EUROPEAN
COMMISSION

Brussels, 1.10.2019
SWD(2019) 345 final

PART 1/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Commission Regulation

laying down ecodesign requirements for external power supplies pursuant to Directive 2009/125/EC of the European Parliament and of the Council

repealing Commission Regulation (EC) No 278/2009

{C(2019) 2126 final} - {SEC(2019) 335 final} - {SWD(2019) 346 final}

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This report commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

This impact assessment relates to the review of Commission Regulation (EC) No 278/2009[1] on the ecodesign requirements for External Power Supplies (EPS).

1.1. Benefits of Ecodesign and Energy Labelling

Ecodesign and energy labelling are ***recognised globally*** *as one of the most effective policy tools in the area of energy efficiency. They are central to making Europe more energy efficient, contributing in particular to the 'Energy Union Framework Strategy'[2], and to the priority of a 'Deeper and fairer internal market with a strengthened industrial base'[3]. Firstly, this legislative framework pushes industry to improve the energy efficiency of products and removes the worst performing ones from the market. Secondly, it helps consumers and companies to reduce their energy bills. In the industrial and services sectors, this results in support to competitiveness and innovation. Thirdly, it ensures that manufacturers and importers responsible for placing products on the European Union (EU) market only have to comply with a single EU-wide set of rules.*

It is estimated that by 2020, ecodesign and energy labelling regulations will deliver around 175 Mtoe (i.e. about 2035 TWh) of energy savings per year in primary energy, roughly equivalent to Italy's energy consumption in 2010, close to half the EU 20% energy efficiency target by 2020 and about 11% of the expected EU primary energy consumption in 2020[4].

The average household will invest in more expensive and efficient products, but in return saves about € 500 annually on its energy bills by 2020. Although the cost for industry, service and wholesale and retail sectors will increase, it will result in € 55 billion per year of extra revenue by 2020.

This legislative framework benefits from a ***broad support*** *from innovative European industries, consumers, environmental non-governmental organisations (NGOs) and Member States (MSs), because of its positive effects on innovation, increased information for consumers and lower costs, as well as environmental benefits.*

External power supplies (EPSs) have been subject to EU ecodesign requirements on minimum energy efficiency from 2009. Since then, the energy consumption and related greenhouse gas (GHG) emissions generated by products using EPSs have decreased with more than 13% (equivalent to over 10 TWh/year energy savings generated by improved EPSs only) compared to business as usual (BAU), the administrative burden has been modest, and the stakeholders have been positive regarding the impact of this instrument on the market[5].

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1 Commission Regulation (EC) No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies, OJ L 93, 7.4.2009, p. 3–10, (Ecodesign Regulation)

2 Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee, The Committee Of The Regions And The European Investment Bank - A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy. COM/2015/080 final. (Energy Union Framework Strategy)

3 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Upgrading the Single Market: more opportunities for people and business COM/2015/550 final. 28 October 2015. (Deeper and fairer internal market)

4 Ecodesign impact accounting – Overview report for the European Commission DG Energy, VHK December 2016

5 Consultant support for the current Impact Assessment and the evaluation of current regulation by Viegand Maagøe A/S, 2018.

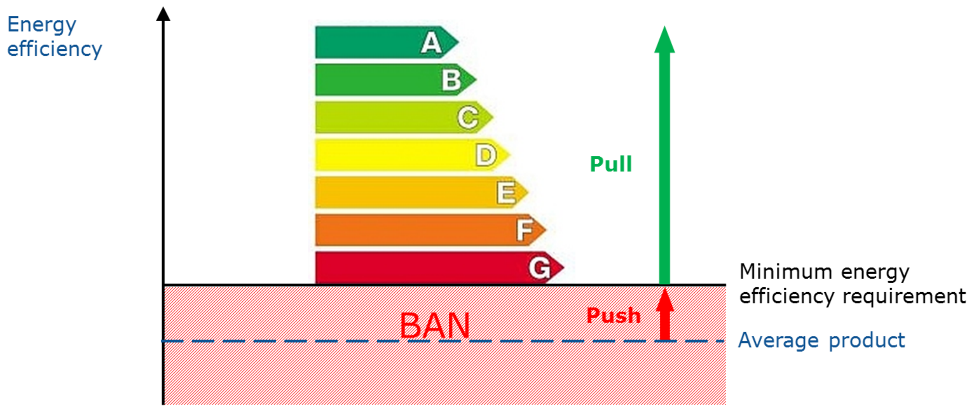
1.2. Legal framework

In the EU, the Ecodesign Framework Directive[6] *sets a framework requiring manufacturers of energy-related products to improve the environmental performance of their products by meeting minimum energy efficiency requirements, as well as other environmental criteria such as water consumption, emission levels or minimum durability of certain components before they can place their products on the market.*

The Energy Labelling Framework Regulation[7] *complements Ecodesign by enabling end-consumers to identify the better-performing energy-related products, via the well-known A-G/green-to-red scale. The energy label is recognised and used by 85% of Europeans*[8]*.*

The legislative framework builds upon the ***combined effect*** *of the two aforementioned pieces of legislation. See Figure 1 for a visualisation of this effect.*

Figure 1 Synergetic effect Ecodesign and energy labelling



The Ecodesign framework Directive and the Energy Labelling framework Regulation are implemented through product-specific implementing and delegated Regulations. Pursuant to Article 15.2 of the Ecodesign Framework Directive, the energy-related products that are covered must:

(i) represent a significant volume of sales (more than 200,000 units a year);
(ii) have a significant environmental impact within the EU, and
(iii) represent a significant energy improvement potential without increasing the cost excessively.

Pursuant to Article 17 of the Ecodesign Framework Directive, the industry can present voluntary agreements or other self-regulation measures as an alternative to the mandatory ecodesign requirements. If certain criteria are met, the Commission formally recognises these voluntary agreements[9]*. The benefits are a quicker and more cost-effective implementation, which can be more flexible and easier to adapt to technological developments and market sensitivities.*

For more details about the legal framework, including a full list ecodesign and energy labelling measures, see Annex 5.

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6 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. 10-35 (Ecodesign Framework Directive)

7 Regulation (EU) 2017/1369 of the European Parliament and of the council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU. OJ L 198, 28.7.2017, p. 1-23 (Energy Labelling Framework Regulation)

8 Study on the impact of the energy label – and potential changes to it – on consumer understanding and on purchase decisions - LE London Economics and IPSOS, October 2014

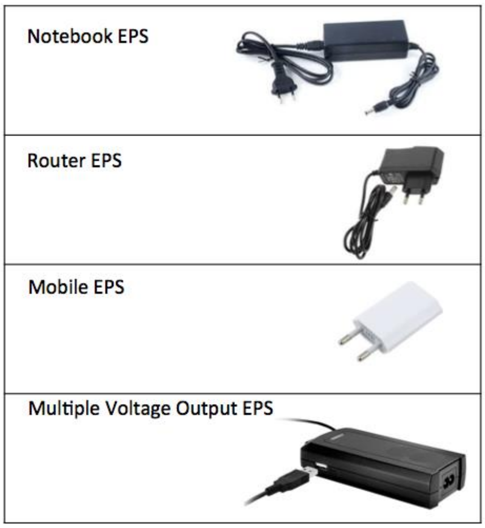
9 Commission Recommendation (EU) 2016/2125 of 30 November 2016 on guidelines for self-regulation measures concluded by industry under Directive 2009/125/EC of the European Parliament and of the Council; OJ L 329, 3.12.2016, p.109-117

1.2.1. *Current regulation for External Power Supplies*

EPSs are devices used to supply electricity to, and to charge built-in batteries of, electronic and electric devices ("primary load products") such as laptops, mobile phones, tablets and electric shavers[10]. For other products without built-in batteries, they serve as the main continuous source of power – for example standalone loudspeakers or computer network equipment such as modems and routers. The use of such products spans both domestic and office settings.

An EPS transforms the voltage supplied by an electric socket normally at 230 V to a lower voltage level suitable to the primary load product – often between 5 V and 20 V. An EPS also often rectifies the Alternating Current (AC) from the electric socket to Direct Current (DC) typically used for portable electric and most electronic products. It may also contain intelligent electronics to enable fast charging cycles and to avoid detrimental over-charging of built-in batteries. Figure 2 shows examples of typical EPS types.

Figure 2 Pictures of typical EPS types.



Source: EPS manufacturers

To note that the multiple voltage output EPS depicted above is not in the scope of the current Ecodesign Regulation because it converts 230 V to more than one voltage level simultaneously.

Commission Regulation (EC) No 278/2009[11] (hereinafter referred to as the Ecodesign Regulation) establishing minimum efficiency requirements for external power supplies was adopted on 6 April 2009. Its scope[12] covers EPSs that meet all of the following criteria:

- converts the mains power source into lower voltage (which could be DC or AC);
- only converts to one voltage level at a time (e.g. 5 V);
- it is intended to be used with a separate device (i.e. the "primary load") but it is contained in a separate physical enclosure;
- it is connected to the device with an electrical cable or similar wired connection;
- supplies power that does not exceed 250 W; and

[10] The EPSs are not the same as battery chargers, which charge batteries in isolation (extracted from the product), and are exempted from the scope of the Ecodesign Regulation.

[11] Commission Regulation (EC) No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies

[12] The stated scope explicitly excludes battery chargers (that connect directly to removable batteries), uninterruptable power supplies (e.g. the ones used in data centres and enterprise server rooms for maintaining continuity of power supply to computers and servers), voltage converters (e.g. 230 V to 110 V travel adapters), converters used for halogen lighting and EPSs for medical devices. Uninterruptable power supplies and halogen lighting converters are addressed in other product-specific regulations.

- it is intended to be used with electrical and electronic household and office equipment (e.g. the products in scope of the Standby Regulation[13]).

The requirements in the Regulation focus on power consumption at no-load condition (i.e. when no primary load is connected to the EPS) and on the EPS' average active efficiency (i.e. power conversion efficiency when the EPS supplies power to a primary load product).

No energy labelling regulation was adopted for EPSs due to the reasons explained in Section 5.3.2.

With regard to the primary load products, only few of them are covered by specific ecodesign regulations: laptops, televisions and portable vacuum cleaners with batteries[14]. In these cases, having more efficient EPSs helps the compliance of the main load product under its specific regulation, as the EPS efficiency is additional to that of the main product. In cases where the main products are not regulated, a better EPS efficiency is a gain in itself. Additionally, the no-load requirement for EPSs is essential for reducing energy consumption when these are plugged in but no main product is connected. This requirement is not related to the product-specific regulation for the main load products.

The EU has also a voluntary scheme, the Code of Conduct for EPS (CoC)[15], which was prepared by the European Commission's Joint Research Centre following the discussions and decisions of an ad-hoc working group composed by independent experts, Member States representatives and representatives of industry. The CoC aims to promote and bring recognition to the top performing EPSs on the EU market. Its most recent requirements, which took effect in January 2016, are more stringent than any regulation in force in the main markets worldwide. For more details see Annex 6. A visual comparison with national regulations is provided in Section 2.1.1.

1.2.2. *EU Ecolabelling Regulation*

The EU Ecolabelling Regulation (Regulation (EC) 66/2010[16]) complements ecodesign and energy labelling. It is a voluntary scheme that awards products with the best environmental performance throughout their lifecycle. Products that fulfil the criteria can bear the EU ecolabel (see Figure 3).

Figure 3: The EU Ecolabel

However, EPSs are not covered by any measures under the Ecolabelling Regulation.

An overview of existing policies, legislations and standards affecting EPSs in the EU and outside is given in Annex 6.

[13] Commission Regulation (EC) No 1275/2008 of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment OJ L 339, 18.12.2008, p. 45–52 (Standby Regulation)

[14] To note that only very few models of televisions are having EPSs (this is only a recent trend, the majority of them still having internal power supplies). Furthermore, the portable vacuum cleaners with batteries are only a small percentage of all the vacuum cleaners covered by the specific ecodesign regulation.

[15] https://ec.europa.eu/jrc/en/energy-efficiency/code-conduct/external-power-supplies (EU Code of conduct for EPS)

[16] Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel. OJ L 27, 30.1.2010, p. 1 (EU Ecolabel Regulation)

1.3. Legal context of the reviews

Article 7 of the Ecodesign Regulation for EPSs requires the Commission to review it in the light of technological progress no later than four years after its entry into force and to present the results to the Consultation Forum. A review study[17] focusing on a technical and environmental analysis has been carried out to assess the potential for updating the Ecodesign Regulation.

Moreover, the Ecodesign working plan 2016-2019[18] also includes this review.

1.4. Political Context

*Several new policy initiatives indicate that ecodesign and energy labelling policies are relevant in a broader political context. The main ones are the **Energy Union Framework Strategy**, which calls for a sustainable, low-carbon and climate-friendly economy, the **Paris Agreement**[19], which calls for a renewed effort in carbon emission abatement, the **Gothenburg Protocol**[20], which aims at controlling air pollution, the **Circular Economy Initiative**[21], which amongst others stresses the need to include reparability, recyclability and durability in ecodesign, the **Emissions Trading Scheme (ETS)**[22], aiming at cost-effective greenhouse gas (GHG) emissions reductions and is indirectly affected by the energy consumption of the products in the scope of ecodesign and energy labelling policies, and the **Energy Security Strategy**[23], which sets out a strategy to ensure a stable and abundant supply of energy.*

1.5. Need to act

The need to act is driven by the following main considerations:

Cost effective energy savings:

Manufacturers and consumers stand to benefit from the fact that cost effective energy savings can still be achieved for the EPS product group. By way of illustration, further electricity savings of over 4 TWh could be secured in a cost-effective way. This would be additional to the savings brought by the existing ecodesign requirements on EPS (initially estimated at 9 TWh per year by 2020, revised to 10 TWh according to the evaluation of the current Regulation, see Annex 7).

Other policies/political imperatives:

Several other policies and political priorities require the product-specific reviews to look beyond the technical revisions mentioned in the review article of the existing regulations, e.g.:

- renewed effort in carbon emission abatement through the Paris climate agreement;
- the Commission's Circular Economy policy;
- the Better Regulation policy aiming at more efficient and effective legislation;
- the need to address possible circumvention of testing standards;
- renewed energy efficiency targets.

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17 Review Study on Commission Regulation (EC) No. 278/2009 External Power Supplies. September 2013. Final Report.

18 Communication from the Commission Ecodesign Working Plan. COM(2016) 773 final, Brussels, 30 November 2016. (Ecodesign Working Plan 2016-2019)

19 http://ec.europa.eu/clima/policies/international/negotiations/future/index_en.htm (Paris Agreement)

20 Protocol to abate acidification, eutrophication and ground-level ozone of 1999 (Gothenburg Protocol)

21 Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions Closing The Loop - An EU Action Plan For The Circular Economy (Circular Economy Initiative)

22 https://ec.europa.eu/clima/policies/ets_en (ETS)

23 Communication of the commission to the European Parliament and the Council European Security Strategy. COM(2014) 0330 final.

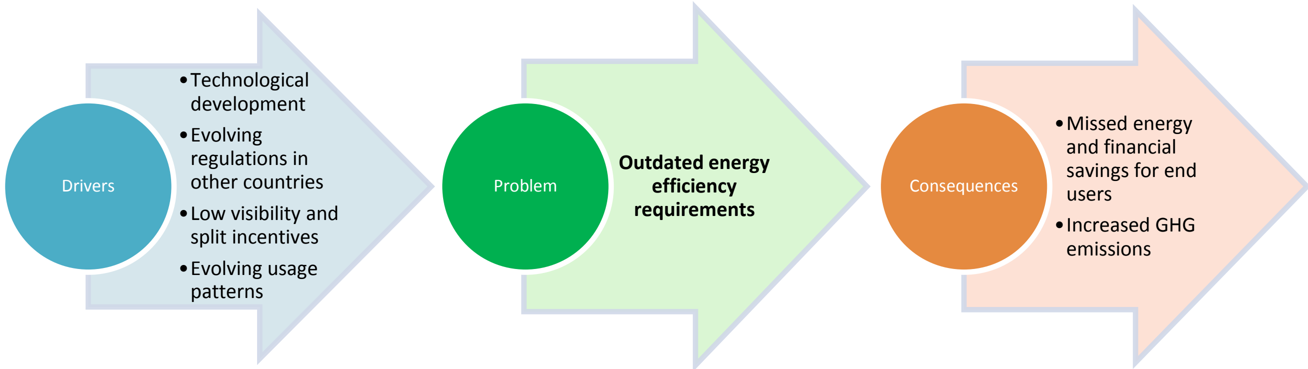
2. PROBLEM DEFINITION

2.1. What are the problems?

2.1.1. *Problem 1: Outdated energy efficiency requirements*

The following diagram summarises the first identified problem, its drivers and its consequences, as explained in the next sections.

