Explanatory Memorandum for the Ecodesign Consultation Forum

Ecodesign – External power supplies and wireless chargers

Meeting of 24 November 2023

Disclaimer:
This text is part of the working documents supporting the revision of COMMISSION REGULATION (EU) 2019/1782 of 1 October 2019 laying down ecodesign requirements for external power supplies. It summarises the main elements of an initial draft of the revised legal text to support the stakeholders' consultation process, in particular the Consultation Forum meeting of 24 November 2023.
Please note that while it has been prepared by DG ENER staff and its consultants, it is by no means an official document endorsed by the European Commission.

1. CONTEXT OF THE ACT

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 efficiency 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 net greenhouse gas emissions by at least 55% by 2030[3].

Ecodesign requirements for external power supplies (EPS) have been introduced in 2009[4] and revised in 2019[5]. Article 7 of the revised regulation requires the Commission to "review this Regulation in the light of technological progress and shall present the results of this review, including, if appropriate, a draft revision proposal, to the Consultation Forum by 14 November 2022. The review shall assess in particular: the feasibility of setting a requirement regarding minimum energy efficiency at 10 % load; options for including within the scope of the Regulation wireless chargers, active power over Ethernet injectors, and external power supplies used with electrical and electronic household and office equipment that is not included in Annex I; and options for including requirements in support of circular economy objectives, including interoperability."

In addition, as part of the Ecodesign and Energy Labelling Working Plan 2020-2024 (EELWP)[6], EPS are among the product groups to be possibly subject to revised requirements, and an analysis of the concept denoted as "Universal External Power Supply" has been carried out as part of the preparatory work. The outcome of the study[7], illustrates how harmonised EPS are designed to be able to power an increasingly wide number of electronic, electric and battery powered products. In this context it is important to note that the USB-PD standard has been recently updated to support a power output of up to 240W over the USB Type-C cable and connector[8].

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[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] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality. COM(2021) 550 final, Brussels, 14.7.2021

[4] Commission Regulation (EC) No 278/2009 with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies

[5] Commission Regulation (EU) 2019/1782 of 1 October 2019 laying down ecodesign requirements for external power supplies pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulation (EC) No 278/2009.

[6] Communication from the Commission Ecodesign and Energy Labelling Working Plan 2022-2024 2022/C 182/01, C/2022/2026, (OJ C 182, 4.5.2022, p. 1–12)

[7] https://www.ecodesignworkingplan20-24.eu/documents

[8] EN IEC 62680-1-2:2022 'Universal serial bus interfaces for data and power – Part 1-2: Common components – USB Power Delivery specification'

The Circular Economy Action Plan 2020[9] provides for policy measures to reduce the generation of electronics waste and to extend product lifetime. To address these challenges, the Commission initiated a 'Circular Electronics Initiative' addressing, among other policy actions, regulatory measures on chargers for mobile phones and similar devices, including the introduction of a common charger, improving the durability of charging cables, and incentives to decouple the purchase of chargers from the purchase of new devices.

In 2020 an impact assessment study on 'common chargers' with a specific focus on mobile phones[10] explored policy options to enhance interoperability of EPS, followed by a study to assess the impacts of the unbundling of chargers[11].

Now, with the revision of the Radio Equipment Directive[12] a range of battery powered radio devices[13] are be required to implement a USB Type-C receptacle and being capable of being charged with a USB or a USB-PD power supply. Further, consumers and other end-users shall have the possibility to acquire this radio equipment without a charging device ('unbundling'). Given that these requirements are set under the Radio Equipment Directive the scope is limited toa sub-set of devices in scope of this directive.

In order to explore options for a revision of Regulation (EU) 2019/1782 an evaluation study[14] was launched in March 2022, followed by a public call for evidence for an impact assessment[15]. 16 stakeholders provided input to this consultation, followed by several bilateral technical meetings with Commission services.

