Ecodesign and energy labelling requirements for electronic displays

On the review of the ecodesign and energy labelling requirements for electronic displays

Brussels, 7 September 2026

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Executive summary

ECOS, Deutsche Umwelthilfe, IFixIt, and the Right to Repair campaign welcome the proposed measures on real-time energy feedback, minimum duration of software support, and an energy-label reform.

However, we strongly oppose the proposal to abandon key material-efficiency measures. The revision should prioritise durability and reliability, ensuring that electronic displays remain functional for as long as possible, while repairability serves as a safeguard when failures occur. Evidence shows that repair barriers are primarily driven by high costs, limited spare-part availability, insufficient repair information and poor diagnostics rather than a lack of consumer interest in repair.

We also strongly oppose the lifting of the ban on halogenated flame retardants. Maintaining this ban is essential to support high-quality plastics recycling, ensure coherence with broader EU objectives, and provide regulatory certainty. As displays covered by the current regulation are only now entering the waste electrical and electronic equipment stream, any reversing measures would be premature.

This accompanying position paper contains relevant information about consumer behaviour and preferences, the need for reliability, repairability and circular material requirements. The role of the Digital Product Passport in supporting this process should be further explored.

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Proposed measures to adopt

Real-time energy consumption on screen (M7.1)

We welcome the proposal to provide transparent information on real-time energy consumption when changing settings and additionally propose to provide non-real time, historical data on energy consumption and the possibility to connect to smart devices such as smart meters or home energy monitors. These measures respond directly to the problem identified that users frequently move away from default picture settings, often towards brighter and more energy-intensive modes. The proposed measures could help consumers understand the energy implications of their choices and encourage more efficient use patterns, beyond the energy label, which is only based on the default setting. However, this measure will only be effective if several conditions are met:

- The information is displayed immediately when the user changes settings such as brightness, HDR activation, gaming mode, AI-enhancement features, or picture presets.
- The feature remains accessible throughout the lifetime of the product and not only during initial setup or hidden in submenus.
- Information is provided in an understandable format. Studies have shown that direct consumer feedback can be helpful to reduce energy consumption, but only when combined with injunctive

social-normative messaging.[1] [2] [3] [4] Social-normative messaging is the comparison of one's own energy consumption with that of a reference group. Injunctive messaging adds a judgement of the behaviour, such as a smiley or frowny face or a coloured scale like the Energy label, and has been shown to make it easier to interpret the values and shape behaviour.

Therefore, we recommend displaying the consumed Watt of the a) changed programme, b) default/reference programme, and a c) classification (good or bad) on the screen in real-time of changing viewer settings.

Additionally, we recommend providing a more extensive **energy consumption report** that can be retrieved **anytime in the user settings** and is shown to the consumer via a **push notification on screen** once per month. Mukai et al.[1] found in a large-scale study that comparison with others is more impactful than no comparison or comparisons with one's own consumption data. Although it can be challenging to provide information on the average energy consumption of other households, increased efforts should be directed towards making this data available.

The report should include:

- The personal cumulated energy consumption by year.
- Estimated personal annual energy consumption for the calendar year if consumption stays constant (kwh/year).
- Based on that value, the estimated energy costs per year.
- A comparison of personal consumption with that of average households.
- A comparison of personal consumption with lowest-performing households.
- Rating of behaviour (injunctive messaging).

Furthermore, it is not sufficient to only provide this report in the settings. Regular push notifications will be necessary, especially in the first three months, as Zangheri et al.[2] found that frequency of feedback exposure determines its effectiveness, especially in the learning phase.

To further increase the impact of transparent energy consumption information, smart, internet-connected electronic displays should provide standardised, machine-readable energy-consumption data that can be accessed by home energy-management systems and smart-home applications without proprietary restrictions. At the same time, there are several risks that should be considered:

- Excessively technical information may confuse rather than inform consumers or create "information fatigue", leading users to ignore the information altogether.
- The measure will have limited impact if manufacturers steer consumers towards energy-intensive modes through setup wizards, gaming optimisations, HDR prompts, or AI-powered picture enhancements, which the study itself identifies as increasingly common.
- Real-time consumption data alone cannot substitute for ambitious energy-performance requirements. Information measures should complement, not replace, regulatory obligations.

We therefore support M7.1 provided that it is designed as a meaningful decision-support tool and coupled with robust minimum efficiency requirements.

Material efficiency measures by software support (M5.1)

We welcome the proposed measures to include software support. It is an important step towards product durability and reliability, preventing premature disposal due to software obsolescence.

With a current average lifetime of six to nine years,[5] [6] TVs underperform their expected ideal lifetime of 12 years according to French consumers.[7] The PROMPT study[6] found that 35% of respondents expect a minimum lifetime of at least 8 years and 40% expected more than 10 years. Therefore, we encourage extending the minimum years of software updates after the last placement on the market to 10 years.

Careful formulation of this measure should ensure that the displays remain functional in their core functions even beyond the years of software support, possibly meeting the ideal lifetime of 12 years.

Displaying the guaranteed years of software support on the energy label could encourage manufacturers to move beyond the minimum requirements and change consumer expectations. This could provide a durability-relevant indicator for this product category, which is currently missing. Additionally, consumer research has shown that consumers have gotten used and adjusted to shorter product lifetimes.[8] A durability index could provide a new durability benchmark and social norm, which has shown to have a strong influence, as described above.

Simplification measures concerning substances of concern (M6.1-M6.3)

We strongly recommend the Commission to maintain the ban on Halogenated Flame Retardants (HFRs in display casings and enclosures until at least the next revision, as the other regulatory aspects can be completed, at minimum after the potential REACH restrictions on ABFRs and OPFRs and the Circular Economy Act are completed and in force. The WEEE (Waste Electrical and Electronic Equipment (WEEE) Directive update, along with Circular Economy Act, should require higher targets for collection and support for the plastic recycling sector. This could include a deposit return scheme of some kind for electronic displays.

Maintaining the ban is crucial for regulatory certainty and consistency with other regulations. The lifting of the ban would lead to increased use of HFR in plastics, which need to be incinerated. This development goes against circular economy ambitions of the European Commission and contradicts other Union aims to reduce Europeans' exposure to these substances. Several other regulatory processes are in progress that could affect the use of these substances, so the elimination under ecodesign is premature and will introduce a lack of certainty to industry. In addition, since there is not adequate evidence to support the elimination of the ban, the precautionary principle must be adhered to, which supports the view that the ban should be maintained.