Figure 4 Problem 1, its drivers and consequences



The problem: The current ecodesign requirements for EPS **no longer capture cost-effective energy savings.** On the one hand, due to technological developments, the performance of the EPSs sold on the market has improved since the Ecodesign regulation came into force. On the other hand, standards in other parts of the world have become more stringent, showing that the optimal requirements and life cycle costs have shifted. The EU is now lagging behind and there is a risk that EPSs that are less efficient than the ones sold on other markets will be placed on the EU market. These findings are supported by the results of the evaluation (see Annex 7, Section 1 – Relevance).

Because of the outdated requirements, in combination with an outdated scope (see Problem 2), the EU as a whole might forego annual energy savings of about 4.3 TWh by 2030 (see Section 6).

Apart from **reinforcing the requirements**, additional consideration could be given to **how are calculated** the parameters for setting these requirements. The key metrics used for measuring the EPS energy performance are: the average active efficiency (i.e. the efficiency of converting from the mains voltage to the voltage and current – AC or DC - suitable for the primary load product), and the no-load condition power consumption (i.e. the energy consumed by the EPS when is plugged in, but its output is not connected to any primary load). The average active efficiency is calculated as the average of efficiencies at four different load levels (25%, 50%, 75%, and 100%). Low load levels under 25% were not considered, as in the past not many products spent time at these levels. However, due to improvements in electronics that are now able to scale down consumption when not intensively used, it might be relevant to consider a requirement for 10% load. An EPS providing high efficiency at low load levels does not currently receive any reward, because it does not contribute to the average active efficiency. It is however important to note that the current calculation method is used not only in the EU, but at the international level too.

The evaluation of the current Regulation (see Annex 7) shows that ecodesign requirements on EPSs remain highly relevant for the internal market and are estimated to bring, in a cost-effective way, annual energy savings of approximately 10 TWh by 2020. This exceeds the initial expectations of 9 TWh, which were estimated in 2009 when the Regulation was first adopted. The higher savings estimated now are largely due to a higher EPS stock in the latest years than the stock estimated back in 2009. The increasing use of these products, together with the potential to secure further energy savings, is another reason to update the Regulation by strengthening its requirements.

The drivers of the problem:

***Driver 1:* Technological development**

Technology for EPS keeps evolving and today, 8 years after entry into force of the current Regulation, the Ecodesign requirements are no longer sufficiently challenging.

Before the current regulation took effect, a typical EPS delivering 60 W output (suitable for e.g. a notebook computer) would have an active efficiency of 84% or lower and a no-load power consumption of 0.75 W or higher. The same EPS today[24] has an active efficiency of at least 87% and a no-load power consumption of maximum 0.5 W, largely due to the effect of the current Ecodesign Regulation. The best performing EPSs in this output range have active efficiency of 96% and no-load consumption of 0.01 W (see details in Table 1 and Table 2). The main technological development that enabled this improvement in efficiency was the move to EPS with more electronics in the conversion circuitry (so-called switch mode EPSs), next to the use of better performing electronics with fewer losses.

Furthermore, since the indicative benchmarks for Best Available Technology ("BAT") were established in Regulation 278/2009, a massive reduction in BAT no-load power consumption has been achieved, as presented in Table 1.

Table 1 BAT no-load condition power consumption[25]

Power output	278/2009 BAT	Current BAT
≤ 49.0 Watts	0.100 Watt	0.002 Watt
Po > 49.0 Watts	0.200 to 0.500 Watt	0.010 Watt

A similar trend can be observed with the average active efficiency, see Table 2.

Table 2 BAT average active efficiency[25]

Power output	278/2009 BAT	Current BAT
≤ 1.0 Watt	N/A	0.767
1.0 Watt < Po ≤ 49.0 Watts	0.680 to 0.887	0.905
49.0 Watts < Po ≤ 250.0 Watts	0.890	0. 962

Approximately 31% of the EPSs available on the international market[26] can already achieve no-load levels in line with Tier 2 of the EU CoC (between 0.075 and 0.150 W), and approximately 62% of EPSs available on the international market (or 27% of models) can already achieve the corresponding efficiency levels of the CoC.

***Driver 2:* Evolving regulations in other countries**

Since 2005 the main markets outside the EU have implemented **mandatory efficiency requirements** for EPSs. They follow a general trend of becoming increasingly stringent in time.

By way of illustration, Figure 5 shows a comparison of the level of requirements in the main

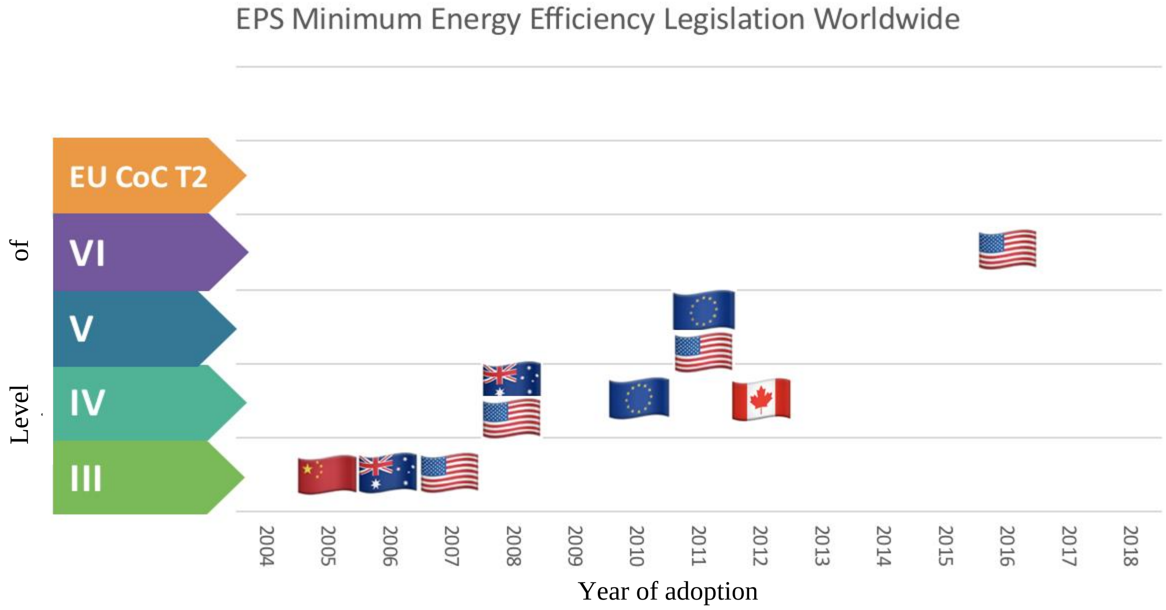
[24] Based on the current Ecodesign requirements on active energy efficiency and no-load power consumption.

[25] Current BAT is based on the top 5% of a 2015 NRCAN database and checked with 2018 data from https://www.digikey.com/. Note: The comparison is an approximation as the power output groupings of the current Regulation are slightly different than the groupings used in the IA.

[26] Data retrieved from www.digikey.com, accessed February 2018. Data was sorted by region utilised and found the share of the EPS in the dataset that comply with the no-load and efficiency requirements from CoC Tier 2.

jurisdictions (i.e. US, China, Australia and EU) and their year of adoption[27] (on the x-axis). The y-axis shows the level of stringency according to the International Efficiency Marking Protocol for External Power Supplies Version 3.0[28], where Roman numerals indicate increasing stringency levels. For comparison, Tier 2 of the EU Code of Conduct ("EU CoC T2") was added on top. The CoC is a **voluntary EU scheme**, which is more stringent than Level VI of the International Marking Protocol. More details on the various regulations and standards applicable to EPSs are available in Annex 6.

Figure 5 EPS minimum energy efficiency legislation in US, China, Australia and EU.



Source: Figure from Viegand Maagøe based on above mentioned legislations and initiatives, 2018

The US Department of Energy's (US DOE) latest requirements, which entered into force in the United States in 2016, are significantly more stringent than the current Ecodesign requirements in the EU.

Table 3 presents a numerical summary of the most ambitious legal requirements worldwide i.e. the ones IN the US and the EU. The CoC Tier 2 was added for comparison.

Table 3 Summary of minimum average active efficiency and no-load power consumption limits according to different EPS requirements in the EU and the US.

EPS requirements	Average active efficiency*	No-load power consumption*	Equivalent to International Efficiency Marking Protocol
EU CoC Tier 2	0.710 – 0.890	0.075 – 0.30 W	-
US DOE	0.709 – 0.880	0.10 - 0.30 W	Level VI
EU Ecodesign	0.655 – 0.870	0.30 - 0.50 W	Level V

*Note: The efficiencies and no-load power consumption are illustrative examples calculated considering several base cases, the actual requirements will depend on the power output of the product.

In summary, the current EU ecodesign requirements are roughly equivalent to Level V international marking, which is now obsolete in the US where it was replaced by Level VI in

[27] For EU there are presented the two tiers provided for in the current Regulation, which came into force in 2010 and 2011 respectively (hence the two EU flags marking those steps). A 'tier' is a level of stringency of the requirements in an Ecodesign regulation. When passing from Tier 1 to Tier 2, the first tier becomes obsolete.
Some other markets (e.g. US and Australia) have also reinforced their requirements over time.

[28] https://www.regulations.gov/document?D=EERE-2008-BT-STD-0005-0218

2016.

Such differences in regulatory requirements have far-reaching consequences on a global market such as the one for EPSs. This market is characterised by the relatively small number of big suppliers (that are dominating the market and producing in large quantities), and by the demand-side characteristics (where only few or no technical modifications are needed for an EPS to be adapted on various markets). Although the advances in the US will naturally bring some of these better products to the EU, poorer performing EPSs (i.e. equivalent to Level V) will continue to be produced by global manufacturers and are likely to be sold in the EU where they continue to comply with the current Regulation. Any lower purchasing cost for the EPS will likely not be passed to the customers, as EPSs are in most cases sold together with main load products that determine the overall selling price (additional details on this aspect are explained also in the following driver section). As consequence the EU consumers, companies etc. will not purchase the most economic EPSs (from a life cycle cost perspective).

Driver 3: **Low visibility and split incentives**

EPSs are usually an accessory product, which means they are less visible at the point of sale. A typical consumer will base their purchase decision on the primary load product (e.g. mobile phone or laptop) rather than on the accompanying power supply. Consumers usually do not perceive the energy performance of the EPS as relevant, and the performance information is also not visible on e.g. retailer websites. This makes it easier for lower performance EPSs that are banned from other markets (e.g. US) to enter the EU.

Since there is no specific consumer demand for more efficient EPSs, manufacturers are not incentivised to produce EPSs that out-perform the current ecodesign requirements. Split incentives (between the manufacturers of the primary load products and the users) are a typical problem driver for EPSs. In this case, the manufacturers of primary load products have little interest in reducing the operating (i.e. energy) costs of the EPSs bundled with their products, even if the price of a more efficient EPS would be as little as 1.6 % of the final product price[29]. As the operating costs are paid for by the user and the costs of improved performance would be paid for by the manufacturer, the latter does not receive any reward or acknowledgment for implementing more costly and innovative energy-efficient technologies. The existence of such split incentives is commonly referred to in the economic literature[30] as the principal-agent problem.

Driver 4: **Evolving usage patterns**

The current regulation does not address all of today's usage patterns, as they evolved due to technological development of the primary load products. Nowadays, many devices (such as networked devices of which approximately 150 million units are sold annually in the EU, as estimated by the current impact assessment) have extended periods when they run at lower loads (around 10% of the rated power). This is because the devices are getting better at scaling the power draw proportionally to the performance. For these lower load levels, where the losses are typically higher (as a percentage of load), the Regulation does not set any requirements regarding minimum efficiency or information disclosure.

For instance, if a device works at full performance level, the EPS power load can be 80-90%, while if the device (such as a home Wi-Fi internet connection) is idling or at the end of a charging cycle, the EPS load may fall to 5-15 %. As such, this is a positive development

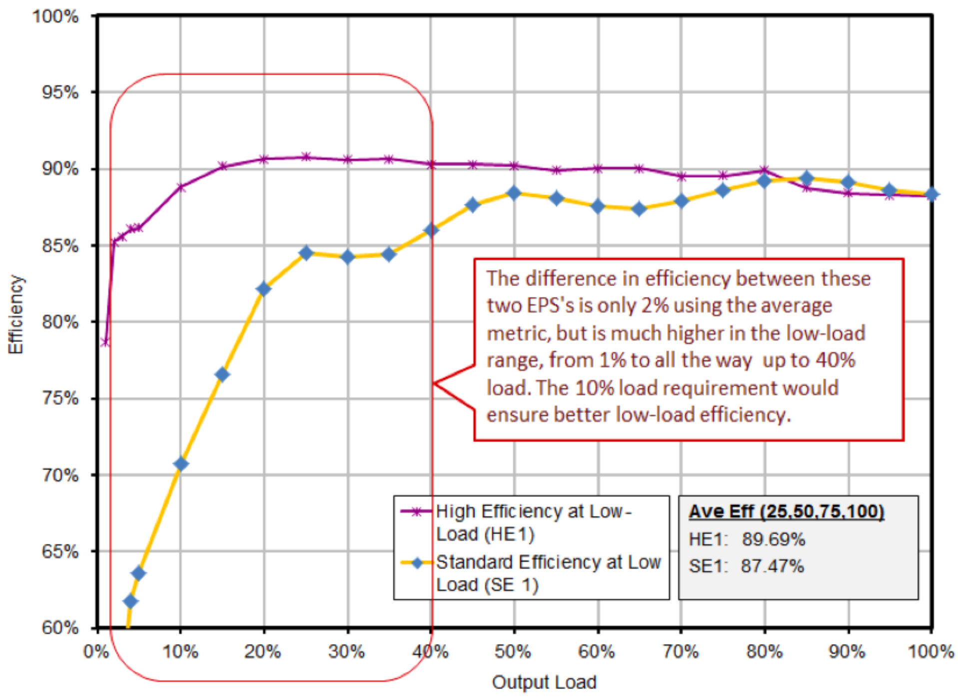
[29] A smartphone's EPS could range from 7 to 11 EUR, while the price of an iPhone 8 is 799 EUR (assessed February 2018 https://www.apple.com/de/shop/buy-iphone/iphone-8)

[30] D. R. Hill (2014), Energy efficiency and the Principal-Agent Problem: Measuring the effect of split incentives on the Austrian residential sector. IEA (2007), Mind the gap – Quantifying principal-agent problems in energy efficiency.

because the devices are able to scale their consumption and use less energy when used for lighter tasks. However, at these low load levels the EPS losses are typically high, because EPSs are optimised for the range of 30-80% load levels, where the Regulation sets minimum efficiency requirements.

As shown in Figure 6, the possible variation across the low load range is considerable between an EPS with high efficiency at low load levels and one with poor efficiency at low load levels.

Figure 6 Low load efficiency variation for two EPS at 230V[31]



Source: Natural Resources Defense Council, 2013

Both EPSs have high average active efficiency (89.7% and 87.5% respectively) and meet the Regulation's minimum efficiency requirements, but the efficiencies below 25% are widely different. At 10% load, the better performing EPS is 88% efficient, while the other is only 70% efficient. If the device spends a significant amount of time at low loads, higher energy consumption can be expected with an EPS that performs poorly at low load levels.

The problem will increase in future due to many more appliances being always on and in standby mode at lower power levels, including networked devices in smart homes (e.g. IoT - Internet of Things), which are increasingly gaining popularity[32].

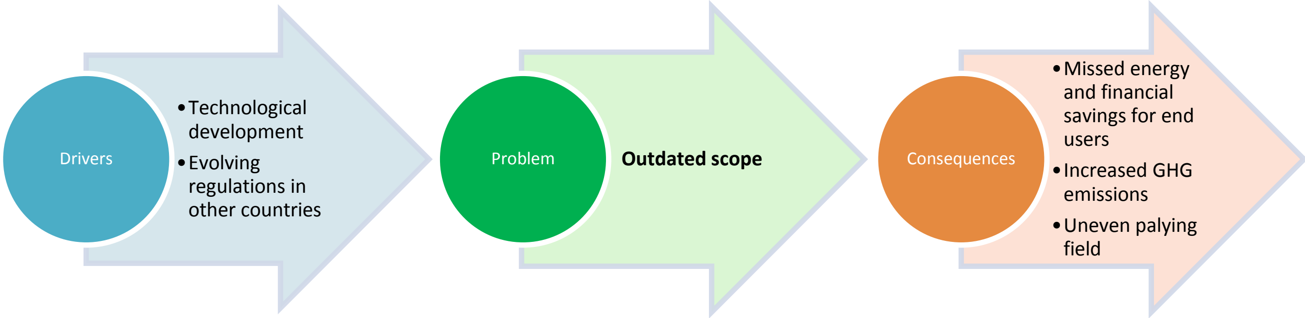
2.1.2. *Problem 2: Outdated scope*

The following diagram summarises the second problem identified, its drivers and its consequences, as explained in the next sections.

[31] Natural Resources Defense Council 'Input on the Review Study on the External Power Supply Regulation (EC) No 278/2009', Delforge & Horowitz - October 31, 2013

[32] "Energy Efficiency of the Internet of Things. Technology and Energy Assessment Report. Prepared for IEA 4E EDNA" April 2016.

