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PART 2/2

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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ANNEX 1: PROCEDURAL INFORMATION

1. LEAD DIRECTORATES GENERAL (DG), DECIDE PLANNING/CWP REFERENCES

DG ENER is the lead DG for the Ecodesign regulation on EPS.

The Decide number of the underlying initiative for the review of ecodesign requirements for external power supplies is 2015/ENER/054. A roadmap was published in June 2015 at http://ec.europa.eu/smart-regulation/roadmaps/docs/2011_ener_044_ecodesign_energy_labelling_implementing_measures_en.pdf.

The following DGs (Directorates General) have been invited to contribute to this impact assessment: SG (Secretariat-General), GROW (Internal Market, Industry, Entrepreneurship and SMEs), ENV (Environment), CNECT (Communications Networks, Content and Technology), JUST (Justice and Consumers), ECFIN (Economic and Financial Affairs), REGIO (Regional policy), RTD (Research and Innovation), CLIMA (Climate Action), COMP (Competition), TAXUD (Taxation and Customs Union) EMPL (Employment), MOVE (Mobility and Transport), TRADE (Trade) and the JRC (Joint Research Centre) were consulted on the draft IA report in April 2018.

2. ORGANISATION AND TIMING

According to Article 7 of Commission Regulation (EC) No 278/2009, the review of the regulation should take place no later than four years after entry into force (i.e. 26 April 2009).

The last Ecodesign Working Plan 2016-2019[1], adopted in November 2016, confirms that external power supplies continue to be a priority product group.

The timing of the review process of Regulation 278/2009 is as follows:

- Entry into force of Regulation 278/2009: 26 April 2009.
- Review study draft final report: 13 March 2013.
- Ecodesign Consultation Forum on the Review of Regulation 278/2009: 18 April 2013.
- Review study final report: September 2013.
- Additional assessment report (it was needed to analyse additional topics which were not covered by the review study, such as: the need for re-design and costs associated, Least Life Cycle Costs based on base cases, update with last versions of the EU CoC and the DOE rules, assess further stakeholder comments, assess material efficiency requirement, and carry out further data collection): September 2013 - January 2014.
- Further consultations with the industry (mainly on the additional topics assessed): February – December 2014.
- Written Consultation: Starting on 16 April 2015, including a presentation of the updated Working Document to stakeholders at the Horizontal Consultation Forum held on 29 April 2015, up to the extended deadline for written comments on 31 May 2015.
- Initial Impact Assessment: December 2014 – September 2015.

[1] https://ec.europa.eu/energy/sites/ener/files/documents/com_2016_773.en_.pdf

- In 2016, two College orientation debates took place aimed at discussing and deciding on the future implementation of Ecodesign. The College decided to adopt ecodesign and energy labelling measures in packages. The first package was subsequently planned for end-2018 (in order to comply with the requirements of the new framework Regulation on energy labelling (EU) 2017/1369 regarding re-scaling some of the existing labels). Thus, the preparatory work on revising the EPS regulation was adapted to fit the new planning.
- Updated Impact Assessment (which was needed for updating the datasets used for the impact modelling, and to update the overall format and intervention logic in line with the Commission's Better Regulation approach): February 2018 - May 2018.

Article 19 of the Directive 2009/125/EC foresees a regulatory procedure with scrutiny for the adoption of implementing measures. Subject to qualified majority support in the regulatory committee and after scrutiny of the European Parliament and of the Council, the adoption of the measure by the Commission is planned for the end of 2018.

3. CONSULTATION OF THE RSB

The Regulatory Scrutiny Board (RSB) delivered a negative opinion on a draft of the Impact Assessment on 18 June 2018 after the meeting on 13 June. The draft report was subsequently improved, based on the Board's Opinion on the EPS impact assessment[2] and the "Horizontal issues for discussion" sent to DG ENER on 8 June 2018, and resubmitted to the Board. A positive overall 2nd opinion[3] was issued on 3 July 2018, containing further recommendations for improving the report The table below shows how those two sets of recommendations are addressed in this revised Impact Assessment report.

RSB Opinion 18.06.2018 - Negative	**Where and how the comments have been taken into account**
(B) Main considerations	
(1) The choice of the preferred option is not sufficiently justified.	Further explanations regarding the preferred option were added in Sections 7 and 8. The analysis was revised and the text was streamlined. Section 7 is now divided into two sub-sections for improved readability. Explanations on the model used (methodology, key assumptions and limitations) were introduced in the new sub-section 6.1, and one assumption was revisited. Updated figures were included in the new Sections 6.3, 6.4 and 6.5 (former Sections 6.2, 6.3 and 6.4 respectively). Some information in Sections 7 and 8 was updated accordingly. Annex 4, as the source of this information, was updated, including all explanations on the changes and reasoning. The sensitivity analysis in Annex 8 was reviewed and consistency improved.