More action should be taken on substances of concern. If OPFRs cannot be effectively recycled, then they should be included in the ban under ecodesign. This could be included in the current revision. **The fact that recyclers do not trust the plastic markings is strong evidence in support of validated and trusted product information.** To that end, we would like to see a requirement for electronic displays to carry Digital Product Passports as soon as possible.

Updating testing methods and recalibration of label (M1.1-M2.3)

We take note of the shortcomings of the current testing method and support the M2 non-linear approach. We understand that this will provide for better differentiation between the products in scope, and encourage European consumers to go for more energy efficiency options. It would also allow, apparently, to penalise screens as they grow larger, which is a desirable methodology to discourage the purchase of electronic displays with too large screens.

Signage active power and standby power (M3.1-M4.2)

We agree with the proposed measures and welcome the extended scope to signage displays as this is a rapidly growing market with high energy consumption.

Proposed measures to discard

We strongly disagree with the consultants' proposal to forgo most material efficiency requirements despite clear evidence of need and consumer demand. The current average lifetime of six to nine years for TVs contrasts sharply with the perceived ideal lifetime of 12 years, according to a French survey.[5] [6] [7]

Therefore, we urge the Commission to reassess the extension of the **availability of spare parts for the most common failures**, the introduction of a **spare part price cap,** as it is the most significant consumer barrier, and better access to **repairability information**.

The priority to achieve circular electronic displays should be optimising for **durability** and **reliability** so that products can be used without failures for as long as possible. **Repairability** serves as a safeguard when failures occur. Very important for circular material selection is ensuring that all used **materials and substances can be recycled** instead of downcycled. Lastly, only **informed customers** can make sustainable purchasing decisions. While the introduction of software support measures is an important first step, it needs to be supported by hardware reliability and repairability.

Design for hardware durability and reliability

During the stakeholder consultation in April 2025, the most common failure types were presented as being defective screens, power supply and motherboard issues for TVs, missing stands, scratched or dented displays, and image defects for monitors. Evidence from a French study shows that 60% of replacements took place when the TV was either fully or partly broken, proving that product reliability is a current shortcoming.[7]

As a first measure, we encourage the Commission to explore the causes of these failures to adequately address the issues. For TV failures, the Horizon Europe project PROMPT identified thermal-induced stress as the dominant underlying failure cause, not human-caused errors, as the explored measures for drop, scratch, or water resistance suggest.[9] None of the previously explored measures address thermal-induced stress.

The PROMPT project proposes a reliability test based on the identification of common failure causes and existing tests. However, it concludes that the testing effort is too time-consuming and expensive. We recommend the Commission to explore alternative testing options to reduce the costs.

Design for repairability

The evidence presented during the stakeholder consultation in April 2025 reveals that the current list of spare parts does not sufficiently cover the most common failure parts and that the challenge of insufficient repair information persists. This clearly calls for adapted measures and does not justify abandoning additional measures.

Consumer behaviour

The consultants' underlying assumption against more extensive repairability measures is that **consumers have a preference for replacement** with new products rather than keeping or repairing old ones. We **disagree strongly** and present the following evidence:

Replacement decisions are not static but can be influenced if the existing product is better designed and repair conditions are improved. When making a replacement decision, consumers assign *relative* values to existing versus new products and weigh them against each other.[10] The products are assessed against functional, emotional, social, epistemic, and conditional criteria[11] (see Table 1). While social aspects cannot be addressed by the Ecodesign for Sustainable Products Regulation (ESPR), the remaining four categories offer possibilities for intervention.

The above-mentioned theory explains very well why the current design of displays leads to a preference for premature replacement. A non-functional, dented, or scratched display that is not repairable, upgradeable, or personalisable is evaluated worse than a new display that promises big technological improvements, social status, and a sense of novelty. Furthermore, the perceived high effort and costs of repairing current displays discourage consumers from considering repair as an option. Marketing efforts can strengthen the perceived added value of new technologies[12], such as promoting 8K instead of 4K TVs even though the human eye can barely see the difference.

Technological advancements of TVs and monitors are not expected to change as disruptively in the coming years as the change from bulky CRT to flat panels. Developments are forecasted to evolve around screen size, resolution, connectivity, and AI. Consequently, the perceived value attributed to new displays should not outweigh existing ones in the future as long as marketing efforts do not suggest otherwise.[13]

In summary, the preference for premature replacement is not a reason for inaction but strong evidence that repairability requirements are inevitable. The table below shows that the scope of the ESPR can particularly influence functional and conditional conditions.

Pro replacement	Con replacement		Pro replacement	Con replacement
Does not function anymore	Better reliability, repairability, upgradability	**Functional**	New useful features, increased energy savings	Incremental, non-noticeable changes
Scratches and dents, out-of-fashion design	Emotional attachment and memories, durability, modularity, repairability, individualisation	Emotional	New design and aesthetics, perceived high quality and long lifetime	Similar design, fear of planned obsolescence
Product is a fashionable item or status symbol; new market trends	*Product not visible by others or purely functional nature*	*Social*	*Visible market trends*	*Product not visible by others or purely functional nature*
No more updates, reduced novelty, familiarity with features or aesthetics	Individualisation, upgradability	Epistemic	New aesthetics or features, novel technology, curiosity and joy	Incremental innovation, low perceived difference from existing product
Effort of repair too high, too costly, no spare parts, no skills, other life circumstances	Empowerment and ability to repair, price cap on spare parts, favourable repair infrastructure	**Conditional**	Strong marketing, promotional offers, more durable and repairable design for the future	New price too high

Table 1. Adapted evaluation criteria of replacement decisions based on van den Berge et al.[11]

Note. **Bold** = very relevant for ESPR, normal = relevant for ESPR, *italics*= difficult to tackle under ESPR

Data already shows that premature replacement is not the majority. A French study showed that 41% of respondents replaced their TV only when it was broken, and 19% while it had issues but was still functional. Only 29% of respondents replaced their TVs despite being fully functional[7]. While this does not directly translate to higher repair rates, it refutes the argument that consumers are replacing fully functional devices because they are looking for novelty.