1.2 Problem Description

The **first problem** identified by the impact assessment is the need for the EPS regulation to contribute to **more rapid reduction in energy use and GHG emissions**.

Achieving the 2050 Zero Net GHG emission target already requires substantial steps to achieve the 2030 reduction targets, i.e. sharp reductions of energy consumption and

[9] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A new Circular Economy Action Plan For a cleaner and more competitive Europe COM/2020/98 final

[10] European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Impact assessment study on common chargers of portable devices, Publications Office, 2020, https://data.europa.eu/doi/10.2873/528465

[11] European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Vazquez, Y., Impact assessment study to assess unbundling of chargers : final report, Publications Office, 2021, https://data.europa.eu/doi/10.2873/788086

[12] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

[13] handheld mobile phones, tablets, digital cameras, headphones, headsets, handheld videogame consoles, portable speakers, e-readers, keyboards, mice, portable navigation systems, earbuds, laptops.

[14] Evaluation of Regulation (EU) 2019/1782

[15] Call for evidence for an impact assessment - Ares(2022)2607558

related GHG emissions. It is desirable for cost-effective energy efficiency measures to be implemented to enable these overall targets to be achieved in the cheapest way for society.

The life cycle energy consumption of EPS contributes to overall energy consumption and GHG emissions both in and outside the EU. In should therefore be explored whether they can be further reduced as a contribution to the overall reductions needed.

The **second problem** identified is the need to reduce **other environmental impacts of EPS**.

Apart from energy use and GHG emissions, EPS also contribute to other environmental impacts such as pollutant emissions from electricity generation, material consumption as fuel and the consumption of materials and the accompanying environmental impacts for manufacture.

Annual EPS sales represent about 22kt of materials, representing about 0.1% of material consumption in sales of all Ecodesign regulated products. The electricity used results in around 3.3Mt of fuel combusted. Pollutant emissions from this electricity generation amount to about 1.4kt of NO_X and 1kt of SO_X in 2020.

A series of **drivers** have been identified behind the two problems.

Scope unclear and too narrow: The current scope of the regulation does not cover EPS for a number of devices with growing markets and thus of increasing relevance for energy efficient charging and power supplies to minimise energy consumption and potentially allow interoperability. Examples are battery charging devices, battery powered devices and gadgets, gardening and power tools, and e-bikes.

No transparency on efficiency and untapped potentials for higher efficiency: The energy efficiency differences between EPS currently placed on the market are considerable, reaching around five percentage points. This large efficiency spread indicates that there is potential for greater energy savings. In addition, the differences in efficiencies are not visible to users.

EPS are less efficient under low load: the EPS efficiency decreases at low load, however there is no correlation between the active average efficiency and the efficiency at low load. In other words, a regulated high active average efficiency does not necessarily mean a high efficiency at low load for the same device. Evidence shows at the same time that a notebook operates below 25% of its maximum load capacity for around 50% of its total operation time.

Lacking interoperability of EPS: EPS are generally not interchangeable because they have different operating voltages, power ratings and connectors. The result can confuse and inconvenience consumers and leads to higher expenditure due to the need to purchase a new EPS with almost every device. Because of the higher level of EPS purchases than if they were interoperable, there is a greater use of materials in their manufacture. The increased processing of raw materials, manufacture, distribution, sales and end of life disposal of the greater number of EPS lead proportionately to higher environmental impacts.

Lack of information on compatibility with load: Consumers have difficulty to decide whether an EPS is compatible with the load of a specific device since the information, if provided, is often hardly readable and understandable.

Bundling of EPS with products: Consumers have become used to receiving an EPS with each device. This experience creates an expectation that products should be delivered with an EPS rather than that an EPS should only be purchased if it is actually needed by the consumer. Bundling of EPS prevents the environmental benefits from interoperable, harmonized common chargers being realised and may reduce the environmental benefits from more energy efficient EPS.

Scope and testing of adaptive EPS: The testing requirements for adaptive EPS are not fully clear, and are not explicitly aligned with the test method adopted by the DoE.