Figure 7 Problem 2, its drivers and consequences



The problem: The current scope of ecodesign requirements **does not cover [multiple voltage output EPSs](), which are sold in increasing numbers.**

Multiple voltage output EPS is an EPS that can simultaneously deliver several voltage outputs, allowing different devices that require different voltages to be simultaneously charged or supplied with power. See Figure 8 for an example of a multiple voltage output EPS that can charge a notebook computer (at about 20 V) and a mobile phone (at 5 V) at the same time. This new trend of universal chargers is becoming increasingly prevalent. Additionally, some appliances need to be supplied with several voltage levels at the same time. For example, up until 2013-2014, the majority of stationary game consoles used multiple voltage output EPSs. Although the newer models of game consoles no longer use these types of EPS, the replacement sales can still occur.

Figure 8 Example of multiple a voltage output EPS (universal charger) for notebooks and mobile phones

Source: [www.finsix.com]() (section 'Design')

Not regulating the multiple voltage output EPSs would lead to additional electricity cost for the consumers in the range of 9 – 13 € per unit over its lifetime due to the EPS' suboptimal efficiency. This is equivalent to an additional energy costs of ca. 104 million € for the 11 million units expected to be sold annually in the EU by 2030 (see details in Section 6).

These increasingly popular EPSs are not in the scope of the current EU Regulation, but are now covered by the US DOE requirements. As a result, European consumers using this new type of EPS miss out on energy and financial savings as the multiple voltage output EPSs are generally less efficient than a regular EPS due to the use of more electronics. Moreover, because no requirements apply in the EU, manufacturers have an incentive to market them. For instance, by adding a 5 V secondary output to a regular notebook EPS, the new EPS does no longer need to comply with any Ecodesign requirements. Thus, the multiple voltage output EPSs have an unfair advantage on the market over the EPSs already covered by the Regulation.

These findings are supported by the results of the evaluation (see Annex 7, Section 1 – Relevance).***The drivers of the problem:***

Driver 1: **Technological development**

The progress of technology allowed EPSs to become smaller, more compact and thus more easily incorporate multiple outputs in a lower volume and weight. An EPS component supplier estimated that the global market for multiple voltage output EPS would be around 20 million per year by 2019. The size of this market in the EU is estimated by the stock model of this impact assessment at around 4 million per year today and is expected to increase to 11 million by 2030 without regulation.

Moreover, the newer USB Power Delivery (USB PD) specification allows for increasingly use of so-called USB Type-C charging connectors for notebook computers, mobiles, tablets and other electronic equipment (for more details on these technologies see Annex 6). EPSs with USB Type-C connectors enable charging with variable power outputs (up to 100 W) and variable voltage levels (5-20 V). This is a big step forward, as the older EPSs only provide fixed output voltage levels and related powers. The Type-C brings also compatibility, as many new primary load products are adopting the standard. This allows adding, for example, an USB Type-C output to a regular notebook EPS. Via the USB Type-C connector a wide range of products could be charged (typical example being smartphones or tablets) at the same time as charging the laptop. As evidence of the increasing popularity of products with USB Type-C connectors, their number has increased globally from nearly zero to more than 1 billion in 2017 and is expected to grow to 5 billion in 2021[33].

Driver 2: **Evolving regulations in other countries**

The fact that the latest US requirements regulate these EPSs and the EU does not could result in the EU market being flooded with products having older designs and lower efficiencies. International data from 2018[34] suggests there are 80% of multiple voltage output EPSs on the market that are not yet compliant with the US DOE Level VI requirement. It should be noted here that the DOE acknowledges that these EPSs are less efficient than the regular ones and sets more lenient requirements.

This impact assessment estimates that by 2030 the market share of multiple voltage output EPS would increase to 11 million units annually sold. Not complying with the EPS regulation would save the manufacturers 0.5 – 0.6 € per unit, i.e. a saving of 6.6 million €, which would be an incentive for not taking action on improving EPS performance.

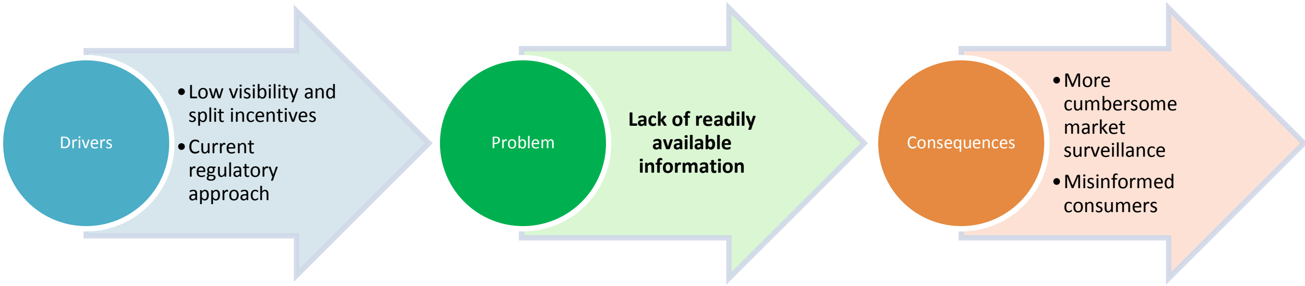
2.1.3. *Problem 3: Lack of readily available information*

The following diagram summarises the third problem identified, its drivers and its consequences, as explained in the next sections.

[33] "USB Type-C Report – 2018" IHS Markit. November 2017.

[34] Dataset from digikey.com, accessed February 2018.

Figure 9 Problem 3, its drivers and consequences



The problem: **Little information on EPSs and their performance is readily available.** This affects the market surveillance, users, and the wider public.

Although the EPS Regulation has been in place since 2009, it has been difficult to find publicly available information on freely accessible websites, regarding the no-load consumption and average active efficiency of EPSs.

Today, all but one of the newer Ecodesign Regulations[35] in force require manufacturers and/or importers to make available relevant information on products performance on publicly accessible websites and, in many cases the user manuals. The aim is to increase the transparency and awareness of the energy efficiency of various products and their different consumption modes. This information can be used by consumer organisations, energy authorities, informed consumers etc. for developing analyses, selecting the most efficient devices and using them in the best ways. It also provides an incentive for manufacturers not just simply to comply with the requirements, but to design products with higher efficiencies that would stand out among other similar devices.

One of the most cost-effective market surveillance instruments is to carry out a screening of the information on publicly accessible websites. This allows the Market Surveillance Authorities (MSAs) to compare a large number of products within a short time and select suitable candidates for further detailed inspection or testing. Without a regulatory instrument that requires this information to be available on publicly available websites, MSAs can only obtain the necessary information on a product-by-product basis, by requesting technical documentations from individual producers. This approach hinders a swift and efficient market surveillance of the EPS market.

Without an alignment of the EPS Regulation with the other (more recent) Ecodesign Regulations, the process to access the necessary information on EPS energy efficiency and power consumption will remain cumbersome.

The drivers of the problem:

Driver 1: **Low visibility and split incentives**

The low visibility of these products (also described in the driver of problem 1) is also reflected in the lack of information for consumers about EPS efficiency and power consumption. This creates a vicious circle, where the lack of information on public websites and the low visibility of EPS mutually enhance each other and lead to poor consumer awareness and lost energy savings.

[35] All Ecodesign Regulations, except Regulation (EC) NO 107/2009 on simple set-top boxes, have information requirements.

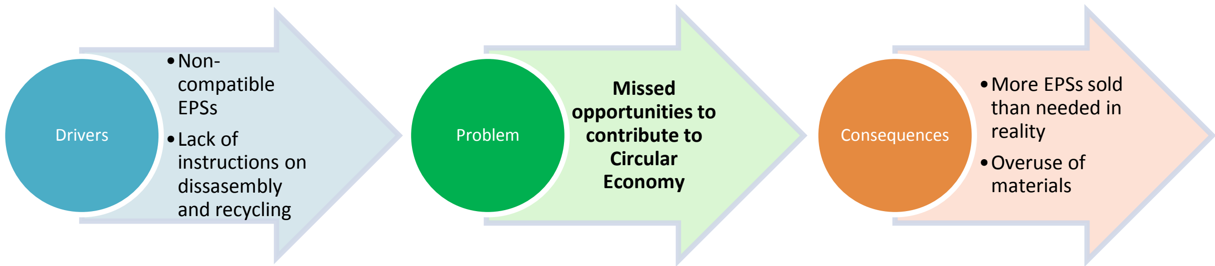
Driver 2: **Current regulatory approach**

The EPS Regulation was one of the first few Ecodesign Regulations ever adopted in the EU. Therefore, the Regulation was already in place when the provision of information became a common requirement for all Ecodesign Regulations. The Ecodesign Framework Directive lays down the basis for having information requirements (i.e. specific data and information on the product's performance relevant for consumers, organisations and MSAs to be published on web sites and added in the user manuals).

2.1.4. *Problem 4: Missed opportunities for contributing to circular economy objectives*

The following diagram summarises the fourth identified problem, its drivers and its consequences, as explained in the next sections.

Figure 10 Problem 4, its drivers and consequences



The problem: **Missed opportunities for EPSs to be more efficient in the use of materials and to contribute better to circular economy objectives.** This affects the users and the environment.

The need to examine options for better supporting circular economy objectives was articulated by stakeholders, although not related to a specific failure on the market. Thus, no specific information was available on the magnitude of the problem.

Based on the overarching objective of reducing consumption of materials, several specific problems were perceived:

- lack of compatibility among EPSs;
- potential over-use of materials resulting in bigger and heavier EPSs than needed;
- the impossibility of detaching cables for some EPS models, therefore a damaged cable results in discarding the whole EPS; and
- lack of information regarding disassembly and recycling.

Ensuring compatibility among different EPSs, notably the ones used for mobile devices, could reduce the need for them to be sold bundled with products and allow consumers to buy a single EPS for use with e.g. tablet and smartphone. Such an approach could decrease the number of products sold, but poses some technical challenges (see Section 5.3.4).

Information on disassembly and recycling, as well as a potential requirement to limit the weight of EPSs, could help reducing their environmental impact.

The drivers of the problem:

Driver 1: **Specific technological solutions developed or adopted by manufacturers**

Manufacturers of primary load products use various (sometimes proprietary) technologies for the connectors that attach to the EPS supply cords. Although a degree of interchangeability is ensured by the use of the USB connector, other solutions exist on the market.

Driver 2: **Sales model that bundles the EPSs with the primary load products**

As a primary load product that should be supplied with an EPS cannot function without the latter, the current practice is to supply the two together, as a single package. The unavailability on the market of a 'universal charger' that would be compatible with many different primary load products closes a vicious circle where the problem and the driver mutually affect each other.

2.2. Who is affected by the problems?

2.2.1. *Consumers*

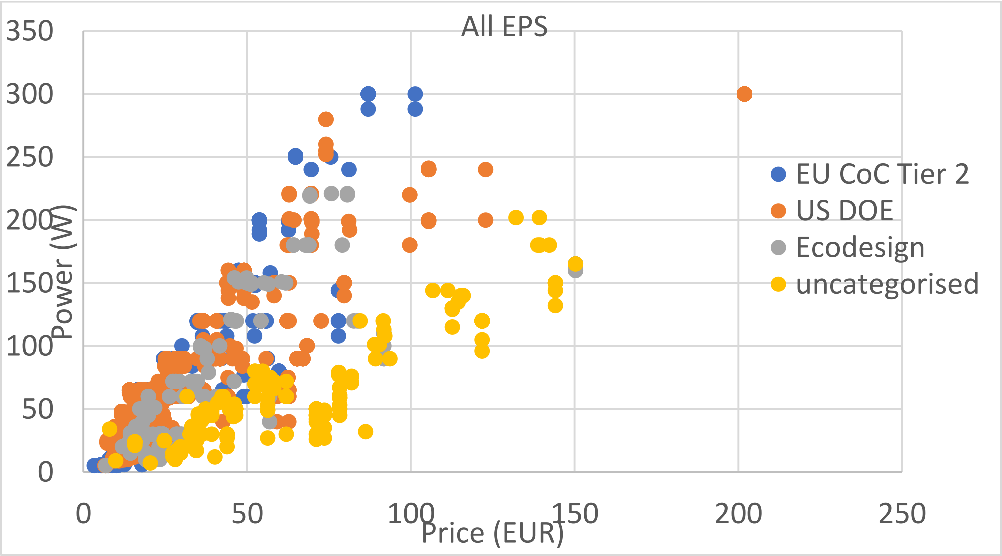
Technological progress and international developments have resulted in more energy efficient EPSs becoming available at lower costs. Figure 11 below shows that:

- **No-load condition power consumption:** Approximately 59% of the EPSs available on the international market can already achieve no-load consumption at the US DOE level (between 0.1 and 0.3 W), while 36% can achieve no-load levels in line with Tier 2 of the EU CoC (between 0.75 and 0.150 W).
- **Average active efficiency:** Approximately 90% of the EPSs available on the international market (equivalent to 82% of models) can achieve US DOE efficiency level, while approximately 62% (equivalent to 27% of models) can achieve efficiency levels in line with Tier 2 of the EU CoC.

The figure plots the models available on the market, while further calculations were made to obtain figures approximating the total sales.

Figure 11 also shows that improved active efficiency and no-load consumption are now achievable over a wide range of EPS output powers and price levels.

Figure 11 Price to power chart for EPS available for retail purchase internationally in 2018



Source: data from Digi-key, retrieved 14/02/2018

However, in many instances consumers of products using EPSs are not benefitting from this as products in the EU market are not obliged to incorporate these better performing EPSs. This results in missed energy and monetary savings at the end-user level.

Consumers may also be buying more EPSs than needed, as they are sold bundled with primary load products.

2.2.2. *EU, Member States and MSAs*

For EU and Member State policy makers, less effective and efficient ecodesign regulations means less contribution from EPSs to achieving policy goals regarding single market, energy efficiency, energy security of supply, and climate change.

Enhancing information availability on websites via a regulatory instrument can improve the productivity of the MSAs, making the market surveillance of EPSs more cost-effective. Publicly available information facilitates the work of policy makers and researchers (for gathering evidence) and raises the awareness of consumers regarding the EPS performance.

2.2.3. *Society as a whole*

For society as a whole, ambitious policies in the area of energy efficiency are important tools to mitigate climate change. Effective and efficient ecodesign regulations contribute to achieving goals set in the Paris Agreement and they help achieve the 2030 EU climate and energy objectives.

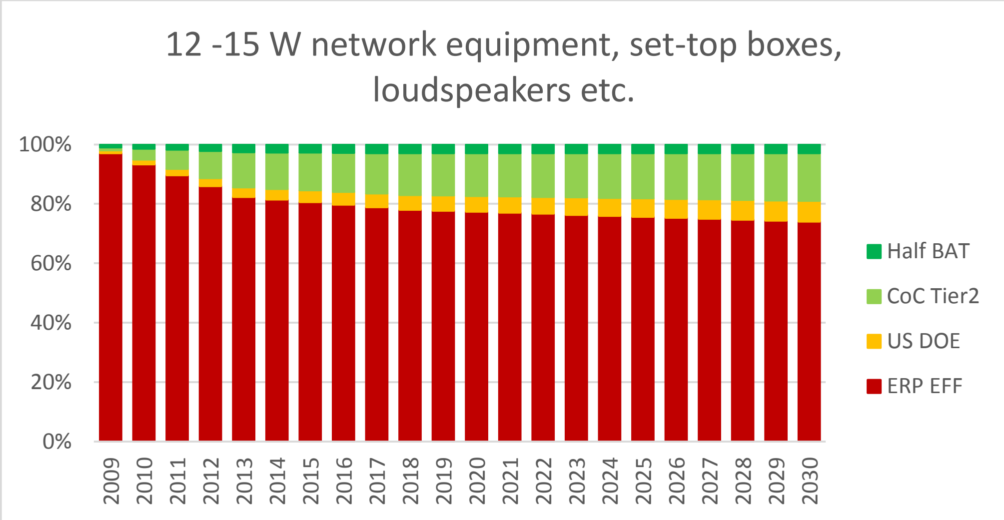
2.3. How will the problems evolve?

2.3.1. *Slow uptake of more efficient EPS will lead to increased missed energy savings*

EPSs are used in a wide variety of household and office equipment. The stock model developed for this impact assessment estimated that in 2015 around 490 million EPS units were sold in the EU, which means that, on average, 9 out of 10 EU citizens bought one the same year. Due to the increasing consumer demand on electronic and electrical equipment, it is estimated that by 2030 around 510 million EPS will be sold annually in the EU.

As an example, Figure 12 below shows the historical and anticipated (in a BAU scenario, where the current Regulation remains unchanged) future efficiency distribution of EPSs with output power of 12-15 W. These are used for electronic products such as network equipment, set-top boxes and loudspeakers. The red bars show the percentage of EPSs that remain at the minimum efficiency levels, and therefore could be improved further. The other colours show the projected evolution of more efficient EPSs driven by compliance with US DOE and EU CoC requirements, or even overpassing all of those. Similar efficiency distributions of EPSs for other primary products can be found in Annex 4. There has been slightly more market uptake of more efficient EPSs up until 2013 as a result of the Ecodesign requirements. From 2016, the US has adopted more advanced requirements than in the EU, and this left room for redirecting to the European market EPSs that became non-compliant in the US. Therefore, the uptake of more efficient EPS is expected to stagnate after 2016.