The perceived functionality of electronic displays depends on the consumers' use case of their display. Research suggests that consumers evaluate hedonic products such as televisions primarily through the quality of the consumption experience[8]. Consequently, even relatively minor defects that impair viewing enjoyment, e.g. dead pixels, may cause substantial reductions in perceived value and accelerate replacement.

For utilitarian products such as purely work-related monitors, consumers place greater emphasis on whether the product continues to fulfil its core functional task, making minor malfunctions potentially more tolerable. Therefore, the willingness to repair and demand for novelty of electronic displays varies strongly.

The assumption that repair is not demanded can be rejected. An online survey with 840 respondents asked consumers what they would do if one of their electronic products became faulty (not specifying the product type and product age when the faults occur). The results show that 56% claim they would look for a professional repairer, 18% claimed to repair it themselves, 13% would replace, 8% would throw it away, and 7% would procrastinate any action.[14] Although self-assessments are not a reliable indicator for actual repair behaviour due to the intention-action-gap[15], multiple sources report strong consumer interest in repair if the conditions are right.[16][17] Data from the French repairability index prove that the bonus led to a 375% increase in TV repairs in France, increasing from 5,230 repairs in 2023 to 26,211 repairs in 2025.[17][18] With a bonus of €60 for TVs and an average bill of 190,20€ the bonus pays about 32% of the total repair costs. This proves that cost reduction interventions are powerful in increasing consumer repair demand.

The most dominant barriers are high repair costs and structural challenges – not a lack of consumer willingness. Roskladka et al.[19] have conducted extensive research on repair barriers and ranked them by importance. They have identified 26 barriers in three categories (technical possibility, consumer convenience, and consumer willingness). Although they used the case of washing machines, where the need for novelty is considered lower than for smartphones and TVs, the findings still demonstrate that structural repair barriers are non-negligible reasons behind low repair rates.

As seen in Figure 1 and 2, too-high costs of repair are the most pressing barrier. The next pressing barriers are the lack of spare parts and the unavailability of repair services and adequate repair manuals. The time and effort for consumers to find repair options until the product is functional again is also a significant hindering reason, as well as the product's economic obsolescence. On technical terms, the difficulty of repairing and dis- and re-assembly complicates the process. Only then do behavioural barriers rank, such as unawareness about repair and desire for new products. Even if the desire for novelty ranks higher for displays, not addressing the other barriers would negate the evidence.

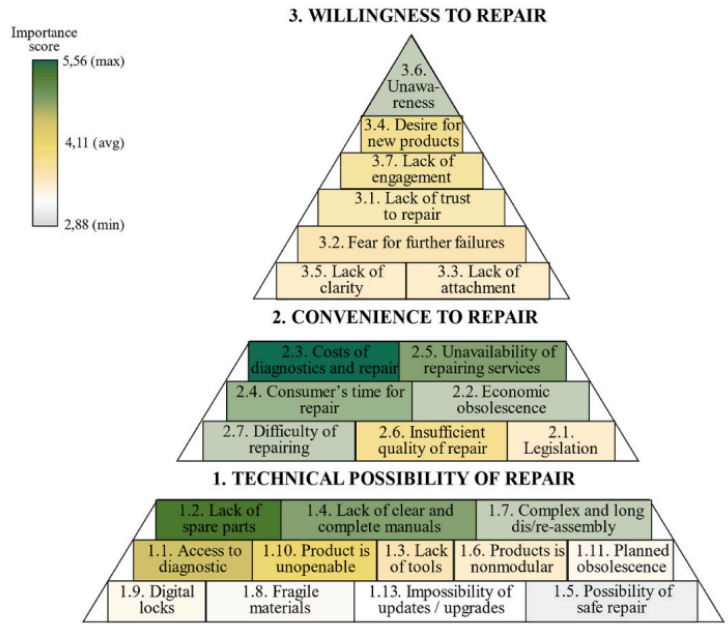


Figure 1. Consumer barriers to repairing a washing machine, classified within three categories and ordered by importance. Taken from Roskladka et al.[19]

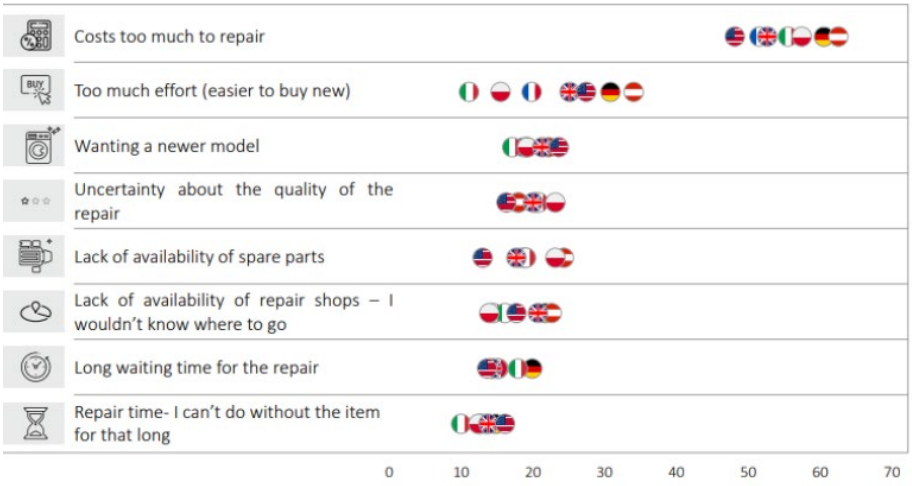


Figure 2. Barriers to repair of consumer electronics. Taken from Nürnberg Institute for Market Decisions.[16]

Other barriers are inability of problem-identification and uncertainty aversion about costs, process, and outcome. The PROMPT project found that specifically for TVs, the lack of fault diagnosis hinders consumers from identifying the problem, therefore reducing their confidence in repair success. They conclude that design for repair is more empowering for consumers than prior repair expertise[20]. Bengart and Vogt[21] explored the impact of uncertainty and found that even vague information on price, warranty, and success rate doubled the willingness to repair. This supports the relevance of costs as barriers and strengthens the need for price caps.