Requirements arising from legislation and standards: a series of requirements from regulations, standards or industrial practice could affect the measures proposed under the revised regulation:

- *Bundling requirements for certain types of electrical and electronic equipment*: EN 60335-1 standard requires class III construction parts of household appliances such as tooth brushes, shavers, epilators, etc., to be sold with a power supply for safety reasons.
- *Safety requirements for wet-use applications:* EN60335-2-8 and EN60335-2-52 require the use of IPX4 transformers with pins for insertion into sockets outlets "for washable/wet shavers, washable/wet clippers, washable/wet epilators, wireless toothbrush chargers". Unbundling and harmonisation would require all USB-PD EPS on the market to meet these safety requirements which would be very costly (estimated additional cost of 2-3€ for an EPS).
- *Improved surge protection for IT and other electronic equipment:* Similarly, electronic products which are not so called end-of-line equipment like for example a mobile phone, but are connected to other devices via a network or other type of shielded cable, like for example a wireless router, require sometimes a higher level of electromagnetic protection from their EPS. Such EPS are required by product manufacturers to be subject to higher electromagnetic immunity standards according to specific sections of EN 55035. In addition, the practice of certain telecom operators is to require from their equipment higher protection levels, for example according to the ITU-T K.21 recommendations. This is to prevent large scale failures of their routers due to poor earth connections in many residential buildings. Industry experts estimated an additional cost of around €0.3 for a conventional EPS to become compliant with such higher levels of EMC protection.
- *Electrostatic discharge protection for vacuum cleaners:* A considerable amount of electrostatic charge can accumulate on a vacuum cleaner during use. This charge can be released when connecting a handheld vacuum cleaner to its EPS. In order not to damage the EPS, this has to be designed to withstand a very high level of electrostatic discharge, for example in accordance with the standard IEC 61000-4-2.

- *Toys:* Toys are by definition intended for use by children and must fulfil special safety precautions, which apply also to their power supply. These are for example given by the standard IEC 61558. If a toy is expected to be operated outdoors, its power supply must also be IP65/IP67 protected.
- *Audio equipment*: There are no specific rules or standards known to apply only to EPSs powering audio products. Nevertheless it appears that very often the quality, in particular the noise of the EPS of an audio product can impact the performance of the product itself. For this reason it appears that linear power supplies are often preferred for high-end audio applications instead of the more common switch mode power supplies. This would normally not be a concern for other product groups.
- *Peak-power demand*: In particular devices with sound output can have a pronounced peak-power demand from their power supply. Such peaks of power are normally in the order of milliseconds and are significantly higher than the nameplate output power of the EPS. Not all EPSs can sustain such short power peaks. USB EPS are for example limited at their rated (nameplate) output power.
- *Restoring operation after a fault condition:* Powered devices generally expect the EPS to attempt resuming operation after it has been interrupted by a fault condition. USB-PD EPS have the option to attempt resuming operation after an over-current or over-temperature condition, or to remain turned off by reverting to the lowest output voltage. It appears that most certified USB-PD EPS attempt resuming operation.

Wireless charging: The driver for the development and growing market of wireless chargers is user convenience. Different wireless charging technologies have differing levels of efficiency, usually around 40-50%. These are inherent to the technology and far lower than the efficiency of regular EPS. The overall efficiency of a wireless charger depends on the system performance, in particular the placement of the device on the charging pad, and not only on the efficiency of the device itself including its power supply.

Power over ethernet: PoE injectors are increasingly used in corporate offices and residential apartments. The large efficiency differences observed among active PoE injectors, and the lack of information about efficiencies can be expected to result in unnecessarily high energy consumption in this growing market. From the declared high efficiencies and DoE level VI compliance for several observed active PoE

The identified problems are expected to affect consumers, the environment and economic operators.

