Making sustainable batteries a reality

ECOS position on the European Commission's Standardisation Request on batteries

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ECOS - Environmental Coalition on Standards is an international NGO with a network of members and experts advocating for environmentally friendly technical standards, policies and laws. We ensure the environmental voice is heard when they are developed and drive change by providing expertise to policymakers and industry players, leading to the implementation of strong environmental principles.

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Summary

The European Commission's Standardisation Request M/579 mandates European Standardisation Organisations CEN and CENELEC to develop standards on battery performance and durability requirements, reuse and repurposing, as well as safety aspects. Together with secondary legislation in support of the EU Battery Regulation, these technical specifications will be key to creating a sustainable battery value chain in the European Union.

To ensure that the European standardisation process that is just starting is fit for purpose, both the European Commission and standardisers should tackle a number of crucial action points:

No further delays. Regulatory measures for sustainable batteries underpinned by standards should be implemented as soon as possible to cope with the surge in battery production, use and end-of-life treatment.

Ambitious standards for reuse and repurposing. While we welcome the inclusion of deliverables on reuse and repurposing, standardisers should stay up to date with new emerging techniques and consider the second-hand EV market.

The need to harmonise data formats. The European Commission should develop an implementing act on data formats for performance parameters as soon as possible, and in consultation with standardisers who will develop the parameters.

Robust safety requirements. The scope of safety tests should be extended to include low-voltage applications. Research on adapted type tests for second-life batteries that are not destructive should be promoted and developed.

A phase-out of single-use portable batteries. Single-use products should be eliminated, especially when reusable alternatives exist. The Commission should study the feasibility of phasing out single-use portable batteries. In the meantime, environmentally ambitious standards should be developed in order to exclude the least performing primary batteries from the market.

Introduction

Despite their crucial role in increasing the integration of renewable energy sources in our economy and in decarbonising the transport sector, batteries do come at a cost to the environment. They can have serious environmental impacts on biodiversity, water and air quality. These impacts are linked to the mining and extraction of a number of critical raw materials, as well as to battery disposal and recycling, not to mention a significant carbon footprint if manufacturing processes prove inneficient and use carbon-intensive and non-renewable energy sources.

A longer lifetime can therefore reduce the environmental impact of batteries, through the extension of the first life and by fostering a second repurposed life. These aspects need to be addressed through ambitious policies and a coherent regulatory framework, supported by effective technical standards, which are not available[1] at the time of writing.

At the policy level, the EU institutions are finalising discussions on a proposal for a Regulation on Batteries and Waste Batteries ('Battery Regulation')[2]. The regulation aims at covering the full battery value chain and will seek to realise the EU's ambition to be a global leader in sustainable battery production[3]. In fact, the intention to develop new rules for the battery sector was listed as one of the main activities of the 2020 EU Circular Economy Action Plan, with the objective to remove most of the regulatory and standardisation obstacles in the battery value chain. While some of the measures on the table set ambitious and much needed objectives, more can be done to enable a competitive and circular battery value chain.

Ambitious policy measures need to be underpinned by solid technical grounds – this is where standards play a crucial role. About a fifth of all European standards are developed following a Standardisation Request (or mandate) from the European Commission to the European Standardisation Organisations (ESOs[4]). This is a request to draw up and adopt European standards or European standardisation deliverables in support of European policies and legislation. However, many standards and methodologies for sustainable batteries are currently still lacking. In 2020, the European Commission started to prepare the ground for this technical work by drafting a Standardisation Request (SR) on batteries, which was then approved by EU member states and accepted by the European Standardisation Organisations CEN and CENELEC in 2021 (and notified as M/579[5]). Alongside standardisation, secondary legislation setting new accounting methodologies will be developed by the Joint Research Centre of the European Commission, notably the methodologies on carbon footprint and recycled content declaration.