Price and warranty are predictors for repair while sustainable values are not. A research project across seven countries sheds light on motivators and ideal conditions for repair and find that consumers value reasonable repair prices and extended product warranty (Figure 3). Consumers' sustainability intentions alone do not increase repair rates if the framework conditions are not met.[15] [16]

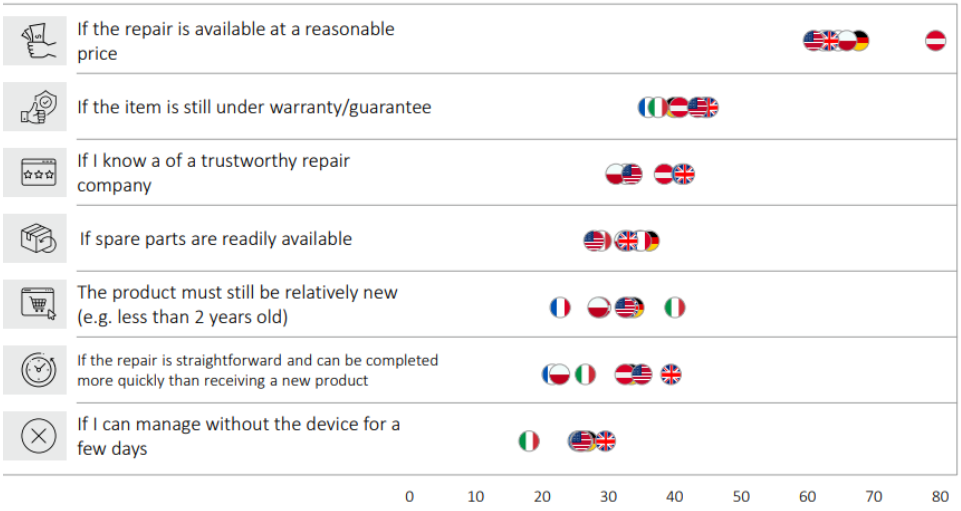


Figure 3. Ideal conditions for repair. Taken from Nürnberg Institute for Market Developments. [16]

Furthermore, extended hardware longevity and repairability not only benefit current consumers but also pave the way for a growing secondary market. Independent market research[22] projects consumer demand for refurbished TVs to grow due to consumers' sustainability consciousness, price pressures, and the professionalisation of the sector. For the overall electronics market, the compound annual growth rate is estimated to be 12.6% from 2023 to 2031. Better repair framework conditions hence

offer an opportunity to grow the European repair and refurbished industry and create new job opportunities.

Altogether, we do not consider the argument that stronger repairability measures would have little influence on consumer behaviour to be sufficiently substantiated. Low repair rates reflect existing barriers such as perceived unaffordability, lack of spare parts and repair information, and logistical challenges, but can be increased.

Costs of spare parts

Transparency on the price of spare parts is the key to addressing the main consumer demand barrier. To maximise the share of end-users who repair rather than replace defective electronic displays, manufacturers must provide access to information on the maximum price of spare parts. Research shows that consumers are not willing to pay over 30% of the price of a new product for a repair. Manufacturers should be obliged to not overshoot this price.

Setting spare part price caps would support the transposition and implementation of the Repair of Goods Directive. In Article 5.4 of the Repair of Goods Directive, Member States are mandated to enforce that "manufacturers that make spare parts and tools available [...] shall offer these spare parts and tools at a reasonable price that does not deter repair". Similarly, the New Battery Regulation provides, in article 11.5, that 'Any natural or legal person that places on the market products incorporating portable or LMT batteries shall ensure that batteries shall be available as spare parts of the equipment they power for a minimum of 5 years after placing the last unit of the model on the market, with a reasonable and non-discriminatory price for independent professionals and end users'. Henceforth, to avoid a disparate transposition of this requirement into national regulations and legal cases, the Commission has a duty to develop guidelines on the definition of a reasonable price. A price cap would be an effective solution that assures compliance with the Directive while addressing the most pressing consumer barrier to repair. On horizontal repairability requirements [23], the French organisation Ethikis has developed a practical way to set price caps on spare parts through the LONGTIME® label.

The revised regulation for electronic displays should at least have the same article on spare part price as the regulation for smartphones. The annexes mandates that 'the manufacturers, importers or authorised representatives shall provide indicative pre-tax prices at least in euro for spare parts [available to professional repairers and end-users], including the pre-tax price of fasteners and tools, if supplied with the spare part, on the free access website of the manufacturer, importer or authorised representative' (e.g. Annex II.B.1.1.(4) for smartphones).

Synergies of the ESPR with other repair costs reduction policies should be explored, such as a repair bonus similar to those developed in France or Austria, potentially financed by Extended Producer Responsibility schemes.

Design for disassembly and modularity

Design for disassembly and modularity can drive down the costs of repair. The PROMPT project found that design for repair is more empowering for consumers than prior repair expertise and suggests the following design options.[20] [24]

Bundling of spare parts must be prevented. Bundling spare parts means that repairers might be required to replace larger parts that might end up being costlier, instead of only replacing the faulty part.[24] In the Smartphones Regulation, the list of spare parts that should be accessible to professional repairers and end-users is protected against bundling. For smartphones, it is through Article B.1.1.(1).(b): "Spare parts [listed in a previous article] shall not be assemblies comprising more than one of the listed spare part types".

We encourage the European Commission to adopt the same approach for electronic displays. Parts that should be accessible separately could be: power unit, LED board, T-con, motherboard, and main processor unit.

In smart TVs, the main processor unit that runs the operating system needs to be modular and easily accessible. Currently, this part is soldered onto the motherboard and therefore hidden in the back of the TV and very expensive to repair. If the main processor can be detached (like a plug-and-play system), the screen could be used for decades while the main processor could be upgraded, thus reducing the material consumption for new displays and frames. Ideally, it would even be compatible with various devices.

The number of components needed to access priority spare parts should be minimised. A list of feasible connections and fasteners has been recommended by van Dolderen et al..[25] If possible, **connectors should be standardised across manufacturers to facilitate modularity and repair.**

External USB-C connectors must be included in all displays to facilitate compatibility.