The further technical potential for saving energy and reducing **consumers** costs will not be fully exploited if the current situation persists. Consumers will also be exposed to additional expenditure as they end up purchasing more EPS than needed. Finally, consumers suffer inconvenience due to the current situation regarding chargers which are generally not interoperable.

The main **environmental effects** of the current situation can be understood to be unnecessary energy consumption, use of resources, increased e-waste and their associated GHG and pollutant emissions. There are technical efficiency potentials which the current minimum active energy efficiency and no-load energy consumption requirements do not exploit to further reduce energy consumption and GHG emissions. As a result of the

electricity consumed during use, there are also substantial amounts of material consumed as fuel in its generation. The Common Charger IA using a stock model, estimated that the raw material use in EPS for mobile phones and similar devices could reach a peak of 15kt by 2022 and remain steady until 2028. An upward trend is expected in e-waste generation due to growing purchases of EPS. Related emissions are connected to all life cycle stages of the EPS. The production phase is always a major contributor. Furthermore, transport and use phases can also be determining phases depending on the use profile.

Manufacturers and suppliers of EPS have an interest in cost-effectively minimising material use in the EPS. However, they lack any interest in the energy efficiency of the EPS and there is no competition on efficiency. Economic operators, including producers of equipment within and outside the scope of the current directive, benefit from the current situation with commercial and competitive advantages due to proprietary solutions for connectors, charging protocols, and economic benefits from selling EPS with the products. The revision of the RED can be considered to largely address the issue of interoperability for devices within its scope (i.e. around 65% of the EPS market).

2. LEGAL BASIS, SUBSIDIARITY

2.1 Legal basis

Article 114 of the Treaty on the Functioning of the European Union (TFEU) is the legal base for measures related to the functioning of the internal market and therefore constitutes the legal base for the Ecodesign Framework Directive and its derived legislation.

In addition, the Ecodesign Framework Directive lays down a set of criteria to identify energy-related products that may be subject to ecodesign measures. EPS are eligible on the basis of the potential energy and material savings that can be achieved through the introduction of cost-effective measures.

2.2 Subsidiarity: Necessity of EU action

The EU market for EPS has sufficient size to justify the development of specific products. The evolution towards lower energy use and GHG emissions needs to be carried out in the least cost manner for society.

Further, the contribution of ecodesign to EU objectives, in particular to the achievement of GHG neutrality by 2050 and the mobilisation of industry for a clean and circular economy, would be undermined if collective EU action is not taken on the efficiency of energy-related products such as EPS.

These factors point to the desirability of setting stricter minimum requirements determining access to the market to ensure that EPS make an appropriate contribution to EU goals. In view of the single market, these requirements should be established in a harmonised way at EU level.

2.3 Subsidiarity: Added value of EU action

Ecodesign measures contribute to the global EU energy and climate objectives by setting requirements that influence the characteristics of construction of energy related products. In this respect, they differ from many other energy and climate legislation that effectively require Member States to implement or promote solutions based on existing technologies but do not require or promote the development of the technologies themselves.

Direct EU action through ecodesign rules reinforces actions taken at Member State level. Ecodesign measures can only be taken at EU level since they act directly on the product, which means that uniformity must be assured to avoid different national rules that would undermine the EU internal market for that product.

3. POLICY OPTIONS

The review of the ecodesign regulation started in March 2022. This is a back-to-back Evaluation and Impact Assessment. Evidence gathering and analytical work has been done through a supporting contract and has involved meetings with stakeholders as well as interviews. A Call for Evidence was published and feedback gathered from 06 April 2022 - 04 May 2022. Extensive desk research and other evidence gathering such as EPS testing has fed into the process. A consultation forum meeting was held in February 2023 to set out the work on the evaluation and Impact Assessment and discuss working documents.

This process has enabled an exploration of weaknesses in the current legislation as well as reflection on the evolution needed in view of the overarching climate, energy and environmental policy goals. The available policy options focus on the achievement of the general and specific objectives through the implementation of measures that maximise the contribution of EPS to energy efficiency and reducing their environmental impacts without imposing significant burden to manufacturers or costs to end-users, as set out in Article 15(5) of the Ecodesign Framework Directive.

