which require less computational effort.

The benefits include the following:

- **Lower energy consumption:** Thin clients generally use far less energy than desktop computers⁸⁰. However, more powerful servers and communications are required that consume additional energy. Real energy savings depend on

⁷⁸ Nathaniel Mills & Evan Mills (2016). Taming the energy use of gaming computers. *Energy Efficiency* (2016) 9:321–338. DOI 10.1007/s12053-015-9371-1
⁷⁹ Ghose T., Namboodiri V., Ravi P. (2015), Thin is green: Leveraging the thin-client paradigm for sustainable mobile computing *Computers and Electrical Engineering* 45, 155–168

the overall network system and have to be assessed case by case. Thin client computers currently registered under US Energy Star have an average annual E_{TEC} of 30 kWh⁸¹.

- **More efficient use of computing resources:** A typical desktop computer would be specified to cope with the maximum load for the user needs, which can be inefficient at times when it is not used.
- **Lower noise:** The removal of fans in thin clients reduces the noise produced by the unit.
- **Higher resource efficiency:** Thin client solutions need less hardware and can remain in service longer, resulting in a longer life cycle and better Life Cycle Cost (LCC) performance. Unlike PCs and laptops, which commonly have a 3- to 4-year replacement cycle, thin clients **last an average of 7 years**. They slow down technology's inevitable slide into obsolescence because they have fewer points of failure and rarely need upgrades.

2.2.1.3 Computer monitors

For electronic displays, covering computer monitors, and external power supplies, new EU Regulations are available that shall enter into force and apply from 1 April 2020 (Ecodesign Regulation for External Power Supplies (EU) 2019/1782) and 1 March 2021 (Ecodesign Regulation for electronic displays (EU 2019/2021) and Energy label Regulation for electronic displays (EU 2019/2013)).

According to the consultation prior to the adoption of the EU 2019/2021, most of the displays on the market would fall at the entry into force of the rescaled labels in the class range D to F (see Table 10 and Figure 14).

Based on this, class E was initially proposed as the threshold for the core criteria and class D as the threshold for the comprehensive criteria. In the second draft criteria, it is proposed that this be revised in order to make the criteria more future-proof with class D proposed as the core criterion and class C as the comprehensive. Moreover, the core threshold proposed is in line with the proposal for the revision of the EU Ecolabel for displays. It is also proposed to apply additional points for computer monitors with better energy efficiency classes as award criteria.

However, according to the supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of electronic displays, there are considerable uncertainties in future projections for this product group because new technologies may result in 'tipping points' improving energy efficiency and new features eroding some savings. For this reason, we consider that an approach proposed based on a technical specification plus award points for better performance is more suitable.

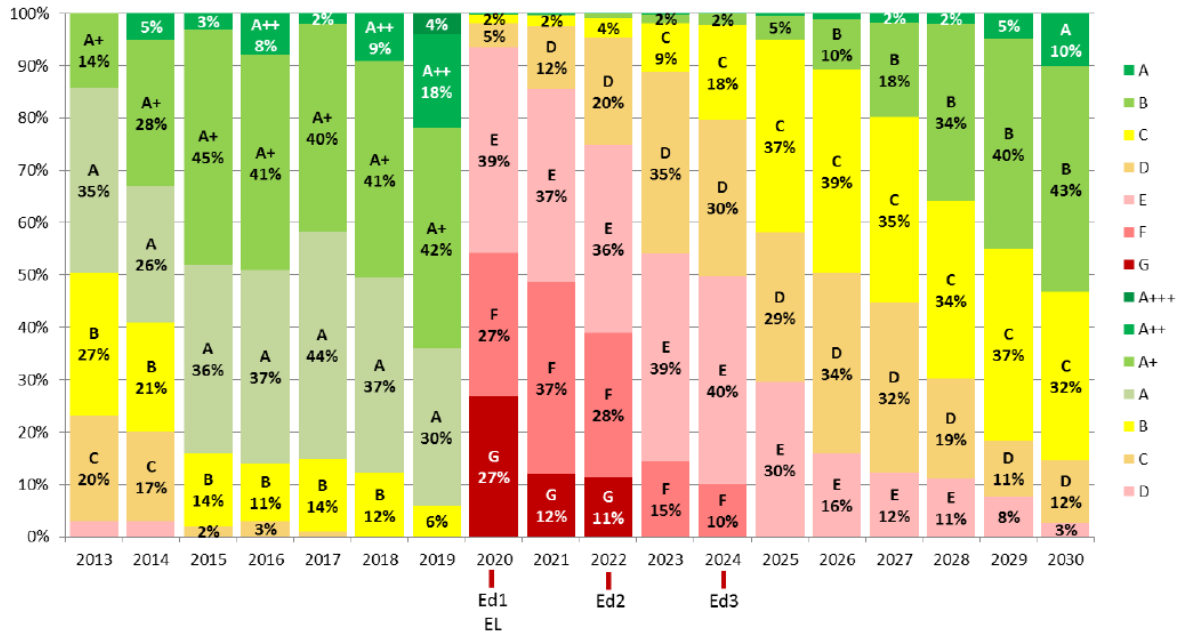
Table 10. Energy efficiency classes and corresponding Energy Efficiency Index for displays

Energy efficiency class	Energy Efficiency Index (EEI)
A	$EEI < 0.30$
B	$0.30 \leq EEI < 0.40$
C	$0.40 \leq EEI < 0.50$
D	$0.50 \leq EEI < 0.60$
E	$0.60 \leq EEI < 0.75$
F	$0.75 \leq EEI < 0.90$
G	$0.90 \leq EEI$

⁸⁰ Based on the analysis of the EU Energy Star-compliant computers at March 2018, the average TEC for desktop computers is around 108 kWh/year, while the average TEC of thin clients is around 36 kWh/year.

⁸¹ <https://www.energystar.gov/productfinder/product/certified-computers/results>

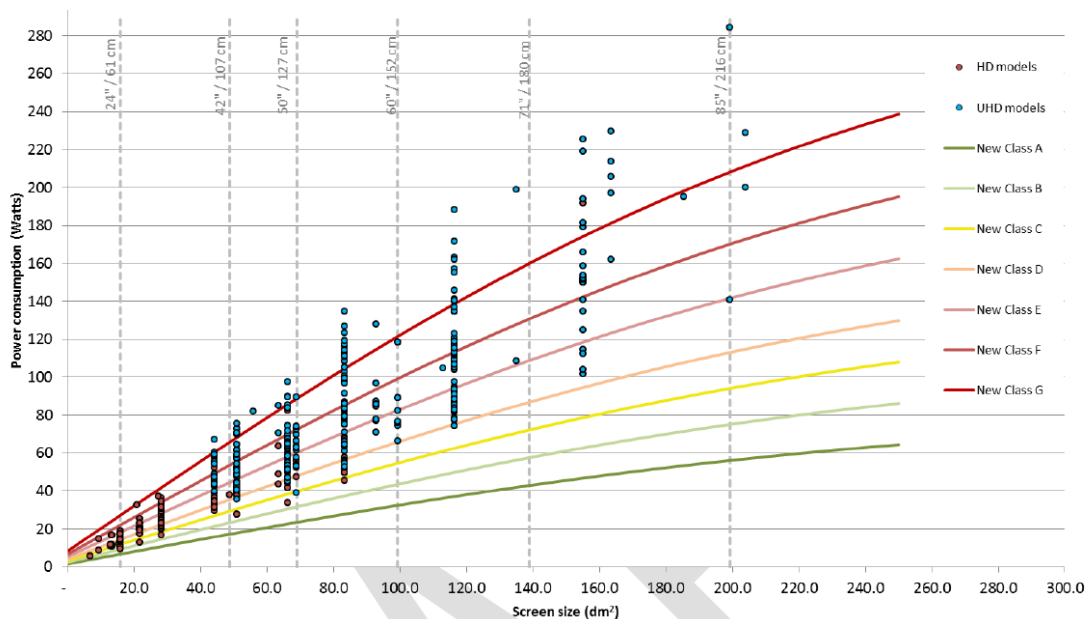
Figure 14. Energy label class distribution of standard electronic display models available in the EU over the period 2010-2030



Note: Actual figures for 2013-2016 and projections for 2017-2030 with proposed Ecodesign and Energy Labelling measures

Moreover, as indicated in the initial survey by stakeholders, the rewarding of more efficient products can also be achieved via an Life Cycle Costing (LCC) approach that includes the energy consumption in the model for the total cost of ownership. Parameters such as the Typical Energy Consumption for computers and the Power in On Mode (in Watts) for displays could be used as a basis for the estimation of the operating costs. As shown in Figure 15 below, it has been considered that power consumption is also related to the screen size and that a higher energy label class means a lower energy consumption compared to a monitor with the same screen size.

Figure 15. Distribution of displays from the 2018 dataset with a projection of expected improvements at the entry into force of the rescaled labels



2.2.1.4 Batteries

The estimation of how long a battery can last under certain use profiles is possible for computers. Benchmark software like BAPCo MobileMark⁸² and PC Mark⁸³⁸⁴ allow testing of the battery life by installing their software and executing it. Including a requirement on this aspect could be relevant for ICT mobile equipment, where improvements in the energy efficiency can result in a longer battery life. Nevertheless, it appears that this type of benchmark software does not use a standardised worklets / use profile, which could imply different ranking of products depending on the software applied. Therefore, it is proposed not to have such a criterion in this revision process, although it could be relevant to consider it in future revisions.

2.2.2 Initial background and rationale for the criteria verification

2.2.2.1 Computers

GPP criteria, when specifying purchasing criteria for office equipment, might draw inspiration from energy performance criteria present in the technical specifications of energy efficiency standards available in third countries (including those of the Energy Star programme).

According to this scenario Energy Star compliance is not requested by TS1; however, Energy Star is considered a possible way to prove compliance with the thresholds described in the criteria.

Also for thin clients, in the absence of a specific European threshold for energy efficiency of thin client computers, the US Energy Star Version 7.1 is considered the most relevant reference. In the same way, this criterion does not require Energy Star compliance; however, Energy Star can still be considered a possible way to prove compliance.

2.2.2.2 Displays

The entry into force of the new Ecodesign and Energy Labelling Regulation on electronic displays will facilitate the verification of criteria on energy efficiency of displays. It shall apply from 1 March 2021. Tenderers could be requested to provide model identification and the related Energy Label. Moreover, public procurers (as well as consumers) will soon be able to surf the "European product database for energy labelling" website⁸⁵ for additional product information.

2.2.3 Summary of stakeholder answers from the initial survey

According to the answers received, the current energy consumption criteria were applied in the past mainly by referring to the provision of Energy Star-certified products. While some stakeholders highlighted the need for stricter requirements for energy consumption, others are of the opinion that efficiency thresholds introduced by the Energy Star version 7.0 for computers are challenging and could be fulfilled by only 30% to 50% of the products on the market.

In the case of requesting a label as proof of compliance, it has been highlighted that it is important to mention the exact version of the label required (and not generally the latest version). An example was provided by a procurer: "if one version is released 1 June and the tender requires this for the offers to be submitted by 5 June then the products will not have the label in time and thus it would restrict the market".

Although as an alternative to the Energy Star certification it is possible to show energy consumption protocols / test results, some service providers highlighted the need to re-establish the relationship with US Energy Star and re-establish EU Energy Star.

Relevant procurers have reported the inclusion of the energy consumption in the financial model as part of the total cost of ownership calculation.

⁸² e.g. <https://bapco.com/products/mobilemark-2018/> or PC Mark

⁸³ <https://benchmarks.ul.com/news/pcmark-10-introduces-a-better-way-to-test-battery-life>

⁸⁴ Please note that these two software tools are provided as examples and the authors do not endorse any specific product.

⁸⁵ https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/european-product-database-energy-labelling_en (Accessed on October 2019)

2.2.4 Further background after the AHWG meeting and first stakeholder consultation

The JRC informed the AHWG meeting that no energy consumption criteria are proposed for smartphones. Furthermore, as the IEC/EN 62623 standard does not cover measurement of 'active' mode so far, however, the metric 'Total Energy Consumption (TEC)' which includes 'short idle' still seems to be relatively representative of normal use in an office environment. With regard to notebooks' battery-life duration, the JRC points out that the performance is a combination of battery capacity and device efficiency, i.e. testing only the battery capacity would not be sufficient; however, standardisation is needed on this issue.

Minimum energy performance for computers

Several comments suggested to refer to the current Energy Star 7.0/7.1 rather than still use the Energy Star 6.1 level. Other stakeholders pointed out that there will not be many more efficiency gains in the future and efficiency gains may be made at the expense of performance (e.g. due to reduced luminance). A comparison of the number of products that were Energy Star 7.1-certified at the time of writing the technical report (November 2019) and in March 2020 showed an increase of 98 certified models, with 946 notebooks and 298 desktop computers models then. In the future there might be an acceleration due to the dissemination of innovations. On the other hand, products can no longer be certified with Energy Star 6.1 since 16 November 2018. Therefore, certified models are relatively old models. Of course, a product could have met the Energy Star 6.1 standard without being certified but Energy Star could no longer be used as verification for newer models.

One stakeholder welcomes using the underlying IEC/EN 62623 standard as a reference after termination of the EU-US Energy Star agreement. With regard to 'active state', the stakeholder recommends the development of criteria only after a standard is developed, as the current IEC standard does not include a definition or measurement procedure for active state so far. Another stakeholder recommends harmonising requirements globally, e.g. to align GPP criteria also to the revision of EU Ecodesign for computers which might not include an active state efficiency metric either.

Minimum energy performance of monitors and AC2. Improvement in the energy consumption upon the specified energy consumption threshold for monitors

In one comment it was asked to include Energy Star as a possibility to prove compliance with the criterion. Meanwhile, another comment stressed that it is important to put the routes established in the EU before the Energy Star. Reply: The criterion refers to the EU Regulation on the energy label to come. The criterion can only be applied in the form described once the Regulation has entered into force. At that time the Regulation is mandatory. Therefore, it seems not to be necessary and - in order to keep complexity to a minimum - not advisable to include Energy Star here.

One comment stated that this core and comprehensive criteria as well as the award core and comprehensive criterion are not ambitious enough. The development of the energy efficiency of monitors on the market will overhaul the criteria, given that the next revision of GPP criteria will be in several years. The comment suggests therefore to delete the lowest energy efficiency class in the core criterion (i.e. class E) and in the comprehensive criterion (i.e. class D). Consequently, the AC2 core and comprehensive criteria also has to be adapted. Points will only be given to monitors with energy efficiency classes A to C and energy efficiency classes A to B, respectively.

The rationale for the comment is understandable. According to Figure 14 in the Technical Report, 51% of monitors in 2021 will already have an energy efficiency of class E or better and in 2023 this will be the case for 85% of all monitor models. Against this background, the level of ambition for these core and comprehensive criteria was increased as proposed and the award core and comprehensive criteria were adapted accordingly.

One stakeholder stated that for the verification of this criterion a list of corresponding type I labels is missing. In the revised version the reference to Energy Star Versions 7.0, 7.1 and 8.0 was added.

Improvement in the energy consumption upon the specified energy consumption threshold for computers

One stakeholder suggested to reducing the number of levels from five to four by grouping the two levels above a 60% reduction proposed in the Technical Report in only one level. The same award levels as in award criteria for displays at the core level should be used. It was argued that further drastic changes in energy efficiency levels would not be expected and additional levels would add to complexity. One stakeholder added that this criterion would have a greater impact if a certain score was required.

The use of this award criterion is recommended in conjunction with a minimum level of efficiency, not for all purposes but for desktop computers if the products specified are for graphics-intensive uses. The energy demand of these products can be relatively high. Therefore, it seems to be reasonable to differentiate five levels in order to reward energy-efficient models. At the same time, five levels does not seem to add much complexity for procurers in comparison to four levels.

New criteria proposed by stakeholders

One comment suggests including two additional criteria on the "as-shipped" conditions:

(1) the first concerns the default settings of the power management (the comment refers to Energy Star 7.1, 3.4.2). "This is an easy and a zero-cost measure for suppliers that would allow to save energy".

Reply: The right presets in the "as-shipped" conditions can help to save energy as users tend to leave the settings as they are. On the other hand, energy demand, e.g. for Energy Star, is measured in the "as-shipped" conditions. Against this background, the energy measurements already reflect the presets in the tested models - energy-saving presets as well as energy-wasting presets. Therefore, it does not seem to add significantly to include a new criterion that asks suppliers to deliver their products with energy-saving presets.

(2) The second criterion concerns the commitment of suppliers to refrain from preinstalled software that is not necessary for the client (e.g. adware, bloatware). This software can potentially reduce performance, waste storage capacity, and present a security risk.

Reply: To ask suppliers to refrain from the installation of unnecessary software makes sense for several reasons: there is possibly less need for storage media (positive from an environmental point of view), a lower security risk, better performance. In view of the fact that overall there are to be fewer rather than more criteria and given that there is only a limited link to environmental issues, no action is proposed.

Several comments stressed the relevance of the manufacturing phase. To include the total energy demand of the manufacturing phase was considered too difficult but one comment suggested the creation of a new criterion on the share of renewable energy used in the manufacturing phase (e.g. <25%; 25-50%; 50-75%; >75%).