Part serialisation

Software techniques that prevent the replacement of spare parts, or the usage of third-party spare parts or consumables, must be banned. Serialised parts, sometimes leading to the part-pairing practice, could create major barriers to independent and self-repair. Part-pairing describes the utilisation of software barriers implemented by electronics manufacturers with the intention of obstructing end-users and professional repairers from substituting components. The practice of sourcing spare parts from second-hand or waste devices to employ them in other recoverable devices has long been a vital aspect of the repair ecosystem, and its continuity is under threat due to the increasing prevalence of parts pairing.

Spare part availability

Once brought to the repair, flat screens are the 3rd most 'repairable - but not repaired' product category at repair cafes, by percentage. 27.8% of all screens brought to events are diagnosed to be repairable but cannot be repaired at the event due to spare part unavailability or lack of time.[26] The most common barriers across EEE products are depicted in Figure 4.

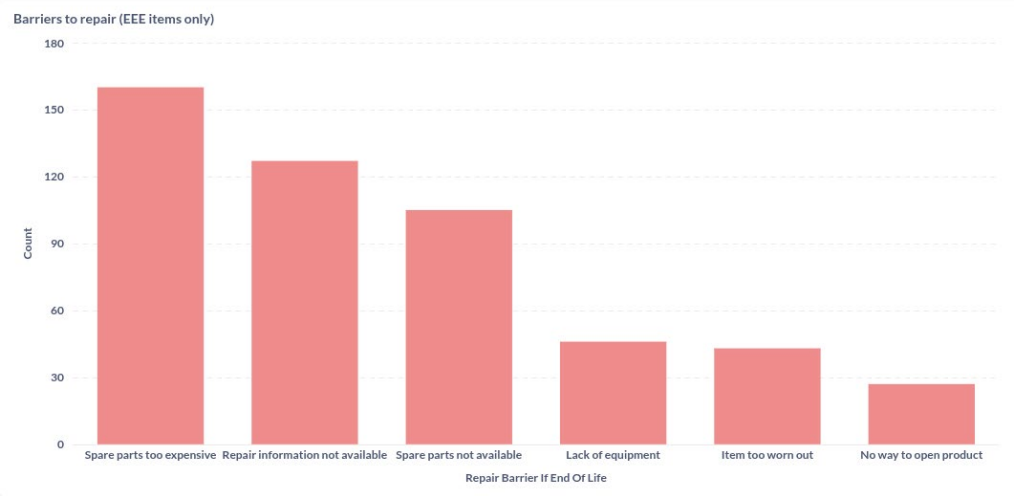


Figure 4. Evidence of EEE repair barriers at repair events worldwide. Taken from Open Repair Alliance.[26]

To adequately address the most common failures identified in the preparatory study, the list of spare parts should be extended to the following parts:

- Stands
- Display modules
- Backlight assemblies
- Motherboards

Spare parts must be available to everyone – not just "professional repairers". The EEA report (2022)[15] points out that current ecodesign requirements only apply to "professional repairers" despite not all member states having this system in place. Therefore, complex validation processes are needed for voluntary (repair cafés) and independent repairers to access spare parts and repair instructions. To reduce this administrative burden and make the repair infrastructure more accessible, as previously identified as a critical barrier, spare parts and repair information must be accessible to everyone.

The list of spare parts should be available for at least 10 years. In the case where a manufacturer would not be able to provide spare parts anymore, the technical specifications should be published to allow for independent production.

Spare part delivery time

Spare parts should arrive at the customer no later than 10 days after the placement of the order. To be considered an attractive alternative to buying new products, the duration of the entire repair must be as fast as possible. This includes the delivery of spare parts.

Repair instructions

The evidence presented during the stakeholder consultation in April 2025 reveals that the challenge of insufficient repair information persists. Particularly for voluntary and independent repairers, this adds a significant barrier to repair. As not all member states have the system in place to verify professional repairers[15], this adds bureaucratic burden and repair barriers.

Therefore, improved repair documentation should provide practical step-by-step disassembly instructions for everyone, including end consumers. Unlike smartphones, displays are often large, heavy and fragile, making transport to repair centres difficult, costly and associated with an increased risk of damage during handling. The review should therefore explore how common television repairs can be facilitated at home and without requiring transport to specialised repair facilities. This is particularly relevant for common failures such as power supplies, stands, connectors and certain electronic modules. The size and fragility of televisions mean that repair-at-home may often be more practical and resource-efficient than transporting products for professional repair.

Repairability indicators

We also disagree with the proposal to discard a repairability indicator. The French *Indice de Réparabilité* and *Indice de Durabilité* demonstrate that repair and durability information can be successfully communicated to consumers. 28% of French consumers consider the index during purchase decisions.[27]

Crucial for the calculation methodology of the repairability indicator compared to the proposal by the Commission is the inclusion of the price of spare parts as a parameter. As explained in this position paper developed by the Right to Repair Europe coalition[i], the price of spare parts is simply a too important parameter to be left out of any repair scoring methodology.

[i] https://repair.eu/resources/position-paper-horizontal-ecodesign-requirements-on-the-price-of-spare-parts/

Upgradability

As explained in the section on consumer behaviour, the desire for novelty and technological up-to-datedness could be met with upgradability of screens[11]. Providing a modular main processor unit could satisfy this need. We encourage the Commission to look further into this.

Failure messaging system in Digital Product Passport (DPP)

To address the challenge of fault diagnosis, the Commission should look into the potential of DPPs for this matter. Examples could be an error code database and repair instructions[28].

Design for recyclability – Flame retardants (FR) clarification

In light of the upcoming requirement of DPPs to provide material information along the product's value chain, the Commission should not forgo current FRs clarification measures. Rather, the adoption of DPPs for electronic displays to facilitate reliable polymer and chemical information transparency should be accelerated. The current EPREL database does not include this information, and as seen in the Restructa study[29], more information could assist recyclers. Requirements could include not just information on FRs and polymers, but more complete requirements on substances of concern as outlined in the ESPR.

The Commission could also establish its own similar database to facilitate European recyclers to better manage the chemicals and materials entering their waste streams. This was, after all, an aim of the SCIP database, though it was not achieved in practice.