By July 2022, CEN and CENELEC will have to present a Work Programme setting out milestones for the development of the standardisation deliverables under the SR M/579. We insist that it is important that standardisers understand the environmental relevance of this work and the urgent readiness of the standards to reduce the impacts of batteries while they allow for the needed electrification of our economy. On the other side, the European Commission will have to ensure the execution of the SR and proceed with other routes to enable a timely implementation of the EU Battery Regulation once it is adopted.

This paper gives an overview of the methodologies and the standards needed to make the Battery Regulation a reality and focuses on the different aspects of the EC Standardisation Request M/579, highlighting its strengths but pointing to its weaknesses. We provide recommendations to both the European Commission and standardisers in charge of developing the deliverables under the Standardisation Request.

Standards will be key to making the Battery Regulation a success

The sustainability and circularity of batteries can be achieved by extending their lifetime as much as possible. The Battery Regulation proposes a number of measures which will positively contribute to the improvement of battery lifetime[6]. This includes performance and durability requirements, the definition of metrics such as end-of-life (EoL) and state of health (SoH), as well as requirements on reuse and repurposing.

While the Commission's proposal and the position of the European Parliament set an ambitious framework, it will be of utmost importance that the regulatory measures are not watered down during the inter-institutional discussions that lead to the adoption of the final text.

Another key success factor will be robust standards and methodologies, are necessary to underpin ambitious legislation. In order to allow for the implementation of certain measures, the Battery Regulation will build on several pieces of secondary legislation (such as implementing and delegated acts), as well as standards and methodologies, which will be developed by the European Commission's Joint Research Centre (JRC) and the European Standardisation Organisations CEN and CENELEC.

The table below shows a non-exhaustive list of secondary legislation and standards needed to implement the measures foreseen in the Regulation proposal:

Measure	Secondary legislation	Technical standards
Carbon footprint	Methodology to calculate the total carbon footprint of the battery and its format, as well as performance classes and thresholds.	Not requested
Recycled content	Methodology for the calculation and verification of the amount of cobalt, lead, lithium or nickel, and its format.	Not requested
Performance and durability requirements for portable batteries	Minimum values for electrochemical performance and durability parameters.	Standards to describe the measurement methods necessary for the determination of performance and durability of portable rechargeable and non-rechargeable batteries of general use.

Measure	Secondary legislation	Technical standards
Performance and durability requirements for industrial batteries and EV batteries	Minimum values for electrochemical performance and durability parameters.	Standards to describe the necessary steps and conditions for the measurement of the parameters, which are relevant for the initial application and (if intended for the battery) the reuse and repurposing application.
Design of portable batteries	Not requested	Informative guidance on design and assembly techniques that facilitate the maintenance, repair, reuse and repurpose of batteries and battery packs.
Safety	Delegated act to amend the safety parameters of the Regulation in view of technical and scientific progress.	Standards on safety requirements.
State of Health	Not requested	Standards for the diagnostics and determination of State of Health (SoH)
Second-life batteries	Not requested	Standards to describe the necessary steps, conditions and protocols for the safe repair, reuse and repurpose of batteries and battery packs, modules and cells originally designed for electro-mobility applications.

While the use of standards in EU policy making is wide, it comes with a number of risks that should be tackled. European standardisation is an industry-dominated process that takes place within the European Standardisation Organisations CEN, CENELEC and ETSI. The process of developing a technical standard usually takes two to three years, but potential lack of consensus among standardisers might result in standards that are not ambitious enough to implement the measures or that are not ready in due time.

To mitigate these risks, the Battery Regulation proposal includes the possibility for the European Commission to develop common specifications through implementing acts if standards are not developed by the time the legal requirements enter into force[7]. This way, the Regulation could provide a 'fall-back solution' in case rules on performance, durability and sustainability need to be implemented before the actual standards are ready.