Reply: As the comment already stated, the total energy consumption of different manufacturers is not comparable. The inclusion of a new criterion concerning the share of renewable energy in the total energy consumption of manufacturing would add disproportionately high complexity as exactly which types of renewable energy will be accepted has to be defined (see EPEAT 9.4.2 for example). Not all countries concerned have the necessary certification schemes at their disposal. In this context, it is not proposed to add a new criterion.

One comment suggested the introduction of a new criterion on the climate / environmental impact of the products. As verification, a third-party analysis was proposed (e.g. EPD, LCA).

Reply: The effort to provide a third-party-certified LCA or EPD for each model would be disproportionately high compared to the benefit or the significance when comparing different products. LCA studies are very helpful when it comes to basic evaluation, e.g. for identifying hotspots or leverage points. The conclusions drawn from them can then be translated into criteria, if necessary. In contrast, demanding LCA results at the individual product level does not bring any significant additional benefit and tends to disadvantage smaller companies that do not have the same resources for conducting LCA studies as large companies. Even for larger companies this might be difficult. Lenovo was cited as one company that does Product Carbon Footprint (PCF) studies of their products. A check showed that PCF data are not available for all models by any means and some of these data are relatively old (e.g. 2015). In EPEAT, LCA and PCF are optional. Against this background, it is not proposed to add a new criterion.

2.2.5 Further background after the second stakeholder consultation

According to some stakeholders, the energy efficiency of computers has been focused in R&D for years and further drastic changes are not expected, with current user patterns. Many products will fall in the same efficiency 'band'/ level; additional levels just add complexity for procurers and suppliers. A simplification of the criteria to include fewer levels was suggested. The suggested modification is applied.

2.3 Criteria area 3 – Hazardous substances

The European Commission published a [chemicals strategy for sustainability](#) on 14 October 2020⁸⁶. This is part of the EU's zero pollution ambition, which is a key commitment of the European Green Deal. Among the objectives of this strategy are minimising the presence of substances of concern in products such as ICT equipment and boosting the investment and innovative capacity for production and use of chemicals that are safe and sustainable by design, and throughout their life cycle. The proposals included in this proposal for revision are considered consistent with this objective.

A range of hazardous substances are used in the manufacturing of ICT equipment which may be present in the final product; this criteria area covers these aspects. Compared to the current set of criteria for hazardous substances, the proposal includes an amendment of the criterion on plasticisers in external cables as some of the former substances are now banned under the RoHS Directive; a proposal for a technical specification for the reduction of chlorinated and brominated flame retardants has been included, as well as two award criteria proposals, one on the reduction of Substances of Very High Concern (SVHC) and another one on the avoidance of regrettable substitution.

It is proposed to remove the award criterion on EoL emissions since the responses from the questionnaire indicated that the fire-tests required were costly and difficult. Meanwhile, the presence of halogenated compounds is now covered with a new TS.

The following table compares the existing GPP criteria with the new proposals as formulated after the AHWG meeting and after the first consultation.

Table 11. Hazardous substances - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
SC1. Restricted substance controls <i>(comprehensive)</i>	SC1. Restricted Substance controls <i>(comprehensive)</i>
TS3. Declaration for REACH Candidate List substances <i>(core and comprehensive)</i>	
TS4. Plasticisers in external cables	TS4. Declaration of Substances of Very High Concern (REACH Candidate List substances)
	TS21. Restriction of chlorinate and brominate substances in plastic parts <i>(core)</i>
AC2(a) Hazardous end-of-life emissions from the main Printed Circuit Board (motherboard)	
AC2(b) Hazardous end-of-life emissions from external power cables	
	AC7. Restriction of Substances of Very High Concern <i>(core and comprehensive)</i>
	New! AC8. Avoidance of regrettable substitution <i>(comprehensive)</i>

Summary of the main changes after the first stakeholder consultation

The reference to IPC Standard 1752 on Materials Declaration Data Exchange has been added as an additional reference for the selection criterion on Substance Control. The technical specification on the declaration for REACH Candidate List substances has been deleted after the AHWG meeting and the first consultation. Regarding the TS on restriction of halogenated substances, the comprehensive level proposal has been removed, and the core level proposal is proposed to be applicable both to the core and comprehensive levels. The –award criteria on restriction of Substances of Very High Concern has been limited to the comprehensive level. An explanatory note has been added regarding the definition of Candidate List substances. Regarding

⁸⁶ COM(2020) 667 final Chemicals Strategy for Sustainability - Towards a Toxic-Free Environment

the award criteria on avoidance of regrettable substitution, the proposal has been modified to extend the scope to both plasticisers and flame retardants. The list of tools and methods that are considered applicable for the assessment of material substitution has also been revised. Further background is available in Section 2.3.4.

Summary of the main changes after the second stakeholder consultation

The criterion SC1 has been modified to be better aligned with the same selection criterion included in the recently published GPP Criteria for Imaging Equipment (SWD(2020) 148 final)⁸⁷ and moved to the comprehensive level.

The scope of criterion TS21 has been clarified: this criterion covers bromine and chlorine composites and not the entire group of halogens; the title of the criterion has been modified accordingly. As a concentration up to 1000 ppm (0.1% by weight) is tolerated, definitions of halogen-free can generate some ambiguities. For this reason, plastic parts (and products) fulfilling this criterion are defined as “low-halogen”.

The following table shows the criteria proposal revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
SELECTION CRITERIA	
	<p>SC1 Restricted substance controls</p> <p><i>Applicable to all relevant product categories except for refurbished/remanufactured devices.</i></p> <p>The tenderer must demonstrate use of a framework for Restricted Substance Controls (RSC) along the supply chain for the products to be supplied.</p> <p>Product evaluations according to the RSC should, as a minimum, cover the following areas:</p> <ul style="list-style-type: none"> • product planning/design; • supplier conformity; • analytical testing. <p>The RSC must at least outline the substances restricted under RoHS and, where relevant, under REACH (Annex XVII) and substances on the REACH Candidate List (see the explanatory note below). Implementation should follow the guidelines in IEC 62476 or equivalent and use the IEC 62474 material declaration database as the basis for identifying, tracking and declaring specific information about the composition of the products to be supplied. Alternatively, IPC1752 can be used to collect declarations from the supply chain.</p> <p>Supplier declarations of conformity with the RSCs must be collected and kept up to date for relevant materials, parts and sub-assemblies of the products to be supplied. These may be supported, where appropriate, by supplier audits and analytical testing.</p> <p>The RSC procedures must ensure that product and supplier compliance is re-evaluated when:</p> <ul style="list-style-type: none"> • restricted substance requirements change; • supplied materials, parts and sub-assemblies change; • manufacturing and assembly operations change. <p>Verification:</p> <p>The tenderer must provide documentation describing the system and its procedures and giving proof of its implementation.</p>

⁸⁷ https://ec.europa.eu/environment/gpp/pdf/20032020_EU_GPP_criteria_for_imaging_equipment_2020.pdf

Explanatory note: List of substances regulated under RoHS and REACH

The current list of restricted substances under RoHS is defined in the Annex II of the Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances.

The Annex XVII of the Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH Regulation) contains a list of substances that shall not be manufactured, placed on the market or used unless it complies with the conditions of that restriction. The list of restricted substances is published and periodically updated on the ECHA website: <https://echa.europa.eu/substances-restricted-under-reach>

The Candidate List of substances of very high concern for Authorisation is published in accordance with Article 59(10) of the REACH Regulation and periodically updated on the ECHA website (<https://echa.europa.eu/candidate-list-table>).

For substances identified as SVHCs included in the Candidate List, a particular duty to communicate the content of the substances in products applies under Article 33 of the REACH Regulation. This communication should happen along the supply chain without being requested. The same information must also be submitted to ECHA by all suppliers along the supply chain under Article 9(1)(i) of the Waste Framework Directive (<https://echa.europa.eu/scip>). That information will be publicly available in the Substances of Concern in Products (SCIP) database.

TECHNICAL SPECIFICATIONS

TS21 Restriction of chlorinate and brominate substances in plastic parts

Applicable to all relevant product categories except refurbished/remanufactured devices.

Equipment delivered as part of the contract can contain only low quantities of halogenated substances in plastic parts that weigh more than 25 grams (5 grams for smartphones). Each plastic part of the device must contain less than 1000 ppm (0.1% weight by weight) of bromine and less than 1000 ppm (0.1% weight by weight) of chlorine.

Applicable exemptions are: printed circuit boards, electronic components, cables and wiring insulation, fans.

Verification:

The tenderer must provide documentation which proves that the requirement has been met by either:

- Test data showing that the part contains less than 1000 ppm chlorine and less than 1000 ppm bromine (test methods used can be IEC 62321-3-1 or IEC 62321-3-2), or
- Documentation based on IEC 62474 or similar (e.g. documents produced according to the Substance Control system, such as analytical testing and suppliers' conformity assessments).

Where exemptions are used, a declaration by the manufacturer must be provided.

Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

AWARD CRITERIA

AC7 Restriction of Substances of Very High Concern

Applicable to all relevant product categories except for refurbished/remanufactured devices.

Points must be awarded when no substances on the REACH Candidate List are intentionally added above 0.1% (weight by weight) in each of the following sub-assemblies:

- Populated motherboard (including CPU, RAM, graphics units);
- Display unit (including backlighting);
- Casings and bezels;
- External keyboard, mouse and/or trackpad;
- External AC and DC power cords (including adapters and power packs).

Compliance must be ensured with the latest version of the REACH Candidate List available at the moment of tendering (see the explanatory note below).

	<p>Verification:</p> <p>The tenderer must provide a declaration of compliance with this criterion. Documentation based on IEC 62474 or similar (e.g. documents produced according to the Substance Control system, such as analytical testing and suppliers' conformity assessments) can be used.</p> <p>Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Candidate List of substances of very high concern for Authorisation</p> <p>The Candidate List of substances of very high concern for Authorisation is published in accordance with Article 59(10) of the REACH Regulation and periodically updated on the ECHA website (https://echa.europa.eu/candidate-list-table).</p> <p>For substances identified as SVHCs included in the Candidate List, a particular duty to communicate the content of the substances in products applies under Article 33 of the REACH Regulation. This communication should happen along the supply chain without being requested.</p>	
	<p>AC8 Avoidance of regrettable substitution</p> <p><i>This criterion is applicable to relevant products containing plasticisers and flame retardants, except for refurbished/remanufactured devices.</i></p> <p>Points are awarded if the substitution of plasticisers restricted under RoHS (restriction of hazardous substances) and halogenated flame retardants is based on methods and tools for comparative hazard assessment indicated by the European Chemicals Agency or the OECD Substitution and Alternatives Assessment Toolbox.</p> <p>This hazard assessment must apply (as a minimum) to the flame retardants and plasticisers used in plastic parts that weigh more than 25 grams.</p> <p>Verification:</p> <p>The alternative plasticisers and flame retardants have to be indicated by name and CAS or EC number.</p> <p>The tenderer must provide evidence that the selected alternative(s) have been assessed by methods or tools for comparative hazard assessment indicated by the European Chemicals Agency (https://echa.europa.eu/assess-compare-and-select-substitution) or the OECD Substitution and Alternatives Assessment Toolbox (http://www.oecdsatoolbox.org/).</p> <p>Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>

2.3.1 Initial background and rationale for the proposed criteria

Substance controls

The proposed set of criteria for hazardous substances includes the selection criterion (SC1) which requires that suppliers have implemented a framework for the operation of substance controls (SCs) along their supply chains. This criterion was already included in the former version, although with a different title (*Restricted Substance Controls*). In the new proposal the restriction of phthalate plasticisers (DEHP, BBP, DBP and DIBP) is no longer included as these phthalates are now banned under the RoHS Directive and therefore already mandatory in the EU. Stakeholders have expressed via the 2019 survey the relevance of such a requirement. Examples of control of substances can be found on the website of the OEMs^{88,89}. Scope, substances covered and procedures for the control of substances are usually provided in a management document.

⁸⁸<https://www.samsung.com/us/smg/content/dam/samsung/sg/aboutsamsung/2017/environment/pdf/standard-substances-products-en.pdf>

⁸⁹https://www.apple.com/environment/pdf/Apple_Regulated_Substances_Specification_Sept2018.pdf

Halogenated substances

The restriction on halogenated flame retardants is well covered among the existing ecolabelling schemes (EPEAT, TCO, TÜV and Blue Angel) although the coverage varies from one scheme to another as shown in Table 12; for example, EPEAT allows exceedance of the limits proposed in their requirement when the compound used has a GreenScreen® Safer Chemicals Benchmark of 2,3,4 or when no alternatives can reach that score. An analysis of voluntary approaches from industry (more details in the Preliminary Report, Sections 4.4.5 and 4.4.6) shows that, in terms of banning halogenated flame retardants, three front-running companies ban them for all their products and one for some, with the latter claiming that brominated flame retardants are phased out in notebooks. With such controls from industry on the restriction of halogenated flame retardants and the coverage in the existing ecolabelling schemes, a criterion to restrict halogenated substances has been introduced. The criterion covers all plastic parts of more than 25 grams (5 g for smartphones) with exemptions for PCBs and cable insulation. The criterion includes a maximum tolerated concentration value of 0.1% by weight of the material in homogeneous materials.

Table 12. Criteria on halogenated flame retardants in different ecolabelling schemes

Scheme	Criterion	Exemptions
EPEAT	Each plastic part in the product exceeding 25 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine at the homogeneous level.	a) When exceeding the limits the manufacturer shall demonstrate that the compound used has a GreenScreen Safer Chemical Benchmark score of 2, 3, 4 or that no alternatives can achieve those scores. b) Parts with >25% post-consumer recycled content the maximum level is 5000ppm. c) PCBs, cables and wiring, fans, and electronic components.
TCO 8	Parts that weigh more than 25 grams (10 g for headsets and 5 g for smartphones) and are made mainly of plastics must not contain flame retardants or plasticizers with halogenated substances or intentionally added halogens as part of the polymer.	PCB laminates, electronic components and all kinds of cable insulation.
Blue Angel	Halogenated polymers shall not be permitted in housings and housing parts. Nor may halogenated organic compounds be added as flame retardants. Nor shall any flame retardants be permitted which are classified under the CLP Regulation as carcinogenic of Category Carc. 2 or as hazardous to waters of Category Aquatic Chronic 1.	a) Fluoro-organic additives (as, for example, anti-dripping agents) used to improve the physical properties of plastics, provided that they do not exceed 0.5 weight percent. b) Plastic parts weighing 25 grams or less.
TUV	Covers product materials.	Cables.

REACH Candidate List substances

Of the existing labelling schemes only two, TÜV and Blue Angel, have a mandatory ban of the REACH Candidate List substances, and at the time of drafting this report Blue Angel has no licensed products besides keyboards. EPEAT, on the other hand, includes the ban of these substances as an optional criterion (further details on the analysis of existing labelling schemes can be found in the Preliminary Report, Sections 4.4.3 and 4.4.4).

An analysis⁹⁰ of voluntary approaches, taken by ICT front-running companies, regarding the Candidate List substances in REACH shows that one of the companies analysed claims to restrict the SVHC in all materials (unless preapproved by the company), and another one aimed to eliminate all SVHC in a concentration of more than 0.1% w/w by 31 December 31 2020. Other companies analysed list the substances on the REACH Candidate List for reporting, declaration and/or monitoring purposes. It seems, therefore, that there is certain interest on the part of industry to take action on the restriction of SVHC. Therefore, an award criterion is proposed (AC3) on the restriction of SVHC as considered useful for the promotion of this type of initiative.

Companies supplying articles containing Candidate List substances in a concentration above 0.1% weight by weight (w/w) on the EU market have to submit information on these articles to ECHA, as from 5 January

⁹⁰ More details on the analysis of voluntary approaches and the list of documents revised can be found in the preliminary report.

2021. The SCIP database⁹¹ will ensure that the information on articles containing Candidate List substances is available throughout the whole life cycle of products and materials, including at the waste stage. The information in the database will be made available to waste operators and consumers.

Avoidance of regrettable substitution

The list of restricted substances in Annex II to the RoHS Directive (Directive 2011/65/EU)⁹² was amended by Commission Delegated Directive (EU) 2015/863 of 31 March 2015⁹³. Accordingly, the four phthalates bis(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP) have been added to Annex II and the restriction applies for most product EEE (including computers, displays and smartphones) from 22 July 2019 on. Therefore, the former TS criterion on plasticisers used in external cables has been removed from this first criteria proposal and instead a new award criterion is proposed. Initially, it was proposed to award those offers that substitute these plasticisers with safer alternatives. After the AHWG meeting and the first consultation, the objective was revised and a broader scope was proposed. Though it might be an unusual criterion, it is forward-looking because it can contribute to avoid future restrictions of equally hazardous substances that are used as substitutes.

2.3.2 Background for the proposed verification

Manufacturers will be able to demonstrate compliance with the criteria through submission of documentation showing that products have been tested using the appropriate test procedures, or equivalent, and meet the hazardous material content requirements (where relevant). This documentation could take the form of a manufacturer's declaration or proven compliance with an ecolabel fulfilling the respective requirements; these are listed for each criterion in the section on verification.