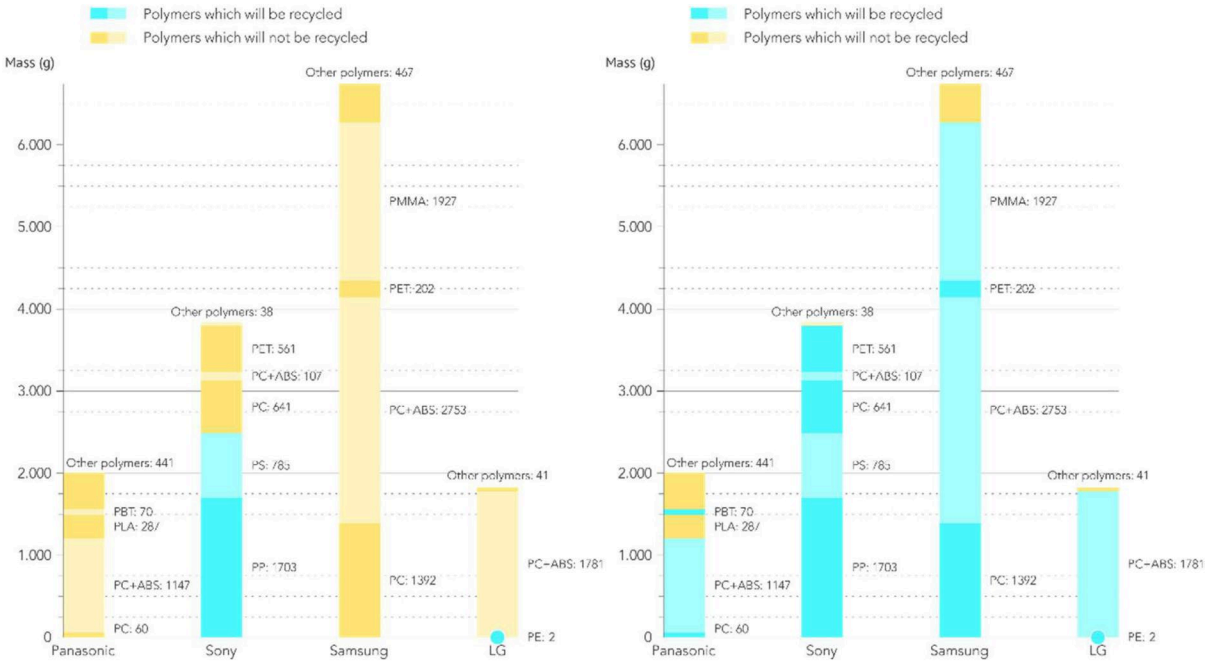
Not-proposed measures

Uniform WEEE plastics and FR

Ensuring that materials can be recycled instead of downcycled at the end of life starts in the design phase and requires careful selection of materials and substances. At the end of life, material identification, separability, and volume determine if materials are practically recycled. The use of FRs is proven to challenge the recyclability of plastics.

Instead of only banning halogenated FRs, risking the substitution by other FRs that also limit recycling, a positive list of safe and recyclable FRs should be developed. The first step here could be to empower the European Chemicals Agency (ECHA) to undertake a study, similar to those ongoing for substances of concern in packaging and end-of-life vehicles, to determine which substances hinder recycling for WEEE plastics, and then utilise the information coming from ECHA to determine which substances can be approved for use in EEE plastics. A requirement that only these safe and recyclable FRs can be used would reduce the diversity of FR and increase volumes of compatible WEEE for recycling.

Defining WEEE-favourable polymers reduces material diversity and increases recycling volumes. A recent study assessing the theoretical vs. practical recyclability of TVs found that several theoretically recyclable materials used in TVs are not recycled in real life (Figure 5)[26]. Therefore, an industry standard could be developed on which materials to use in electronic products so that recycling volume rises. Specifically for TVs, the study finds that PP, PS, PE, and ABS are most likely to be recycled. We encourage the European Commission to look further into this study.



a) *b)*

Figure 5. Practical recyclability of four different TVs in current recycling system (left) vs. theoretical recyclability of the same TVs (right). Taken from van Dolderen et al.[25]

Recycled content target(s) for these WEEE-favourable plastic materials in displays would create a market for the recyclates, lower material costs, and help move the sector towards a closed loop system. With better collection, there should also be a requirement for closed loop recycling of plastics from WEEE. With closed loops, there would be less risk of hazardous substances making their way into other products made with recycled materials.

Innovations in redesign should also be encouraged. While the current ecodesign measure aims to reduce energy consumption and carbon emissions, a scientific study should be undertaken to understand more fully the life cycle emissions and energy consumption if innovative redesign options were combined with a closed loop, WEEE-EEE material use system. It may be the case that by closing the loop and using external power supply systems, the emissions could be lower overall than by solely focusing on energy efficiency points. This would require a more in-depth analysis of the sector than has been done.

"Ideal distance to screen" pictogramme

As mentioned in our previous feedback following the Ecodesign Forum on electronic displays 01/04/2025, we propose the addition of a new pictogramme called the **"ideal distance to screen"** (see below).

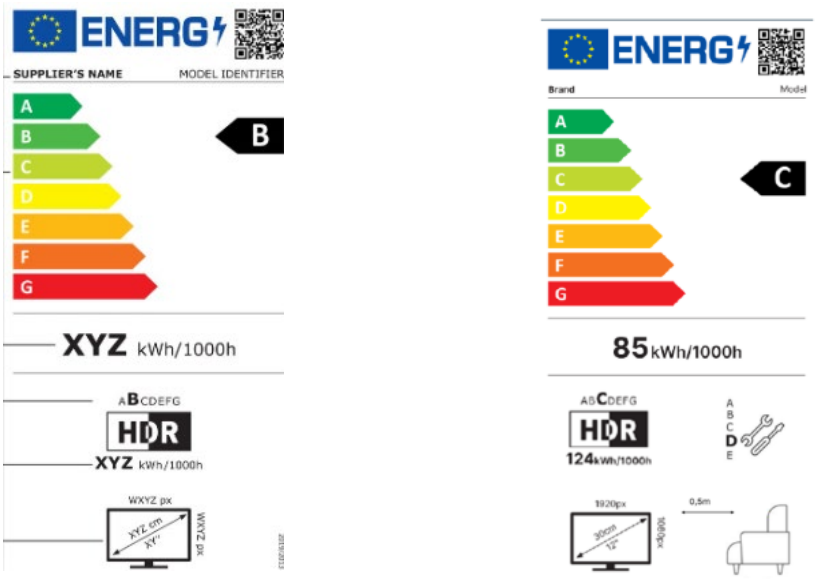


Figure 6. Visualisation of energy label including ideal distance to screen diagramme.

