Explanatory Memorandum for the Ecodesign Consultation Forum

Ecodesign and Energy Labelling – Mobile phones, cordless phones and tablets

1. CONTEXT OF THE PROPOSAL

1.1 Grounds for and objectives of the proposal

The Ecodesign Directive 2009/125/EC[1] establishes a framework for the setting of ecodesign requirements for energy-related products at EU level. It is a key instrument of the union policy for improving the energy and other environmental aspects of products placed on the market or put into service in the European Economic Area (EEA). It is an important instrument for achieving the EU energy savings objectives for 2030, and it is also expected to contribute significantly to the transition towards a more circular economy, as expressed in the Circular Economy action plan 2015[2] and the Circular Economy action plan 2020. Furthermore, the implementation of Directive 2009/125/EC will contribute to the EU's target of reducing greenhouse gases by at least 40% by 2030.

The Circular Economy action plan 2020 provides for the introduction of legislation to ensure mobile phones and tablets are designed to be resource efficient, i.e. avoiding unnecessary waste and obsolescence by designing products that are energy efficient and durable, can be maintained, repaired and upgraded throughout their lifetime, and then reused or recycled at the end of it. Under the Circular Electronics Initiative, regulatory measures for mobile phones and tablets under the Ecodesign Directive, so that devices are designed for energy efficiency and durability, reparability, upgradability, maintenance, reuse and recycling, are announced.

In order to explore options for both, Ecodesign and Energy Label regulations, a preparatory study[3] was launched in 2020, resulting in a final report[4] published in March 2021. The study included active stakeholder consultation through the project website and two stakeholder meetings, one in June 2020 and another in December 2020. The consultation involved over 130 stakeholders.

There are strong indications, that consumers are increasingly interested in considering sustainability for purchase decisions of smartphones, but the market fails to provide the required transparency in this regard.

1.2 General context

Functionality of mobile devices

Smartphones and tablet computers became ubiquitous devices in the past 10 to 15 years, replacing partly less universal feature phones and also landline phones, including cordless phones. Mobile phones developed into multifunctional handheld computers, defined by the interplay of software and hardware features. Developments in this product group are

[1] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10).
[2] Closing the loop - An EU action plan for the Circular Economy". COM(2015) 614 final, Brussels, 2.12.2015
[3] Ecodesign preparatory study on mobile phones, smartphones and tablets, available at: https://www.ecosmartphones.info
[4] https://data.europa.eu/doi/10.2873/175802

characterised by short innovation cycles, and introduction of a new telecommunication generation roughly every 10 years, 5G being rolled out currently.

Lifetime and market development of mobile phones and tablets

In 2020, around 150 million mobile phones and 23.90 million tablets were sold in the EU. The overall stock on the EU market is estimated to be around 450 million for mobile phones and around 150 million for tablets. The market is considered mature without further growth in terms of sold units. Shifts in the market reflect the implementation of further functionality and increasing performance. This increase in functionality leads to increasing environmental impacts of the manufacturing phase of smartphones and tablets specifically. The use lifetime of mobile phones is 2,5 to 3,5 years and rather short in comparison to other consumer goods, while tablets are kept in active use for around 5 years.

Lifetime limiting factors are product defects due to accidental incidents, such as drops on hard surfaces and immersion in water, decreasing battery charge capacity over time, and less frequently other types of malfunction due to mechanical stress (buttons, connectors). Occasionally also other components fail, such as cameras or radio connectivity components. Such kind of malfunction frequently triggers the replacement of a device and better reparability could lead to more repairs being undertaken instead of new buys. Reparability as such depends on several factors, such as spare parts availability, access to broken parts, required tools and work environment, required skills, risk of additional damages resulting from repair operations, availability of repair instructions, access to repair professionals and costs of parts and services.

In past years there has been the trend towards better protection against water and dust ingress, but at the expense of reducing reparability. Whereas batteries of most mobile phones where user-replaceable 10 to 15 years ago, the vast majority of smartphones and tablets nowadays are designed with integrated pouch-cell batteries, which are not meant to be removed or replaced by the user.