Regarding the avoidance of regrettable substitution, there are methods and tools for comparative hazard assessment listed by the European Chemicals Agency ECHA⁹⁴ and by the Organisation for Economic Co-operation and Development (OECD)⁹⁵. One example there is the GreenScreen® for Safer Chemicals, which is already applied by some ecolabels such as EPEAT or TCO Certified.

2.3.3 Summary of stakeholder answers from the initial survey

Some stakeholders expressed the difficulty of applying the restricted substance control criterion, given the lack of expertise in that area of the preparers of the tender (who will have to perform the evaluation of the documentation provided). The uncertainty of the market uptake for this criterion was also mentioned as a challenge for the application of the substance control criterion.

The declaration of REACH Candidate List substances happens to be considered an important criterion and some stakeholders confirmed that it has been implemented in tenders. The validity of a declaration letter from the manufacturer/CEO as a verification method was questioned.

Regarding the criterion on plasticisers in external cables, it has been as applied well in tenders, although stakeholders suggest referring directly to the RoHS directive at product level rather than to certain parts only.

For hazardous EoL emissions from components, it was suggested to ensure a correct recycling process with an EoL criterion for that. A respondent also argued that fire tests are not possible in practice and that there is low consensus on those tests, although the ban of halogenated flame retardants in PCBs and cable insulation was welcomed by some stakeholders.

It was suggested that TCO Certified Edge halogen-free display could be reported as a verification method for displays, or self-declaration such as The ECO declaration⁹⁶.

⁹¹ <https://echa.europa.eu/scip-database>

⁹² See the consolidated version and all amendments of the Annexes at: http://ec.europa.eu/environment/waste/rohs_eee/legis_en.htm

⁹³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L0863>

⁹⁴ <https://echa.europa.eu/assess-compare-and-select-substitution>

⁹⁵ <http://www.oecd-satoolbox.org/Home/AAGuides> and <http://www.oecd-satoolbox.org/Home/Tools>

⁹⁶ <https://www.ecma-international.org/publications/standards/Ecma-370.htm>

2.3.4 Further background after the AHWG meeting and first stakeholder consultation

There were some overall comments from the AHWG meeting in Seville: to reduce the number of criteria and to include all criteria as technical specifications because the adoption of award criteria was questioned. Further concern was raised that it would be too difficult for procurers to understand the verification for the criteria area in hazardous substances.

The comments submitted during the consultation were numerous and in some cases showed contradictory positions to comments made in the AHWG meeting as well as between each other, e.g. claiming too much burden for manufacturers versus affirming that companies are well equipped to handle advanced criteria on hazardous substances in products.

It was suggested in the comments to mention the labels that fulfil the criteria in the verification, which was taken up as a proposal.

Another comment suggested inserting an example on how verification could look for each criterion. In the context of the hazardous substances, the suggestion of a database for the different criteria came up because stakeholders felt that additional information can easily be made accessible and is only retrieved on demand. The suggestions in these comments would need to be completed in a future task, it was noted and communicated to the JRC.

Substance control

One stakeholder highlighted the clear objective of the criterion and the opportunity for additional information. Another stakeholder suggested to change it into a core criterion; the comment encouraged the continuation of this criterion as IT companies are well equipped to handle advanced criteria on hazardous substances in products. It was further suggested to supplement the criterion on the comprehensive level with routines on the assessment on how to substitute hazardous substances. As methods or tools, the ECHA 5-step model⁹⁷ on substitution of chemicals for example or methods like GreenScreen were proposed.

There was also a contradictory comment that this criterion would be an unnecessary burden on manufacturers and too complex for procurers; instead the comment suggested providing publicly available product declarations from manufacturers.

Another stakeholder still noted that the scope of substances was unclear (REACH Candidate List and IEC 62474) and how a procurer with limited time for verification should analyse different verification documents.

Another comment claimed that it should be clarified how the verification could look and what this document should contain.

Based on the stakeholder comments, it was decided to transform the requirement on substance control into a core criterion in order to stress it as a focus and prerequisite for restrictions of hazardous substances.

As for the verification, it was decided to add additional ways to perform substance control, e.g. manufacturers can go beyond the IEC 62474 substance declaration list and use full material declarations, e.g. according to IPC 1752 to track all substances instead of only tracking those substances listed in the IEC 62474 database.

It was decided not to implement any demands on assessing and substituting substances in the comprehensive criterion as it might be an overburden of the intention behind the criterion. However, instead it was decided to take this aspect up in the award criterion covering the assessment for safer alternatives to hazardous substances.

Declaration of Substances of Very High Concern (REACH Candidate List substances)

At the AHWG meeting, some stakeholders expressed the view that two criteria on SVHC are confusing; this number should be reduced also in view of an excessively high number of criteria in total.

During the consultation it was mentioned several times that this criterion covers the already existing legal obligation according to REACH Article 33 to communicate the content of SVHCs in a product along the supply chain. The information is available to the consumer upon request. An extra criterion was therefore seen to provide little information to procurers, especially if broken down per sub-assembly. However, one comment suggested informing procurers about this right to transparency.

⁹⁷ <https://echa.europa.eu/know-your-substances-and-needs-substitution>

It was further mentioned that ECHA would provide the “SCIP database”^[2] on substances of very high concern in materials; however, the operative database was scheduled for January 2021. This EU-wide database also has the ambition to extend its scope in the future to substances of concern in materials.

Several comments recommended deleting the TS and only one suggested making a core criterion out of it. The potential benefits raised by the comment was that the listing of the SVHC could help manufacturers to avoid a bad choice of chemical; there were also potential future product recall issues mentioned.

A suggestion made in one comment was that information about the products should be submitted to the JRC team instead of to the procurers so that the JRC could compile a list of SVHC substances used for future GPP requirements.

It is decided to delete the criterion in order to reduce the overall number of criteria. Furthermore, the declaration of SVHC is a legal obligation and should be part of a wider approach by companies to control the use of substances. The requirements to communicate the content of substances is covered in a broader scope in the criterion on substance controls where SVHC should basically be covered.

Restriction of halogenated substances in plastic parts

Though the comments from the stakeholders differ to some extent, the feedback given indicated that the criterion as a technical specification and a core criterion was too advanced; instead it was proposed to make it an award criterion.

Furthermore, it was noted several times that an exemption for PVC in cable insulation should be kept. Stakeholders argued differently, e.g. because of additional costs (PVC-free cables would only be achievable for about 5-10% of the market) or due to the beneficial material properties (low ignitability, comparatively low heat release, absence of flaming droplets, good recyclability) or reliable durability.

It was suggested to insert an exemption for the restriction if no reliable alternatives exist or if the hazard of the halogenated flame retardant is assessed.

The use of alternatives, more precisely the assessment of the alternatives in order to guarantee that safer alternatives are used, was also suggested by another stakeholder.

Another stakeholder mentioned that the wording would not be in line with industry standards, but that industry would use low-halogen and then refer to bromine and chlorine and not all halogens.

A further comment suggested excluding the use of HFR in external or accessible parts to avoid exposure of final users to the substances while reducing the legacy chemicals burden overall.

The marking of the plastic parts with the flame retardant used was also mentioned as formulated in the eco-design requirements for displays.

It was decided to keep the wording as it is in line with the Ecodesign requirements for displays and is also in line with the wording of ecolabels.

The restriction of halogenated parts is not limited to accessible parts to avoid exposure of final users to the substances because human health is not the reason for the restriction but considerations of waste and circular economy.

The suggestion for the marking of the plastic parts is recommended to be taken up in the criterion on the end-of-life criteria set (e.g. for the comprehensive requirement; see “Other cross-cutting issues” section).

It was however decided to formulate only one criterion with certain exemptions in order to reduce the overall number of criteria and to focus on the restriction (in the first criteria proposal, the core criterion listed exemptions and the comprehensive did not allow for exemptions.) As the criterion requires that the use of exemptions must be declared, transparency is now provided for this aspect.

Cross-cutting issue: recycled plastics

With regards to the restriction of halogenated substances in plastic parts, there were comments with regards to recycled plastics. The comments pointed out that if the plastics contain recycled materials, they might contain halogenated substances to a higher extent.

Plastic containing brominated flame retardants needs to be sorted and removed according to WEEE requirements and is sent to incineration in the event that the concentration of brominated flame retardants is too high. Therefore, it is estimated that recycled plastics would only contain halogenated flame retardants as

contaminants (<1000 ppm). Moreover, there is not enough information to set a limit for plastics with recycled content regarding the chlorinated content.

Restriction of Substances of Very High Concern

Only a few comments were submitted on this award criterion. It was suggested twice to delete this criterion as the restriction of Substances of Very High Concern would not be verified with a level of certainty for third-party products and because substances that are under review could not be covered.

Another comment questioned whether a core criterion should be formulated here, referring to the definition of the GPP website stating that “core criteria are those suitable for use by any contracting authority across the Member States and address the key environmental impacts. They are designed to be used with minimum additional verification effort or cost increases.”

It is concluded to keep the criterion only as comprehensive, as an award criterion and which can optionally be used by procurers. Moreover, the comprehensive proposal would be more coherent with REACH, referring to the 0.1% w/w in components instead of at the product level. It is a common objective in Europe to promote the substitution of substances recognised as SVHC listed on the REACH Candidate List with safer alternatives.

The analyses of ecolabels showed that they explicitly refer to an elimination/ban of SVHCs or indirectly avoiding SVHCs by assessing safer alternatives such as TCO (TCO Certified ASL).

However, there remains the risk that manufacturers choose a substitute with equally hazardous chemicals that are not on the SVHC list; this is indeed an issue that is a continuous challenge if certain substances are restricted. The choice of safer alternatives needs to be generally assessed. It was therefore decided that the assessment of alternatives should be integrated into the following award criterion.

Avoidance of phthalates / Avoidance of regrettable substitution

Some stakeholders gave the feedback that basically the approach of using a white list instead of blacklists was welcomed. One stakeholder noted that procurers do not have the chemical knowledge and that the criteria on hazardous substances risk being resource-intensive; the stakeholder also stated that lists of substances are difficult to manage. Another stakeholder supported this by suggesting simplifying the verification as much as possible.

It was also noted that the heading of the criterion indicates that all phthalates are equally hazardous to those restricted under the RoHS Directive and that there might be hazardous plasticisers that are not phthalates.

It was noted that the GreenScreen was agreed but that other methods should also be suggested. The ECHA 5-step model on substitution of chemicals was also mentioned by another stakeholder.

Based on the comments collected and further background analysis, in this revision it is proposed to expand the scope of this criterion beyond phthalates and expand the reference to other tools for comparative hazard assessment as indicated by the European Chemicals Agency at: <https://echa.europa.eu/assess-compare-and-select-substitution> or the OECD Substitution and Alternatives Assessment Toolbox at <http://www.oecd-saatoolbox.org/>.

The intention behind the criterion was that the substitution of the restricted phthalates should be assessed and that substitution with an equally hazardous plasticiser should be avoided. However, the same could be said for the halogenated flame retardants and all SVHCs.

As already mentioned above, there were several stakeholder comments at various points for the other criteria that substitution should be addressed as an issue and that hazardous substances should not be substituted by equally hazardous substances. So, it was decided to reframe this criterion using the wording avoidance of regrettable substitution. Though it is still a challenging criterion, it is considered to be future-oriented: it would prevent risks of substances recently developed and/or recently recognised as being hazardous.

Other cross-cutting issue: Marking of plastics

In the context of restricting halogenated substances in plastic parts, it was remarked by stakeholders that the ecodesign requirements for displays stipulates that “(b) Components containing flame retardants shall additionally be marked with the abbreviated term of the polymer followed by hyphen, then the symbol “FR” followed by the code number of the flame retardant in parentheses. The marking on the enclosure and stand components shall be clearly visible and readable.” This comment was considered to address a cross-cutting issue as it is addressed in the area of the end-of life criteria by adding the reference to ISO 1043-4 Plastics

— Symbols and abbreviated terms — Part 4: Flame retardants. It is proposed to address this marking/reporting for the comprehensive criterion for plastics.

2.3.5 Further background after the second stakeholder consultation

Substance control

Some stakeholders expressed the opinion that the criteria proposed in version 2 need to be clarified in terms of scope and verification. The JRC included some clarifications and aligned this criterion with the recently published EU GPP Criteria for imaging equipment⁹⁸, which include a selection criterion “SC1 Restricted Substance Control”.

Restriction of halogenated substances in plastic parts

Some OEMs proposed referencing the iNEMI⁹⁹ Position Statement on the Definition of “Low-Halogen Electronics”¹⁰⁰. According to this position paper, the definition of low-halogen electronics is based on specific thresholds and measurement methods applicable to:

- 1) printed Board and substrate laminates;
- 2) components other than printed board and substrate laminate.

It is also proposed to change the heading of the criterion to “brominated and chlorinated” instead of “halogenated” substances, and to make it an award criterion instead of a Technical Specification.

Representatives of the bromine industry do not agree with the reference to the recent Ecodesign Regulation on electronic displays (Commission Regulation (EU) 2019/2021), which contains a ban on the use of halogenated flame retardants in the enclosures and stands of display equipment. The ban comes into effect in April 2021 and is being contested in the European Court of Justice. Therefore, it is considered premature to cite it as a precedent for general actions on flame retardants, halogenated or otherwise.

Concerning that point, the JRC would like to highlight that this criterion proposal is aligned with globally recognised ecolabel initiatives, like TCO Certified, EPEAT and Blue Angel. These labels are established in an open and transparent procedure in which all relevant stakeholders, including government bodies, consumers, social partners, manufacturers, distributors and non-governmental organisations, may participate; similar criteria and thresholds for the use of brominated and chlorinated substances in plastic components are applied in these labels. The scope of this criterion is wider than the Ecodesign Regulation for Electronic Displays, as it is applicable to products such as computers, tablets and smartphones. Moreover, as described in Section 4.4.5 of the Preliminary Report, several OEMs have already voluntarily reduced the use of brominated and chlorinated flame retardants. This is also confirmed by the products registered under TCO Certified¹⁰¹ and EPEAT¹⁰² and compliance with the corresponding criteria on restriction of halogenated flame retardants.

The same stakeholder from the Bromine sector pointed out that the Commission is now proposing thresholds for total bromine and chlorine concentrations (0.1%) in plastics for enclosures of displays (as a possible amendment to the Commission Delegated Regulation 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays¹⁰³). The JRC has already proposed to apply these thresholds in the GPP criteria for two main reasons:

- the availability of international standards referring to the same threshold;
- consistency with the thresholds applied by several ecolabels.

⁹⁸ https://ec.europa.eu/environment/gpp/pdf/20032020_EU_GPP_criteria_for_imaging_equipment_2020.pdf

⁹⁹ The International Electronics Manufacturing Initiative (iNEMI) member companies supporting this definition are: Cisco, Dell Inc., Doosan Corporation, HP, Intel Corporation, Lenovo, Nan Ya Plastics Corporation, Senju Comtek Corp., Sun Microsystems, Inc., Tyco Electronics Ltd.

¹⁰⁰ http://thor.inemi.org/webdownload/projects/ese/HFR-Free/Low-Halogen_Def.pdf

¹⁰¹ TCO Certified Registry, available at <https://tco certified.com/product-finder/>

¹⁰² EPEAT Registry, available at <https://epeat.net/>

¹⁰³ <https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=41384>

A manufacturer suggested including additional exemptions such as fans and electronic components and introducing higher thresholds (5000 ppm) for the components with a high content of post-recycled plastic. However, due to the risk of containing persistent organic pollutants banned under the POP Regulation¹⁰⁴, plastics containing FRs (heavy fraction of density separation and sorted XRF fraction with BFR > 1000 ppm) are normally not recycled and end up being sent for incineration¹⁰⁵.

OEMs consider that the way the criterion is written in this second draft does not allow for the same level of differentiation (awarding front runners). It is also requested to allow the fulfilment of the criterion for PVC-free cords.

Given all of the above, the JRC revised the draft criterion in order to:

- include a more specific reference to brominated and chlorinated substances in the title of T55;
- introduce the concept of low-halogen instead of halogen-free;
- better specify which components can be exempted from this requirement.

Restriction of Substances of Very High Concern

Some industry representatives question the use of this type of criteria where absence of substances that are under review is rewarded and suggest deleting this criterion. An OEM considers that restricting REACH SVHC will not be feasible for any manufacturers since some SVHC such as lead are used in key applications across product groups. The JRC, based on the preliminary analysis carried out during this study, considers that the inclusion of this criterion as an award criterion (comprehensive level) is appropriate. This is also applied by EPEAT, as optional criterion 4.1.6.2 and some front runners are already providing devices compliant with this criterion (mainly monitors, but also some notebooks and desktop computers). A similar optional criterion is under EPEAT for smartphones, but there are no devices registered that meet this optional criterion yet.

A Member State recommended including this criterion as a technical specification to guarantee consistency with GPP criteria of other product groups. An environmental NGO agrees with the interpretation of the restriction of SVHCs included in the document, supporting the justification as to why this should be included as an award criterion. Moreover, it is suggested to be considered under the core GPP level criteria and not only the comprehensive GPP criteria.