Evidence from the preparatory study shows that consumers tend to be encouraged to buy larger electronic displays, with the promise of a better consumer experience. This has led to an increase in the energy consumption associated with the usage of electronic displays. However, consumers should be encouraged to buy products which are adapted to their needs rather than waste money on too large displays that in turn waste energy. In order to help consumers find products that fit the layout of their viewing space, the ideal distance to screen ratio, calculated based on the width and resolution of the screen, would be a perfect proxy for this sufficiency approach.

This information has been relevant enough for the retailers Coolblue and Vandenborre to integrate it to their web platform: it is the 8th filter proposed by Coolblue and the 14th filter proposed by Vandenborre to the visitors of their website for finding the ideal electronic display. There is also science behind this parameter bringing more comfort to the user.[30] Existing literature on that issue or a harmonized European standard could help manufacturers determine how to measure this ideal distance to screen ratio.

Sustainable and recycled materials in the production of electronic displays

When possible, sustainable raw materials should be used for the production of electronic displays to reduce social and environmental impacts in mining countries. To achieve improvements in this matter, transparency is a crucial building block. All producers should reveal the materials they use, as well as their origin. This will hopefully be achieved through the Digital Product Passport currently proposed by the Commission in its Ecodesign for Sustainable Products Regulation, currently under negotiation between the European Parliament and the Council of the European Union.

Usage of recycled material can considerably contribute to reducing the environmental impacts related to the extraction of minerals. In the proposed Critical Raw Materials Act, recycled content targets are about to be set for permanent magnets (for neodymium, dysprosium, praseodymium, terbium, boron, samarium, nickel and cobalt). The new Battery Regulation also adopts the same approach for battery materials (cobalt, lead, lithium and nickel). The same approach should be adopted for the electronic displays resource efficiency requirements: recycled content targets should be set for plastic, copper, quartz, iron, gold, platinum, and silver.

Recycled content targets are crucial to close material loops and improve the competitiveness of recycled materials. Also, to encourage the development of a healthier plastic recycling market, the use of substances of concern such as FRs must be banned for the manufacturing of consumer products

such as electronic displays (see above). In any case, if recycled content objectives are set for electronic displays, recycled content must be measured with robust methodologies, as suggested by ECOS[ii] in the context of the Single- Use Plastic Directive (SUPD). Only then can trust and reliability be guaranteed for subsequent recycled content claims economic operators will make on e-displays.

Techniques such as pyrolysis and gasification should however not be accepted for calculation of recycled content. These processes thermally decompose plastic waste into feedstock molecules. Therefore, they are chemical recovery processes for pre-treatment of plastic waste, not recycling processes.

Failure rate & repair database for future ESPR revision

As recommended in section *II. 1. Design for hardware durability and reliability*, we recommend the Commission to assess the failure causes. A publicly available failure rate database, based on consumer feedback, manufacturer data, and repair statistics, would help identify problematic components.[28] This information could inform the next revision to examine more targeted reliability and repairability requirements.

References

1 Mukai T, Nishio KI, Komatsu H, Sasaki M. What effect does feedback have on energy conservation? Comparing previous household usage, neighbourhood usage, and social norms in Japan. Energy Research & Social Science [Internet]. 2021 Dec 3;86:102430. Available from: https://doi.org/10.1016/j.erss.2021.102430
2 Zangheri P, Serrenho T, Bertoldi P. Energy Savings from Feedback Systems: A Meta-Studies' Review. Energies [Internet]. 2019 Oct 6;12(19):3788. Available from: https://doi.org/10.3390/en12193788
3 Schultz PW, Estrada M, Schmitt J, Sokoloski R, Silva-Send N. Using in-home displays to provide smart meter feedback about household electricity consumption: A randomized control trial comparing kilowatts, cost, and social norms. Energy [Internet]. 2015 Sep 1;90:351–8. Available from: https://doi.org/10.1016/j.energy.2015.06.130
4 Nolan JM, Schultz PW, Cialdini RB, Goldstein NJ, Griskevicius V. Normative Social Influence is Underdetected. Personality and Social Psychology Bulletin [Internet]. 2008 May 9;34(7):913–23. Available from: https://doi.org/10.1177/0146167208316691
5 Poppe E, Aigner TM, Meyer K, Molnár M. Erweiterte ökologische Wirkungsabschätzung zum Reparaturbonus Thüringen. Ergebnisbericht für die Förderperiode 2021 - 2023 [Internet]. Fraunhofer IZM. Fraunhofer IZM; 2024. Available from: https://doi.org/10.13140/rg.2.2.36393.40800
6 PROMPT (Premature Obsolescence Multi-Stakeholder Product Testing Programme): Product Lifecycle & Product Replacement reasons for Washing machines, Smartphones, TV's, and Vacuum cleaners [Internet]. 2021 May. Available from: https://prompt-project.eu/wp-content/uploads/2021/07/2021_PROMPT-lifecycle-and-replacement-reasons-report.pdf
7 Caillard J, Vasseur L, Vonderscher F, HOP - Halte à l'obsolescence programmée, Abdennadher M, Carnino G, et al. Conditionné·es à surconsommer [Internet]. 2025 Jun. Available from: https://www.halteobsolescence.org/wp-content/uploads/2025/09/Surconsommation-a-qui-la-faute-Rapport-obsolescence-marketing-de-HOP.pdf
8 Magnier L, Mugge R. Are short product lifetimes ineluctable? An exploration of consumers' perceptions of lifetime extension strategies. Proceedings of DRS [Internet]. 2022 Jun 16; Available from: https://doi.org/10.21606/drs.2022.507
9 Hahn D, Sehr F, Straube S, Dobs T, Berwald A, Wittler O, et al. Current State of Durability Assessment for four consumer product groups [Internet]. Proceedings. 2020 Sep. Available from: https://prompt-project.eu/wp-content/uploads/2020/10/Hahn-et-al.pdf

[ii] https://ecostandard.org/publications/ecos-feedback-the-implementing-decision-of-the-single-use-plastic-directive-supd-defining-the-methodology-for-recycled-content/