[2] Ref. Ares(2018)3220517 - 18/06/2018
[3] Ref. Ares(2018)3523237 - 03/07/2018

(2) The report does not integrate circular economy aspects comprehensively and in a way which is consistent across ecodesign products. It does not impact assess them either.	Further specific explanations were added in Section 5.3.4, and general comments in the first part of Section 5 and Section 6.1.
(C) Further consideration and recommendations for improvement	
(1) The analysis and arguments presented in favour of the preferred option (option 2: global alignment) are not convincing. The modelling work does not seem to support the choice made. The preferred option implies less savings in energy and costs than do more ambitious alternative options. To support the choice of the preferred option, the report argues that alternative options would result in excessive price increases for consumers. The price issue is however uncertain given that EPS typically are sold bundled with other products. Also, the evidence presented does not support the argument that price increases would be excessive for other options. For instance, the difference between price increases across options 2 (global alignment) and 3 (ambitious EU measure) are minor. In terms of life cycle costs, the alternative options are cheaper. Furthermore, the most ambitious option 4 (very ambitious EU measures) has a better fit with the objectives than option 2. The report also puts forward the argument that the preferred option is more robust vis-à-vis changes in assumptions than other options. But the sensitivity analysis presented in annex does not confirm it. Hence, the modelling work does not support the preferred option. The report should present a revised and more convincing analysis.	The reply to (B)(1) addresses the analysis for the preferred option, including explanations on life cycle costs per product and aggregated consumer expenditure and savings per product overall stock in use. One assumption in the model was revisited, as also explained in (B)(1). New text on the use of EPS price in calculating least life cycle costs and consumer expenditure (in order to support the selection of the optimal policy option) was introduced in the current Section 6.4 (former 6.3). The sensitivity analysis in Annex 8 was reviewed and consistency improved.
(2) The report does not deal with circular economy considerations, such as recycling and reuse of EPS. It is not consistent with the treatment of other ecodesign products. It introduces the issue in the problem section, but does not address the magnitude of the problem. The intervention logic does not cover material efficiency, but it pops up in the monitoring and evaluation framework. The report	The reply to (B)(2) provides details on the approach to circular economy. Further explanations (e.g. on recycling) were added in Section 5.3.4. An explanation regarding data availability and problem magnitude was added in Section 2.1.4, and details on the intervention logic were added to complement Figure 13 (at the beginning of Section 5).

should follow a more systematic and consistent approach for the treatment of circular economy issues for EPS.	Additional explanation on monitoring was added in Section 9.
(3) The quantitative scenarios and impacts are based on scenarios generated from a simple model. The results should, however, take proper account of the limitations and caveats of the modelling. For instance, the model seems to assume that price increases induced by more ambitious energy efficiency requirements have no impact on demand. For that reason, turnover is increasing proportionally to prices and since employment is a simple function of turnover, it increases proportionally to the energy efficiency requirement. The model is therefore likely to overestimate impacts on employment. The report should properly address the limitations of the modelling and interpret results with proper caveats.	Explanations on the model used (methodology, key assumptions and limitations) were introduced in the new sub-section 6.1. Qualifiers were added in the current Section 6.5 (former 6.4) for recognising the constraints of the model.
(4) The report should better explain how evaluation support the problems identified, the approach to international standards, the market failures which are the basis for intervention and how options are defined and selected.	Additional text included in Section 2.1.1 and 2.1.2 regarding the input of evaluation in defining the problems (where Problem 1 includes findings regarding the evolution of international initiatives, and Problem 2 addresses a potential market failure). The introduction of Section 5 recognises the input of evaluation in identifying suitable policy options. A general explanation regarding the approach to evaluation is also added in the beginning of Annex 7.
(5) This report should be streamlined as far as possible with the impact assessments accompanying the other proposals in this package of proposals for implementing legislation regarding ecodesign and energy labelling. Horizontal issues: a. Explanations regarding how the evaluation worked, and information on expected energy efficiency gains and those actually achieved; b. Better explain the need to act; c. Explain what elements have already been agreed upon (and on what basis), and what is left open for political decision;	The horizontal issues raised by RSB and identified as relevant for the ecodesign of EPSs were addressed as follows: a. See reply to (C)(4); b. The new Section 1.5 was introduced; c. Explanation added in the first part of Section 5; d. See reply to (B)(2); e. See reply to (|C)(3); f. Details were introduced in Section 8.1.