Avoidance of phthalates / Avoidance of regrettable substitution

According to a manufacturer, the current proposal is too vague and the number of substances are under evaluation should be clarified. The JRC considers that the criterion makes sense if implemented for the entire group of substances under the scope (flame retardants and plasticisers). It was also commented that different labels may not be equivalent in terms of the quality assurance of the hazard assessment. Although some differences in the verification approaches can exist, the intention of this criterion is to encourage the uptake of a “safer substitution” approach to the assessment of hazardous chemicals in products.

¹⁰⁴ REGULATION (EU) 2019/1021 on persistent organic pollutants

¹⁰⁵ Wagner S., Schlummer M., (2020) Legacy additives in a circular economy of plastics: Current dilemma, policy analysis, and emerging countermeasures. Resources, Conservation and Recycling, Volume 158. <https://doi.org/10.1016/j.resconrec.2020.104800>

2.4 Criteria area 4 – End-of-life management

2.4.1 Criterion 4.1 – Design for recycling

Compared to the GPP criteria version 2016, it is proposed to maintain the Technical Specification on recyclability of plastic casings. The thresholds for plastic parts size for marking of plastic casings, enclosures and bezels have been updated.

A few new proposals were included in the first draft revision:

- Criterion on the "plastic composition" used for casings, enclosures and bezels.
- Battery marking for the correct identification of the chemistry.
- Declaration of Critical Raw Materials.

These additional proposals were then removed during the stakeholder consultation process (see Table 13). The following table compares the existing GPP criteria with the new proposal.

Table 13. Design for recycling - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
TS8. Marking of plastic casings, enclosures and bezels	TS22. Marking of plastic casings, enclosures and bezels
TS7(a). Recyclability of plastic casings, enclosures and bezels	AC9. Recyclability of plastic casings, enclosures and bezels - separable inserts and fasteners <i>(Comprehensive level)</i>
TS7(b). Recyclability of plastic casings, enclosures and bezels	AC10. Recyclability of plastic casings, enclosures and bezels- paints and coatings <i>(Comprehensive level)</i>
	New! TS24 Plastic composition recyclability
	New! TS26 Battery packs marking for the correct identification of their chemistry
	New! TS27 Declaration of Critical Raw Materials

Summary of the main changes after the first stakeholder consultation

Based on the comments received from some stakeholders, the applicability of these criteria was limited to the desktop computers and displays, expected to have larger plastic components. The criteria were slightly modified in order to ensure coherence with Ecolabels that include similar criteria on the design for recyclability (e.g. EPEAT). Regarding the technical specification on marking of plastic casings, enclosures and bezels, this proposal was limited to the comprehensive level and the applicability to plastic parts with a weight greater than 25 grams. The criteria proposals on battery packs marking and declaration of Critical Raw Materials were deleted based on the comments received.

Summary of the main changes after the second stakeholder consultation

Based on the comments received, the criteria on recyclability of marking casing have been changed to award level criteria (AC9 and AC10). The criterion "Plastic composition recyclability" has been deleted due to the overlap with the two previous criteria and to reduce the overall number of criteria.

The following table shows the criteria as revised after the second stakeholder consultation.

Third Criteria Proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
	<p>TS22 Marking of plastic casings, enclosures and bezels</p> <p><i>Applicable to stationary computers and computer displays.</i></p> <p>External plastic casings, enclosures and bezels with a weight greater than 25 grams must be marked in accordance with ISO 11469 and ISO 1043 Section 1 and 4. Plastic parts are exempted from marking in the circumstances described by the explanatory note below.</p> <p>Verification:</p> <p>The tenderer must identify the plastic parts by their weight, their polymer composition and their ISO 11469 and ISO 1043 markings. The dimension and position of the marking must be illustrated visually.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Plastic marking exemptions</p> <p>Plastic components are exempt from marking requirements in the following circumstances:</p> <ul style="list-style-type: none"> (i) if the marking is not possible because of the shape or size; (ii) if the marking would impact on the performance or functionality of the plastic component; or (iii) if the marking is technically not possible because of the moulding method. <p>For the following plastic components, no marking is required:</p> <ul style="list-style-type: none"> (i) packaging, tape, labels and stretch wraps; (ii) wiring, cables and connectors, rubber parts and wherever there is not enough appropriate surface area for the marking to be of a legible size; (iii) PCB assemblies, PMMA boards, optical components, electrostatic discharge components, electromagnetic interference components, speakers; (iv) transparent parts where the marking would obstruct the function of the part in question. 	
AWARD CRITERIA	
	<p>AC9 Recyclability of plastic casings, enclosures and bezels - separable inserts and fasteners</p> <p><i>Applicable to stationary computers and computer displays.</i></p> <p>Additional points will be awarded if all discrete plastic parts >25 grams do not contain a metal insert or fastener that is moulded-in, inserted by heat or ultrasonically, or glued-in, unless the metal component is either separable by breaking it off from the plastic part or is separable by using commonly available tools. Fan impellers are excluded from this requirement.</p> <p>Verification:</p> <p>The tenderer must provide either:</p> <ul style="list-style-type: none"> 1) documentation showing that the product does not contain a metal insert or fastener that is moulded-in, inserted by heat or ultrasonically, or glued-in;

	<p>2) where metal inserts or fasteners are moulded, inserted by heat or ultrasonically, or glued into plastic parts, documentation showing how it is separable by way of breaking it off from the plastic part or by using commonly available tools.</p> <p>or</p> <p>3) a basis for exemption(s) from safety, legal or technical requirements for a metal insert/fastener, if claimed.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
	<p>AC10 Recyclability of plastic casings, enclosures and bezels</p> <p><i>Applicable to stationary computers and computer displays.</i></p> <p>Additional points will be awarded if the presence of paints and coatings in the plastic components of the devices does not have a significant impact on the resilience of plastic recyclate produced from these components upon recycling and when tested according to ISO 180 or equivalent (see the explanatory note below).</p> <p>Discrete plastic parts >25 grams must not have an adhesive, coating, paint or finish that is incompatible with recycling.</p> <p>The following are excluded from this requirement:</p> <ul style="list-style-type: none"> • printed circuit board assemblies and fan impellers; • wires and cables, connectors, electronic components, optical components, acoustic components, ESD components and EMI components; • metal inserts/fasteners required for safety, legal or technical requirements. <p>Verification:</p> <p>The compatibility of a surface coating(s) (adhesives, coatings, paints, or finishes) with recycling must be demonstrated through either:</p> <p>1) test results showing that the surface coating(s) does not lead to more than a 25% reduction in the notched Izod or Charpy impact at room temperature, as measured using ASTM D256, ASTM E23, ISO 180, or ISO 179-1; one test result can be representative for multiple parts in the event that the same material is used in the parts and that the worst-case application is tested;</p> <p>or</p> <p>2) a statement from a minimum of three plastics recyclers individually, or at least one plastics recycler processing plastics from electronics and working under an independent entity (e.g. not contracted/associated with the manufacturer or contracted with a trade organisation), confirming these surface coatings do not negatively impact the recyclability of the plastic;</p> <p>or</p> <p>3) test results from an independent laboratory.</p> <p>Equipment holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</p>
<p>Explanatory note: Impact on the resilience of plastic recyclate</p> <p>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 180:2019 Plastics - Determination of Izod impact strength.</p>	

	<p>New! TS24 Plastic composition recyclability</p> <p><i>Applicable to stationary computers and computer displays</i></p> <p>Plastic parts with a mass greater than 25 g must be comprised of a single resin or a blend of different resins that is compatible for recycling.</p> <p>The following are excluded from this requirement:</p> <ul style="list-style-type: none"> ● Printed circuit boards, wires and cables, connectors, electronic components, optical components, acoustic components, ESD components, and EMI components <p>Verification:</p> <p>The tenderer must provide a list of the plastic parts > 25g including the resin type used and its compatibility with recycling.</p> <p>If the plastic part > 25g is made from a blend of resins, the tenderer must provide one of the following:</p> <ol style="list-style-type: none"> 1) Test results showing that there is not more than a 25% reduction in the notched Izod or Charpy impact at room temperature, as measured using ASTM D256, ASTM E23, ISO 180, or ISO 179-1; one test result can be representative for multiple parts in the event that the same material is used in the parts and that the worst-case application is tested; or 2) A statement from a minimum of three plastics recyclers individually, or at least one plastics recycler processing plastics from electronics and working under an independent entity (e.g., not contracted/associated with the manufacturer or contracted with a trade organization), confirming the resin is recyclable. <p>Equipment holding a relevant Type I Eco-label fulfilling the specified requirements will be deemed to comply. In particular holding the following label is considered as proof of compliance:</p>
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2.4.1.1 Initial background and rationale for the proposed criteria

Plastic composition / recyclability

It is proposed to maintain the current EU GPP criteria on material composition of plastic casings, enclosures and bezels, in order to eliminate barriers for recycling due to metal inserts, coatings and flame retardants. The usage of such materials can impact the quality of the recycled resin obtained in terms of physical/mechanical properties.

In general, high product complexity hinders recycling. While sorting and recycling processes and technologies have improved in recent years, increasing product complexity continues to generate costs and reduce the quality of recycled materials. Such complexity is, for example, expressed through the types of materials, compounds, adhesives, pigments and other additives used in the product.

Following the aim of reducing recycling burdens, a new TS has been proposed to limit the type of resins used to produce plastic parts heavier than 25 g. The requirement allows only the use of resins that are compatible with recycling technologies. Similar requirements are already implemented by type I ecolabels like IEEE, Blue Angel and Green Product Mark, although their restrictions differ from one label to another, as for example Blue Angle and Green Product Mark allow for a maximum of four types of plastic in a blend (see the Preliminary Report for further details on the criteria used in other ecolabels).

Marking of plastics

As discussed in the Preliminary Report (Section 4.3.3) of the current EU GPP Criteria for Computers and Displays, most of the analysed ecolabel schemes as well as the revised EU Ecodesign Regulation on displays (which applies from 1 March 2021) have criteria with regard to marking of plastic parts to facilitate recycling processes, referring to ISO 11469 and/or ISO 1043 Sections 1-4. However, there are slight differences with

regard to the components covered or exempted, the weight and size of plastic parts to be marked and the specific marking reference (Table 14).

Table 14. Analysis of EU GPP and ecolabel schemes: Differences in criteria on marking of plastic parts

	Components	Weight / size of plastic parts for which the requirements apply	Marking reference
EU GPP	External plastic casings, enclosures and bezels	Core: Weight greater than 100 grams and a surface area greater than 50 cm ² . Comprehensive: Weight greater than 25 grams for tablet and portable all-in-one notebooks and 100 grams for computers and monitors and in all cases a surface area greater than 50 cm ² .	Core: ISO 11469 and ISO 1043 Section 1. Comprehensive: ISO 11469 and ISO 1043, Sections 1-4.
IEEE	All discrete plastic parts; excluded from the requirement: printed circuit boards; wires and cables, connectors, electronic components, optical components, acoustic components, ESD components, and EMI components.	Weight greater than 25 grams.	ISO 11469/1043, excluding optical parts.
Blue Angel	Plastic parts; Exempted: transparent plastic parts the function of which requires transparency (e.g. visible plastic films in displays).	Mass greater than 25 grams each and an even surface of more than 200 mm ² .	ISO 11469 with due regard to ISO 1043, Parts 1-4.
Green Product Mark	Plastic components.	Weight greater than 25 grams.	ISO 11469.
TCO	Parts made mainly of plastics; exempted are printed wiring board laminates as well as plastic parts containing other materials in any significant amounts.	Weight greater than 25 grams.	ISO 11469 and ISO 1043, Sections 1-4.
Ecodesign Regulation on Displays	Plastic components; Plastic components are exempt from marking requirements in the following circumstances: (i) The marking is not possible because of the shape or size; (ii) The marking would impact on the performance or functionality of the plastic component; and (iii) Marking is technically not possible because of the molding method. Marking is not required for: (i) Packaging, tape, labels and stretch wraps; (ii) Wiring, cables and connectors, rubber parts and anywhere not enough appropriate surface area is available for the marking to be of a legible size; (iii) PCB assemblies, PMMA boards, optical components, electrostatic discharge components, electromagnetic interference components, speakers; (iv) Transparent parts where the marking would obstruct the function of the part in question. Components containing flame retardants shall additionally be marked with the abbreviated term of the polymer followed by hyphen, then the symbol "FR" followed by the code number of the flame retardant in parentheses. The marking on the enclosure and stand components shall be clearly visible and readable.	Weight heavier than 50 grams.	'Appropriate standard symbols or abbreviated terms set between the punctuation marks '>' and '<' as specified in available standards.

In order to be aligned with the revised Ecodesign requirement for displays and the existing ecolabel schemes, it is proposed to update the current EU GPP criterion on plastic marking to parts heavier than 50 g for the core criterion and parts heavier than 25 g for the comprehensive.

Marking of plastic parts is implemented by some manufacturers that have their own initiatives for closed loop recycling.

Battery marking for recycling

The increased demand for portable electronics such as notebook computers, tablets and smartphones has stimulated the market of battery recycling. According to the preparatory study for Ecodesign requirements on computers, batteries collected at the end of life mostly appear as mixtures and are subject to manual sorting according to their chemistries. However, when the batteries reach the recycling facility, the logos are sometimes missing, making identification and sorting difficult.

To address such issues, it was initially proposed in this revision to include a TS on battery marking following IEC 62902:2019. The proposal also includes the indication of the metals present in the battery cell, or pack, with a weight percentage higher than 1. This would allow the improvement of batteries' recyclability with further information on the composition. This proposal was removed after the first stakeholder consultation (see details in Section 2.4.1.3).

Declaration of Critical Raw Materials

CRMs are the raw materials that combine a high economic importance to the EU with a high risk associated with their supply. The criticality of these materials is also associated with low substitutability and low recycling rates. Including a requirement on declaration of the CRM contained in the products has been identified as a relevant measure to reduce risks associated with CRM supply.

The new set of Ecodesign requirements for servers and data storage products (EU2019/424) includes the following criterion:

- From 1 March 2020, the following product information on servers and online data storage products shall be made available from the time a product model is placed on the market until at least 8 years after the placing on the market of the last product of a certain product model free of charge by manufacturers, their authorised representatives and importers to third parties dealing with maintenance, repair, reuse, recycling and upgrading of servers (including brokers, spare parts repairers, spare parts providers, recyclers and third party maintenance) upon registration by the interested third party on a website provided:
 - indicative weight range (less than 5 g, between 5 g and 25 g, above 25 g) at component level, of the following critical raw materials:
 - (a) cobalt in the batteries;
 - (b) neodymium in the HDDs.

For the products under the scope of this EU GPP criteria revision (desktop computers, monitors, laptops, tablets and smartphones), a list of parts containing CRM has been identified (Table 15). Initially, a criterion requesting the tenderers to provide a document declaring the indicative weight range of the CRM that are present in the parts listed in Table 15 that apply to their product has been proposed. This proposal was removed after the first stakeholder consultation (see details in Section 2.4.1.3).

Table 15. List of CRM present in the products under the scope

Part	CRM
Battery (portable devices)	Cobalt
HDD (all types of devices)	Neodymium and other rare earth elements
Display panels	Indium
Vibration module	Tungsten
PCBs	Palladium

2.4.1.2 Comments from the initial GPP survey 2019

Recyclability of plastic casings, enclosures and bezels

No applications of the criterion have been reported. A respondent considers this as not fully targeting the real issues: as most recycling facilities now and in the future are going to be automated, meaning that the product is shredded and separated by chemical or mechanical processes, it is considered that the verification process of TS7b may be challenging and costly, especially if verification is needed for all plastic parts before a certificate can be issued. The study team considers that contamination of waste streams is still an issue in the recycling of plastics and this type of requirements can help in the transition to more circular products.

For the TS about marking of plastic casings, enclosures and bezels, the same stakeholder highlighted that it is much more important to reduce the contamination of the plastic by reducing hazardous chemicals than marking them.

2.4.1.3 Further background after the AHWG meeting and first stakeholder consultation

Recyclability of plastic casings, enclosures and bezels - separable inserts and fasteners

One stakeholder pointed out that this criterion only has a low sustainability value for small products like notebooks as they are grinded and not separated. Additionally, the stakeholder stated that metal inserts can prolong the lifetime of ICT products with, at the same time, a probably limited negative impact. Another comment suggested aligning the criterion with EPEAT in order to widen the options for purchasers. One comment proposed to change TS23(a) from a comprehensive criterion to an award criterion as it is a new criterion.

Reply: The metal inserts addressed by the criterion disturb the recycling process and alternatives exist (e.g. metal foils). An alignment of TS23(a) with EPEAT would mean that EPEAT can be used for verification. It is assumed that this would facilitate the purchasing process for procurers even though some adaptations have to be done (e.g. restriction of the criterion to discrete plastic parts > 25g). Against this background, the revised criterion has been aligned to EPEAT as relevant Type I Ecolabel for verification. TS23(a) is not a core criterion but a comprehensive one and limited to desktop computers and displays. The fact that TS23(a) is a new criterion does not seem to be a convincing argument to change it to an award criterion.

Recyclability of plastic casings, enclosures and bezels - paints and coatings

Two comments asked for an alignment with EPEAT in order to make it easier for purchasers to use the GPP criteria. Two comments asked for an exemption for parts that contain >25% recycled content, as these still have / might have such paints and coatings. One comment suggested exempting refurbished products from this criterion.