Figure 12 Efficiency distribution of EPS for network equipment, set-top boxes and loudspeakers etc. in Business As Usual scenario without further EU intervention. ERP EFF represents current ecodesign level, Half BAT represents the efficiency half way between current BAT and CoC Tier 2 level.



Source: Based on 2015 NRCAN database and 2018 data from https://www.digikey.com/ and calculations by Viegand Maagøe (see Annex 4)

Every user of products with an EPS (in industry, services and households) will be impacted by the lost energy and monetary savings resulting from the use of less efficient EPSs.

2.3.2. *Market failure due to outdated regulation*

Without requirements adapted to technological progress and regulatory evolutions on other markets (such as US), the EU could become a dumping ground for the less efficient EPSs that cannot be sold any longer in other markets.

Outdated requirements would negatively affect EPS suppliers that are selling more efficient (and slightly more expensive) products by decreasing their competitiveness on the European market. It would also result in lower industry revenues, as the highly competitive market for electronics will not facilitate the bundling of primary products with more efficient EPSs. Ultimately, consumers will not benefit from slightly cheaper and more energy consuming products because their overall life cycle cost, including the energy consumption, will be higher.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

The legal basis for acting at EU level through the Ecodesign framework Directive and the Energy Labelling Framework Regulation is Article 114 and Article 194 of the Treaty on European Union (TEU)[36] *and the Treaty on the Functioning of the European Union (TFEU)*[37] *respectively. Article 114 relates to the "the establishment and functioning of the internal market", while Article 194 gives, amongst others, the EU the objective "in the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment" to "ensure security of energy supply in the Union" and "promote energy efficiency and energy saving and the development of new and renewable forms of energy".*

[36] Consolidated version of the Treaty on European Union OJ C 326, 26.10.2012, p. 13–390 (TEU)
[37] Consolidated version of the Treaty on the Functioning of the European Union. OJ C 326, 26.10.2012, p. 47 (TFEU)

The Ecodesign Framework Directive includes a built-in proportionality and significance test. Articles 15(1) and 15(2) state that a product should be covered by an ecodesign or a self-regulating measure if the following conditions are met:

- *The product should represent a significant volume of sales;*
- *The product should have a significant environmental impact within the EU;*
- *The product should present a significant potential for improvement without entailing excessive costs, while taking into account:*
  - *an absence of other relevant Community legislation or failure of market forces to address the issue properly;*
  - *a wide disparity in environmental performance of products with equivalent functionality.*

The procedure for preparing such measures is described in Article 15(3). In addition, the criteria of Article 15(5) should be met:

- *No significant negative impacts on user functionality of the product;*
- *No significant negative impacts on health, safety and environment;*
- *No significant negative impacts on affordability and life cycle costs;*
- *No significant negative impacts on industry's competitiveness (including SMEs, see Section 6.6.1).*

During the review process (Review study 2013, see Annex2), it was established that EPSs fulfil the above-mentioned eligibility criteria.

The option of self-regulation has been considered. However, no industry proposal that would meet the requirements (inter alia minimum 80% market coverage) was put forward (see Section 5.3.1 for more details). In short, during the consultations none of the MSs or any other stakeholder suggested any other option than setting ecodesign requirements on minimum energy efficiency at EU level.

3.2. Subsidiarity: Necessity of EU action

Action at EU level gives end-users the guarantee that they buy an energy efficient product and provides them with harmonised information no matter in which MS they purchase their product. This is becoming all the more relevant as the online trade increases. With ecodesign and energy labelling at EU level, energy efficient products are promoted in all MSs, creating a larger market and hence greater incentives for the industry to develop them.

It is essential to ensure a level playing field for manufactures and dealers in terms of requirements to be met before placing an appliance on the market and in terms of the information supplied to customers across the EU internal market. For this reason, EU-wide legally binding rules are necessary.

Market surveillance is carried out by the MSAs appointed by MSs. In order to be effective, the market surveillance effort must be uniform across the EU to support the internal market and incentivise businesses to invest resources in designing, making and selling energy efficient products.

In the particular case of EPSs, the Regulation should be updated to: (i) enable further cost-effective energy savings for end users, (ii) expand the scope by including a new type of EPS present on the market and closing a potential regulatory loophole, and (iii) improve the information provided to the users and other stakeholders with regard to the performance of EPSs.

3.3. Subsidiarity: Added value of EU action

There is clear added value in requiring minimum energy efficiency levels at EU level.

Without harmonised requirements at EU level, MSs would be incentivised to lay down national product-specific minimum energy efficiency requirements in the framework of their environmental and energy policies. This would undermine the free movement of products. Before the ecodesign and energy label measures were implemented, this was in fact the case for many products.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objectives

The general objectives of a revised regulation on EPS are:

1. *Facilitate the* ***free circulation*** *of efficient EPSs within the EU internal market ;*
2. *Promotes* ***competitiveness*** *of the EU industry manufacturing products using EPSs and the EU EPS manufacturers through the creation or expansion of the EU internal market for more sustainable products;*
3. *Promotes the* ***energy efficiency*** *of EPSs as a contribution to the Commission's proposal to reduce energy consumption by at least 30% and to the EU's objective to reduce domestic greenhouse gases (GHG) emissions by 40% by 2030; implement the 'energy efficiency first' principle established in the* Commission Communication on Energy *Union Framework Strategy: and*
4. *Increase the* ***energy security*** *in the EU and reduce energy dependency through a decrease in energy consumption of EPSs.*

There are several synergies between these objectives. Reducing electricity consumption (by increasing the energy efficiency) leads to lower carbon, acidifying and other emissions to air. Tackling the problem at EU level enhances efficiency and effectiveness of the measure.

4.2. Specific objectives

The specific objectives of the policy options considered in this impact assessment are intended to correct the identified problems (see Section 2). These objectives aim to:

1. **Update the energy efficiency requirements** in line with the technological developments and the international initiatives, so that they continue to effectively support a functioning internal market, ensure further energy savings and reduce environmental impacts;
2. **Expand the scope** to close potential loopholes and facilitate a level playing field, thereby promoting competitiveness of the EU industry that manufactures EPSs or products using EPSs;
3. **Enhance transparency regarding EPS energy efficiency**, raise their profile and improve consistency with other Ecodesign Regulations, thereby raising awareness of the policy framework update under objectives 1 and 2 with consumers and improving enforcement by Member States.

These objectives will drive investments and innovations in a sustainable manner, increase monetary savings for the end-users, and contribute to the objectives of the Energy Union Framework Strategy and the Paris Agreement.

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

The procedure for identifying policy options stems from the Better Regulation Toolbox[38]*. The specific measures in the policy options are the result of a combination of initiatives mentioned in the Review study 2013, the evaluation in Annex 7, and inspiration taken from the Ecodesign Framework Directive. They aim to address the problems identified in Section 2 and achieving the policy objectives defined in Section 4.*

The policy options considered are listed in Table 4 (with detailed description in the next sections). The options comprise a number of measures that were identified as (technically) feasible in the discussions with stakeholders (their views in relation to each option are provided). They are fully examined in section 6 with regard to their projected impacts. Measures that were considered not feasible or impractical at this stage, based on technical analysis and the same discussions with stakeholders, are presented in section 5.3 'Discarded options' together with the reasoning for doing so.

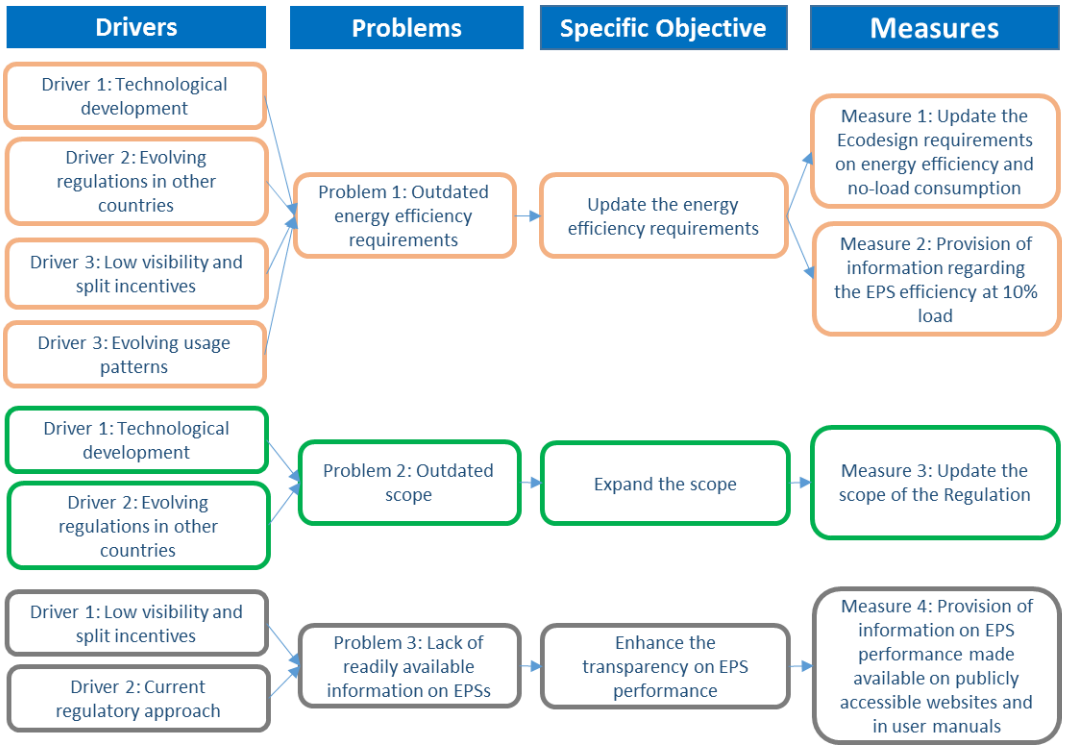
Table 4 Available policy options

Policy option		Name	Description
PO1		**Business-as-Usual (BAU)**	This is the baseline scenario, where the current regulation remains unchanged
PO2	*	**Global alignment**	Reinforced ecodesign requirements on minimum efficiency and no-load, implemented through a single tier in alignment with current US DOE requirements.
PO3	*	**Ambitious EU measure**	Reinforced ecodesign requirements on minimum efficiency and no-load, implemented through two tiers: first tier aligned with current US DOE requirements and a subsequent second tier aligned with EU CoC Tier 2.
PO4	*	**Very ambitious EU measure**	Reinforced ecodesign requirements on minimum efficiency and no-load, implemented through two tiers: first tier aligned with US DOE requirements and a subsequent more ambitious second tier set at a level between the EU CoC tier 2 and BAT.
***Measures that are common to all PO2-PO4, and are additional to the reinforced ecodesign measures stated above:** (i) Extension of scope to include multiple voltage output EPS; (ii) Provision of information requirement regarding the efficiency at 10% EPS load, and; (iii) Provision of information on EPS performance made available on publicly accessible websites and in user manuals.			

The figure below summarises the intervention logic for the envisaged measures.

[38] https://ec.europa.eu/info/sites/info/files/file_import/better-regulation-toolbox-17_en_0.pdf (Better Regulation Toolbox)

Figure 13: Link between the drivers, problems, objectives and the measures proposed in support of policy options



It should be noted here that no measure is proposed at this stage for addressing material efficiency. The full reasoning (based on technical analyses and consultations with stakeholders) is presented in Section 5.3.4.

5.1. What is the baseline from which the options are assessed? - BAU option

This option implies that the current Ecodesign and all other relevant EU-level policies and measures are assumed to continue. This option is retained as the baseline – "Business as usual" (BAU) scenario.

It is worth noting that the current BAU scenario, which is the basis for evaluating the proposed policy options, is different from the BAU 0 scenario from 2009[39] before any regulation on EPS was in place. The distinction between the BAU and the previous one (BAU 0) is instrumental in evaluating the effectiveness and efficiency of the current Regulation (see details in Annex 7).

In the baseline scenario, the current ecodesign regulation has been able to transform the market towards more efficient products for all EPSs in scope (see evaluation of current Regulation in Annex 7). However, the effect of the regulation slows down after end of 2012, a year after the final Tier came into force. From then on, the efficiency for all EPSs in scope is assumed to improve autonomously but very slowly beyond the existing minimum requirements due to suboptimal market development and the potential risk of EPSs banned in the US entering the EU market. The US DOE requirements increase the probability of staying at the current efficiency level in EU – as opposed to enhancing efficiency in an autonomous manner - when manufacturers continue to sell in the EU EPSs which remain compliant here, but that cannot be sold anymore in the US.

[39] The BAU scenario from 2009 was used then for analysing the impacts of introducing the Regulation currently in force, therefore it was a scenario without any ecodesign requirements in place. By contrast, the current BAU scenario incorporates the requirements of the current regulation, and also covers more EPS types to allow for an assessment of the scope extension.

This scenario implies no requirements for multiple voltage output EPS, no information requirement for efficiency at 10% loading, and no general information requirement on EPS performance.

The requirement in the EU ETS to reduce emissions from amongst other electricity production will impact EPS in the PO1 - BAU. Indeed, if the energy consumption of EPSs is not reduced, the indirect emissions (i.e. from electricity consumption) relative to the allowed emissions will increase. In general, this means that more EU ETS emissions allowances will have to be bought and that the price of electricity could slightly increase.

5.2. Description of the policy options

5.2.1. *Ecodesign legislative amendments that are common for all policy options (PO2 – PO4)*

The three measures described in this section are applicable to policy options PO2, PO3 and PO4. They apply in the same conditions in all options and are additional to the specific measures put forward in each policy option with regard to reinforced ecodesign requirements. The three common measures were duly analysed, discussed with stakeholders and broadly agreed upon. Therefore they are presented as a 'horizontal' component in all three policy options.

(i) Extension of scope

The extension of scope means including multiple voltage output EPSs, similar to the US DOE requirements.

The requirements on active efficiency and the no-load consumption for multiple voltage output EPSs (see requirements in Table 5 and Table 6, as included in PO2) are less strict than the similar requirements for the 'regular' single voltage output EPS (see requirements in Table 8 and Table 9). This is necessary because there are more electronic components in multiple voltage output EPSs that bring additional losses. Manufacturers already deliver compliant products to the US market, and it would therefore not be an issue for them to supply also the EU market.

Table 5 Requirements on maximal no-load power consumption for multiple voltage output EPS

EPS type / Nameplate output power	$P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq 250$ Watts
Multiple voltage output EPS	0.300 Watt	0.300 Watt

Source: Draft working document for EPS Regulation 2015

Table 6 Requirements on minimal average active efficiency for multiple voltage output EPS

EPS type / Nameplate output power	$P_O \leq 1.0$ Watt	1.0 Watt < $P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq 250$ Watts
Multiple voltage output EPS	$0.497 \cdot P_O + 0.067$	$0.075 \cdot \ln(P_O) + 0.561$	0.860

Source: Draft working document for EPS Regulation 2015

This extension would require specifying a test method for multiple voltage EPS. Such a method already exists in the United States[40], prepared by the DOE. This test method includes a description of how to load the individual connections at different voltage levels for achieving the loading conditions required by the regulation in order to measure the efficiency.

[40] Electronic Code of Federal Regulations. Title 10 → Chapter II → Subchapter D → Part 430 → Subpart B → Appendix Z - Uniform Test Method for Measuring the Energy Consumption of External Power Supplies https://www.ecfr.gov/cgi-bin/text-idx?SID=c9dbafe3c54ecf1ee3bbb502608fca50&mc=true&node=ap10.3.430_127.z&rgn=div9

Stakeholder views: During the stakeholder consultations for the Review Study 2013 and impact assessment procedure the MSs and NGOs (such as ECOS and NRDC) expressed support for the scope extension. Industry stakeholders e.g. DIGITALEUROPE also broadly accepted this proposal.

(ii) Information requirement on 10% loading efficiency

A requirement regarding the provision of information on EPS efficiency at 10% load is proposed at this stage. The requirement would take effect at the same time as Tier 1 efficiency requirements (see PO2 to PO4 below).

A measurement of efficiency at 10% load can be implemented at marginal extra test cost by increasing the load conditions for measurements from five points (0%, 25%, 50%, 75%, 100% loading) to six points (one additional point at 10% loading). No additional equipment is required, and overall testing time would increase by no more than 10 minutes according to testing experts. EPSs redesigned for compliance with the new efficiency requirements should in any case be retested and the additional measurement for the 10% load point would add little additional test burden.

Stakeholder views: This measure was largely supported by stakeholders when discussed at the Consultation Forum meeting held on 18 April 2013. Industry stakeholders represented by DIGITALEUROPE have accepted the proposal for an information requirement, if enough transition time is allowed. MSs also supported this requirement. However, NGOs, such as ECOS and ANEC/BEUC, are asking for a specific requirement on minimum efficiency at 10% loading. Nonetheless, they also agree that having an information requirement for data collection purpose would be useful and would facilitate analysing a hard requirement in the next revision of the Regulation.