Besides hardware, software is considered crucial for longevity of mobile phones and tablets: The operating system has to be maintained with security updates to minimise the risk of data leakages. Operating systems also evolve in terms of functionality features and for third party application developers it is an economic decision, which operating system versions are supported. Application developers typically ensure compatibility with latest operating system versions and frequently even require an software update to the latest version. In that sense supporting mobile phones and tablets with most recent operating system updates over an extended period of time is essential for overall functionality of the device. Currently there are large differences in the market regarding the provided OS support, which ranges from below 1 year to above 5 years.

The objective of the regulations is to trigger a change in market conditions and mobile phones and tablets that are offered on the market. With the proposed regulations it is envisaged that mobile phones and tablets can efficiently fulfil the intended functions while extending replacement cycles.

Energy use mobile phones and tablets

As regards the total energy use of mobile phones and tablets in the EU, the upwards trend came to a hold with market saturation and there is little indication that this trend might be reversed in future without intervention.

Battery endurance per full charge is an important performance criterion for users and relevant for purchasing decisions, but as of now there is no consistent way of measuring the time a device can fulfil a given functionality until a fully charged battery is drained. This is further complicated by the fact that users use mobile phones and tablets for a multitude of functions. Although enhanced battery endurance in cycles is already an important design target and sales argument, better transparency and comparability of related performance has the potential to change the market further towards energy efficient devices. Enhanced battery endurance per cycle also increases overall battery lifetime as the battery needs to be charged less frequently and as every charging cycle contributes to battery ageing.

The total primary energy consumption of the installed base in the EU27 of mobile phones and tablets in 2020 over their lifecycle was **39,5** TWh (thereof 28,5 TWh for smartphones, 1,6 TWh for mobile phones other than smartphones, 1,8 TWh for cordless phones and 7,6 TWh for tablets) which includes a major share of primary energy consumption in production outside the EU27. Of these 39,5 TWh the share attributed to electricity consumption is 26,6 TWh, including electricity consumption for both, production and use. Contrary to many other energy-related products, short-living ICT products such as mobile phones and tablets are related with rather high energy use in upstream processes instead of the actual product use.

Without a regulation, primary energy consumption across all product life cycle stages from raw materials acquisition to end-of-life will slightly decrease to 39,3 TWh per year (29,3 TWh, 1,5 TWh, 1,4 TWh and 7,3 TWh respectively for smartphones, mobile phones other than smartphones, cordless phones and tablets) in 2030. The combined effect of an ecodesign and energy labelling regulation is expected to limit this 2030 value to 25,4 TWh (18,2 TWh, 1,0 TWh, 1,1 TWh and 5,2 TWh respectively for smartphones, mobile phones other than smartphones, cordless phones and tablets), saving around 33% on the primary energy consumption of smartphones, mobile phones other than smartphones, cordless phones and tablets.

Resource intensive production

The production of mobile phones and tablets is very resource intensive and Life Cycle Assessments (LCA) show that the highest impact for all impact categories stems from the extraction of materials and the manufacturing processes[5][6]. Both the type and the processing of materials used in smartphones and tablets are key factors when it comes to

[5] Proske, Marina; Sánchez, David; Clemm, Christian; Baur, Sarah-Jane (2020): Life Cycle Assessment of the Fairphone 3. Fraunhofer IZM. Amsterdam, The Netherlands. Available online at https://www.fairphone.com/wp-content/uploads/2020/07/Fairphone_3_LCA.pdf

[6] 'Ecodesign preparatory study on mobile phones, smartphones and tablets', DOI 10.2873/175802

determining the environmental impacts of the devices. The production of ICT hardware requires refined materials and processing in energy-intensive clean rooms. In manufacturing, the highest impacts on the global warming potential stem from integrated circuits (ICs) and the printed circuit boards (PCB). Additional environmental impacts stems from the use of (critical) raw materials in main electronic components.