Reply: The alignment of the criterion with EPEAT has the advantage that EPEAT can be used for verification. It is assumed that this would facilitate the purchase process for procurers in comparison to the current criterion where there is no Type-I label that can be used for verification. In EPEAT an exemption is already included for parts with >25% recycled content. Against this background, the revised criterion has been aligned to EPEAT and EPEAT as relevant Type I Ecolabel for verification. The treatment of refurbished products within GPP is a horizontal issue. Therefore, it is defined in a separate chapter of the TR which GPP criteria will apply for refurbished products and which will not apply.

New! Plastic composition recyclability

One stakeholder asked for the alignment of this criterion with EPEAT in order to give procurers more options.

Reply: With the same arguments as for the alignment of the previous criteria to EPEAT, this revised criterion has been aligned with EPEAT.

Marking of plastic casings, enclosures and bezels

Two stakeholders asked to remove the 5 g threshold for smartphones as it is currently not required by ISO 11469 and ISO 1043, it is difficult to achieve as the pieces are small, and it is not clear why the 5 g threshold should only apply to smartphones. In contrast, one comment suggested including the 5 g threshold for smartphones not only as a comprehensive criterion but also in a core criterion (TS25). This comment

additionally suggested asking for the marking of flame retardants in plastics as it is included in the Ecodesign requirements for displays (Commission Regulation 2019/2021).

Reply: After weighing up the expected effort and potential benefits of the 5 g threshold for smartphones, it was deleted in the revised criterion. The marking of flame retardants is also included by the reference to ISO 1043-4:1998 Plastics — Symbols and abbreviated terms — Part 4: Flame retardants.

Battery packs marking for the correct identification of their chemistry

Three stakeholders asked to delete the criterion as it would not help recyclers or procurers. They stated that the Battery Association of Japan (BAJ) had used a similar mark but then gave it up and asked to check this for the revision of the criterion.

Reply: To demand an indication of all metals would bring transparency to the market, which would also help recyclers. Mainly, cobalt is economically interesting for recyclers, but if an indication is demanded this should not be restricted to cobalt. In principle, a strong instrument (like Ecodesign) would be needed that obliges an indication on all batteries. GPP could prepare for such a strong instrument but would for itself not be able to push battery producers to indicate the metals in all batteries. Concerning the hint on BAJ, no evidence was found that in Japan there had been a label on the market that indicated the content of specific metals as a weight percentage. On the website of BAJ the revised labelling is explained: <http://www.baj.or.jp/e/recycle/recycle11.html>. The label indicates the metal with the highest weight percentage but it does not indicate the exact percentage, either in terms of the metal with the highest share or of other metals contained in the battery. Additionally, it has to be indicated in the event that the "Tin (Sn)" content in a single cell is more than 1.0 wt-% per single cell weight and in the event that the "Phosphorus (P)" content in a single cell is more than 0.5 wt-% per single cell weight. Both would hinder the recycling. TS26 was deleted for the revised version of the criteria.

Declaration of Critical Raw Materials

One stakeholder fears that the data necessary for verification are only available to the manufacturers. Two stakeholders strongly suggested deleting this criterion for several reasons: the information on CRM content might be interesting for researchers and recyclers but data are not available for single products to manufacturers but only representative products and only with considerable effort. Additionally, the information on CRM is difficult for procurers to assess.

Reply: As for batteries, it is in principle a good idea to have more market transparency concerning the CRM. Still there are several difficulties: Manufacturers do not have the information on CRM at the moment. It is questionable if GPP is strong enough to push the declaration of CRM on ICT products. Against the background of the comments, criterion TS27 was deleted from the revised version of the criteria.

2.4.1.4 Further background after the second stakeholder consultation

Recyclability of plastic casings, enclosures and bezels - separable inserts and fasteners

A stakeholder expressed doubts about the environmental benefits of this criterion, as in some cases the use of metal inserts is considered beneficial for the durability of the product (e.g. metal insert to open and close the product). Another stakeholder suggested changing these two criteria on recyclability to award criteria, since they are new and the environmental impact is not well understood.

Based on the comments received, the JRC changed this criterion to an award criterion. Moreover, the JRC wants to clarify that use of metal inserts (e.g. to facilitate screwing) is still allowed as long the insert is separable at the end of life.

Recyclability of plastic casings, enclosures and bezels - paints and coatings

A stakeholder considers that a verification based on suppliers' letters is not trustworthy and should be replaced with a written statement from an independent expert on the matter of mixtures of resins from an independent verification organisation. In this way, the buyer can better trust the fulfilment of the criterion. In the second revision, the criterion was proposed that as not applicable to plastic components < 100 g and if the recycled content is >25%. According to a stakeholder, it could be too easy to pass with exceptions and thus make it extremely hard for the purchaser to actually know if the manufacturer did do something extra or only passed on technicalities. The revised proposal is aligned with the EU Ecolabel proposal for displays, which

means that is applicable to plastic components > 25 g. The criterion is proposed as an award type, comprehensive level.

Plastic composition recyclability

As pointed out by a stakeholder, the ECMA-341 reference is outdated and has to be removed. Based on the general comments received about reducing the number of criteria, it was decided to remove this criterion. Due to the partial overlap with the recyclability criteria already available and in order to reduce the number of applicable criteria, it is proposed to withdraw this new criterion proposal.

Marking of plastic casings, enclosures and bezels

According to a stakeholder comment, small ICTs, at the end of life, are almost always just sent to a shredder. For large plastic casings, it could potentially be used since some are manually disassembled but, from experience and observations of visiting recycling facilities, no one is using these markings; instead, they use XRF scanners to determine if the plastics contains any RoHS substances. It is therefore suggested that the JRC removes this criterion to decrease the number of criteria in the document to make the more important ones stand out.

Battery packs marking for the correct identification of their chemistry

No further comments received.

Declaration of Critical Raw Materials

A stakeholder does not agree with the deletion of this criterion. Improving the availability and transparency of environmental product data is considered an essential step towards creating secondary markets for raw materials.

2.4.2 Criterion 4.2 – Design for dismantling

The AC product dismantling potential is not supported by respondents from industry in the absence of standardised methods. It is proposed to remove the criterion AC10 on this topic of the current EU GPP criteria.

Results from the study 'Analysis and development of a scoring system for repair and upgrade of products', where the disassembly time is listed as one of the key parameters, concludes that this type of requirement should not be applied to the product groups analysed (one of them being notebooks). The reasoning for laptops is that, although this parameter can be relevant since the repair duration affects repair costs, disassembly time is also covered indirectly by other parameters (e.g. disassembly depth, fasteners, tools, availability of repair information). The study also concludes that methodological developments are still needed before such a parameter can be measured in a standardised and not-too-burdensome way. The same arguments are also valid for the disassembly time for recycling operations.

2.4.3 Criterion 4.3 – End-of-life management

As a result of the initial survey, minor changes were applied to the technical specification and the CPC criterion. Meanwhile, the award criteria have been removed as they are already covered in the technical specification or they were considered too complex for their implementation by tenderers.

The following table compares the existing GPP criteria with the new proposals.

Table 16. End-of-life management - current criteria (2016) and TR v3.0

GPP 2016	TR v3.0 Proposal
TS1. Secure computer collection, sanitisation, re-use and recycling	TS23. Secure computer collection, sanitisation, re-use and recycling
AC1. Inventory tracking system	
AC2. Dismantling to facilitate recycling	
CPC1. Reporting on equipment status	CPC3. Reporting on the end-destination of ICT equipment
CPC2. Operation of reuse and recycling facilities	

Summary of the main changes after the first stakeholder consultation

This criterion proposal was kept almost identical.

Summary of the main changes after the second stakeholder consultation

No substantial changes were made.

The following table shows the criteria that were revised after the second stakeholder consultation.

Third criteria proposal	
Core criteria	Comprehensive criteria
TECHNICAL SPECIFICATION	
<p>TS23 Secure computer collection, sanitisation, re-use and recycling</p> <p><i>(same for core and comprehensive criteria)</i></p> <p><i>Procurement of end-of-life management services for all ICT devices.</i></p> <p>Tenderers must provide a service for the re-use and recycling of the whole product or of components requiring selective treatment in accordance with Annex VII of the WEEE Directive for equipment that has reached the end of its service life. The service must comprise the following activities:</p> <ul style="list-style-type: none"> • collection (take back system); • confidential handling and secure data erasure (unless carried out in-house); • functional testing, servicing, repair and upgrading to prepare products for re-use; • the remarketing of products for re-use; • dismantling for component re-use, recycling and/or disposal. <p>In providing the service, they must report on the proportion of equipment prepared or remarketed for re-use and the proportion of equipment</p>	

prepared for recycling.

Preparation for re-use, recycling and disposal operations must be carried out in full compliance with the requirements in Article 8 and Annexes VII and VIII of the (recast) WEEE Directive 2012/19/EU and with reference to the list of components for selective treatment [see the explanatory note below].

Verification:

The tenderer must provide details of the arrangements for collection, data security, preparation for re-use, remarketing for re-use and recycling/disposal. This must include, during the contract, valid proof of compliance by the WEEE handling facilities to be used.

Explanatory note: Component requiring selective WEEE treatment

The following are components requiring selective treatment in accordance with Annex VII of the WEEE Directive:

- mercury containing components;
- batteries;
- printed circuit boards greater than 10 cm²;
- plastic containing brominated flame retardants;
- chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC);
- external electric cables;
- polychlorinated biphenyls containing capacitors;
- components containing refractory ceramic fibres;
- electrolyte capacitors containing substances of concern;
- equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15;
- ozone-depleting gases, which must be treated in accordance with Regulation (EC) No 1005/2009.

CONTRACT PERFORMANCE CLAUSES

CPC2 Reporting on the end-destination of ICT equipment

(same for core and comprehensive criteria)

To be used in conjunction with criterion TS23.

The contractor must provide a report on the status of the equipment in the inventory once all items have been processed for re-use, recycling or disposal. The report must identify the proportion of items re-used or recycled, and whether they remained in the EU or were exported.

For equipment and components recycled in the EU, the following means of proof for the handling facilities must be accepted:

- a permit issued by the national competent authority in accordance with Article 23 of Directive 2008/98/EC, or
- third-party certification of compliance with the technical requirements of EN 50625-1 or an equivalent compliance scheme.

Where equipment and components are exported for re-use or recycling, contractors must provide the following shipment and treatment information:

- shipping information for equipment intended for re-use, in accordance with Annex VI of WEEE Directive 2012/19/EU.

WEEE that is exported to be treated outside the EU requires third-party certification of compliance with the minimum WEEE requirements laid down in the criterion, or with the technical requirements of EN 50625-1 or an equivalent compliance scheme¹⁰⁶. Where equipment and components are exported for re-use or recycling, contractors must provide the following shipment and treatment information:

- shipping information for equipment intended for re-use, in accordance with Annex VI of WEEE Directive 2012/19/EU.

For WEEE exported to be treated outside the EU, a third-party certification of compliance with the minimum WEEE requirements laid down in the criterion, or with the technical requirements of EN 50625-1 or an equivalent compliance scheme.

¹⁰⁶ The following compliance schemes are considered, at the time of writing, to meet these requirements: WEEELABEX:2011 requirement on 'Treatment of WEEE'; 'Responsible Recycling' (R2:2013) standard for electronics recyclers; e-Stewards standard 2.0 for Responsible Recycling and Reuse of Electronic Equipment; Australian/New Zealand standard AS/NZS 5377:2013 on 'Collection, storage, transport and treatment of end-of-life electrical and electronic equipment'.

2.4.3.1 Background and rationale for the proposed criteria

EU GPP, IEEE and TCO have dedicated requirements on take-back schemes. It has to be noted, however, that in Europe the collection and recycling is regulatory covered by the WEEE legislation with extended producer responsibility for the participation and/or financing of collection and recycling processes. Therefore, the proposed TS28 is formulated in a way that goes beyond WEEE to further enhance recycling and reuse processes, e.g. requiring reporting on the status of on the proportion of equipment prepared or remarketed for reuse and the proportion of equipment prepared for recycling. Traceability and reporting on the reuse and recycling of the refurbished devices during the contract performance (CPC3) can be triggered by blockchain systems (see as an example http://www.usody.com/?page_id=1055). Comments from the GPP survey 2019).

Secure computer sanitisation, reuse and recycling

Some public administrations cover recycling through different framework contracts and are not included in the contracts covering the product purchase. Respondents reported to have applied this TS in some tenders and suggested adding a sentence clearly requesting that data have to be securely erased before the equipment reuse. Also, some stakeholders suggested referring to standards for Asset Disposal services (e.g. ADISA).

Dismantling to facilitate recycling

The respondents offered different opinions, with some considering it challenging and others considering that this should be standard.

Reporting on equipment status

It was mentioned that a product can be stripped for parts. This will result in some parts being reused and some being discarded as waste. Therefore, it is requested that a third category to be added.

Operation of reuse and recycling facilities

It was requested to specify which certificates are needed. It was also stated that no certificate is needed for reuse.

2.4.3.2 Further background after the AHWG meeting and first stakeholder consultation

Secure computer collection, sanitisation, reuse and recycling

One stakeholder pointed out that providing a service for reuse “and” recycling should instead be an “or” criterion. It was suggested later on to refer only to the WEEE Directive instead of including a list in the explanatory note. A second comment refers to a comment on the GPP criteria on data centres and server rooms and suggest using an IT Asset Disposal specialist over manufacturers due to higher reuse rates.

Reply: The proposed criterion aims to go beyond the legal compliance; for this reason, the proposal aims to ensure that the reuse option is provided by the tenderer. Concerning the use of an asset disposal specialist, the criterion proposal goes in this direction because it allows a separate procurement service for end-of-life services.

Reporting on the end-destination of ICT equipment

One comment suggests including the R2 standard on responsible recycling (see <https://sustainableelectronics.org/r2-standard>) and deleting the reference to T30.

Reply: Tenderers as well as purchasers may use a certain flexibility and refer to existing reporting schemes when reporting on reuse and recycling if the key points mentioned in the criterion are respected. GPP criteria explicitly address environmental issues and do not include social criteria as included in the R2 standard. The correct reference has been included (T28 and not T30).

New criterion proposed on packaging material

One stakeholder suggested a new criterion on packaging material including requirements on hazardous substances and the content of recycled material in packaging. It therefore refers to TCO Certified Generation 8, Nordic Label and 2013's Italian Minimum Environmental Criteria.

Reply: In comparison to the ICT products, the packaging is less important in terms of its environmental impact. Against this background and with the aim to keep criteria feasible and to those strictly necessary, no new criterion on packaging was added in the revised version of the GPP criteria.

2.5 Criteria area 5 – Criteria proposals for “refurbished/remanufactured products” (separate procurement route)

2.5.1 Initial background and rationale for the proposed criteria

In criteria area 3, several requirements are listed which public procurement authorities can set as criteria for new IT products to ensure that their product lifetime is extended as much as possible (e.g. design for reparability, reusability and upgradability, quality of the battery, or design for durability). However, another relevant option of facilitating “product lifetime extension” is the procurement and use of refurbished/remanufactured IT equipment.

A second use of IT products can be ensured through:

- a refurbishment / reconditioning process;
- a remanufacturing process;
- preparation for reuse (in the specific case the product has been discarded and is managed according to the WEEE legislation).

As introduced in Section 1.5, in this study “refurbishment” is defined, according to IEEE 1680.1-2018¹⁰⁷ as the “process by which a used electronic product or component is restored to a defined condition in function and form that is comparable to, or better than, a new unit, while not significantly changing the unit’s composition and design”. The standard BS8887-2:2009¹⁰⁸ also provides a similar definition of refurbishment/reconditioning, as process that aims to returns a product to a satisfactory working condition.

Remanufacture aims to return a used product to “at least” its original performance (Cordella et al., 2019; BS8887-2:2009) and, from a customer viewpoint, the remanufactured products can be considered to be the same as the new products. It means that any subsequent warranty is generally at least equal to that of new products.

According to the standard EN45553 “General method for assessing the ability of an energy-related product to be remanufactured”, remanufacturing is an industrial process which produces a product from used products or used parts where at least one change is made which influences the safety, original performance, purpose or type of the product. A note specifies that a products created by the remanufacturing process may be considered a new product when placed on the market, according to the EU Blue Guide for additional information¹⁰⁹. According to Directive 2008/98/EC, preparation for reuse is defined as “checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing”.