d. Treatment of circular economy aspects; e. Explanations about employment impacts; f. Information about contributions from particular product groups to be presented systematically.	
RSB Overall (second) Opinion 03.07.2018 - Positive	**Where and how the comments have been taken into account**
(B) Main considerations	
Further improve the report with a more robust justification for the choice of preferred option	Additional details included in sections 7.2 and 8.1 for better justifying the policy option proposed (see the replies in boxes (C)(2) and (C)(3) below).
(**C) Further consideration and recommendations for improvement**	
(1) While the comparison of options analysis is essentially unchanged from the previous version, various aspects are better explained. Some remaining questions still need to be addressed more convincingly. The Board recommends to either strengthen the justification of the choice of the preferred option or to make the conclusions more open-ended with more reflection on the evidence for and against.	Additional details included in sections 7.2 and 8.1 for better justifying the policy option proposed (see the replies in boxes (C)(2) and (C)(3) below).
(2) The most ambitious option is clearly the option that contributes best to meeting the objectives. However, it is rejected for being contrary to article 15 in the directive as it may negatively affect consumers of certain product categories. The report shows in particular that in six out of ten product categories, there may be negative impacts on consumers. The report should explain the reasons behind the steep increase in purchase prices for consumers under this option.	Additional details included in Section 7.2 with regard to life cycle costs per EPS type and aggregated consumer costs projected for the whole EPS stock on the market.
(3) The options of aligning with US standards or exceeding them slightly seem to perform similarly, though more ambition is preferable in terms of consumer, environmental and business impacts. It is not clear how the report can conclude that the alignment option is better for consumers as the analysis clearly shows that the slightly more	Additional explanations included in Section 8.1 with regard to higher marginal costs in PO3, robustness of PO2, and assumptions and limitations of the model used.

ambitious option results in higher total consumer savings. The relative advantage of aligning with US standards should be elaborated. The report should explain how the model accounts for the extra costs and the need for sensitivity analysis if these costs are normally included in the purchase price.	
(4) The attached quantification tables of the various costs and benefits associated with the preferred option of this initiative need proper caveats reflecting the assumptions and limitations of the simple model used and the level of uncertainty around the resulting estimates.	Caveats introduced in Annex III, point 2.

4. EVIDENCE, SOURCES AND QUALITY

The impact assessment draws on an extensive amount of desk research, external studies, targeted consultations, interviews with relevant stakeholders and input from Member State representatives.

This updated impact assessment is based on the findings of the Review Study carried out by an external consultancy company (Viegand Maagøe A/S), the Ecodesign Consultation Forum, the additional assessment carried out in 2013 by Viegand Maagøe A/S, and further consultations and impact assessment in 2015 with the support of Viegand Maagøe A/S).

On the basis of this review work, the Commission drafted the policy options presented in this IA.

The calculations are based on an impact assessment model used in other impact assessments of product regulations [4] under the Ecodesign framework Directive and the Energy Labelling Framework Regulation.

As part of the Review Study an extensive stakeholder consultation was performed to collect data on efficiency, prices, costs etc. and to verify assumptions and data quality.

During the impact assessment, further data were collected from stakeholders and from a market research organisation to provide input on the modelling of the impact on energy, environment, economy and employment.

The stakeholders included:

- Manufacturers of EPSs;
- Manufacturers of electronic components, chips etc., which are used in the EPSs;
- Manufacturers of primary load products (such as electric and electronic devices in homes and offices) using EPSs;
- Industry associations of the above-mentioned manufacturers;

[4] Based on the same principles of the model developed by VHK for over 20 impact assessment. It is the same model used for e.g. impact assessments of servers and data storage products, and the revised Tyre Labelling.

- Environmental and consumer organisations.

External expertise was used where necessary, for example from the ad-hoc working group (composed by independent experts, Member States representatives and representatives of industry) behind the EU Code of Conduct for EPSs.

The following Annex 2 provides more details on the stakeholder consultations held.

ANNEX 2: STAKEHOLDER CONSULTATION

A thorough consultation of stakeholders took place throughout both the preparatory phase (when completing the review study and additional assessments) and the impact assessment phase (when further data was collected and latest technological developments were discussed with the industry). This was done both in formal meetings, as well as bilateral contacts. Details on processes employed, stakeholders consulted and their positions are provided hereafter.

This measure did not require an Open Public Consultation, due to its preparation timeline and the extensive inputs received throughout the process.

1. CONSULTATION AND EXPERTISE

Formal stakeholder meetings took place in 2013 and 2015 (during the preparatory phase) under the specific Ecodesign framework for gathering the positions of MS representatives and interested parties concerned with the product, such as industry, industry associations, environmental protection groups and consumer organisations. External expertise on external power supplies was collected and analysed during this process. The results of the stakeholder consultation before, during and after the two consultation forums (Consultation Forum meeting of 18 April 2013 on EPS and of 29 April 2015 on horizontal aspects, which included EPS) are described in the following section. The minutes of these forum meetings are included in this annex.