It is therefore critical that, in its adopted version, the Battery Regulation confirms the possibility to develop alternative technical solutions in the absence of harmonised European standards. All options, including the so-called transitional testing methods or other reliable, accurate and reproducible methods, should be available if the official standardisation route hinders or causes considerable delays in the development of methodologies which are vital for policy implementation.

A swift implementation of the Battery Regulation is key to ensure a sustainable battery value chain, designed to address human rights and environmental impacts from the very beginning. Failing to implement measures in a timely manner would not only be harmful for the environment, but it would also be a missed opportunity to support a new sustainable and strategic European industry.

It is also essential that, for the drafting of harmonised standards in particular, which serve the EU public interest, the standardisation process ensures a balanced representation of societal stakeholders such as environmental organisations.

Recommendations for ambitious and timely standards

After more than a year and a half of discussions and negotiations, CEN and CENELEC, EU member states, civil society representatives and the European Commission have agreed on a Standardisation Request (SR) on batteries that was notified in December 2021 as M/579[8].

Mandate M/579 requires standardisers to develop standards on:

- **Performance and durability aspects** of portable rechargeable and non-rechargeable batteries, as well as of rechargeable batteries with internal energy storage;
- **Reuse and repurposing** of rechargeable batteries with internal energy storage;
- **Safety aspects** of stationary battery energy storage systems with internal energy storage.

The SR is an unprecedented first step in support of environmentally sustainable batteries. The text calls for the development of better definitions to be used in tests for second-life batteries, and rules to determine the end-of-life and state-of-health of batteries. New norms will also allow batteries to be repaired and reused properly, which is challenging today because several parts (including battery packs) are usually welded and cannot be dismantled.

On a less positive note, the SR went through many negotiation rounds, which have watered down the ambition of several aspects included in its original draft. The SR now lacks a call for the standardisation of battery data formats and a clear guidance on safety testing for second-life batteries. It also sets a lengthy timeline for the execution of the Request.

It is also worth mentioning that the Request is likely to be amended. In fact, since the Battery Regulation proposal was still under negotiations when the SR was approved, the Request states in its Recital 13 that 'In case the proposal is subject to substantial modifications during the ordinary legislative procedure, this standardisation request may have to be amended accordingly'. This means that there might be an amendment to the SR in case major changes happen after the EU co-decision process, or at least to include the legal reference of the EU Battery Regulation and change the legal basis of the SR[9]. If the text is eventually amended, we invite the European Commission to take into account the recommendations included in this paper.

Below, we highlight the positive and negative aspects of the Standardisation Request.

Positive aspects

Standardisation of **metrics to measure performance and durability** parameters of batteries

Development of standardised procedures to determine the **state of health** of a battery and determine whether it is ready to undergo second-life applications

Negative aspects

A **long timeframe** for the development of standards which may cause implementation delays

Lack of **harmonised data formats**

Destructive type-tests for second-life batteries

No phase-out for **single-use portable batteries**

No room for further delays

Although many aspects of the SR are steps in the right direction, we will need to wait for their realisation: the agreed timeline for the development of standards was set at 48 months, too long for such crucial requirements.

This timeframe is out of phase with market needs, and risks slowing down the implementation of the EU Battery Regulation altogether. This will ultimately undermine the European Commission's objectives set in the Circular Economy Action Plan, and the transition to an integrated, renewable and electrified energy system. Unfortunately, during the negotiations several EU member states pushed for the delay of key measures, on issues such as performance and durability requirements and due diligence[10].

The EV battery sector has announced plans for battery manufacturing in so-called 'gigafactories' to start producing as early as 2023[11]. Developing future-proof standards at the end of 2025 (at best) will mean that these factories will only start producing sustainable batteries according to commonly agreed European standards towards the end of the decade.

Despite a call for battery standards from both industry[12] and civil society[13], standardisation bodies claimed it was impossible to shorten the time needed to develop the standards, and insisted on extending deadlines. This resulted in a compromise on a time frame of 48 months. This is already twice the time initially proposed by the EU Commission, but, most importantly, this period is certainly longer than what EU industries need to keep their competitive advantage in battery sustainability. Moreover, such a long timeline does not align with the CEN-CENELEC 'Flexible Standards Development Process' which aims at shorter periods of 24-30 months[14].