3.1 Options discarded at different stages of the assessment

As a result of analysis and consultation with stakeholders a number of options were discarded:

- **Setting requirements for repairability**
  The main reasons are safety issues as opening the power supply provides direct access to the 230V circuitry. Repair can theoretically be carried out by professionals, but under no circumstances should repair by laymen be facilitated. Given the rather low cost of EPS repair by professionals is also not economically viable.
- **Harmonisation of wireless charging and requirements on its active efficiency**
  As the energy efficiency of wireless charging depends on the various system components power transformation circuitry, power transmission coil, power reception coil, battery charging, of which electrical and physical characteristics of the end-device plays a crucial role, there are no reliable, repeatable, representative means to determine the efficiency of the transmission side only. Enhancing the interoperability of wireless chargers with end-devices is not seen as urgent, as the Qi protocol is a de-facto industry standard, which is followed by the vast majority of the market, thus interoperability is largely already the case.
- **EU Energy Label**
  As long as the majority of EPS are provided bundled with the end-device an Energy Label on the EPS only or in parallel to the main product Energy Label is very likely to create confusion to the consumer. In addition, given the high level of energy efficiency requirements put in place since the adoption of the first EPS ecodesign requirements, there is a limited performance spread in the market that is probably insufficient to justify the introduction of seven efficiency classes.
- **Voluntary agreement by the industry**
  The product is characterised by a very large number of manufacturers and it is likely to be very difficult, if not impossible, for an agreement to be established covering a larger enough share of the market.
- **Extension of the scope to chargers of E-bikes**

EPS for e-bikes are out of scope of the Ecodesign Framework Directive 2009/125/EC which excludes means of transport, and chargers for e-bikes are in addition subject to industry driven harmonisation efforts.

- **Extension of the scope to external power supplies for lighting products intended to be powered from power outlets**
  Power supply units for lighting equipment are regulated, including for efficiency, as control gear under Regulation (EU) 2019/2020.
- **Unbundling of EPS from the products they power**
  This would involve establishing requirements for selling products without an external power supply. The ecodesign Directive does however not allow for an unbundling requirement targeting directly the powered product. Unbundling can therefore only be a voluntary measure. An assumption for such voluntary unbundling was made in the impact assessment.

3.2 Policy measures assessed

Scope extension

Extending of the scope of the ecodesign requirements to a larger list of products than currently listed in the Regulation's Annex I, including wireless chargers, battery chargers, charging cradles, the EPS of equipment not covered by exemptions, including the EPS of power tools / gardening tools, stand-alone EPS including interoperable EPS, i.e. stand-alone USB and USB-PD EPS.

Introduction of information requirements on interoperability and efficiency

Introducing product marking by nameplate entries, (USB) port markings and a complementary pictogram signalling that the power supply bearing it is the common charger solution referred to by the amended Radio Equipment Directive.

Requiring compatibility with USB-PD specifications to increase interoperability

USB / USB-PD (further denoted as USB) is the only standardised power supply protocol to date and its use has been mandated under the RED. The measure therefore concerns requirements for a standardised receptacle, voltage levels and communication protocol for all or a subset of the EPS under the revised scope with a rated power less or equal to 240W.

The following sub-measures have been analysed:

- USB required for the EPS powering all products in the current scope of the RED.
- USB required for the EPS powering all products in the current scope of this regulation.
- USB required for the EPS powering all products in the current scope of this regulation, excluding wet-use, high ESD, audio, peak-power, and toys applications.
- USB required for the EPS powering all products in the extended scope of this regulation (including for EPS powering battery chargers, charging cradles wireless charging pads, power and gardening tools), excluding wet-use, high ESD, audio, peak-power, and toys applications.