(iii) Requirement for making information on EPS performance available on publicly accessible websites and in user manuals

This requirement establishes the obligation of manufacturers and/or importers to make available relevant information including EPS efficiency and no-load consumption. This information is already provided by manufacturers in the technical documentations, but these are currently only available to a limited audience e.g. MSA. Including an information requirement will therefore not create additional administrative burden. Additionally, it will ensure consistency with the other Ecodesign Regulations.

Stakeholder views: No stakeholder expressed any particular concerns about this requirement.

5.2.2. *Policy Option 2 - Global alignment*

The PO2 reflects proposals from industry stakeholders for a single tier aligned with US DOE requirements (see requirements in Table 8 and Table 9) to avoid variations in EPS design between the EU and US markets.

This option has the following characteristics (presented in Table 7) and requirements (presented in Table 8 and Table 9):

Table 7 PO2 implementation timeline

Option 2	January 2020	July 2020	January 2021	July 2021	onwards
Efficiency and no-load	Tier 1 →	→	→	→	→
10% loading efficiency	Info req. →	→	→	→	→

Table 8 Requirements on maximal no-load power consumption for EPS - Tier 1

EPS type / Nameplate output power	$P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq 250$ Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	0.210 Watt	0.210 Watt
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	0.100 Watt	0.210 Watt
Low voltage EPS	0.100 Watt	0.210 Watt
Multiple voltage output EPS	0.300 Watt	0.300 Watt

Source: Draft working document for EPS Regulation 2015

Table 9 Requirements on minimal average active efficiency for EPS - Tier 1

EPS type / Nameplate output power	$P_O \leq 1.0$ Watt	1.0 Watt < $P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq$ 250 Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	$0.5 \cdot P_O + 0.160$	$0.071 \cdot \ln(P_O) - 0.0014 \cdot P_O + 0.67$	0.880
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	$0.5 \cdot P_O + 0.160$	$0.071 \cdot \ln(P_O) - 0.0014 \cdot P_O + 0.67$	0.880
Low voltage EPS	$0.517 \cdot Po + 0.087$	$0.0834 \cdot \ln(Po) - 0.0014 \cdot Po + 0.609$	0.870
Multiple voltage output EPS	$0.497 \cdot P_O + 0.067$	$0.075 \cdot \ln(P_O) + 0.561$	0.860

Source: Draft working document for EPS Regulation 2015

Increasing the energy efficiency requirements will remove or shift the efficiency of 70% of the products on the market in 2020 compared to a BAU scenario (see Annex 4). This is similar to the effect that the current Ecodesign Regulation had on the market when it was first adopted in 2009 (for more information see Annex 7).

Stakeholder views: The industry stakeholders[41] expressed support for this policy option, as globally harmonised requirements will bring economies of scale.

5.2.3. *Policy Option 3 - Ambitious EU measure*

This policy option includes the same first tier as in PO2, but it adds a second tier which is aligned with the EU CoC Version 5 Tier 2. The EU Code of Conduct was chosen as the basis for this second and more ambitious tier because the CoC is a result of extensive consultations (typically bi-annual meetings) and analyses over many years. This was done with an ad-hoc working group composed of independent experts, Member States and industry representatives covering EPS, component and end-product manufacturers, and large purchasers of end-products such as telecommunication providers. The CoC was signed to date by four large companies[42]. The EU Code of Conduct was supported as a good basis for tightening requirements at the Consultation Forum on 18 April 2013. This option is based on the proposal subsequently presented to the Consultation Forum on 29 April 2015, albeit with revised timescales for implementation.

This option has the following characteristics (presented in Table 10), and Tier 2 requirements (presented in Table 11 and Table 12). The Tier 1 requirements are presented in Table 8 and Table 9 above.

[41] DIGITALEUROPE, consultation in February – March 2018 and Nintendo position paper,2015

[42] Alcatel-Lucent (mobile telephones), Lenovo Group Ltd. (power supplies), Salcomp Oy (AC adapter and battery chargers for mobile telephone and IT equipment) and Samsung (mobile telephones).

Table 10 PO3 implementation timeline

Option 3	January 2020	July 2020	January 2021	July 2021	onwards
Efficiency and no-load	Tier 1 →	→	→	Tier 2 →	→
10% loading efficiency	Info req. →	→	→	→	→

Table 11 Requirements on maximal no-load power consumption for EPS - Tier 2

EPS type / Nameplate output power	$P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq 250$ Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	0.075 Watt	0.150 Watt
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	0.075 Watt	0.150 Watt
Low voltage external power supplies	0.075 Watt	0.150 Watt
Multiple voltage output external power supplies	0.300 Watt	0.300 Watt

Source: Draft working document for EPS Regulation 2015

Table 12 Requirements on minimal average active efficiency for EPS - Tier 2

EPS type / Nameplate output power	$P_O \leq 1.0$ Watt	1.0 Watt < $P_O \leq 49.0$ Watts	49.0 Watt < $P_O \leq 250$ Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	0.5 · Po + 0.169	0.071 · ln(Po) – 0.00115 · Po + 0.670	0.890
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	0.5 · Po + 0.169	0.071 · ln(Po) – 0.00115 · Po + 0.670	0.890
Low voltage EPS	0.517 · Po + 0.091	0.0834 · ln(Po) – 0.0011· Po + 0.609	0.880
Multiple voltage output EPS*	0.497 · Po + 0.067	0.075· ln(Po) + 0.561	0.860

Source: Draft working document for EPS Regulation 2015
**The second tier does not bring any changes in the requirements for multiple voltage output EPS*

The increase of the energy efficiency requirements will remove or shift the efficiency of 80 % of the products on the market in 2020 compared to a BAU scenario (see Annex 4).

Stakeholder views: NGOs such as ECOS and MSs have supported the two-tier approach (although some MS such as Germany and Italy asked for a thorough assessment, during the impact assessment phase, of the benefits of having a second tier). Industry stakeholders have strongly opposed the two tiers approach.

5.2.4. *Policy Option 4 - Very ambitious EU measure*

Environmental and consumers NGOs initially requested even more ambitious requirements, such as higher active efficiency requirements in Tier 2 or adding an ambitious third tier while keeping Tier 2 as described in PO3. The option of having a third tier was however discarded after further consultation with stakeholders.

Building on the idea of supporting a very ambitious approach, PO4 includes the same first tier of minimum energy efficiency requirements as PO2 (see requirements in Table 8 and Table 9), but includes a Tier 2 that is more ambitious than the one in PO3. This would provide higher energy savings that should balance better the associated additional costs for manufacturers in terms of design changes. The timing of the second tier is half a year later than that proposed in PO3 to allow the higher ambition level to be achieved at reasonable cost. This policy option has the characteristics presented in Table 13, and Tier 2 requirements in Table 14 and Table 15. The proposed requirements[43] are calculated as the midpoint between the CoC Tier 2 and BAT.

Table 13 PO4 implementation timeline

Option 4	January 2020	July 2020	January 2021	July 2021	January 2022	onwards
Efficiency and no-load	Tier 1 →	→	→	→	Tier 2 →	→
10% loading efficiency	Info req. →	→	→	→	→	→

Table 14 Requirements on maximal no-load power consumption for EPS - Tier 2

EPS type / Nameplate output power	$P_O \leq 49.0$ Watts	49.0 Watt $< P_O \leq 250$ Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	0.058 Watt	0.096 Watt
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	0.058 Watt	0.096 Watt
Low voltage external power supplies	0.046 Watt	0.096 Watt
Multiple voltage output external power supplies	0.300 Watt	0.300 Watt

Source: Midpoint between CoC Tier 2 and BAT which is based on the top 5% of a 2015 NRCAN database and checked with 2018 data from www.digikey.com

Table 15 Requirements on minimal average active efficiency for EPS - Tier 2

EPS type / Nameplate output power	$P_O \leq 1.0$ Watt	1.0 Watt $< P_O \leq 49.0$ Watts	49.0 Watt $< P_O \leq 250$ Watts
AC-AC external power supplies, except low voltage EPS and multiple voltage output EPS.	0.843	0.843 – 0.885	0.858 – 0.902
AC-DC external power supplies except low voltage EPS and multiple voltage output EPS.	0.843	0.843 – 0.885	0.858 – 0.902
Low voltage external power supplies	0.741	0.741	0.741
Multiple voltage output external power supplies	$0.497 \cdot Po + 0.067$	$0.075 \cdot \ln(Po) + 0.561$	0.860

Source: Source: Midpoint between CoC Tier 2 and BAT which is based on the top 5% of a 2015 NRCAN database and checked with 2018 data from www.digikey.com

The increase of the energy efficiency requirements will remove or shift the efficiency for 90% of the products on the market in 2020 compared to BAU scenario (see Annex 4).

Stakeholder views: NGOs such as ECOS and ANEC/BEUC requested, during consultation on the review study, that a detailed assessment would be carried out regarding setting more ambitious efficiency requirements than the ones of CoC Tier 2. MS had mixed views regarding a possible third tier to introduce even more stringent requirements, and subsequently concentrated their views on analysing the two tiers as described in PO3.

5.3. Options discarded at an early stage

5.3.1. *Voluntary agreement by the industry*

A voluntary agreement has to be given priority according to the Ecodesign Framework Directive, provided it meets the objectives in a quicker and more cost-effective manner. Today minimum mandatory requirements are already in force. Since no proposal has been put forward by the industry, there is no voluntary agreement that meets the conditions[44] of the Ecodesign Directive. When substituting mandatory requirements by a voluntary agreement there would

[43] The minimum efficiencies are expressed in efficiency intervals applicable to specific base cases, rather than using formulae as in PO3.

[44] One of the conditions that has to be met by a self-regulation is to cover at least 80% of the market. This is not the case with e.g. the EU CoC that is also a voluntary instrument, but which does not cover such a large share of the units sold on the EU market as it is aimed at the best performing products.

also be a risk of free riders[45]*, should not all actors present on the market sign and comply with the agreement. As a consequence, this option is discarded from further analysis.*

Stakeholder views: None of the stakeholders are in favour of a voluntary agreement for the reasons described above.

5.3.2. *Energy labelling*

A complementary option to minimum energy efficiency requirements could be the use of energy labels according to the Energy Labelling Regulation. These provide comparable information on the energy efficiency levels and other relevant information to consumers.

However, it is important to underline that EPSs usually are sold bundled with primary load products, which are typically the focus of the consumer purchasing choice. This entails the following consequences:

(i) The purchasing criteria do not focus on the quality of the EPS, but rather on the quality (and price) of the main product;

(ii) The potential energy saving of the individual EPS is rather small compared with the primary load product (majority in the range of 3 – 20 kWh energy savings over entire product lifetime), so there is little incentive for buyers to make EPS efficiency a criterion for their purchase choice.

In addition, in most cases the EPSs in scope are purchased by professional buyers that bundle them with primary load products. Professional buyers may not always choose the most efficient EPS for several reasons (as discussed in the previous sections, e.g. higher price, low visibility of EPSs). Nevertheless, these reasons do not usually involve a lack of information or inability to understand the information provided, i.e. problems for which an energy label would offer a good solution.

Finally, it would also be technically challenging to define energy efficiency classes that would enable sufficient differentiation between various EPSs because the difference in electricity cost between two classes would be minor. As an illustrative example, the difference in energy savings between the US DOE level to CoC Tier 2 level is approximately 0.1 kWh/year for an EPS used by a mobile phone or a grooming product. This results in additional financial savings of some 0.02 €/year[46].

An energy label under the Energy Labelling Regulation would thus create administrative burden on manufacturers and retailers while offering little to no gain. Therefore, this option is discarded from further analysis.

Stakeholder views: None of the stakeholders are in favour of energy labelling of EPSs for the reasons described above.

5.3.3. *Requirement on minimum energy efficiency at 10% load*

Minimum active efficiency requirement at 10% load was discarded during the consultations with stakeholders because of the reasons mentioned below.

Firstly, there is a lack of data on EPS efficiency at 10% load, which makes it very difficult to set an appropriate efficiency level. The additional EPS redesign costs associated with a minimum

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[45] A free-rider problem occurs when those who benefit from resources, goods, or services do not pay for them, which results in an underprovision of those goods or services. (*Baumol, William (1952). Welfare Economics and the Theory of the State. Cambridge, MA: Harvard University Press.)*

[46] Calculation done under this impact assessment, Viegand Maagøe, 2018

efficiency requirement could be disproportionate at this stage without reliable data to calculate the energy savings, and could result in negative LCC for products.

Secondly, there are strong divergent views between the stakeholders on a specific efficiency requirement. Neither the International Marking Protocol, nor the US regulations contain such a requirement for the time being.

Therefore, this option will not be further assessed. An alternative requirement on measuring the efficiency at 10% load and disclosing the information was proposed instead. This approach will bring transparency regarding the behaviour at 10% load and make available the data needed. That could be subsequently used in the next revision of the regulation for re-assessing the need to have a requirement on minimum efficiency.

Stakeholder views: NGOs such as ECOS, ANEC/BEUC and NRDC expressed strong support for minimum efficiency requirement at 10% load, while the industry stakeholders expressed strong opposition to this requirement. Some MSs, such as Germany, were concerned about the costs implication of this requirement as being disproportionate in comparison with the benefits it would bring. As a consequence, most of the participants at the Consultation Forums in 2013 and 2015 (not including the NGOs) expressed support for the Commission's proposal made back then to include at this stage an information requirement (as described in the policy options), rather than a minimum efficiency requirement.

5.3.4. *Material efficiency requirements*

Material efficiency aspects and possible measures were discussed with the stakeholders at two Consultation Forums. An additional assessment (completed between these two meetings) examined closer the topics discussed. Three possible main approaches were discussed:

1. A compatibility requirement, i.e. a requirement making it easier to use a common EPS for a broader range of products, and to avoid bundling a separate EPS with each product;
2. A requirement on detachable cables, which would avoid discarding the entire EPS if the cable is damaged;
3. A requirement on maximum weight of the EPS, which would be a simple way of reducing material content.

The Commission services stressed at the Consultation Forum that:

- for point 1 – a mandatory requirement could have disproportionate effects on a whole range of products and might hamper innovation. Manufacturers would also lose control over the charging process, creating problems for e.g. fast-charging optimised products. For these reasons, voluntary approaches proposing a universal EPS standard would be a better tool for reducing the number of EPSs shipped with products and would achieve savings more quickly than an Ecodesign requirement, whilst allowing for frequent updating of the requirements. It also pointed out that the Commission was preparing a Memorandum of Understanding (MoU) for stimulating the industry, in a voluntary way, to standardise certain EPSs for consumer products (mainly smartphones) and allow interchangeability;
- for point 2 – this would lead to potential safety risks, wrong use, standardisation problems and additional costs to manufacturers for components and design rights;
- for point 3 - the regulation in force has already contributed substantially to reducing the average weight of EPSs and that more data was needed to judge the actual savings potential and the broader implications linked to a possible requirement on maximal EPS weight.

Furthermore, several challenges were identified that led to not proposing disassembly measures in this revision. These include: the lack of standardised methods for compliance assessment, difficulties in allowing flexibly for developments in recycling processes and materials/technology innovations, the need to balance design for disassembly against product safety considerations, and the risk of adding disproportionate administrative burden.

A further analysis carried out during the impact assessment found that even in cases where standardisation of output connectors would be achieved for EPSs, the need to put in place additional measures aimed at unbundling the sales of EPSs together with their main load products would still remain. Thus, a twofold approach could be followed: (i) to take advantage on the latest market evolutions brought by the recent introduction of USB Type-C connectors backed up by the USB Power Delivery specifications (more details on the USB technology are presented in Annex 6), and (ii) to introduce, where possible, measures incentivising unbundling (as it is now investigated in the revision of the ecodesign regulation on electronic displays[47]).

Finally, based on the findings regarding EPSs used for laptops[48], dismantling the main EPS parts for recycling still does not present a business case (not even for those relatively larger EPSs). At the end of life, they are treated as waste electrical and electronic equipment (WEEE) and are subject to mechanical shredding followed by material recovery of the most valuable waste fractions (notably ferrous and copper).

Therefore, a possible requirement in this review of the Regulation was discarded based on the consultations, reflecting the views of a majority of stakeholders (see also the meeting minutes in Annex 2), and on further analysis by the Commission services. The proposal from the Commission services is to re-assess material efficiency in the next review process, based on a stock tacking of the latest technological and market developments (notably regarding the deployment of USB Type-C compatible EPSs and main load products). It should be also noted that the MoU mentioned above did not yet take shape.

For coping with the difficulties to include circular economy requirements in the current revision, the Commission's proposal would provide for the next revision to be carried out sooner, i.e. within four years instead of the usual five-year period.