Standardisation bodies in other parts of the world (e.g. in China or the United States) have proven to be able to develop new standards for the industry, including in ground-breaking fields such as battery repurposing (e.g. UL 1974 standard[15], published in 2018). Accepting that European standardisers take almost a decade more to propose similar standards will certainly not benefit the EU ambition to be a global leader in battery sustainability and in standard-setting. Even worse, the EU will miss the opportunity to become the trend-setter in battery standards, as China and the US will already have a head-start.

This missed opportunity on a timely battery standardisation has recently been pointed out by the European Commission itself in its EU Standardisation Strategy[16]. The Commission stresses the importance for the EU to be at the forefront of standardisation initiatives, especially in such sensitive areas as lithium batteries, where the EU can claim a sustainability advantage compared to other regions.

ECOS urges the European Commission and EU member states to:

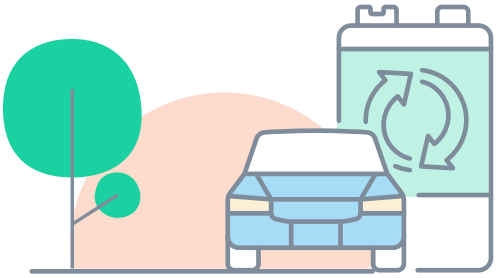
- **Ensure the timely entry into force and implementation of regulatory measures for sustainable batteries**. The implementation of the EU Battery Regulation is urgently needed to deal with the high number of batteries that will be produced, used and treated in the EU[17]. Measures will need to enter into force immediately after the adoption of the regulation and the underpinning standards must respect the – already too long – Standardisation Request timeline.

- **Develop transitional testing methods and metrics, if harmonised standards are not ready by mid-2024**. Given that the Battery Regulation will likely be adopted before the drafting of the standardisation deliverables under the SR starts, European battery manufacturers might risk losing their sustainability competitive advantage if no common specifications are put in place. We welcome Article 16 of the proposed Battery Regulation, so as to enable a timely implementation and enforcement of legal requirements in the absence of European harmonised standards (see section 1 'Standards will be key to making the Battery Regulation a success').

Long live EV and industrial batteries

Using second-life (repurposed) batteries as stationary electricity storage units is likely to extend their lifespan not only by significantly improving the lifecycle footprint of the battery but also through avoiding the production of new storage batteries.

Whether a battery is suitable for a repurposed application after its first life can only be evaluated with appropriate tests. These will make sure that the battery is safe and that its remaining capacity is still high enough for a second lifetime. However, the current absence of standardised tests and parameters such as State of Health (SoH) makes it very hard to carry out such evaluations.



Performance and durability requirements

The SR mandates the development of standards that describe steps and conditions for the measurements of parameters that are relevant for either the initial application or the second-life application of a battery.

We welcome the adoption of a comprehensive approach to testing[18], which foresees not only accelerated ageing testing, but also continuous capacity fade estimations during the battery lifetime. We support the introduction of performance evaluation criteria such as rated capacity fade, rated power fade, internal resistance increase, round-trip efficiency fade and expected lifetime, as these will give the needed overview of the status of the battery and its ability to be repurposed for second-life applications.

State of Health and remaining lifetime

In order to solve the gaps in evaluation tests for second-life batteries, the SR also asks for the development of a robust and precise procedure to determine the SoH and to provide a reliable estimate of the remaining capacity and expected behaviour of the battery[19]. Besides, in the recitals, the SR mentions the need to provide historic data coming from the Battery Management System (BMS) as part of a SoH diagnostic method. This procedure will build on the common definition of parameters that go beyond SoH and that will help determine a remaining battery lifetime and not simply a 'snapshot' SoH (see previous section 'Performance and durability requirements').