10 Guiltinan J. Consumer durables replacement decision-making: An overview and research agenda. Marketing Letters [Internet]. 2009 Aug 7;21(2):163–74. Available from: https://doi.org/10.1007/s11002-009-9085-2
11 Van Den Berge R, Magnier L, Mugge R. Too good to go? Consumers' replacement behaviour and potential strategies for stimulating product retention. Current Opinion in Psychology [Internet]. 2020 Jul 21;39:66–71. Available from: https://doi.org/10.1016/j.copsyc.2020.07.014
12 Van Den Berge R, Ramos, Belen, Magnier, Lise, Thysen, Tom. Premature replacement of well-functioning products and choice for replacement over repair [Internet]. Premature Obsolescence Multi-Stakeholder Product Testing Program. 2022 Apr. Available from: https://prompt-project.eu/wp-content/uploads/2023/06/D5.2_TUD_Premature-replacement-of-well-functioning-products-1.pdf
13 HOP (Halte à lÓbsolescence Programmée). Made to Overconsume: Survey on marketing obsolescence and the influence of commercial strategies [Internet]. 2025 May. Available from: https://www.halteobsolescence.org/wp-content/uploads/2025/07/Made-to-overconsume-HOP-report.pdf
14 Wijenayake, Fakhredin, Mehmood. Consumer Willingness to Repair Electronics: Machine Learning-Based Analysis of Consumer Survey [Internet]. EcoDesign 2025. Available from: https://bradscholars.brad.ac.uk/handle/10454/20764
15 Manoochehri S, Schluep M, WRFA, Dams Y, VITO, Mehlhart G, et al. An overview of Europe's repair sector [Internet]. ETC CE Report 2022/6. EEA; 2022. Available from: https://circulareconomy.europa.eu/platform/sites/default/files/2022-12/Repair%20sector.pdf
16 NIM (Nuremberg Institute for Market Decisions) Founder of GfK, Zürn MK, Unfried M, Biró T, Stubbe B. Repair or buy new? A study on attitudes toward the repairability of electrical appliances in seven countries [Internet]. 2025 Jun. Available from: https://www.nim.org/fileadmin/PUBLIC/3_NIM_Publikationen/NIM-Studien/NIMpulse/2025/ENG/250704_NIMpulse_11_-_Repairability_EN_fin.pdf
17 ADEME. Bilan de l'observatoire du fonds réparation des équipements électriques et électroniques (EEE) [Internet]. 2026. Available from: https://www.clcv.org/storage/app/media/Xilan%20du%20Fonds%20r%C3%A9paration%20des%20EEE%202025.pdf
18 ADEME. Bilan de l'observatoire du fonds réparation des équipements électriques et électroniques (EEE) [Internet]. 2025. Available from: https://www.clcv.org/storage/app/media/Bilan%20fonds%20r%C3%A9paration%202024-1.pdf
19 Roskladka N, Jaegler A, Miragliotta G. From "right to repair" to "willingness to repair": Exploring consumer's perspective to product lifecycle extension. Journal of Cleaner Production [Internet]. 2023 Nov 13;432:139705. Available from: https://doi.org/10.1016/j.jclepro.2023.139705
20 Dangal S. Advancing repairability in consumer electronics [Internet]. Research Repository (Delft University of Technology). 2025. Available from: https://doi.org/10.4233/uuid:33b078a4-8dc9-4144-a455-a6e2c265c11c
21 Bengart P, Vogt B. The impact of uncertainty in repair service attributes on consumer preferences: Insights from a dual-response choice experiment. Journal of Industrial Ecology [Internet]. 2025 Jun 25;29(4):1414–25. Available from: https://doi.org/10.1111/jiec.70064
22 Research TM. Europe Secondhand Electronic Products Market [Internet]. Transparency Market Research. 2023. Available from: https://www.transparencymarketresearch.com/europe-secondhand-electronic-products-market.html
23 Right to Repair Europe. Preparatory Study for the Setting of Horizontal Ecodesign Requirements on Repairability - 2nd version [Internet]. Right to Repair Europe. 2026 Apr. Available from: https://repair.eu/wp-content/uploads/2026/05/R2R-ESPR-Repairability-Feedback-May-2026-pdf.pdf
24 Dangal S, Ruud Balkenende, Jeremy Faludi, Sepp Eisenriegler, Harald Reichl, Julia Haas, et al. Design for physical durability, diagnosis, maintenance, and repair [Internet]. PROMPT. Available from: https://prompt-project.eu/wp-content/uploads/2022/05/PROMPT-D4.3-TEXT-APPENDIX.pdf
25 Van Dolderen DC, Versloot DL, Aghaeian S, Bakker CA, Balkenende AR. Shredding for science: How smart TV design affects recyclability in practice. Resources Conservation and Recycling [Internet]. 2026 Aug 11;235:109114. Available from: https://doi.org/10.1016/j.resconrec.2026.109114
26 Open Repair Alliance 2025-07. Barriers to repair (EEE items only) [Internet]. 2025. Available from: https://metabase.openrepair.org/public/dashboard/4d5cd77f-77bf-4ed5-beba-b93c9e2e1347?tab=36-repair-attempts&product_category=Flat%20screen&country=&event_date=&eee_%252F_non-eee=EEE

27 HOP (Halte à lÓbsolescence Programmée). Les chiffres exclusifs de l'enquête Occurrence-Groupe Ifop pour HOP 2025 [Internet]. HOP. 2025. Available from: https://www.halteobsolescence.org/sondage-exclusif-hop-occurence-ifop-obsolescence-marketing/

28 PROMPT (Premature Obsolescence Multi-Stakeholder Product Testing program). Summary Report on the overall Assessment of the methodology [Internet]. 2019. Available from: https://prompt-project.eu/wp-content/uploads/2023/11/D6.3_STIWA_Summary-Report-on-the-overall-Assessment_01.pdf

29 Fidra. Case Study - Restructa: Using XRF technology for POPs detection - Fidra [Internet]. Fidra. 2025. Available from: https://fidra.org.uk/download/case-study-restructa-using-xrf-technology-for-pops-detection/

[30] RTINGS.com. TV Size to Distance Calculator (And the science behind it) [Internet]. RTINGS.com. 2026. Available from: https://www.rtings.com/tv/reviews/by-size/size-to-distance-relationship