The interoperability requirement targets in particular the EPS powering the following equipment:

- IT and network equipment, like for example wireless routers, modems, switches, hubs, docking stations, web-cams.
- Consumer and office electronics, like for example computer monitors, compact desktop PCs, set-top-boxes, game consoles.
- Battery chargers, charging cradles, wireless charging pads.
- Battery powered devices in general.

It should be noted that in order to serve certain category of products, this interoperability measure must come in conjunction with the following requirements in addition to the USB-PD specifications :

- higher electromagnetic immunity and surge protection common for IT network equipment under specific requirements of the laid down in the ITU-T K.21 recommendations.
- restoring operation after a fault condition.

Minimum energy efficiency at 10% load

Based on data gathered for around 450 commercial EPS, this measure would involve establishing requirements in relation to the minimum energy efficiency of EPS at 10% of the maximum rated power. A threshold of 10%pt below the current average active efficiency defines a minimum requirement, which the majority of the market already complies to. A more ambitious requirement at of 5%pt load is an alternative measure. A threshold of 10W for applying such requirement has been also considered.

Raising the minimum requirement on active average efficiency

Data gathered as part of the evaluation and the recent proposal of the DoE ([16]) justify the possibility for more stringent active and no-load efficiency requirements. The following two sub-measures have been considered:

- Active average efficiency increased and no-load requirements tightened to the draft DoE level VII ("CSL1"). The active average efficiency would be raised by ca. 1%pt.
- Active average efficiency increased and no-load requirements tightened to the more ambitious "CSL2" level achieved by 50% of the current market. The active average efficiency would be raised by ca. 1.5%pt.

Limiting stand-by losses for wireless chargers

The electromagnetic coupling efficiency of a wireless charging pad varies significantly with the position of the product on the pad and its distance to it. It is therefore considered impossible to date to set requirements for the coupling efficiency. This has been confirmed by the recent work on EPS and battery charging efficiency by the US DoE. An outcome of the same work has been however the proposal for a stand-by limit of 0.8W for open placement wireless chargers. Assuming a (low-voltage) EPS low-load efficiency of 60% would translate into a stand-by limit of 0.48W for the wireless charging pad. The fixed-location wireless chargers have been excluded from this limit in the DoE proposal, most likely as they are subject to battery-charging rules. There is however no technical reason

([16]) https://www.regulations.gov/document/EERE-2020-BT-STD-0006-0033

observed why the fixed-location wireless charging pad should not be able to meet the same stand-by limit.

Externalisation of power supply circuitries for battery charging devices and wireless chargers

Battery and wireless charging devices would be brought into the scope of the Regulation with the purpose to require by design a separation of battery/wireless charging functionality and the power supply function, and further to require power to be provided with an USB-PD EPS

Durability

The measure concerns EPS technical lifetime requirements as it introduces reliability requirements for the design according to ETSI standard ES 202 874-1, extending the use lifetime of EPS to 10 years, which are otherwise replaced earlier due to technical defects.

Industry experts confirmed that the most critical components determining the lifetime of an EPS are its electrolytic capacitors. The cost difference between higher and lower quality capacitors are in the order of a few cents.

4. PREFERRED POLICY OPTION / CONTENT OF THE DRAFT LEGAL ACT

The analysis of the individual measures showed that the effectiveness and cost efficiency of stricter energy efficiency requirements is affected by the relatively short useful life of EPS linked to the short lives of the products they power. Greater interoperability enables however longer lives for the EPS reinforcing the effects of stricter energy efficiency and making it cost-effective. Combining several of the individual measured into policy options resulted in synergies and became therefore be more attractive.

The preferred policy option entails the following measures:

- **Scope**
    - Scope extension to wireless chargers, wireless charging pads, battery chargers, charging cradles.
    - Discarding Annex I and focus on scope exemptions, including for separate control gears for lighting applications and EPS for means of transport for persons or goods (including e-bikes).
    - active PoE injectors, EPS for battery powered power tools / gardening tools included by default.
    - Stand-alone EPS included by default.
    - Limit of 60V output voltage proposed in-line with IEC 60950-1.