This holistic approach is essential since battery degradation (evaluated through capacity fade or round-trip efficiency) is often non-linear and the provision of SoH data in a fixed moment gives only a limited picture of the situation and is not sufficient to describe the battery's remaining lifetime.

However, it is important to stress that SoH and remaining lifetime estimation methodologies are still subject to extensive research from academia and industry. New technologies are continuously emerging, involving machine-learning techniques, electro-chemical modelling as well as hybrid techniques. The innovation potential is still very high, since numerous paths are still to be explored, including the evaluation of different machine-learning techniques, increased hybridisation with electro-chemical modelling, new telecommunication technologies such as 5G that allow transfer of larger data volumes, trade-offs between accuracy and speed, etc.

Although standardisation is highly needed to define SoH and remaining lifetime, creating a common industrial reference, it is important to keep in mind that an optimisation of the process with new technologies could further reduce time and costs, and foster battery reuse and repurposing.

The Commission should therefore request standardisers to reassess the state-of-the-art of such methodologies

shortly, and also to consider methodologies based on machine learning techniques. Although there is a clear need to create a common industrial reference through standards, they should not block the emergence of new and more efficient methodologies.

Guidance on reuse and repurposing

Another positive aspect of the SR is the development of technical provisions to facilitate the reuse and repurposing of rechargeable batteries (including packs and modules) with internal energy storage. This will be a game-changer for the reuse and repurposing industry, which currently lacks a common reference on best practices, leading to a highly asymmetrical offer from industrial players.

This standardisation deliverable includes guidance on design, and more specifically on assembly and disassembly techniques on necessary steps, conditions and protocols for safe repair, reuse and repurpose of batteries (including packs, modules and cells for EV applications).

The standards that will derive from the SR must thoughtfully take into consideration the problem of data availability, to avoid hindering the deployment of the reuse and repurposing industry. For instance, the Battery Regulation will start to impose storing and transferring data on battery use history only upon its entry into force. This means that such data will only be available within 5-6 years from the moment the Regulation enters into force, and that it will be impossible to evaluate remaining lifetime based on historic data before this time. It is therefore key to consider ramping up data-driven methods for performance evaluation in the reuse and repurposing industry. For example, any standard for repurposing, such as the UL 1974, should not limit its performance assessment methods to the ones that only rely on historic data, but also provide alternative options such as methods based on qualitative data analyses or experimental methods.

We have already pointed out a number of times that[20], when discussing evaluation performance for reuse and repurposing, the Commission should not forget that the same exact needs exist for the EV secondary market and verification bodies. Consumer uncertainty as to the remaining battery lifetime is one of the most common barriers to the development of both secondary and primary EV markets.

A worrying lack of harmonised data formats

The SR lacks a reference to the standardisation of battery data formats, which will fortunately be developed by the European Commission through implementing acts by 2025[21]. Harmonised data formats are key to making the performance and durability parameters exploitable.

The lack of data formats risks making the obligation for data provision utterly meaningless. For example, manufacturers might decide to provide measurements over a period that is too long (for instance, a day), thus filtering out any extreme values, which are nonetheless important for determining remaining lifetime. Similarly, battery manufacturers might decide to use proprietary data formats or logging devices which might raise very important barriers to the reuse industry.

Issues deriving from lack of data standardisation are widely known throughout the industry (especially the digital industry). Failing to standardise at this stage, given the opportunity at hand, would mean letting the energy storage industry develop in the wrong direction, as other industries have developed for years.

Lack of data standardisation is not only very likely to cause important loopholes, but also hinder implementation of the Battery Regulation. We therefore urge the European Commission to develop the implementing act on data formats as soon as possible and to exchange with standardisers in charge of developing the parameters whose format needs to be harmonised.