Stakeholder views: NGOs such as ECOS and ANEC/BEUC expressed support for material efficiency requirements and actions to promote unbundling of EPSs from their primary load products. MSs expressed more reserved views, generally not asking for, or even opposing, mandatory ecodesign requirements at this stage (e.g. Italy opposed including material efficiency requirements at this stage, DE and NL that supported voluntary standardisation of EPSs – via a standardisation mandate if possible – and BE proposed an information requirement on EPS weight).

5.3.5. *Scope extension to cover wireless chargers*

Scope extension to include wireless chargers (using the inductive charging principle) was considered during the review process because of growing interest in wireless chargers for mobile devices, such as mobile phones. The option was however not pursued because the technology is still maturing with different wireless standards being promoted[49]. More importantly, standardised measurement methods are still lacking. Having a way of reliably measuring the performance of wireless chargers is instrumental for enforcing a mandatory measure, and the lack of such a standardised test would prevent MSAs from surveying the market. Furthermore, the market penetration of wireless chargers was considered not high

[47] The ongoing revision of Commission Regulation (EC) No 642/2009 investigates the possibility to incentivise the sales of televisions and computer displays without the EPS required to function, and include an indication on this on the energy label. Thus, the users could reuse compatible EPSs they have previously purchased.

[48] Analysis of material efficiency aspects of personal computers product group - Joint Research Centre, Technical Report January 2018. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105156/20180115_-_jrc_technical_report_online_v02.pdf

[49] http://www.qiwireless.com/ and https://www.airfuel.org/

enough for justifying at this stage the major research efforts needed for addressing them properly.

Therefore, this option will not be further assessed. The potential of wireless chargers will nevertheless be re-assessed during the next review of the Regulation, on the basis of the latest technological and market developments.

Stakeholder views: NGOs such as ECOS, have expressed strong support for the inclusion of wireless chargers in the scope. MS such as Germany supported the option to investigate this scope extension during the next revision.

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

6.1. Methodological considerations and key assumptions

With the adoption of the Ecodesign Working Plan 2016-2019 in November 2016, the Commission committed for the first time explicitly to systematically exploring resource efficiency requirements in ecodesign. As a result, the methodological basis for the inclusion of such requirements is not yet fully developed; there are no well-established and accepted methodologies in place to identify requirements in the context of mandatory legislation (contrary to green public procurement, ecolabels, etc.).

Therefore, the 'circular economy' requirements that are analysed are based in particular on stakeholder input, existing studies and evidence of product failure, and focus on measures that can be relatively easily implemented. As such, they can be considered a starting point that can subsequently be complemented or refined when the methodological tools are available.

There is also a lack of methodologies to 'quantify' the costs and benefits of such criteria in the context of the 'least life cycle cost' (LLCC) calculations applied for energy efficiency in ecodesign, in particular as regards the assessment of trade-offs.

To address the gaps in the methodological framework, the Commission mandated CEN/CENELEC to develop standards for material efficiency under ecodesign and a first set of horizontal standards is expected next year. These will be integrated in the MEErP methodology as appropriate. A broader update of the MEErP is foreseen in 2019, in particular to see how circular economy aspects could be better integrated in preparatory and review studies, and the LLCC calculations.

The methodology and key assumptions used in this impact assessment are as follows:

The analytical methods used to determine the impacts and the details about the share of products that would be removed from the market under different scenarios are described at length in Annex 4. A model is used for calculating the EPS stock (based on current stock, sales and end-of-life), overall energy consumption and GHG emissions (based on unit consumption and total stock), user expenditure (including EPS purchase and energy costs), and industry turnover and jobs created. This model is built on ten 'base cases', representing the main EPS types on the market. Each base case has specific usage patterns, expected life times, efficiencies, and purchase costs. For each policy option (PO) the additional improvement costs, needed for modifying the products to achieve the proposed ecodesign requirements are also calculated. Life cycle costs (LCC) for each of the ten base cases are calculated based on purchase costs (including additional compliance costs for each PO) and energy consumption costs (including specific gains for each PO). As an indication of the least life cycle cost (LLCC), a total LCC is calculated across all base cases, considering a typical household with ten EPSs, one from each category.

A key assumption is that by the end of each year when a certain requirement comes into force, 80% of the annual sales will be made up of EPSs that will already be compliant. Another important assumption is the improvement costs entailed in each PO. These are based on the approach taken by the US DOE for adopting the US requirements (see details in Annex IV, point 4). Key assumptions were also used for modelling the industry turnover and jobs created. The total improvement costs are assumed to be passed on entirely to the customers, without the demand being affected. This indeed seems to be the case, as the EPSs are sold bundled with main load products. Additional employment per sector is then derived from the industry turnovers and turnover per employee ratios. Although this is an imperfect approximation and the estimated additional employment cannot be guaranteed in practice, it is based on a method widely used in the ecodesign impact assessments.

Additional assumptions and details on calculations are presented in the following sections.

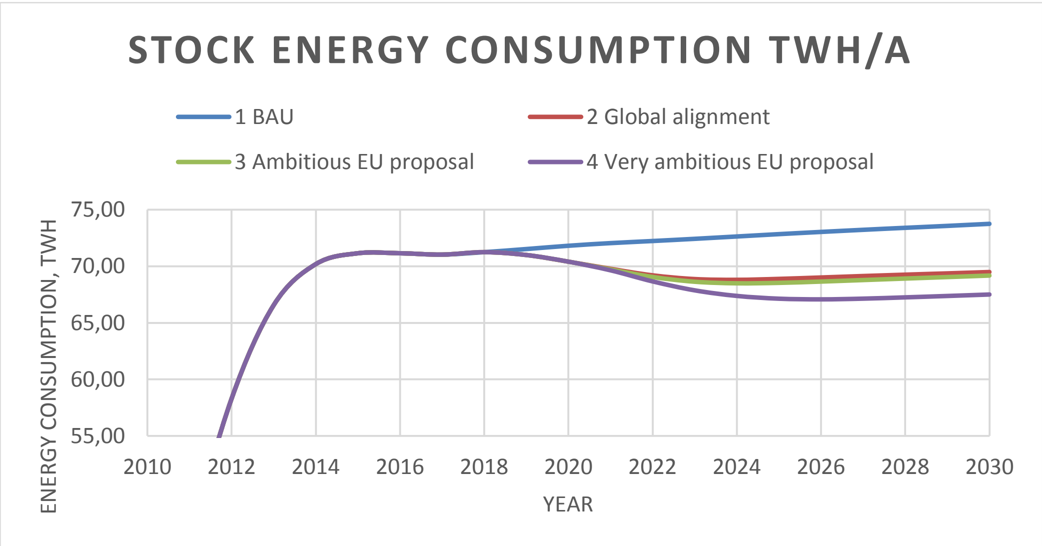
6.2. Environmental impacts

6.2.1. *Electricity savings*

The electricity savings calculated for each policy option come from the higher efficiency levels that would be required for the EPSs placed on the EU market. In PO2, the majority of EPSs would reach the US DOE efficiency level of efficiency by the end of 2020, considering that the requirement comes into force in January 2020. PO3 and 4 will follow the same pattern as PO2 until the second tier comes into force and then follow the evolution for matching that level. That means that in PO3 by 2022 the majority of the EPSs would reach CoC Tier 2 efficiency level, and in PO4 the majority would reach the Tier 2 efficiency level of midway between CoC Tier 2 and BAT. See Annex 4 for assumption of efficiency distribution of sales over the years.

The energy consumption of the total product stock[50] is presented in Figure 14. It can be observed that PO2 and 3 result in very similar energy consumption.

Figure 14 Total stock energy consumption in TWh per annum



Source: Based on calculations by Viegand Maagøe (see Annex 4)

[50] The stock energy consumption includes the energy consumption of both the EPS and the primary load product. This approach was chosen to better align with other existing calculation methodologies and figures (e.g. the ones developed by the industry stakeholders). However, the energy savings (i.e. the differences in the energy consumption when compared with BAU) are achieved exclusively by improving the EPS performance. In other words the energy savings are only due to implementing the different policy options, as the sole change in each PO is the change in the efficiency levels of the EPSs with no changes in behaviour of the primary load products.

Table 16 presents the electricity consumption, and annual and cumulative savings for the policy options. In 2030, PO4 yields the most savings (6.25 TWh), PO3 yields the second largest savings (4.57 TWh), followed by PO2 (4.26 TWh, with only 0.31 TWh less compared to PO3). PO2 would bring annual savings approximately equal to the electricity consumption of Cyprus in 2015.

Table 16 Electricity consumption and annual and cumulative savings for different policy scenarios

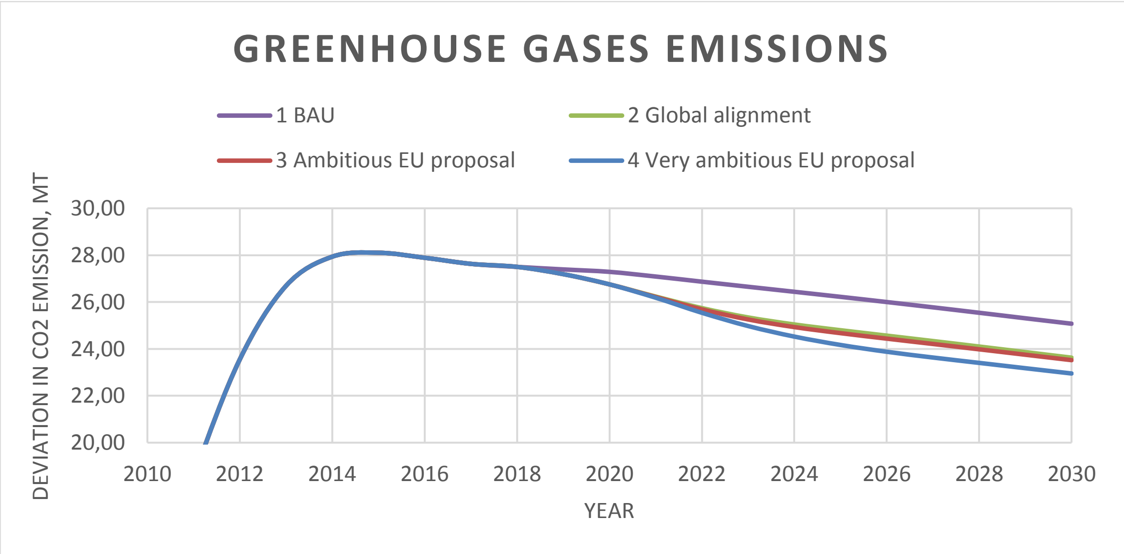
Policy options	Total energy consumption, TWh/year				Saving vs. BAU, TWh/year				Cumulative saving, TWh			
	2015	2020	2025	2030	2015	2020	2025	2030	2015	2020	2025	2030
1 BAU	71.2	71.8	72.9	73.8	-	0.00	0.00	0.00	-	0.0	0.0	0.0
2 Global alignment	71.2	70.4	68.9	69.5	-	1.40	3.96	4.26	-	1.93	18.6	39.3
3 Ambitious EU measure	71.2	70.4	68.5	69.2	-	1.40	4.31	4.57	-	1.93	19.7	42.1
4 Very ambitious EU measure	71.2	70.4	67.1	67.5	-	1.40	5.71	6.25	-	1.93	23.4	54.1

Source: Based on calculations by Viegand Maagøe (see Annex 4)

6.2.2. *Greenhouse gases emissions reduction*

The greenhouse gas (GHG) emissions are calculated by using the emission rate for electricity in Ecodesign Impact Accounting status report 2016 [51] to convert the electricity consumption presented above in TWh to Mt CO2-eq.

Figure 15 Greenhouse gases emission in CO2-eq for different policy options



Source: Based on calculations by Viegand Maagøe (see Annex 4)

The results in Figure 15 follow a very similar pattern as the electricity consumption, but with an overall downward trend because the emission rate is decreasing over time, as it is anticipated that renewable energy sources will increasingly be used for generating electricity. In 2030, PO4 yields the highest emission reduction (2.12 Mt), PO3 the second largest reductions (1.55 Mt), with PO2 immediately after that (1.45 Mt, equivalent to around 55% of the total GHG emissions of Malta in 2015). Table 17 presents the greenhouse gas emission and annual and cumulative reductions for all policy options.

[51] https://ec.europa.eu/energy/sites/ener/files/documents/eia_ii_-_status_report_2016_rev20170314.pdf

Table 17 Greenhouse gases emission and reductions compared with BAU for different policy options

Policy options	CO2-equivalent emissions Mt CO2-eq/year				Reductions vs. BAU Mt CO2-eq/year				Cumulative reductions Mt CO2-eq/year			
	2015	2020	2025	2030	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	28.1	27.3	26.2	25.1	-	0.00	0.00	0.00	-	0.0	0.0	0.0
PO2 Global alignment	28.1	26.8	24.8	23.6	-	0.53	1.42	1.45	-	0.74	6.85	14.1
PO3 Ambitious EU measure	28.1	26.8	24.7	23.5	-	0.53	1.55	1.55	-	0.74	7.25	15.0
PO4 Very ambitious EU measure	28.1	26.8	24.2	23.0	-	0.53	2.05	2.12	-	0.74	8.61	19.3

Source: Based on calculations by Viegand Maagøe (see Annex 4)

6.3. Business impacts

Manufacturers in this impact assessment are the EPS manufacturers. Wholesalers are usually the sales channels from which retailers can buy a product and sell it to consumers. However in the case of EPSs, the wholesaler is often the primary product manufacturer who sells its products together with the EPS to retailers. Since EPSs are usually not directly sold to end-users, with only a few exceptions of spare parts or replacement sales, the retailers' revenue is not considered here.

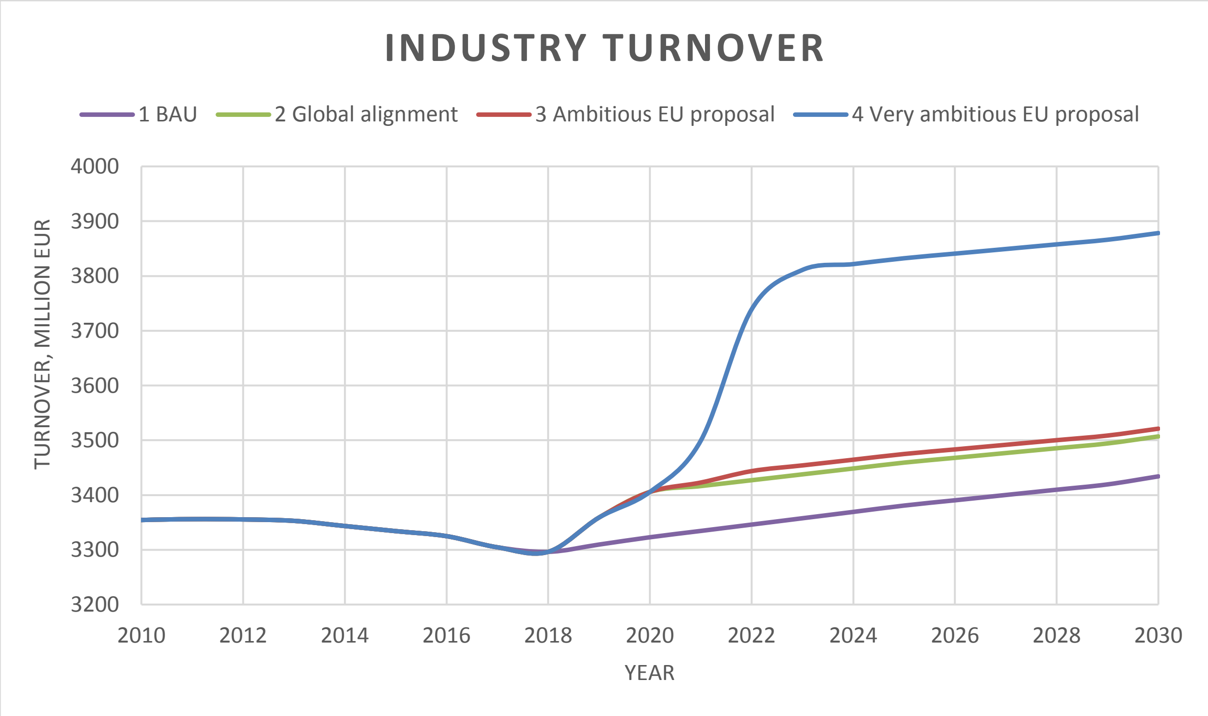
The EPS manufacturer selling price is estimated at 57%[52] of the final product price paid by the consumer. This is multiplied by the annual sales to arrive at annual turnover. The wholesaler's selling price is assumed to be 74%[53] of the product price (having a 17% wholesaler margin added on top of the 57%). This is also multiplied by the annual sales to arrive at the wholesale turnover. The turnover of the retailer (where a margin of 26% is assumed) is usually the actual product price multiplied by the annual sales. However, as EPSs are usually not sold alone but together with the primary products and the EPS accounts for a marginal share of the primary product price, it would have little added value to quantify the impact of EPSs on the retailer. Product prices are expressed in constant 2015 prices. See Figure 16 for industry turnover.