Since the main impact is related to the product manufacturing, prolonging the useful lifetime has a high potential to reduce the overall environmental impact of the devices . This can be reached through more robust design and longer battery lifetimes (higher reliability) as well as better reparability and upgradability of the devices. In particular, better reparability and upgradability could render second use more attractive and boost the market of refurbished devices.

The preparatory study[7] identified a number of areas for potential regulatory intervention, related to a) design for reliability (resistance to accidental drops, scratch resistance, protection from dust and water, battery longevity), b) ability of the product to be disassembled and repaired, c) availability of operating system version upgrades, d) data deletion and transfer functionalities, e) provision of appropriate information for users, repairers and recyclers and f) battery endurance.

Problematic end-of-life management

Many households do not discard their old smartphones or tablets, but rather keep them at home in hibernation[8, 9]. On the European Union level the stock of hibernating mobile phones is almost 700 million units[10]. Hence, there is a significant untapped potential for collecting these devices, reuse a significant share, recovering valuable materials and disposing of hazardous substances properly. Besides convenient recycling options, confidence in data security is a major reason for mobile phones and tablets in hibernation.

1.3 Existing regulation and standards in EU and third countries

The Ecodesign Framework Directive 2009/125/EC is an important instrument for achieving the European targets on energy efficiency and the implementation of a regulation for mobile phones and tablets is a concrete contribution to this process.

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[7] 'Ecodesign preparatory study on mobile phones, smartphones and tablets', DOI 10.2873/175802

[8] Sofies (2019): Étude du marché et parc de téléphones portables français en vue d'augmenter durablement leur taux de collecte.

[9] Bitkom e.V. (2020): Deutsche horten fast 200 Millionen Alt-Handys. In Bitkom e.V., 4/16/2020. Available online at https://www.bitkom.org/Presse/Presseinformation/Deutsche-horten-fast-200-Millionen-Alt-Handys

[10] European Economic and Social Committee (2019): Identifying the impact of the circular economy on the Fast-Moving Consumer Goods Industry: opportunities and challenges for businesses, workers and consumers – mobile phones as an example. Available online at https://www.eesc.europa.eu/sites/default/files/files/qe-03-19-510-en-n.pdf

Under the 'Common Charger' initiative of the European Commission efforts are underway to harmonise chargers for mobile phones and similar devices, and an Impact Assessment Study on Unbundling of Chargers currently analyses the options of decoupling sales of handsets and chargers.

On the member states level, a reparability index for smartphones is effective in France[11] since January 1, 2021. This index provides better transparency in the market regarding reparability of devices, but does not involve specific requirements in the sense of minimum thresholds for market entry. The scale of the reparability index in France ranges from 0 to 10 and although the proposed specific ecodesign requirements on reparability are in general rather ambitious, plotting these requirements on the French scale yields a score of 2,4 only (for smartphones). Reasons for this low score are some criteria, which are not or not directly addressed with the specific ecodesign requirements:

- The ecodesign Regulation requires publication of spare parts prices as such, but does not set any price limits, which could be scored according to the the French regulation (up to 2 scoring points);
- The ecodesign Regulation requires several measures to ease repair significantly, but does not define a maximum number of disassembly steps as a threshold (up to 1 scoring point on the reparability scale);
- The ecodesign Regulation provides the options either to make the battery user-replaceable or to demonstrate a particularly long battery endurance in cycles; in case the second option is implemented, this durability aspect does not yield any scores on the reparability scale
- The French reparability score assesses also spare parts availability for spare parts retailers, whereas the ecodesign Regulation covers only spare parts availability for repairers and (partly) consumers; if these two target groups are provided with spare parts there is limited added value to have spare parts retailers as intermediaries
- The French score asks for comprehensive update information and instructions (up to 1 scoring point), whereas such an information requirement is not included in the ecodesign Regulation, assuming that an implemented update support will be communicated properly anyhow

Introducing similar regulation in Spain is under discussion and the French reparability index is planned to evolve into a durability index in the next few years, addressing the short-comings of scoring on reparability only. Upcoming inconsistencies between national regulations and with EN-standards interfere with an EU-approach and require EU wide regulations.