According to the initial stakeholder feedback, second-hand IT equipment could be a procurement option in some scenarios (e.g. education). The analysis of voluntary approaches of manufacturers revealed that some manufacturers offer their own refurbished products; see for example Apple’s ‘Certified Refurbished products’¹¹⁰ which are based on full testing to meet the same functional standards as new products and have a 1-year guarantee. This is also the case of Fairphone, which offers ‘Refurbished Products’ (Fairphone 2: New Life Edition)¹¹¹. According to Fairphone, a factory-refurbished product has undergone factory restoration and passed rigorous quality testing at Fairphone production facilities to ensure performance like new. Although the refurbished product might have minor physical marks, such as scratches or blemishes, it is guaranteed that the quality and performance will not be compromised; the refurbished product is also covered by a 2-year warranty. Samsung offers ‘Certified Pre-Owned’¹¹² smartphones: Samsung engineers take the old devices apart, inspect them, replace damaged parts, reassemble them and update the software. Each device must pass more than 400 rigorous tests to make sure it has been returned to its original condition; each Samsung Certified Pre-Owned phone comes with a 12-month warranty, just like Samsung’s new devices. The appliances are packaged with a new charger and headphones. Regarding the software, Microsoft has launched the Microsoft Authorised Refurbisher (MAR) programme, a programme tailored to the needs of large refurbishers’ minimum average threshold of 1 000 PCs shipped per month. Microsoft offers specially priced Microsoft

¹⁰⁷ 1680.1-2018 - IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

¹⁰⁸ BS8887-2:2009 Design for manufacture, assembly, disassembly and end-of-life processing (MADE) Part 2: Terms and definitions

¹⁰⁹ 2016/C 272/01; “Blue Guide”, 2016.

¹¹⁰ <https://www.apple.com/shop/refurbished>

¹¹¹ <https://www.fairphone.com/nl/2019/04/16/refurbished-phones-give-valuable-resources-a-new-life/>

¹¹² <https://www.samsung.com/us/explore/certified-pre-owned-phones/s/Device/>

licences for refurbished computers with a previous Windows operating system Certificate of Authenticity (COA) or a Genuine Microsoft label affixed to the equipment¹¹³.

Furthermore, social enterprises are active in the refurbishment of ICT products. They already tend to source their products from public or private bodies. However, it is very rarely the other way around. According to the experience of RREUSE members, it has been found that only two social enterprises (Promise IT¹¹⁴ in Ireland and Atelier du Bocage¹¹⁵ in France) have provide refurbished ICT equipment to schools, but in the form of donations. Atelier du Bocage's equipment is sold with a minimum warranty of 6 months and provided with after-sales service. They also offer troubleshooting and computer assistance services in order to facilitate the use of digital tools for everyone. They provide customised and optimised solutions for all uses: associations, schools, individuals, VSEs and SMEs. The expert technicians configure the equipment according to the target groups, and install and maintain it. Their activities are certified according to ISO 14001. Promise IT (a project implemented by Rehab Recycle in Ireland) also provide a 6-month warranty. They securely wipe all the data from the hard drives, rebuild the equipment using a Microsoft Operating System, clean it and polish it. Their activities are certified according to ISO 14001.

In cities and regions where such organisations exist, procuring from them or with manufacturers that have developed partnerships with social enterprises could be a way to have a positive impact in both an environmental and social terms. Indeed, these structures provide jobs and training programmes to people at risk of socio-economic exclusion.

The initial criteria proposal (TS8 Refurbished Products, which was not included in the existing 2016 GPP criteria for computers and monitors) requires that a certain percentage of the equipment provided as part of the contract has to be refurbished products, and that minimum requirements in terms of the quality for refurbished products be set. As for verification, it was proposed to ask for details of the refurbished products, including confirmation of compliance with a minimum technical performance level for acceptance specified in the tender specifications. The verification of this criterion might benefit from labelling schemes on the quality of refurbished products.

Table 17. Initial criteria proposal TS8 Refurbished Products (GPP Technical Report Draft V1 November 2019)

	<p>New! TS8 Refurbished Products</p> <p>An X% of the equipment provided as part of the contract must be a refurbished products.</p> <p>Minimum requirements in terms of quality for refurbished products must be set (see the explanatory note for examples).</p> <p>Verification</p> <p>The tenderer must provide details of the products refurbished, including confirmation of compliance with minimum technical performance for acceptance specified in the tender specifications (see the explanatory note below).</p>
<p>Explanatory note: examples of requirements for refurbished ICT products</p> <p>Operating status: in perfect working order and cleanliness</p> <p>Aesthetic grade: micro scratches, invisible to more than 20cm</p> <p>Battery state: new and compatible, with the same technical specifications of the original one</p> <p>Accessories: New and compatible charger, USB cable, headphones.</p> <p>Warranty: a minimum one year extended warranty services offered with the product</p>	

¹¹³ http://download.microsoft.com/download/F/5/C/F5CCA956-A993-4ED6-B7B1-8BDBDAB3423F/MAR_Fact_Sheet_FY1403.pdf

¹¹⁴ <http://www.promiseit.ie/>

¹¹⁵ <http://ateliers-du-bocage.fr/>

2.5.2 Further feedback and background after the AHWG meeting and first stakeholder consultation

Several stakeholders generally supported the inclusion of this criterion, as the potential for refurbished products is very high and very promising in terms of resource savings and product lifetime extension. However, several challenges are highlighted:

- 1) Whether or not a refurbished/remanufactured product should fulfil all the same criteria (including the GPP criteria) as a new product.
- 2) How to ensure/verify that a minimum level of performance is achieved and the durability of the product.
- 3) Whether or not the procurement of a refurbished/remanufactured product should be covered under a separate call for tender.

Regarding point 1), the proposal of the JRC is to delete criterion TS8 from the initial list of GPP criteria, which are mainly targeted at the procurement of new equipment, and to include a separate route for the procurement of refurbished or remanufactured ICT products, describing which GPP criteria would be applicable for refurbished products and which regulation(s) apply.

On point 2) above, according to some stakeholders, the provision of a warranty is enough to guarantee the functionality of the product. The request of additional certifications could represent an unnecessary burden that will prevent the expansion of this market. On the other hand, some remanufacturers consider that the quality of the process should be ensured by the application and compliance with standards such as BS 8887-220:2010.

Regarding point 3), it is proposed that the procurement of refurbished products should usually be covered under a specific tender not associated with the procurement of new products. In this way, small companies which specialise in refurbished products and do not have new products in their portfolio can also take part.

Finally, stakeholders pointed out that refurbished products could be provided by social enterprises, with further social benefits. This aspect is now described above; however, social aspects are not in the scope of the EU GPP criteria and the proposed criteria on refurbished products are based only on the *environmental* benefits.

2.5.3 Revised criteria proposal for the procurement of refurbished/remanufactured products

It was questioned whether refurbished ICT equipment could or should also fulfil all the GPP criteria listed in the areas above.

For the requirements in the **criteria area on Energy Consumption** (Section 2.2), for example, one stakeholder highlighted that Regulation 2017/1369 setting a framework on energy labelling explicitly says that “products that are made available on the Union market for a second or additional time should not be included [under the scope of the Regulation]”. Furthermore, the energy consumption in the use phase of ICT equipment is relatively dependent on the design of the initially new products, which is rarely improvable without changing major components; however, doing so would mean additional resource consumption for integrating new components for improving the appliances’ energy efficiency. As life cycle assessments of computers show, the impact of the resource consumption due to manufacturing of computer components is higher than the impact of the energy consumption during the use phase. Finally, as the main target of procuring refurbished products is the extension of the lifetime of the products, the GPP criteria for refurbished products will not target their energy consumption.

For the requirements in the **criteria area on Hazardous Substances** (Section 2.3), it has to be noted that for refurbished/remanufactured products, generally the legal provisions apply such as the RoHS Directive requirements and the duty to communicate on the content of SVHC according to REACH Article 33.

If refurbished products contain the RoHS restricted substances beyond existing exemptions, then they require their own exemption and it has to be requested. This has been done for medical devices for example (RoHS Directive Annex IV, exemption 31a).

As for GPP criteria going beyond the legal provisions, at the moment the GPP criteria for hazardous substances as described above should not apply to refurbished products. This is meant to support/promote the placing on the market of refurbished products. However, for the next revision of GPP criteria, it must be reassessed whether the criteria on hazardous substances should apply then.

For the requirements in the **criteria area on Product Lifetime Extension**, the following criteria initially proposed for the procurement of new ICT equipment are, with slight adaptations, also applicable to refurbished ICT equipment:

- TS1. Provision of an extended services agreement.
- CPC1. Service Agreement (to be used in conjunction with TS1 on a services agreement).
- TS3. Manufacturer's warranty (in this case refurbisher's/remanufacturer's warranty).
- AC21. ICT Equipment without accessories.

The following criteria, being Technical Specifications for the procurement of new ICT equipment, could be applicable as award criteria for refurbished products, as for example some of the most recently refurbished products are also available with a standardised external power supply or detachable cables. In order to not generally favour these most recent products in the procurement of refurbished ICT, it is recommended to change the following Technical Specifications into award criteria:

- TS15. Standardised External Power Supply.
- TS16. External Power Supply: Detachable Cables.

Finally, the requirements on the quality of the battery of mobile ICT equipment are also relevant for refurbished ICT products:

- TS6. Rechargeable battery endurance.
- TS7. Minimum requirements on the electrical performance.
- AC5. Further rechargeable battery endurance.

However, one stakeholder does not support the proposal in the initial Explanatory Note that batteries and accessories should always be new. These parts should only be replaced if non-functional or where they do not meet the criteria laid out here. The revised proposal takes this argument into consideration by differentiating between refurbished products equipped with a new battery, where the above criteria should also apply, and those with the old battery. If the refurbished products still include the second-hand battery, the above quality criteria should not apply; however, in these cases, information about the quality of the battery should be given.

Core criteria	Comprehensive criteria
<p>SC2 Quality of Refurbishment / Remanufacture Process</p> <p><i>(same for core and comprehensive criteria)</i></p> <p><i>Applicable to the procurement of refurbished/remanufactured products. To be included in a separate procurement route from the one used for brand new products.</i></p> <p>The tenderer must implement quality assurance/quality control procedures to ensure minimum quality of the equipment delivered as part of the contract (see the explanatory note below). Quality assurance and control procedures must cover, as a minimum, the following steps:</p> <ul style="list-style-type: none"> ● Inspection ● Reprocessing (e.g. repair, replace or upgrade) if needed ● Cleaning ● Testing ● Storage ● Packaging and Transport 	

Verification:

The tenderer must provide details of the quality assurance/quality control procedures established to ensure the quality of the equipment delivered as part of the contract.

Third-party certified management systems for refurbishment/remanufacturing according to the following standards (or equivalent) can be accepted as proof of compliance:

- Quality and environmental management systems according to ISO 9001 and ISO 14001/EMAS, including quality assurance/quality control procedures for the steps mentioned above.
- BS 8887-220:2010 - Design for manufacture, assembly, disassembly and end-of-life processing (MADE). The process of remanufacture. Specification (applicable to remanufacture processes).
- BS8887-240:2011 - Design for manufacture, assembly, disassembly and end-of-life processing (MADE). Reconditioning (applicable to refurbished/reconditioned equipment).

EN50614:2020 in case the equipment was previously discarded as WEEE, which has been prepared for re-use for the same purpose for which it was conceived.

Explanatory note: Quality assurance levels

The procurer should establish minimum quality requirements as per the examples below:

- Aesthetic grade: no sign of aesthetic damage should be visible to more than 20 cm.
- Original factory settings: the products must be restored to their original factory settings and must be fully unlocked for use.
- Products must be upgradeable to the latest firmware supported by the OEM (where applicable and technically feasible).
- An instruction manual must be provided. In the absence of physical instruction manuals, a link or reference to the manufacturer's instruction manual should be included, when possible.

TECHNICAL SPECIFICATIONS

TS24 Refurbished / remanufactured product warranty

Applicable to the procurement of refurbished/remanufactured products. To be included in a separate procurement route from the one used for brand new products.

The tenderer must provide products covered by X years [at least 1 year] warranty.

Verification:

The tenderer must provide written evidence of the warranty.

TS24 Refurbished / remanufactured product warranty

Applicable to the procurement of refurbished/remanufactured products. To be included in a separate procurement route from the one used for brand new products

The tenderer must provide products covered by X years [at least 2 years] warranty.

Verification:

The tenderer must provide written evidence of the warranty.

TS25 Rechargeable battery endurance

Applicable to refurbished mobile equipment (laptops, tablets and smartphones) equipped with a new battery.

The battery endurance must be greater than 300 battery cycles (with SoH \geq 80%).

Tests must be carried out according to standard IEC EN 61960-3:2017 or equivalent.

Verification:

Tenderers must provide test results obtained by accredited ISO17025 test bodies according to the IEC EN 61960-3:2017 standard.

Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

TS25 Rechargeable battery endurance

Applicable to refurbished mobile equipment (laptops, tablets and smartphones) equipped with a new battery.

- The battery endurance must be: greater than 500 cycles (with SoH \geq 80%), or
- The battery endurance must be: greater than 300 cycles (with SoH \geq 90%).

Tests must be carried out according to standard IEC EN 61960-3:2017 or equivalent.

Verification:

Tenderers must provide test results obtained by accredited ISO17025 test bodies according to the IEC EN 61960-3:2017 standard.

Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.

TS26 Information on the rechargeable battery endurance

Applicable to refurbished mobile equipment (laptops, tablets and smartphones) equipped with a second-hand battery.

The tenderer must indicate minimum levels of the second-hand battery's State of Health (SoH) in the tender (e.g. SoH > 80%).

Verification:

Tenderers must provide information on the battery SoH for the mobile equipment shipped as part of the contract.

	<p>TS27 Minimum requirements on the electrical performance</p> <p><i>Applicable to refurbished mobile equipment (laptops, tablets and smartphones) equipped with a new battery.</i></p> <p><i>The battery must comply with the electrical test criteria according to the standard IEC EN 61960-3:2017.</i></p> <p><i>Verification:</i></p> <p><i>Tenderers must provide test results obtained by accredited ISO17025 test bodies.</i></p> <p><i>Products holding a relevant Type I Ecolabel fulfilling the specified requirements will be deemed to comply.</i></p>
	<p>TS28 Provision of an extended services agreement</p> <p>The tenderer must provide a minimum of X years [<i>to be defined</i>] services as detailed in the Service Level Requirements document (see explanatory note below).</p> <p>Verification:</p> <p>The tenderer must provide a written declaration that the products supplied will be warrantied in conformity with the contract specifications and the related service level agreement.</p>

Explanatory note: Examples of service level requirements

A Service Level Requirements document describes how the service should be delivered to the customer. Examples of possible service level requirements are listed below:

- Access to the refurbisher/remanufacturer's warranty: register the warranty; manage any documentation or proof required to invoke the warranty; invoke the warranty on behalf of the public administration (during the warranty); follow up with the refurbisher to ensure that the terms of the refurbisher's warranty are met.
- Pick-up and return: pick up the product(s) from a specified location on the public administration's premises and return it/them to a specific location on the public administration's premises. Alternative options for convenient return of products can also be requested.
- Management of failures: provide an efficient single point of contact for technical issues and escalations of problems, a person responsible for following the progress of the case, reports on progress, transparent access to a warranty database (whoever manages this warranty data) to verify warranty status, and incident status for open incidents.
- Access to diagnostic and repair tools: access to all technical tools necessary to perform hardware diagnostics and corrections; access to any technical training required to become a certified repair technician; possibility, through non-exclusivity, to become a certified technical partner (perform warranty repairs).
- Battery coverage: the service explicitly covers battery defects for applicable products with rechargeable batteries, such as failure to charge or a faulty battery connection. A progressive drop in battery capacity due to usage must not be considered a defect unless it is covered by the battery replacement policy in the bullet below.
- Battery replacement policy: the service covers the replacement of batteries that do not fulfil the minimum performance conditions related to endurance in terms of number of cycles (see criteria TS25 and TS26 on rechargeable battery endurance).
- Provision of failure statistics: provision of high-level, aggregated, anonymous and non-traceable statistics on incident types (nature and quantity), problems and diagnostics concerning the products within the scope of the contract.
- Incident management/problem management/preventive maintenance: this service includes all the operations necessary to maintain the ICT products in perfect working order, or to restore a defective product or one of its components to perfect working order, including incident management, problem management and preventive maintenance. Preventive maintenance during the warranty period includes ensuring OS and security updates for the duration of the contract.
- Upgrading: a scan for upgrading possibilities can take place after a certain period (e.g. 3 years) and cover performance aspects like CPU/Memory/Disk.
- Repair/replacement activities: repair or replace any products which become damaged or defective in the course of normal use during the extended warranty period with products which have identical or better performance characteristics. Breakdowns related to firmware are also covered. If part of an item is replaced, the replacement part must be covered by the same level and duration of extended warranty as the part that has been replaced. The extended warranty applies to both hardware and software, unless explicitly agreed otherwise.
- Commitment to repair/upgrade as first remedy: in the event of failures and, whenever technically feasible, the service provider commits to provide the option of repairing/upgrading the equipment instead of substituting it.