Table 18 presents the EPS manufacturers' and wholesalers' turnover and extra turnover compared with BAU for policy options. PO4 yields the highest overall industry revenue increase (444 mln. €) in 2030 because the purchase costs for consumers are the highest for PO4. PO3 has the second largest increase (87 mln. €) and PO2 the lowest increase (73 mln. €).

[52] The mark-up of 2.56 was used for deriving manufacturing costs at 39% of the EPS product price, to which the manufacturer profit margin of 18% was added to obtain the figure of 57% manufacturer selling price reported to the final consumer price. Source: DIGITALEUROPE, feedback to the Revision of Lot 7 External Power Supplies Regulation, Brussels, 16 June 2015

[53] DIGITALEUROPE, feedback to the Revision of Lot 7 External Power Supplies Regulation, Brussels, 16 June 2015

Figure 16 Industry turnover (incl. manufacturers and wholesalers) for policy options



Source: Based on calculations by Viegand Maagøe (see Annex 4)

The derived revenue figures are global figures as EPS manufacturers are multinational companies with R&D and administration in the EU, but production often located elsewhere. Data on the global electrical and electronic industry from ZVEI[54] indicated that the EU accounts for around 14% of the global market (in terms of bln. €). Thus, it is estimated that the EU industry turnover is 14% of the calculated figures. This means that PO4 yields an EU industry revenue increase of 62 mln. € in 2030. PO3 yields an increase of 12 mln. € and PO2 yields an increase of 10 mln. €.

It is important to note that the increase in turnover is assumed to cover only the extra costs for producing more efficient EPSs. No changes in profits for manufacturers are included in the calculations.

Table 18 EPS manufacturers' and wholesalers' turnover and extra turnover for industry (manufacturer + wholesaler) compared with BAU for different policy options

Overview of impact in industry	Turnover, mln. €/year								Extra turnover, mln. €/year			
	2015	2015	2020	2020	2025	2025	2030	2030	2015	2020	2025	2030
Policy options	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Industry	Industry	Industry	Industry
PO1 BAU	2,576	758	2,567	756	2,612	769	2,653	781	-	-	-	-
PO2 Global alignment	2,576	758	2,631	775	2,672	787	2,709	798	-	83	78	73
PO3 Ambitious EU measure	2,576	758	2,631	775	2,685	790	2,720	801	-	83	94	87
PO4 Very ambitious EU measure	2,576	758	2,631	775	2,961	872	2,996	882	-	83	452	444

Source: Based on calculations by Viegand Maagøe (see Annex 4)

[54] https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/2017/Juli/Die_globale_Elektroindustrie_Daten_Zahlen_Fakten/Fact-Sheet-International-2017.pdf , accessed April 2018.

6.4. Consumer expenditure

The prices of EPS are usually included in the primary product price and it is difficult to obtain the separate EPS price, unless it is sold as a spare part or it is a universal charger sold as an accessory. For the purposes of the impact assessment calculations, equivalent representative prices for the consumer were determined by factoring in the EPS manufacturer costs via "mark-ups" (see Annex 4 for details). The manufacturing costs are obtained from US DOE technical analyses[55], and industry stakeholder consultation[56] and are evaluated against the desk research of spare part costs and component costs of primary products (via reports from Statista[57], which is a portal with statistics from a broad range of sources). Although EPS prices might not affect the purchasing decision of customers buying the main load products, these prices are nevertheless instrumental for calculating the life cycle costs of EPSs (at a product level) and determining the most cost-effective way of improving their energy performance. EPS prices are also an important input for estimating overall consumer expenditure and savings (aggregated for the whole stock of EPSs in use).

A basic EPS in the range of 3.5W to 5W could have an equivalent consumer price of between 2 and 4 €. An EPS for a smart phone or tablet (10W to 18W) could range from 7 to 11 € (top end for a USB charger using USB PD standard to automatically change the output voltage and deliver fast charging). The price for an EPS for notebooks or game consoles, covering a wide range of voltages and possibly including multiple voltage outputs, could range between 12 to 35 €.

Table 19 presents the total consumer purchase costs and savings compared with BAU for different policy options. The savings are negative (effectively meaning increased costs) because the re-designed EPSs are more efficient, but also slightly more expensive.

Table 19 Consumer purchase costs and savings compared with BAU for different policy options

Policy options	Purchase costs, mln. €/year				Saving vs. BAU, mln. €/year			
	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	4,487	4,472	4,550	4,622	-	-	-	-
PO2 Global alignment	4,487	4,584	4,656	4,720	-	-111	-106	-98
PO3 Ambitious EU measure	4,487	4,584	4,677	4,739	-	-111	-127	-117
PO4 Very ambitious EU measure	4,487	4,584	5,158	5,220	-	-111	-608	-598

Source: Based on calculations by Viegand Maagøe (see Annex 4)

Electricity prices from PRIMES 2016 model[58] have been used to calculated energy costs. The electricity prices have been converted from 2013 prices to 2015 prices by using the average inflation rates from Eurostat[59]. Table 20 presents the consumer energy costs and savings compared with BAU for different policy options.

[55] https://www.regulations.gov/document?D=EERE-2008-BT-STD-0005-0217
[56] Manufacturing costs and estimated EPS prices have been sent to industry stakeholders for verification, 2015. The prices have been confirmed to have not changed drastically during consultation in February – March 2018.
[57] https://www.statista.com
[58] Scenario REF2015f
[59] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:HICP_all-items,_annual_average_inflation_rates,_2006-2016_(%25)_YB17.png

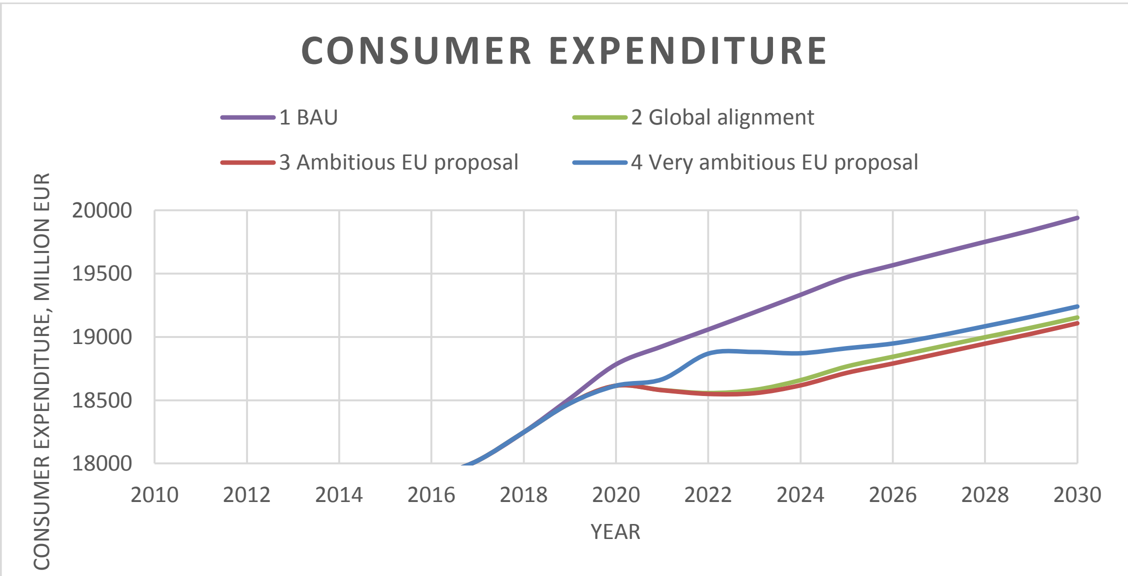
Table 20 Consumer energy costs and savings compared with BAU for different policy options

Policy options	Energy costs, mln. €/year				Saving vs. BAU, mln. €/year			
	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	13,209	14,311	14,921	15,318	-	-	-	-
PO2 Global alignment	13,209	14,031	14,110	14,433	-	280	810	885
PO3 Ambitious EU measure	13,209	14,031	14,039	14,369	-	280	882	950
PO4 Very ambitious EU measure	13,209	14,031	13,752	14,020	-	280	1,169	1,298

Source: Based on calculations by Viegand Maagøe (see Annex 4)

The consumer expenditure cost is the sum of purchase costs and energy costs. Figure 17 and Table 21 show that PO2 and 3 follow a similar pattern, but PO3 yields slightly higher savings as there is a second tier of requirements. PO4 shows a much higher consumer expenditure between 2020 and 2024 due to higher purchase prices under a very ambitious tier 2 requirement, but the savings are also larger after 2024.

Figure 17 Consumer expenditure costs (EPS purchase + energy costs) for different policy options.



Source: Based on calculations by Viegand Maagøe (see Annex 4)

Table 21 Consumer net expenditure (EPS purchase + energy costs) and savings compared with BAU for different policy options

Policy options	Consumer expenditure, mln. €/year				Saving vs. BAU, mln. €/year			
	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	17,696	18,783	19,471	19,940	-	-	-	-
PO2 Global alignment	17,696	18,614	18,766	19,153	-	169	705	787
PO3 Ambitious EU measure	17,696	18,614	18,716	19,108	-	169	755	833
PO4 Very ambitious EU measure	17,696	18,614	18,910	19,240	-	169	561	700

Source: Based on calculations by Viegand Maagøe (see Annex 4)

Table 22 gives an overview of the life cycle costs (LCC) assessed for 'typical' EPSs (i.e. the 10 categories chosen as base cases). It can be seen that achieving the higher efficiencies of PO4 Tier 2 would cost consumers more than in the BAU for six out of the ten EPS types, meaning that their LCC is higher than for EPSs compliant with the current Ecodesign Regulation. The second tier of PO3 yields LCCs higher than BAU in three out of ten EPS types. PO2 costs consumers slightly more only for the low voltage EPS (type a in the table below). However, if in this case we consider a typical household with several different EPSs (belonging to various types shown in Table 22), the overall LCC per household would still yield savings.

Table 22 Life cycle cost per unit for different efficiency levels[60]: current Ecodesign (BAU), US DOE (PO2), CoC Tier 2 (PO3) and mid-point between CoC Tier 2 and BAT (PO4), and savings compared with BAU

	LCC, €/unit				LCC savings, €/unit		
EPS base case	BAU	PO2	PO3	PO4	PO2	PO3	PO4
a. 5 W low voltage (e.g. mobile phone and rechargeable grooming products)	6.22	6.39	6.36	7.28	-0.18	-0.14	-1.06
b. 10 W normal voltage (e.g. tablets, smart phones etc.)	10.48	10.11	10.09	10.77	0.37	0.39	-0.29
c. 12 W normal voltage (e.g. small network equipment and set-top boxes etc.)	70.42	66.95	66.76	66.31	3.48	3.66	4.11
d. 18 W normal voltage (e.g. portable devices and portable game consoles etc.)	13.98	13.86	13.86	16.11	0.11	0.11	-2.13
e. 30 W normal voltage (e.g. notebook computer)	79.71	78.26	78.08	81.62	1.45	1.63	-1.92
f. 36 W multiple voltage output (e.g. e.g. multi-device universal chargers etc.)	110.98	102.88	102.90	100.59	8.09	8.08	10.39
g. 65 W normal voltage (e.g. high-end notebooks computers)	89.49	89.37	89.81	89.91	0.12	-0.32	-0.42
h. 120 W normal voltage (e.g. high-end notebook computers)	90.20	90.11	90.57	90.70	0.09	-0.37	-0.50
i. 120 W Multiple voltage output (e.g. stationary game consoles)	145.26	133.86	133.90	134.73	11.40	11.36	10.53
j. 15 W normal voltage (e.g. loudspeakers and sound systems)	36.57	35.41	35.43	36.27	1.16	1.14	0.30
Household average (across all 10 EPS types)	**653.31**	**627.22**	**627.77**	**634.29**	**26.10**	**25.54**	**19.02**

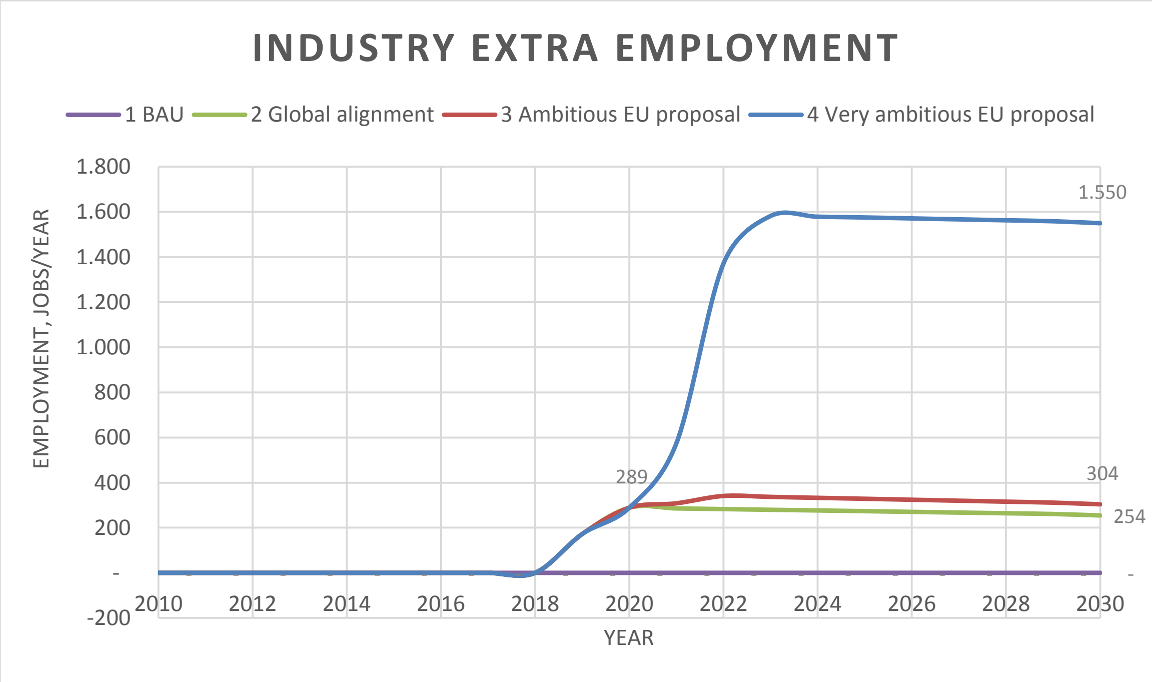
Source: Based on calculations by Viegand Maagøe (see Annex 4)

6.5. Social impacts

This section assesses the impact that a revised regulation would have on employment. Figure 18 presents the extra industry employment (in EPS manufacturers and wholesalers) for the different policy options. Employment in each sector is estimated using the annual turnover of the sector and the turnover per employee ratio. The extra employment is assumed to come from the fact that higher efficiency means more R&D work for the EPS manufacturers as well as the sourcing and buying of components for the primary product manufacturers (also called wholesaler in this context). However, the extra employment cannot be guaranteed in practice, as it is based on the assumption that all extra costs borne by the industry for developing and producing more efficient EPSs will be transferred to consumers (and accepted by them), resulting in higher turnover for the manufacturers and wholesalers. See details calculation of employment and key assumptions made in Annex 4.

[60] ERP EFF are the requirements in the BAU scenario, US DoE represent the implementation of PO2, CoC Tier 2 represent the enforcement of the second tier in PO3, while Half BAT is the enforcement of the second tier in PO4.

Figure 18 Industry extra employment (in EPS manufacturers and wholesales) for different policy options.



Source: Based on calculations by Viegand Maagøe (see Annex 4)

This impact assessment estimates that there are approx. 10141 full-time employees in the EPS manufacturers and 1488 employees in the wholesale of primary products using EPS in 2015. It is estimated that the total extra employment in the industry will be 289 jobs in 2020 for all policy options (since the same first tier will be in force in all). In 2030, PO2 creates a total of 255 extra jobs, PO3 creates 304 extra jobs and PO4 creates 1549 extra jobs. See details in the tables below. Following the same estimate of 14% EU market share as presented in case of the industry revenue, in 2030 PO2 creates 35 extra jobs in the EU, PO3 creates 42 jobs and PO4 creates 216 jobs.

While there is a correlation between revenue and employment for manufacturing industry, there are other influencing factors (e.g. macro-economics, EU trade policy, strategy of EU companies to move workforce to low-cost countries outside the EU, etc.) that have not been taken into account in the impact modelling. Hence, the real job impacts are expected to be lower than indicated in the report.