Under Mandate M/543 the CEN (European Committee for Standardisation) developed a range of standards addressing material efficiency aspects, which are partly reflected in the French legislation. Product group specific standards for mobile phones and tablets following horizontal standards EN 45550 et seq. need to be developed under a new standardisation mandate, though some aspects dealt with by the generic standards (such the classifications of tools, working environments and skill levels laid down under EN 45554) seem of direct applicability in regulatory terms.

[11] Law N°2020-105: Anti-waste law for a circular economy

2. LEGAL ELEMENTS OF THE PROPOSAL

Summary proposed options Ecodesign & Energy Labelling Regulation

The two working documents on ecodesign and energy labelling requirements for mobile phones, cordless phones and tablets propose and explain the following measures:

1. <u>As regards the scope of the proposed Regulations</u>

   The scope of the Regulations covers
   - Smartphones;
   - Mobile phones other than smartphones;
   - Cordless phones;
   - Tablets.

2. <u>As regards ecodesign and labelling requirements for energy efficiency</u>
   - The energy performance of smartphones and tablets refers to an Energy Efficiency Index, which is calculated on the basis of battery endurance, measured as endurance per cycle and representing a metric of how efficiently the devices manages the energy delivered by the battery to fulfil typical functions;
   - As better battery endurance per cycle reduces also the need to recharge the battery, improved energy performance is expected to extend also the lifetime of the battery, and thus of the product as such.
   - The label would display:
     - the energy efficiency class based on the Energy Efficiency Index;
     - the battery endurance per cycle for active use, to provide the user with a realistic expected duration for which a device with a fully charged battery can be used permanently;
     - the ingress protection class, i.e., IP rating to allow for a distinction of devices which exceed the specific ecodesign requirement;
     - the battery endurance in cycles to allow for a distinction of devices which exceed the specific ecodesign requirement;
     - the robustness in terms of repeated free fall tests to allow for a distinction of smartphones which exceed the specific ecodesign requirement and for tablets, where no minimum threshold ecodesign requirement is proposed;

3. <u>As regards ecodesign requirements for material efficiency</u>
   - Enhanced reparability increases overall product lifetime and thus material efficiency, and includes requirements on spare parts availability, design for reparability, which includes fasteners, tool, skill level and work environment requirements;
   - Reparability requirements include a minimum availability of these spare parts for at least 5 years in case of smartphones and 6 years in case of tablets, and an even longer availability of repair instructions of seven years;
   - Delivery of spare parts within 5 working days is mandatory;
   - Replacement of batteries is particularly relevant, and shall be feasible for laymen, unless batteries are of long lifetime, i.e. after 1000 cycles at least 80% remaining charge capacity, which delays the need to replace a battery significantly;

- Spare parts available to end users shall be display assemblies of smartphones and chargers, and batteries in case the criterion of a lifetime of 1000 cycles is not met;
- An extended list of spare parts needs to be available to professional repairers;
- Preparation for reuse is supported by mandatory data encryption and a software function, that resets the device to its factory settings and erases by default the encryption key;
- Battery health knowledge is essential for reuse of mobile phones and tablets and as such relevant battery life data shall be accessible from the battery management system for end-users and thus also for professional remanufacturing enterprises;
- Battery endurance in cycles according to EN 61960-3:2017 shall be at least 500 cycles at 80% remaining charge capacity;
- Fast charging of the battery with a relevant adverse impact on battery lifetime shall not be default setting, but might be enabled by the user;
- Robustness under conditions of accidental drops on hard surfaces, which is approximated with a repeated free fall test in a tumble tester, as defined in EN 60068-2-31:2008 and with adaptations for tablets to determine the number of falls passed;
- To incentivise the provision of protective covers with the product smartphones can be tested with such a protective cover provided with the product, to be assessed against a minimum of 200 falls to be tested;
- As users will use smartphones and tablets also without protective covers even if these are provided with the product, smartphone shall withstand at least 100 repeated falls without any such protective cover;
- Foldable phones are most likely to be subject to accidental drops when they are in use, thus in an unfolded state, and for this reason repeated free fall tests shall be performed also in the fully extended state, and a minimum of 100 falls shall be passed in this case;
- As scratches impair the aesthetic appeal of a device and as such foster a psychological obsolescence and reduce the market value of otherwise reusable phones and tablets, a minimum scratch resistance has to be met by the screen, corresponding to hardness level 4 on the Mohs hardness scale, to be tested according to EN 157771:2010;
- Protection against dust and water ingress shall meet at least class IP 44, according to EN 60529, and higher IP ratings shall be displayed on the energy label;
- Software updates of the operating system shall be provided for 5 years, comprising security updates and for at least the first 3 years also functionality updates;
- Such updates shall be provided within reasonable time after the market introduction of a related release;
- Updates shall not have an adverse effect on device performance, or the user has to have the option to downgrade to the prior version of the operating system;
- Marking of larger plastics part shall ease manual separation of polymer types;