Safety requirements should enhance repair and repurposing

Besides what has been discussed above, the Standardisation Request presents overly simplistic guidance on safety testing, or rather a lack thereof, which cannot be applied to the existing diversity of energy storage products on the market.

The SR would benefit from an additional reference to the EU Low-Voltage Directive (LVD), which includes essential requirements for avoiding the risk of fire incidents caused by storage system faults linked to insufficient basic low-voltage (< 1000 V) safety measures. This could also help battery repair. While repair services are aware of LVD procedures, any repair process that cannot be positioned within the LVD rules will cause confusion or even prevent some repair actions from taking place.

Another issue worth pointing out relates to safety tests for second-life batteries that could hinder the uptake of this sector. Type tests are an accepted method to assess the quality and safety of products[22] but are not generally compatible with second-life batteries. A battery type test consists in testing one single battery per series, which would be used as a representative sample for the entire series through quality control procedures; if one important technical detail changes in the series, then new type tests must be performed. Type tests are destructive and usually make the sample battery unsafe for use once the test is completed.

If individual cells with different first-life ageing profiles are combined within a single second-life energy storage system, this system's behaviour is not representative, even within a series of such second-life systems, because, unlike new cells, second-life cells cannot be assumed to be identical in their characteristics and a batch of second-life batteries will not have the same characteristics. This does therefore not allow for a representative type testing of one second-life system. In other words, if all second-life systems were tested, every test would likely yield different results.

A technically viable solution may be to mandate routine testing of all systems at the end of the production line, by using the same test procedure as in the case of type tests. However, given that some type tests are destructive and make the test object non-functional or at least unsafe to operate after the test[23], new non-destructive but equivalent methods should be developed from scratch to assess product quality in a reliable way for second-life applications. This needs to happen before these methods can be documented in a standard, be it mandated or not. Besides, if battery or car manufacturers provide certificates of the initial tests to reuse and repurposing operators, there is no need to perform most tests again, e.g. impact or drop tests with the same (or harsher) conditions.

Routine tests of every single piece of a product will certainly lead to increased costs, especially for SMEs, which are regularly driving sustainable innovation, also in the case of second-life energy storage products. Other non-destructive test methods alternative to type-tests could be used in accordance with EU Decision 768/2008 on a common framework for the marketing of products, which establishes modules for conformity assessment procedures.

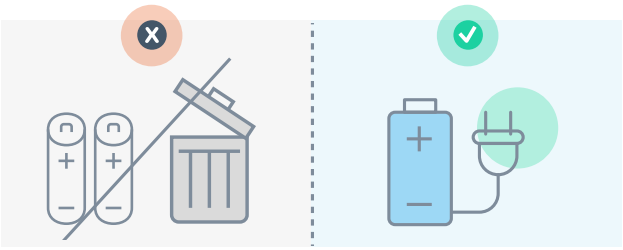
In conclusion, the SR seems to imply that all second-life batteries must be routinely type-tested if they are assembled from second-life cells – an interpretation that should not be left open to standardisers.

We therefore urge the European Commission to:

- Include a reference to the Low-Voltage Directive;
- Address specific standards for prototypes, custom design and small series;
- Clarify specifications on safety tests for second-life batteries and support non-destructive safety testing requirements, based on standard UL 1974;
- Oblige battery manufacturers to provide the results of first-life safety tests to second-life battery operators.

Phase out single-use batteries

The SR asks to develop measurement methods for the performance and durability of portable batteries of general use (where the most common formats are AA and AAA), both rechargeable and non-rechargeable.



Today, portable batteries of general use are still mostly disposable - thrown away after their first and only use. Regretfully, the European Commission deviated from its initial plan of progressively phasing out non-rechargeable single-use batteries (as stated in its Circular Economy Action Plan) and opted for minimum performance and durability requirements instead. The phase-out was strongly opposed by the industry[24], which argued that the so-called 'low-drain' applications (such as remote controls, wall clocks and small medical devices) still needed non-rechargeable batteries. While this statement could be true for certain applications, this is only substantiated by industry claims and cannot be the reason to allow single-use batteries on the market, even if they are better performing.