AWARD CRITERIA	
	<p>AC11. Further rechargeable battery endurance</p> <p><i>Applicable to refurbished mobile equipment (laptops, tablets and smartphones) equipped with a <u>new</u> battery.</i></p> <p>Additional points will be awarded if the battery endurance is greater than 500 cycles (with ≥80% capacity retention of the initial rated capacity) proportionally to the additional number of cycles ensured.</p> <p>Verification:</p> <p>Tests must be carried out according to the standard IEC EN 61960-3:2017. Tenderers must provide test results obtained by accredited ISO17025 test bodies.</p>
	<p>AC12 Standardised External Power Supply</p> <p><i>Applicable to portable computing devices with power supplies up to 100 W.</i></p> <p><i>This is not applicable to products with only Qi charging capability (e.g. for strong resistance to immersion into water or to dust, such as industrial computers).</i></p> <p>Additional points will be awarded if the equipment delivered as part of the contract carries a USB Type C standardised receptacle for power delivery (PD) according to the standard EN/IEC 63002:2017.</p> <p>If the product does not have a built-in USB PD receptacle, then an adapter must be available to be ordered at no additional costs.</p> <p>Verification:</p> <p>The tenderer must provide a product manual for each model provided, which must include an exploded diagram of the device illustrating the types of receptacle used for power delivery.</p>
<p>EXPLANATORY NOTE: Standardised External Power Supply</p> <p>Interoperability guidelines for external power supplies are defined according to the IEC 63002:2016 - Identification and communication interoperability method for external power supplies used with portable computing devices.</p>	
	<p>AC13 External Power Supply: Detachable Cables</p> <p>Additional points will be awarded if the External Power Supply (EPS) configuration consists of an EPS with a detachable input cable (or integrated in the EPS housing) and a detachable output cable to the ICT device</p> <p>Verification:</p> <p>The tenderer must provide a product manual for each model provided, which must include an exploded diagram of the device illustrating the types of EPS used.</p>
CONTRACT PERFORMANCE CLAUSE	
	<p>CPC3 Service Agreement</p> <p><i>Applies to the procurement of refurbished/remanufactured products. To be included in a separate procurement route from the one used for brand new products.</i></p> <p><i>To be used in conjunction with criterion TS28 on provision of an extended service agreement.</i></p>

	The tenderer must provide periodic [frequency to be agreed between the procurer and supplier] reporting on their compliance with all the metrics, Key Performance Indicators and other indicators defined by the service level agreement.
<p>Explanatory note: Examples of Key Performance Indicators</p> <p>Aggregate KPI 1 – Incident solved: number of incidents resolved within the incident resolution time during a month / total number of incidents opened during the given month or opened during a previous month and still pending. Monthly target: ≥90%.</p> <p>Aggregate KPI 2 – Commitment to repair as first remedy: number of incidents resolved within a product repair or upgrade / number of incidents resolved within a product replacement.</p>	

2.5.4 Further feedback and background after the second stakeholder consultation

As a general comment, social aspects in the supply chain for refurbished/remanufactured products are considered to a relevant topic by all the stakeholders. Also, in this case it is suggested to take into consideration social aspects when setting procurement criteria.

OEMs suggest building the definition of *refurbished* and *remanufactured* on an international standard. Moreover, it is suggested to make reference to IEEE Std 1680.1 for the definition of refurbishment “*as the process by which a used electronic product or component is restored to a defined condition in function and form that is comparable to, or better than, a new unit, while not significantly changing the unit’s composition and design*”.

A Member State representative considers that a minimum share of refurbished products should be maintained, as a TS or CPC, in tenders for new products for the following reasons: it is very unusual for a tenderer to issue a specific tender to buy only refurbished products; the demand for refurbished products must be increased in order to stimulate the offer. The JRC considers that separate tenders allow small companies that are specialised in refurbished products and that do not have new products in their portfolio to take part in the procurement process.

Regarding fully unlocking products for reuse, it is commented that this might not be possible for all products since some customers (first-time users) add software ID tags with software from a vendor that does not have in place collaborations with the service providers at the time of retiring the products.

It is suggested to create a separate award criterion for refurbished products, or at least delete the provision of firmware upgradeability. A stakeholder suggested adding the wording “*where technically feasible*” and this suggestion is accepted.

Regarding warranty, it was suggested to set a core and a comprehensive level. A stakeholder recommended specifying 6 months instead of 1 year because it is considered difficult for refurbishers to provide longer warranties: computers and smartphones might not work anymore because of updates that cannot be implemented and the refurbishers do not have control over these aspects. The same stakeholder considers that once ecodesign measures on the upgradeability of ICT products are developed, this minimum warranty could be revised to 1 year. The JRC is of the opinion that a very short lifetime of refurbished products would reduce the environmental benefits and increase the costs for the procurers. Moreover, in several EU countries a 1-year legal guarantee is mandatory for second-hand products¹¹⁶. Therefore this should be the minimum applicable warranty. Similar comments for new products were provided for the battery endurance.

¹¹⁶ An overview of notifications received by the Commission regarding provisions going beyond Article 5(1) to (3) and Article 7(1) of Directive 1999/44/EC (the Consumer Sales and Guarantees Directive) is available at https://ec.europa.eu/info/article-8a-consumer-sales-and-guarantees-directive_en

3 GUIDANCE: CRITERIA APPLICABILITY AND PRIORITIES FOR THE DIFFERENT PRODUCT GROUPS IN THE SCOPE

Some stakeholders providing feedback at the AHWG meeting and the following stakeholder consultation asked the JRC to provide better guidance and orientation for procurers on the most relevant criteria among the long list of GPP criteria in the four areas on energy consumption, hazardous substances, product lifetime extension, and end-of-life management.

Following this proposal, in a first step, the long list of GPP criteria has been filtered to show which of the criteria are applicable to the respective subgroups of the ICT devices within the scope.

3.1 Applicability of criteria for the different product groups in the scope

3.1.1 Stationary ICT devices (computers, computer displays)

3.1.1.1 Stationary computers

Table 18 shows the GPP criteria applicable to stationary computers, i.e. desktop computers, all-in-one computers or integrated desktop computers, desktop thin clients and desktop workstations. The criteria focus on all four of the areas identified: product lifetime extension, energy efficiency, hazardous substances and end-of-life management.

Table 18. GPP criteria applicable to stationary computers

Criteria Level: Core	Criteria Level: Comprehensive	Type of GPP criteria
TS1 Provision of an extended services		Technical Specification
TS2 Continued availability of spare parts		Technical Specification
TS3 Manufacturer's warranty		Technical Specification
TS4 Design for reparability	TS4. Design for reparability	Technical Specification
TS5 Functionality for secure data deletion		Technical Specification
CPC1 Service Agreement (to be used in conjunction with the TS1)		Contract Performance Clause
TS14 Standardized port		Technical Specification
---	TS16 External Power Supply: Detachable Cables	Technical Specification
---	TS17 Backward compatibility: adapters	Technical Specification
TS18 Minimum Energy performance for computers	TS18 Minimum Energy performance for computers	Technical Specification
---	TS20 Thin Client devices in a server based environment	Technical Specification
AC5 Improvement in the energy consumption upon the specified Energy consumption threshold for computers	AC5 Improvement in the energy consumption upon the specified Energy consumption threshold for computers	Award Criterion
---	SC1. Substance controls	Selection Criterion
TS21 Restriction of halogenated substances in plastic parts		Technical Specification
---	AC3. Restriction of Substances of Very High Concern	Award Criterion
---	AC4. Avoidance of regrettable substitution	Award Criterion
---	TS22 Marking of plastic casings, enclosures and bezels	Technical Specification
---	AC10 Recyclability of plastics casings, enclosures and bezels – paints and coatings	Award Criterion
TS23 Secure computer collection, sanitisation, re-use and recycling		Technical Specification
CPC2 Reporting on the end-destination of ICT equipment		Contract Performance Clause

3.1.1.2 Computer displays

Table 19 shows the GPP criteria applicable to computer displays. Similarly to desktop computers, the focus is relatively balanced across the four criteria areas identified.

Table 19. GPP criteria applicable to computer displays

Criteria Level: Core	Criteria Level: Comprehensive	Type of GPP criteria
TS1 Provision of an extended services		Technical Specification
TS2 Continued availability of spare parts		Technical Specification
TS3 Manufacturer's warranty		Technical Specification
TS4 Design for reparability	TS4. Design for reparability	Technical Specification
CPC1 Service Agreement (to be used in conjunction with the TS1)		Contract Performance Clause
TS19 Minimum Energy performance of monitors	TS19 Minimum Energy performance of monitors	Technical Specification
AC6 Improvement in the energy consumption upon the specified Energy consumption threshold for monitors	AC6 Improvement in the energy consumption upon the specified Energy consumption threshold for monitors	Award Criterion
---	SC1. Substance controls	Selection Criterion
TS21 Restriction of halogenated substances	in plastic parts	Technical Specification
---	AC3. Restriction of Substances of Very High Concern	Award Criterion
---	AC4. Avoidance of regrettable substitution	Award Criterion
---	TS22 Marking of plastic casings, enclosures and bezels	Technical Specification
---	AC10 Recyclability of plastics casings, enclosures and bezels – paints and coatings	Award Criterion
TS23 Secure computer collection, sanitation, re-use and recycling		Technical Specification
CPC2 Reporting on the end-destination of ICT equipment		Contract Performance Clause

3.1.2 Mobile ICT devices

3.1.2.1 Portable computers (notebooks, two-in-one notebooks, mobile thin clients)

Table 20 shows the GPP criteria applicable to mobile computers, i.e. notebooks, two-in-one notebooks and mobile thin clients. In order to increase the overall product lifetime of portable computers, the focus of the criteria covers battery endurance and stress resistance. Also, the extended services agreement and/or manufacturer's warranty, design for reparability and continued availability of spare parts as well as interoperability and reusability of components (standardised ports, detachable cables, adapters) apply.

Table 20. GPP criteria applicable to portable computers

Criteria Level: Core	Criteria Level: Comprehensive	Type of GPP criteria
TS1 Provision of an extended services		Technical Specification
TS2 Continued availability of spare parts		Technical Specification
TS3 Manufacturer's warranty		Technical Specification
TS4 Design for reparability	TS4. Design for reparability	Technical Specification
TS5 Functionality for secure data deletion		Technical Specification
CPC1 Service Agreement (to be used in conjunction with the TS1)		Contract Performance Clause
TS6 Rechargeable battery endurance	TS6. Rechargeable battery endurance	Technical Specification
---	TS7. Minimum requirements on the electrical performance	Technical Specification
TS8 Information on battery state of health		Technical Specification
---	TS10 Battery protection software	Technical Specification
---	AC1 Further rechargeable battery endurance	Award Criterion
TS11 Drop testing		Technical Specification
---	TS12 Temperature stress	Technical Specification
---	TS13 Ingress protection level – Semi Rugged and Rugged Devices	Technical Specification
AC2 Mobile equipment durability testing		Award Criterion
AC3 Ingress protection level - Semi rugged / rugged devices		Award Criterion
TS14 Standardized port		Technical Specification
---	TS15 Standardized External Power Supply	Technical Specification
---	TS16 External Power Supply: Detachable Cables	Technical Specification
---	TS17 Backward compatibility: adapters	Technical Specification
---	AC4 ICT Equipment without accessories	Award Criterion
TS18 Minimum Energy performance for computers	TS18 Minimum Energy performance for computers	Technical Specification
---	TS20 Thin Client devices in a server based environment	Technical Specification
AC5 Improvement in the energy consumption upon the specified Energy consumption threshold for computers	AC5 Improvement in the energy consumption upon the specified Energy consumption threshold for computers	Award Criterion
---	SC1. Substance controls	Selection Criterion
TS21 Restriction of halogenated substances in plastic parts		Technical Specification
---	AC3. Restriction of Substances of Very High Concern	Award Criterion
---	AC4. Avoidance of regrettable substitution	Award Criterion
TS23 Secure computer collection, sanitisation, re-use and recycling		Technical Specification
CPC2 Reporting on the end-destination of ICT equipment		Contract Performance Clause

3.1.2.2 Tablet computers and smartphones

Table 21 shows the GPP criteria applicable to tablet computers and smartphones. In general, they are the same as for mobile computers (notebooks, two-in-one notebooks and mobile thin clients), with a focus on increasing the overall product lifetime through several quality requirements for the rechargeable battery and the battery's state of health as well as durability testing. Also, the extended services agreement and/or manufacturer's warranty, design for reparability and continued availability of spare parts as well as interoperability and reusability of components (standardised ports, detachable cables, adapters) apply. For portable computers, facilitating the end-of-life management through improved recyclability of the appliances is also possible. For tablet computers and smartphones, GPP criteria on energy consumption / efficiency are not applied as the efficiency of these devices is considered less relevant in terms of life cycle impacts and already optimised by the manufacturers.

Table 21. GPP criteria applicable to tablet computers and smartphones

Criteria Level: Core	Criteria Level: Comprehensive	Type of GPP criteria
TS1 Provision of an extended services		Technical Specification
TS2 Continued availability of spare parts		Technical Specification
TS3 Manufacturer's warranty		Technical Specification
TS4 Design for reparability	TS4. Design for reparability	Technical Specification
TS5 Functionality for secure data deletion		Technical Specification
CPC1 Service Agreement (to be used in conjunction with the TS1)		Contract Performance Clause
TS6 Rechargeable battery endurance	TS6. Rechargeable battery endurance	Technical Specification
---	TS7. Minimum requirements on the electrical performance	Technical Specification
TS8 Information on battery state of health		Technical Specification
---	TS10 Battery protection software	Technical Specification
---	AC1 Further rechargeable battery endurance	Award Criterion
TS11 Drop testing		Technical Specification
---	TS12 Temperature stress	Technical Specification
---	TS13 Ingress protection level – Semi Rugged and Rugged Devices	Technical Specification
AC2 Mobile equipment durability testing		Award Criterion
AC3 Ingress protection level - Semi rugged / rugged devices		Award Criterion
TS14 Standardized port		Technical Specification
---	TS15 Standardized External Power Supply	Technical Specification
---	TS16 External Power Supply: Detachable Cables	Technical Specification
---	AC4 ICT Equipment without accessories	Award Criterion
---	SC1. Substance controls	Selection Criterion
TS21 Restriction of halogenated substances in plastic parts		Technical Specification
---	AC3. Restriction of Substances of Very High Concern	Award Criterion
---	AC4. Avoidance of regrettable substitution	Award Criterion
TS23 Secure computer collection, sanitisation, re-use and recycling		Technical Specification
CPC2 Reporting on the end-destination of ICT equipment		Contract Performance Clause

3.2 Use of labels as means of proof

According to Article 43 of the Procurement Directive¹¹⁷, where contracting authorities intend to purchase works, supplies or services with specific environmental, social or other characteristics, they may require a specific label **as means of proof** that the works, services or supplies correspond to the required characteristics. These labels must fulfil the conditions (a-e) of Article 43. It is important to note that contracting authorities requiring a specific label shall accept all labels that confirm that the works, supplies or services meet equivalent label requirements to those specified in Article 43.

Table 22, Table 23, Table 24 and Table 25 include a non-exhaustive list of labels applicable as means of proof for the EU GPP criteria. Ideally, the use of these labels as means of proof should reduce the verification burdens for public authorities. This table is based on the analysis of labels performed as part of the [Preliminary Report](#) to this study. Where labels able to ensure the fulfilment of the criteria are not identified, test reports or other documents can still be used as proof of compliance as described in the text of the proposed criteria.

It should be noted that at the time of the drafting this report (June 2020), only Energy Star, TCO Certified and EPEAT have a relevant number of products labelled/registered, with a relatively limited number of labelled products under the categories “Tablets” and “Smartphones”. Moreover, the new [EU Ecolabel for Displays](#) can be used in the future as a means of proof for some of the criteria applicable to displays.

The availability of labelled products can be verified directly through the product finder tools available at the following websites:

- EU Ecolabel: <http://ec.europa.eu/ecat/>
- Energy Star: <https://www.energystar.gov/productfinder/>
- TCO Certified: <https://tcocertified.com/product-finder>
- EPEAT <https://epeat.net/>
- BLUE Angel <https://www.blauer-engel.de/en/products/electric-devices/computers-and-keyboards>
- Nordic Swan: <https://www.svanen.se/en/search-for-ecolabelled-products-and-services/?productgroup=030>

This applicability analysis is limited to the current version of the labels at the time of drafting of this report, as specified in the verification requirements of each criterion and in particular:

- TCO Certified Generation 8;
- EPEAT Computers and Displays Category criteria [based on IEEE 1680.1™ – 2018 Standard for Environmental and Social Responsibility Assessment of Computers and Displays]¹¹⁸ and following Amendment 1: Editorial and Technical Corrections and Clarifications [IEEE 1680.1a™ – 2020];
- EPEAT Mobile Phones [based on the UL 110 Standard for Sustainability for Mobile Phones (Second Edition, Dated March 24, 2017 (including revisions through September 28, 2018))63];
- Blue Angel Computer and Keyboards (DE-UZ 78);
- Blue Angel for Mobile Phones (DE-UZ 106);
- Nordic Swan Ecolabel for rechargeable batteries and portable chargers, Version 5.0.

¹¹⁷ Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement

¹¹⁸ An amendment for Editorial and Technical Corrections and Clarifications was published in 2020: EPEAT Computers and Displays Category criteria [based on 1680.1a-2020 – IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays–Amendment 1: Editorial and Technical Corrections and Clarifications].