Table 23 EPS manufacturers employment and extra job creation compared with BAU for policy options

Overview of impact in employment	Manufacturer employment, jobs/year				Extra employment, jobs/year			
Policy options	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	10,141	10,107	10,283	10,445	-	-	-	-
PO2 Global alignment	10,141	10,359	10,521	10,667	-	252	238	222
PO3 Ambitious EU measure	10,141	10,359	10,569	10,710	-	252	286	265
PO4 Very ambitious EU measure	10,141	10,359	11,656	11,796	-	252	1,373	1,351

Source: Based on calculations by Viegand Maagøe (see Annex 4)

Table 24 Wholesaler employment and extra job creation compared with BAU for policy options

Overview of impact in employment	Wholesale employment, jobs/year				Extra employment, jobs/year			
Policy options	2015	2020	2025	2030	2015	2020	2025	2030
PO1 BAU	1,488	1,483	1,509	1,533	-	-	-	-
PO2 Global alignment	1,488	1,520	1,544	1,565	-	37	35	33
PO3 Ambitious EU measure	1,488	1,520	1,551	1,572	-	37	42	39
PO4 Very ambitious EU measure	1,488	1,520	1,710	1,731	-	37	202	198

Source: Based on calculations by Viegand Maagøe (see Annex 4)

6.6. Other impacts

6.6.1. *Small and Medium Size Enterprises (SMEs)*

The SMEs share of the EPS market is estimated to be marginal, i.e. less than 1 %. It was not possible to identify any specific SMEs currently producing EPS in Europe. This is mainly because the EPS market is a high-volume market, where EPS products are mass-produced for a broad range of end-use products making it very difficult for an SME to compete. The major EPS manufacturers have been identified and presented in Annex 9, none of which can be classified as SME according to the EU definition.

Due to the increased manufacturer selling price of EPS as a result of improving efficiency and the need to re-test and re-certify the end products, European SME manufacturers of primary products using EPS will still be impacted by a revision of the regulation. There are a number of such SMEs in the EU, but they are unlikely to see disproportionate costs as EPS are mass-produced and they will benefit from the economies of scale of the large primary product manufacturers sourcing improved efficiency EPSs. The current impact assessment has identified a minimum of 30 SMEs of primary products using EPS in the EU[61].

The key investments for SME manufacturers of primary products using EPSs will be in terms of the administrative and compliance costs. The impact of these costs has been taken into account in the model as increased product price and are presented in next section.

6.6.2. *Administrative burden and compliance costs*

In line with the established practice of legislation for the EU single market for goods, the proposed policy options would make use of the CE marking, affixed based on a declaration of conformity. In practice, when placing products regulated by Ecodesign on the market, companies are therefore required to:

i. assess the product's conformity with the relevant requirements (typically requires physical testing of the energy efficiency of products);
ii. issue an EC declaration of conformity;
iii. affix the CE mark on the products;
iv. keep the documents relating to conformity assessments and declarations of conformity available for inspection by Member States for a period of 10 years after the last product has been manufactured.

[61] SMEs for different primary products matching the base cases used in this impact assessment have been identified online during the research of primary product models (in March 2018). However, this is the consultant's best approximation and there can be more SMEs.
Identified European SMEs/product: portable game console: 1, notebook computer: 1, network equipment and set-top boxes: 2, mobiles: 7, speakers and sound systems: 19.

Such costs are business as usual for products placed on the European market. A change to the current Ecodesign Regulation would mean that the EPS manufacturers, as well as primary product manufacturers (SMEs and large companies), would be subject to testing and certification/documentation costs to prove compliance.

The testing cost is estimated at 5000 € per model[62] for the majority of primary load products, but it can be also as high as 35,000 € for high-end computers and stationary game consoles. For primary products, the total EU SME compliance costs is estimated at 0.65 million €, and for large companies at 4.6 million €. See detail assumptions and calculations on costs and price in Annex 4. In total, the compliance costs for all primary product companies is ca. 5.25 million €, which equates to a range of 0.001 – 0.09 € per unit sale. This cost is typically transferred to the consumer through the product price.

The EPS manufacturers will also bear compliance costs associated with testing, certification and documentation. However, the testing of EPSs is usually simpler than for primary products, with testing cost estimated at 500-1000 € per model[63]. By summing up around 28 EPS manufacturers and approx. 190 models, the total compliance costs (using the more conservative estimate of 1000 € per model) is estimated at 5.29 million €. This equates to 0.01 € per unit sale.

If a two-tier approach (option 3 and 4) is taken in the revised regulation, there is a risk that there will be a double requirement for the re-testing of products with re-sourced EPSs and the re-issuing of product documentation (i.e. compliance documentation, technical product fiche, website information) for the second tier. However, option 3 compliant EPSs are already available according to online datasets[64]: around 20 % of the 2018 market is already at the better performing level of EU CoC Tier 2. Thus, re-testing costs would not be an issue for all products. This means that SMEs and any large companies could mitigate the risk of double compliance costs by sourcing from the outset EPSs that are compliant with the most stringent requirements.

7. HOW DO THE OPTIONS COMPARE?

7.1. Summary of the impacts

The major environmental, consumer, business, and social impacts are summarised in Table 25 below.

Table 25 Comparison of impacts of different policy options in 2030

Changes in 2030 compared to BAU	Energy savings		GHG Reduction	Consumer cost savings			Extra turnover		Extra employment	
	Electricity	Primary	CO2eq	Overall	Pur chase	Ener gy	Manu facture	Whole sale	Manu facture	Whole sale
Policy options	TWh	PJ	Mt CO2eq	mln. €	mln.€	mln. €	mln. €	mln. €	Jobs	Jobs
1 BAU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
2 Global alignment	4.26	38.36	1.45	787	-98	885	56	17	222	33
3 Ambitious EU measure	4.57	41.16	1.55	833	-117	950	67	20	265	39
4 Very ambitious EU measure	6.25	56.24	2.12	700	-598	1298	343	101	1,351	198

Source: Based on calculations by Viegand Maagøe (see Annex 4)

62 DIGITALEUROPE comments, 2015

63 Estimated based on stakeholder estimate of ca. 500 EUR per test, March 2018. It is also based on that a standby testing cost of ca. 1300 EUR provided by a EU test laboratory, 2017.

64 Data retrieved from www.digikey.com, accessed February 2018.

7.2. Assessment of policy options

In accordance with Article 15(5) of the Ecodesign Framework Directive, each policy option should not have a significant negative impact, and therefore should fulfil the criteria in Table 26. This assessment, which is detailed in various parts of Section 6, is summarised below.

Table 26 Evaluation of policy options in terms of their impacts compared to the baseline.

Significant impacts as stipulated in Article 15 of the Ecodesign Directive	BAU	PO2	PO3	PO4
No significant negative impacts on the functionality of the product from the perspective of the user	✓	✓	✓	✓
Health, safety and the environment shall not be adversely affected	✓	✓	✓	✓
No significant negative impact on consumers in particular as regards affordability and life-cycle costs	✓	✓	✓	×
No significant negative impacts on the industry competitiveness	✓	✓	✓	✓
Setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers	✓	✓	✓	✓
Impose no excessive administrative burden on manufacturers	✓	✓	✓	✓

Although PO4 has the best values in most of the categories in Table 25, it cannot be retained because it does not fulfil the criterion 'no significant negative impact on consumers' of Article 15(5) for the following two reasons:

- As shown in Table 22, the consumer expenditure in PO4 is too high in terms of life cycle cost at product level:
    - (i) Six out of the ten EPS 'base cases' are presenting losses over their entire life cycle under PO4 compared to BAU; and
    - (ii) For two of the remaining base cases, even if they show savings over the EPS life cycle, those savings are lower in PO4 than in PO and PO3.
- The overall consumer savings projected for 2030 (in Table 25) are also lower for PO4 compared to PO2 and PO3.

For all options, there would be compliance costs incurred by the manufacturers for redesign and production. These are assumed to be passed on to end users via higher EPS purchase prices (also if the EPS is bundled with the main load product). As explained in Annex 4, point 4, PO4 in particular would require more extensive redesigns of EPSs. Therefore, the additional costs would be higher for PO4 than for the other two options. These costs are reflected in the life cycle costs, leading to either losses (for six EPS types) or lower cost savings in PO4 than in other policy options (for two EPS types).

The lower consumer savings at the level of individual products (i.e. the 'base cases') in PO4, lowers the overall consumer savings projected for 2030 for the entire EPS stock for PO4 compared the other options.

On the other hand, PO2 and PO3 fulfil all criteria of Article 15(5).

An assessment of the options against the objectives set in Section 4 is presented in Table 27 below. The assessment is based on the impacts detailed in Section 6.

Table 27: Score of impacts against objectives. No Change (0), limited improvement (+), significant improvement (++). (Impact Assessment Study 2018)

General Objectives	BAU	PO2	PO3	PO4
1. Facilitate free circulation of efficient EPSs within the internal market of EU	0	+	+	+
2. Promotes competitiveness of the EU industry manufacturing products using EPSs through the creation or expansion of the EU internal market for sustainable products*	0	+	+	+
3. Promotes the energy efficiency of EPS as contribution to the Commission's objective to reduce energy consumption by at least 30% and domestic greenhouse gases (GHG) emissions by 40 % by 2030	0	+	+	+
4. Increase the energy security in the Union and reduce dependency through a decrease in energy consumption of external power supplies	0	+	+	+
Specific Objectives				
1. Update the requirements on energy efficiency in line with the technological development and international initiatives	0	++	+	+
2. Expand the scope to close potential loopholes and provide level playing field	0	+	+	+
3. Enhance transparency regarding EPS energy efficiency, raise their profile and improve consistency with other Ecodesign Regulations	0	+	+	+

*Innovation will enhance competitiveness of the EU manufacturers; the effect on innovation is therefore included in this objective.

All policy options (except BAU) improve the contribution of a revised Regulation to the general objectives. Although PO4 would bring higher energy and emissions savings than PO2 and PO3 against 2030 objectives, its overall contribution is very small[65] and does not constitute a significant improvement.

Similarly, all policy options (except BAU) bring improvements regarding their contributions to the specific objectives. PO2 is considered to bring a significant improvement as it aligns with the US requirements in force and with the latest level (i.e. VI) of the International Efficiency Marking Protocol. This is therefore likely to bring economies of scale and facilitate the update of testing standards (see more details in Section 8.1).

8. PREFERRED OPTION

8.1. Preferred option – Why?

PO2 – Global alignment fulfils the criteria in Article 15(5) of the Ecodesign Regulation and will achieve the objectives set out in Section 4. It is therefore retained as the preferred option because:

(i) It is projected to yield only marginally (0.31 TWh) less electricity savings than PO3 (i.e. savings of 4.26 TWh/year compared to 4.57 TWh/year respectively by 2030);

(ii) However, when the costs savings are broken down per EPS type, it is estimated that PO3 will result in higher average life cycle costs than PO2 (see Table 22); and

(iii) PO2 is likely to be less sensitive to changing assumptions (see summary of sensitivity analyses below), as it will achieve the biggest economies of scale because it aligns with the US requirements already in force. This aspect was also acknowledged in the scoring given for the first specific objective (see Table 27).

65 0,1% more in PO4 than in PO2 with regard to energy savings, and 0.06% with regard to GHG emissions

PO2 and PO3 projections show very similar performance in terms of energy savings and GHG abatement. This happens because, while the second Tier in PO3 would bring additional energy savings, these are limited compared with the gains already secured by the first Tier (i.e. the equivalent of implementing PO2). However, this increased efficiency will come at additional (compliance) cost, which is sensitive to assumptions. For example, PO3 was assumed to have relatively modest additional compliance costs compared to PO2, but this might not be the case. Therefore, the impact assessment includes a sensitivity analysis that examined the impacts of variations in the compliance costs, which are assumed to directly reflect into the EPS sales prices.

The sensitivity analysis in Annex 8 shows the impact of a potentially higher cost of the Tier 2 requirement in PO3. Currently, the cost is assumed to remain proportional to the percentage of efficiency increase. The cost increase from PO2 to PO3 thus remains very modest, as the increase in efficiency is small. In the sensitivity analysis the cost is increased to the same level of costs for complying with Tier 1. As the additional Tier 2 would mean a departure from e.g. US DOE standards that mark a level where producers are already achieving economies of scale, it would require redesign and modified production capacities for EPSs, which might be more costly than a simple incremental increase. In other words the marginal improvement costs per product could be significantly higher than the ones assumed by the model used. In such a scenario, PO3 would result in a lower consumer expenditure saving in 2030, with a value below that realised by PO2. This shows that PO2 is more robust and performs better than PO3 when some cost assumptions change. It has to be noted that the model used in the IA does not directly account for the economies of scale brought by implementing PO2. Additional details about compliance costs are presented in Annex 4, point 4.

Another sensitivity analysis in Annex 8 investigated the impacts of underestimating the BAU efficiency of some EPSs with output power in the range of 10 – 20 W, and whether higher efficiency in the BAU scenario would undermine the savings potential. The impacts in 2030 show that PO2 is impacted the least with still 4.25 TWh/year savings (a reduction of 0,01 TWh), while PO3 has slightly more reduced savings (i.e. by 0.05 TWh to 4.52 TWh/year). This also shows that PO2 remains more robust than PO3 when assumptions on the energy efficiency of the overall stock change, although the energy savings brought by PO2 still remain slightly lower than in PO3.

Finally, in terms of comparing PO2 and PO3, the latter might require higher testing costs due to a need for recertification of a number of products, as explained in Section 6.6.2 and further detailed in Annex 4, point 5. This aspect is difficult to quantify in the projections of costs and benefits, and is therefore not accounted for in the model used.

In conclusion, PO4 is too costly for end users, while PO2 and PO3 perform fairly similarly in terms of energy savings, reducing GHG emissions, and economic impacts.

Based on the analyses presented above, the preferred option is PO2 - Global alignment.

Table 28 Preferred policy option

Policy option	Measures
PO2 – Global alignment	- Extension of the scope to include multiple voltage output EPS; - Information requirement regarding the efficiency at 10% EPS load; - Provision of information on EPS performance on publicly accessible websites and in user manuals; - Reinforced ecodesign requirements on minimum efficiency and no-load, implemented through a single tier in alignment with current US DOE requirements.

By 2030, PO2 Global alignment will result in:

- Energy savings of 4.26 TWh/year and GHG emission reductions of 1.45 $MtCO_2$-eq./year, i.e. 0.3% of the EU 2030 target for final energy consumption savings and 0.14% of the EU 2030 target for GHG-emissions savings;
- Savings on annual end-user expenditure of € 787 million and extra business revenue of € 73 million per year, which translates into an indicative number of approximately 250 jobs for the manufacturers and wholesalers (out of which 35 jobs estimated in the EU);
- An update of Ecodesign requirements to keep up with technological progress, while achieving cost savings for the end-user;
- Closer alignment with requirements in other economies (in particular the US) and with the most stringent requirements of the International Efficiency Marking Protocol (which is one of the most visible international references for regulators). Such an alignment is expected to reap the full benefits of economies of scale, while also being ambitious;
- Maintaining limited impacts on SMEs manufacturing primary products that use EPS.

8.2. REFIT (simplification and improved efficiency)

The changes in the regulation are minor in terms of simplification and improving the efficiency of the regulation. The main impact on the Member States' administrative burden is positive and relates to the requirement for product information to be made available on freely accessible websites. This can provide the Member States' market surveillance authorities with easily accessible information on the manufacturers' marketed EPSs, which will facilitate the screening and selection of EPSs for possible reinforcement checks. The cost savings are however difficult to assess because they are very much linked to the specific activities at the level of each individual MS, with no central point of information regarding these costs being available for reference.

Table 29 REFIT Cost savings for the preferred option

REFIT Cost Savings – Preferred Option(s)		
Description	***Amount***	***Comments***
Requirement on publishing information on freely accessible websites	n.a.	Recurrent cost savings for Member State market surveillance authorities.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The main monitoring element will be the tests carried out to verify compliance with the Ecodesign requirements. This monitoring should be done by MS market surveillance authorities to ensure that requirements are met.

The main indicator for evaluating the impact of potential Ecodesign regulations is the achievement of a market improvement towards EPSs with a smaller environmental impact. An *analysis of the products on the market (sales figures, performance, etc.) will determine if the shift towards more resource efficient EPSs has happened as estimated, in particular based on the following sub-indicators, which reflect the general and specific objectives:*

- Compliance with energy efficiency requirements, i.e. maximum no-load power consumption and minimum average active efficiency for the different product categories;
- Compliance with the revised Regulation of those products that were initially excluded due to loopholes;
- *Reduction of the electricity consumption and related GHG emissions of EPSs;*
- *Increasing the economic savings for European consumers;*
- Safeguarding the competitiveness of the European industry for EPS and primary products using EPS and the full value chain;
- *Improving the regulatory effectiveness and efficiency of the regulation.*

The evaluation should therefore assess these sub-indicators.

An important element that will be also monitored and subsequently assessed will be how EPSs could contribute better to circular economy objectives. The natural/technical convergence on the market towards a common solution that could support interchangeability (like the use of USB Type-C connectors) will be monitored in particular, together with any standardisation initiatives or industry commitments for supporting standardised EPSs that could be used for a wide range of products. This monitoring information does not refer to the performance of the Regulation, but to market-relevant information that could support a future analysis on circular economy aspects.

The Ecodesign regulations include legal review obligations for the Commission. These review obligations are usually the trigger for evaluating the measures in place, and for developing new policy options that ensure a continued alignment of the ecodesign requirements with the pace of technological progress and the latest international policy developments.

It is proposed to evaluate the revised EPS Regulation by 2024, considering that the new requirements would come into force in January 2020. The results of this evaluation should be presented to stakeholders and Member States in the Ecodesign and Energy Labelling Consultation Forum.