- **Energy efficiency requirements**
    - Active average efficiency increased and no-load requirements tightened to the draft DoE level VII ("CSL1").
    - 10% load minimum efficiency requirement of 5%pt below the active average efficiency for EPS with output power > 10W.
    - Stand-by power of wireless charging pads limited to 0.48 W, and of wireless chargers with internal power supply to 0.8 W.

- **Interoperability requirements**

- An AC/DC external power supply to be a USB power supply, unless it fulfils at least one of the following conditions :
  - output power > 240 W.
  - intended to be used in a wet environment requiring IPX1 or higher.
  - must withstand electrostatic discharge > 4 kV (contact discharge) and > 8 kV (air discharge) according to IEC 61000-4-2.
  - intended to operate in inaccessible locations or in harsh environments.
  - intended to be used with toys.
  - intended to be used with non-battery powered audio equipment.
  - intended to be used with non-battery powered products with peak-power demand.
  - is subject to technically justified cases where the powered equipment necessarily requires input voltage > 20 V and input power < 100 W, or input voltage > 28 V and input power < 140 W, or input voltage > 36 V and input power < 180 W.
- Battery chargers (excepting wall-plugged), charging cradles, wireless chargers to be powered by a USB power supply.
- EPS with non USB compliant USB ports (Type-A or Type-C) must have at least one compliant USB port.
- USB EPS must attempt to resume operation after an over-current or over-temperature fault.

- **Durability requirements**
  - EPS to have an expected lifetime of 10 years and an MTBF of 300 000 hours.
  - USB EPS to meet the resistibility requirements for the 2.5 kV basic test levels under ITU-T K.21

- **Information requirements**
  - Display of active average efficiency on EPS nameplate.
  - USB / USB-PD port marking, including output power.
  - Non-compliant USB ports not permitted to bear the marking "USB".
  - Complementary RED pictogram on enclosure of USB EPS.
  - Minimum contrast requirement for visibility/readability.

- **Testing requirements (alignment with DoE)**
  - Adaptive EPS to test at lowest and highest output voltage.
  - Load condition 1 of 2 A at lowest voltage for USB PD EPS.
  - Stand-alone EPS to test with standard cable.

5. PRELIMINARY IMPACTS OF THE PREFERRED OPTION

The preliminary impacts of the preferred option anticipated for 2035 are shown in this table.

	GHG emissions (Mt CO_2eq)	Total energy (GER, PJ)	Annual societal life cycle costs (€m EU27)	Annual consumer expenditure (€m EU27)	Cumulative EPS weight (e-waste) (kt)	Fuel combusted (Mt)	Acidification emissions (kt SO_2eq)	Particulate matter (kt)
BAU	1.95	96.8	8729	8248	32.02	2.99	3.9	0.8
Absolute	1.67	84.6	8015	7604	27.32	2.63	3.05	0.64
Reduction	0.28	12.3	714	644	4.7	0.36	0.85	0.16
Benefit	14.36%	12.67%	8.18%	7.81%	14.68%	12.04%	21.79%	20.00%

There are important synergies between the aspects addressed. Re-use due to interoperability and durability make higher efficiency requirements economically viable and reduce materials use. Longer lifetimes increase both the energy and material benefits.

Based on 2035 forecasts, the action would save annually 3.4TWh of primary energy (13%) and associated emissions. This corresponds roughly to **the energy used in one year by 600 000 electric cars**. Additionally, 4.7 kt of e-waste (14.7%) and 360kt of fuel would be avoided each year.

Ecodesign requirements make an important contribution to the EU's long-term energy and climate objectives. The preferred option contributes to achieving those objectives and to achieving the goals of the EU Climate Law.

Significant environmental impacts have been assessed and the analysis shows that the largest ones are associated with the consumption of energy in the use phase. These are reduced, while in line with the 'do-no-significant-harm' principle no other significant impacts are caused by the preferred option.