The environmental benefits of phasing out disposable batteries are undeniable: savings in CO_2 emissions from manufacturing, reduction of mining of non-renewable resources and critical raw materials, reduction of dependency on material flows from outside the EU and reduction of hazardous waste.

Industrial players, whose pushback led to the withdrawal of the proposal, argued that a phase-out would have negative impacts on certain devices, which would become obsolete without a disposable battery. They also claim that, based on LCA studies carried out by the industry, rechargeable batteries would last less than primary batteries in the same devices due to self-discharge, especially in the so-called 'low-drain' products.

While we agree that an LCA approach is needed, it is also clear that single-use products are not more sustainable than reusable ones:

- **Phase-out is certainly possible for some primary batteries if not all.** While for some devices there is no technological alternative to primary batteries (such as coin cells), the Commission must not abstain from examining the possibility to phase out primary batteries, or their specific types, in other devices. This should especially be examined for medium and high-drain devices.

- **Innovation can be driven to counter self-discharging.** For most applications (such as smartphones or laptops) the advent of lithium batteries has largely reduced self-discharging effects. There are still many areas where certain battery technologies (e.g. lead-acid batteries) are likely to be replaced by lithium batteries (e.g. automotive batteries), or other technologies. Battery technologies have evolved in leaps for smartphones in the last few years; market demand has forced manufacturers to increase energy density of mobile phone's batteries manifold in only a decade. It is hard to imagine that, given sufficient incentive, industry would not find a way to counter self-discharge effects, especially when one of the dominant technologies today (lithium-ion) performs so much better in these aspects.

- **Life-cycle analysis should consider a longer period.** Whereas in the short term it could be argued that disruption might cause inefficiencies and render some existing devices obsolete, analyses should cover a much longer period in the future. Phasing out disposable batteries in the next few years would lead to a new generation of products running on rechargeable batteries. In the long term, the advantages of rechargeable batteries will be undisputable.

- **It is questionable that batteries in low-drain devices last 10 years**. In devices such as clocks, remote controls or smoke detectors, which are often cited as examples of low-drain devices, batteries last significantly less than 10 years (e.g. clocks 1-2 years, remote controls 5-6 years[25], smoke detectors 8 years etc.)

Meanwhile, industry proposes to adopt a standard that would ensure that only best-in-class batteries enter the market, eliminating batteries with poor performance, and helping consumers to choose when to use rechargeable or primary batteries. While we recognise that this is indeed a step in the right direction, this does not mean that phasing out certain types of portable batteries should not be pursued in parallel. We therefore call for an assessment on the feasibility of phasing out disposable batteries to be done without delay and not after 2030 as currently proposed by EU decision-makers.

Notes and references

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7 European Commission, COM(2020) 798/3 Proposal Regulation concerning Batteries and Waste Batteries, Article 16 'Common Specifications', 2021

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17 ECOS et al., Enhancing the sustainability of batteries: A Joint Position Paper on the EU Battery Regulation Proposal, 2021

18 Listed in Annex I, paragraph 2.2 of M/579

19 M/579, Annex I, paragraph 2.3.2

20 ECOS, The Positive Side of Batteries: The Role of Standards in Supporting Sustainability Requirements for Batteries, 2020

21 Battery Regulation, Article 64(5b)

22 Procedure is explained in EU Decision 768/2008 on common framework for the marketing of products

23 For instance, any test regarding mechanical damage by external forces usually removes or at least degrades the structural integrity of the test object and therefore it is not acceptable to be carried out for every product within routine tests

24 https://www.digitaleurope.org/resources/joint-industry-statement-on-the-impact-of-restricting-primary-batteries-in-europe/

25 https://techprojournal.com/how-long-do-tv-remote-batteries-last/

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