Table 22. Applicability of labels as means of proof for the Product Lifetime Extension Criteria

























	Desktop Computer		Notebook Computers		Tablets and Smartphones		Computer Monitors	
	Core	Comprehensive	Core	Comprehensive	Core	Comprehensive	Core	Comprehensive
PRODUCT LIFETIME EXTENSION								
TS1 Provision of an extended services agreement	Service Contract							
TS2 Continued availability of spare parts	Service Contract							
CPC1 Service Agreement	Service Contract							
TS3 Manufacturer's warranty	Manufacturer Warranty							
T4 Design for reparability	 Note	 Service / repair manual	 Note	 Service / repair manual	 Note	 Service / repair manual	 	
TS5 Functionality for secure data deletion							Not applicable	
TS6 Rechargeable battery endurance	Not applicable		 Note1	 Note2	 Note 6	 Note 7	Not applicable	
TS7 Minimum requirements on the electrical performance	Not applicable		IEC 61960-3 Test Report				Not applicable	
TS8 Information on battery state of health	Not applicable				Not applicable	Software specifications	Not applicable	
TS9 Battery protection software	Not applicable				Not applicable	Software specifications	Not applicable	
TS10 Intelligent Charging								
AC1 Further rechargeable battery endurance	Not applicable		IEC 61960-3 Test Report				Not applicable	
TS11 Drop testing	Not applicable						Not applicable	
TS12 Temperature Stress	Not applicable						Not applicable	
TS13 Ingress protection level Ingress protection level – Semi Rugged and Rugged Devices	Not applicable		* IEC/EN 60529:2013, Degrees of Protection Provided by Enclosures (IP Code), or * MIL-STD-810H 510.7 – Procedure I - Sand and Dust – Blowing Dust and MIL-STD-810H 506.6 – , Procedure I Rain				Not applicable	
AC2 Mobile equipment durability testing	Not applicable		IEC 60068, US MIL810H				Not applicable	
AC3 Ingress Protection Level – Semi Rugged and Rugged Devices	Not applicable		IEC/EN 60529:2013				Not applicable	
TS13 Standardized port								
TS15 Standardized External Power Supply	Not applicable		Not applicable	EN/IEC 63002:2017	Not applicable	Product Specifications	Not applicable	
TS16 External Power Supply: Detachable Cables	Not applicable		Not applicable	Product Specifications	Not applicable	Product Specifications	Not applicable	
TS17 Backward compatibility: adapters	Not applicable		Not applicable	Product Specifications	Not applicable	Product Specifications	Not applicable	
AC4 ICT Equipment without accessories	Not applicable		Not applicable	Product Specifications	Not applicable	Product Specifications	Not applicable	
Note1: EPEAT for Computers and Displays is acceptable as proof of compliance if the device fulfill the optional criteria 4.4.2.5 (Product upgradeability and reparability) and 4.4.2.2 (Publicly available service information) in the area or Member State								
Note 2: TCO Certified Generation 8 is acceptable if the certificate shows compliance with 80% SoH retention								
Note 3: TCO Certified Generation 8 is acceptable if the certificate shows compliance with 90% SoH retention								

Table 23. Applicability of labels as means of proof for the Energy Efficiency Criteria
















	Desktop Computer		Notebook Computers		Tablets and Smartphones		Computer Monitors	
	Core	Comprehensive	Core	Comprehensive	Core	Comprehensive	Core	Comprehensive
TS18 Minimum Energy performance for computers		  			Not applicable			
TS19 Minimum Energy Performance of Monitors				Not Applicable			 CLASS A-D	 
TS20 Thin Client devices in a server based environment	Not Applicable	  			Not Applicable			
AC5 Improvement in the energy consumption upon the specified Energy consumption threshold for computers	Not Applicable	  			Not Applicable			
AC6 Improvement in the energy consumption upon the specified Energy Consumption threshold for monitors				Not Applicable			 CLASS A-C	 

Table 24. Applicability of labels as means of proof for the Hazardous Substances Criteria

















Criterion	Desktop Computer		Notebook Computers		Smartphones and Tablets		Computer Monitors		
	Core	Comp	Core	Comp	Core	Comp	Core	Comp	
HAZARDOUS SUBSTANCES									
SC1 Restricted Substance controls	IEC 62476 / IEC 62474 or IPC1752								
TS5. Restriction of halogenated substances in plastic parts	   Note 3								
AC3 Restriction of Substances of Very High Concern	 Note 4						Not Applicable	  Note 4	
AC4 Avoidance of Re-grattable Substitutions	 						Not Applicable	  Note 5	
Note 3: in case in using EPEAT for smartphones the optional criterion 9.2.3 Restriction of Bromine must be fulfilled									
Note 4: in case of using EPEAT the device must fulfill the optional criterion 4.1.6.2									
Note 5: in case of using EPEAT the device must fulfill the optional criterion 4.1.8.1									

Table 25. Applicability of labels as means of proof for the End-of-Life Criteria

Criterion	Desktop Computers		Notebook Computers		Smartphones and Tablets		Computer Monitors	
	Core	Comp	Core	Compe	Core	Comp	Core	Comp
END OF LIFE								
TS22 Marking of plastic casings, enclosures and bezels	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
AC9 Recyclability of plastics casings, enclosures and bezels - separable inserts and fasteners	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
AC10 Recyclability of plastics casings, enclosures and bezels - paints and coatings	Not applicable		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
TS23 Secure computer collection, sanitisation, re-use and recycling	Service Contract							
CP2 Reporting on the end-destination of ICT equipment	Service Contract							

Annexes

Annex 1: Battery testing according to IEC EN 61960-3:2017

Parameter	Description	Battery Acceptance Criteria
Discharge performance at 20 °C (Rated Capacity)	This test verifies the rated capacity of the battery.	100% of the rated capacity (C5 Ah) ¹¹⁹
Discharge performance at -20 °C (Rated Capacity)	This test determines the capacity of the battery at low temperatures	30% of the rated capacity (C5 Ah)
High rate discharge performance at 20 °C	This test determines the capacity of the battery when discharged at high rate. This test is not required if the battery is not designed to be used at this rate (1 ItA)	60% of the rated capacity (C5 Ah)
Charge (capacity) retention and recovery	This test determines firstly the capacity which a battery retain after a storage for an extended period of time (28 days) and secondly the capacity that can be recovered by a subsequent recharge.	60% of the rated capacity (C5 Ah)
Charge (capacity) retention after long term storage	This test determines the capacity of a battery after extended storage (90 days) at 50% state of charge, followed by a subsequent charge	85% of the rated capacity (C5 Ah)
Endurance in cycles	This test determines the number of charge/discharge cycles which a battery can endure before its capacity has been significantly depleted.	60% of the rated capacity (C5 Ah) after 300 cycles
Electrostatic discharge	This test is to evaluate the ability of a battery to with stand electrostatic discharge.	Operational

¹¹⁹ Amount of electricity declared by the manufacturer that a cell can deliver in a 5-hour period.

Annex 2: Durability tests for mobile equipment

Test	Test method	Minimum thresholds		Functional performance requirements
Accidental drop	IEC 60068 Part 2-31 (Freefall, procedure 1) OR MIL-STD-810G w/CHANGE 1 Drop test: Method 516.7 - Shock (procedure IV) OR MIL-STD-810H Method 516.8 - Shock (Procedure IV)	CORE CRITERIA The notebook or tablet must be dropped from: a minimum of 45 cm (modified drop test height) of height onto a non-yielding surface. A minimum of one drop must be made on each bottom side and each bottom corner.	AWARD CRITERIA The notebook or tablet must be dropped from: a minimum of 76 cm (30 inches ¹²⁰) of height onto a non-yielding surface. A minimum of one drop must be made on each bottom side and each bottom corner.	After exposure to any of the specified stress tests, the product should be able to: 1. Boot up and operate normally: ● Boot or resume should not exceed 50% greater time increase as a result of the test. ● No noticeable operational faults when using standard software applications. ● No major damage to the product that does not allow for standard usage. 2. Not create hazards to end user. ● No case or display cracking or other sharp points created from failures that could injure a user. ● No electrical component failures or access that could result in a user safety issue.
Temperature stress	IEC 60068 Part 2-1: A Cold Part 2-2: B Dry Heat OR MIL-STD-810G w/CHANGE 1 High temperature: Method 501.6 - Basic Hot (A2) Low temperature: Method 502.6 - Basic Cold (C1) OR MIL-STD-810H Method 501.7 - High temperature - Basic Hot (A2) Method 502.7 -Low temperature - - Basic Cold (C1)	The mobile equipment must be subjected to test cycles of a minimum of 48 hours exposure for storage temperature at: ● High temperature Storage ≥ 60 ° C ● Low temperature Storage ≤ -30 ° C The mobile equipment must be subjected to test cycles of a minimum of 4 hours for operational temperature at: ● Operational temperature ≥ 40 ° C ● Operational temperature ≤ -20 ° C		
Screen resilience	The test equipment and setup used must be confirmed by the tenderer. Applicable test standards include: ISO 1518-1:2019 Paints and varnishes — Determination of scratch resistance — Part 1:		With the product placed on a flat surface two loading tests must be carried out: A minimum load of 50kg must be evenly applied to the screen lid (for notebooks) or screen (for tablets). A minimum load of 25kg must be applied to a point at the	

¹²⁰ US Department of Defence standard MIL-STD-810G Method 516.6 Procedure IV 'Transit drop test'

Test	Test method	Minimum thresholds		Functional performance requirements
	Constant-loading method. ISO 1518-2:2019 Paints and varnishes — Determination of scratch resistance — Part 2: Variable-loading method. ASTM C1895 – 19 using a hardness test pencil equipped with a spiral spring and a carbide ball tip of 1 mm diameter (in accordance with ISO 1518).		centre of screen with a diameter of approximately 3cm.	
Resistance to shock	IEC 60068 Part 2-27: Test Ea and guidance: Shock. Part 2-47: Test - Mounting of specimens for vibration, impact and similar dynamic tests.		A minimum of a 40G peak half-sine wave pulse must be applied three times for a duration of a minimum of 6 ms to the top, bottom, right, left, front and rear side of the product.	
Resistance to vibration	IEC 60068 Part 2-6: Test Fc: Vibration (sinusoidal). Part 2-47: Test - Mounting of specimens for vibration, impact and similar dynamic tests.		Minimum specification: Randomised sinusoidal vibrations in the frequency range 5Hz up to a minimum of 250Hz must be applied for a minimum of 1 sweep cycle to the end of each axis of the top, bottom, right, left, front and back of the product.	
Dust ingress protection	IEC 60529, Degree of Protection provided by Enclosures or MIL-STD-810G Method 510.5, Procedure I Sand and dust - Blowing dust or MIL-STD-810H 510.7 – Procedure I - Sand and Dust – Blowing Dust.		IP-6x - No ingress of dust; complete protection against contact.	
Water ingress protection	IEC 60529, Degree of Protection provided by Enclosures or MIL-STD-810G, Method 506.5 Procedure I Rain and blowing rain Or MIL-STD-810H 506.6 Procedure I Rain.		IP-x5 - Water is projected in jets against the enclosure from any direction with no harmful effects.	

Annex 3: Minimum energy performance for computers (based on Energy Star for Computers, Specification 7.1)

Calculated Typical Energy Consumption (E_{TEC}) for Desktop, Integrated Desktop, and Notebook Computers shall be less than or equal to the maximum TEC (E_{TEC_MAX}) as calculated below:

(E_{TEC_MAX}) per Equation below:

$$E_{TEC_MAX} = (1 + ALLOWANCE_{PSU}) \times (TEC_{BASE} + TEC_{MEMORY} + TEC_{GRAPHICS} + TEC_{STORAGE} + TEC_{INT_DISPLAY} + TEC_{SWITCHABLE} + TEC_{EEE} + TEC_{MOBILEWORKSTATIONS})$$

Where:

- $ALLOWANCE_{PSU}$ is an allowance provided to power supplies that meet the optional more stringent efficiency levels specified in Table 26; power supplies that do not meet the requirements receive an allowance of 0;
- TEC_{BASE} is the Base allowance specified in Table 27; and
- $TEC_{GRAPHICS}$ is the discrete graphics allowance as specified in Table 27, with the exception of systems with integrated graphics, which do not receive an allowance, or Desktops and Integrated Desktops with switchable graphics enabled by default, which receive an allowance through $TEC_{SWITCHABLE}$; and
- TEC_{MEMORY} , $TEC_{STORAGE}$, $TEC_{INT_DISPLAY}$, $TEC_{SWITCHABLE}$, TEC_{EEE} and $TEC_{MOBILEWORKSTATIONS}$ are adder allowances as specified in Table 28.

Table 26. Power Supply Efficiency Allowance

Power Type	Supply	Computer Type	Minimum Efficiency at Specified Proportion of Rated Output Current				Minimum Average Efficiency	Allowance _{PSU}
			10%	20%	50%	100%		
IPS	Desktop		0.86	0.90	0.92	0.89	-	0.015
			0.90	0.92	0.94	0.90	-	0.03
	Integrated Desktop		0.86	0.90	0.92	0.89	-	0.015
			0.90	0.92	0.94	0.90	-	0.04

Table 27. Base TEC (TEC_{BASE}) Allowances for Desktops or Integrated Desktops and Notebooks

Category Name	Graphic Capability	Desktop or Integrated Desktop	
		Performance Score, P	Base Allowance
0	Any Graphics dGfx≤G7	P≤3	69.0
I1	Integrated or Switchable Graphics	3<P≤6	112.0
I2		6<P≤7	120.0
I3		P>7	135.0
D1	Discrete Graphics dGfx≤G7	3<P≤9	115.0
D2		P>9	135.0
Category Name		Notebooks	
		Performance Score, P	Base Allowance
0		P≤2	6.5
I1		2<P≤5.2	22.0
I2		5.2<P≤8	8.0
I3		P>8	14.0

Table 28. Functional Adder Allowances for Desktop, Integrated Desktop, and Notebook Computers

Function		Desktop	Integrated Desktop	Notebook
TEC _{MEMORY} (kWh) vi		0.8		2.4 + (0.294 x GB)
TEC _{GRAPHICS} (kWh) vii	Graphics Category VIII	G1 (FB_BW ≤ 16)	36	29.3 x tanh (0.0038 x FB_BW - 0.137) + 13.4
		G2 (16 < FB_BW ≤ 32)	51	
		G3 (32 < FB_BW ≤ 64)	64	
		G4 (64 < FB_BW ≤ 96)	83	
		G5 (96 < FB_BW ≤ 128)	105	
		G6 (FB_BW > 128; Frame Buffer Data Width < 192 bits)	115	
		G7 (FB_BW > 128; Frame Buffer Data Width ≥ 192 bits)	130	
TEC _{SWITCHABLE} (kWh)		0.5 x G1		N/A
TEC _{EEE} (kWh) x		8.76 x 0.2 x (0.15 + 0.35)		8.76 x 0.2 x (0.10 + 0.30)
TEC _{STORAGE} (kWh) xi		26		2.6
TEC _{INT_DISPLAY} (kWh) xii		N/A	8.76 x 0.35 x (1+EP) x (4xr + 0.05 x A)	8.76 x 0.30 x (1+EP) x (2 x r + 0.02 x A)
TEC _{MOBILEWORKSTATION} (kWh) xii		N/A		4.0

Equation 1. Calculation of Allowance for Enhanced-performance Integrated Displays

$$EP = \begin{cases} 0 & \text{No Enhanced Power Displays} \\ 0.3 & \text{Enhanced Performance Display } d < 27 \\ 0.75 & \text{Enhanced Performance Display } d \geq 27 \end{cases}$$

Where:

- vi TEC_{MEMORY} Adder: Applies per GB installed in the system.
- vii TEC_{GRAPHICS} Adder: Applies to only the first dGfx installed in the system, but not Switchable Graphics.
- viii FB_BW: Is the display frame buffer bandwidth in gigabytes per second (GB/s). This is a manufacturer declared parameter and should be calculated as follows: (Data Rate [Mhz] × Frame Buffer Data Width [bits]) / (8 × 1000).
- ix TEC_{SWITCHABLE} Incentive: Applies to automated switching that is enabled by default in Desktops and Integrated Desktops.

- x TEC_{EEE} : Applies per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.
- xi $TEC_{STORAGE}$ Adder: Applies once if system has more than one Additional Internal Storage element.
- xii $TEC_{INT_DISPLAY}$ Adder: EP is the Enhanced Performance Display allowance calculated per Table 28; r is the Screen resolution in megapixels; and A is viewable screen area in square inches.

Calculation of E_{TEC_MAX} for Thin Clients

- $E_{TEC_MAX} = TEC_{BASE} + TEC_{GRAPHICS} + TEC_{WOL} + TEC_{INT_DISPLAY} + TEC_{EEE}$

Where:

- TEC_{BASE} is the Base Allowance specified in Table 29;
- $TEC_{GRAPHICS}$ is the Discrete Graphics allowance specified in Table 29, if applicable;
- TEC_{WOL} is the Wake-on-LAN allowance specified in Table 29, if applicable;
- $TEC_{INT_DISPLAY}$ is the Integrated Display allowance for Integrated Desktops specified in Table 28, if applicable; and
- TEC_{EEE} is the Energy Efficiency Ethernet incentive for Desktops specified in Table 28, if applicable, per IEEE 802.3az-compliant (Energy Efficient Ethernet) Gigabit Ethernet port.

Table 29. Adder Allowances for Thin Clients

Adder	Allowance (kWh)
TEC_{BASE}	31
$TEC_{GRAPHICS}$	36
TEC_{WOL}	2

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