4. <u>Information requirements</u>

- Dismantling information on how to access and separate the battery shall be made available for recyclers;
- Repair instructions complement design for repair requirements and spare parts provision and include explicitly also means of software tools and assistance to allow for repairs by professional repairers, if authorised by the owner of the device;

- The maximum pre-tax price of spare parts shall be disclosed and not raised later on when the product is placed on the market; this is meant to create transparency on a major price component for repairs allowing users to take potential repair costs into account when purchasing a device;
- For a range of particularly relevant environmental aspects of upstream manufacturing processes information has to be disclosed with regards to whether high reduction rates for fluorinated greenhouse gases are achieved in the manufacturing of most relevant semiconductor components and the display, whether air cargo is involved in distribution of the device after it has left final product assembly; if and for which components electricity stems from 100% renewable energy in the most relevant tier;
- An indication of contained weight ranges for the four elements cobalt, tantalum, neodymium and gold shall be provided to create transparency on material content, according to EN 45558:2019 for critical raw materials (CRMs) and a similar procedure for gold, which currently is not considered a CRM;
- A recyclability rate shall be calculated following a transitional method aligned with EN 45555:2019;
- Where the percentage of recycled content is stated, this shall be done in accordance with EN 45557:2020;
- Instructions for battery maintenance to create awareness how to treat the battery gently;
- To stress the positive effect of unbundling the charger, the sales package shall bear the information where applicable, that the charger is not included for environmental reasons and with which charger types the device is compatible.
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5. Requirements not proposed in the working documents

- The subsection 1.3 ('Existing regulation and standards in EU and third countries') presented the French reparability score, together with some considerations on how the (compliance with) ecodesign requirements would be ranked in this score. A reparability score mirroring (some parts of) the French one could complement the ecodesign requirements to provide further transparency on reparability criteria (e.g. by being presented in the energy label). Obviously, the number of aspects to be assessed would significantly increase, some adaptations to the French scheme would be needed and the trade-offs aspects between reparability and reliability would not be properly factored in.

  The subsection on 'Resource intensive production' highlighted the relevance of the environmental impacts stemming from the manufacturing phase of mobile phones and tablets. With this regard, as shown in the previous subsection, a set of information requirements is proposed. The preparatory study also devised a potential information requirement on the results of a Life Cycle Assessment, including the assessed environmental impact indicators and the results of the calculation, over the product life cycle from cradle to the location. Despite the relevance of such category of requirements, this requirement would entail very specific technical and legal discussions (concerning the methods to be used, the

conformity assessment procedures[12], etc), that could be difficulty finalised within the challenging timeframe for the preparation of the Ecodesign and Energy Labelling Regulations for mobile phones and tablets.

[12] See for example analogous ongoing work for the Ecodesign requirement on the ecological profile of the manufacturing phase of photovoltaic modules, https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-04/Discussion%20paper%20Ecodesign%20Photovoltaic%20Products.pdf