2. REVIEW STUDY AND STAKEHOLDER CONSULTATIONS

The review study for Commission Regulation (EC) No 278/2009 started in Q1 2013 and was completed in September 2013. The study was followed by an additional assessment, in September 2013 - January 2014, that were needed to cover additional topics not covered by the first review study (such as: the need for re-design and costs associated, Least Life Cycle Costs based on base cases, updates with last versions of the EU CoC and the DOE rules, assess further stakeholder comments, assess material efficiency requirements, and further data collection). The review study and subsequent additional assessment study covered EPSs in the current scope of the Regulation, and also considered various EPSs not currently in the scope, such as high power (>250W) EPS, multiple voltage output EPS (i.e. those that supply current at different power levels on different outlets at the same time) and wireless chargers. It considered the saving potential of three tiers of requirements and a 10% loading active efficiency requirement.

The review study included a technical and environmental analysis to assess the pertinence of introducing regulatory measures for these products and to assess policy options, as per the review clause of the regulation, and within the framework of the Ecodesign Directive 2009/125/EC. The Ecodesign Consultation Forum that took place on 18 April 2013 (see below) discussed the technical option proposed. The subsequent additional assessment, which was requested by the stakeholders, focused on the economic impacts these options would have.

The review study and subsequent additional assessment were developed in an open process, taking into account input from relevant stakeholders including manufacturers and their associations, environmental NGOs, consumer organisations and Member State representatives. As part of these assessments, various web-meetings and an informal stakeholder consultation meeting were held between 2013 and 2015 for interested stakeholders to discuss and validate the review study results. An informal stakeholder meeting was held at DIGITALEUROPE premises in Brussels on 30 September 2013.

3. WORKING DOCUMENT AND CONSULTATION FORA

Building on the preliminary results of the review study, the Commission services presented a Working Document (i.e. a draft revised Regulation) to the Ecodesign Consultation Forum on EPS on 18 April 2013. Representation was balanced between Member State representatives and all relevant interested and affected parties (manufacturer associations, NGOs, etc.) concerned with the product group, in line with Article 18 of the Ecodesign Directive.

Further to the conclusions of the Ecodesign Consultation Forum and the additional assessment, the Commission services presented an updated Working Document at the horizontal Consultation Forum of 29 April 2015 and asked for further written comments.

In both cases, the Working Documents were circulated before the meeting to the members of the Consultation Forum. The working document was included in the Commission's CIRCABC online system (accessible to the registered stakeholders), together with the stakeholder comments received in writing before and after the meetings, and the meeting minutes.

4. RESULTS OF STAKEHOLDER CONSULTATIONS

The Consultation Forum on External Power Supplies on 18 April 2013 concluded that:

- The current review should focus on those options that would realise the most savings;
- The EU Code of Conduct (CoC) v5 Tier 2 was considered a good reference for tightening of requirements for the energy efficiency of EPS. However, more information on costs and impacts is to be sought;
- A third tier of requirements would not be appropriate;
- A requirement for active energy efficiency at 10% load did not get a broad agreement, due to insufficient information and lack of standards. Instead, an information requirement should be included at this stage, with a view of revisiting the issue at the next revision of the Regulation;
- Multiple output voltage EPS should be included and the definition of EPSs established in Article 2.1 of the Regulation should be modified accordingly;
- Due to minimal savings potential the high power EPSs should not be included in the current revision. The matter could be re-assessed under the next revision of the Regulation.
- Issues linked to the exemption of low voltage EPS and related primary load products from the provisions of Commission Regulation (EC) No 1275/2008 on standby and off mode, and networked standby electric power consumption should be addressed in the context of the review of that regulation, rather than the review of EPS Regulation.
- Provisions on material efficiency and wireless chargers are difficult to include at this stage (due to lack of information, lack of a broader support on issues and evolving technological trends on the market). However, a strong message on the intention to address these issues should be included in the revision clause, to be addressed by the next revision of the Regulation.

After taking on board the above-mentioned conclusions of the Consultation Forum, the Commission presented an updated working document at the Ecodesign Consultation Forum on Horizontal Matters held on 29 April 2015. No specific conclusions were sought during that meeting, but stakeholders were invited to provide further written comments.

The minutes of both Consultation Forums are included at the end of this annex.

The main positions expressed in writing by stakeholders regarding the revised Working Document can be summarised as follows (details are provided subsequently):

- Industry represented by DIGITALEUROPE made a strong case for having only one tier, aligning with the requirements of the US DOE rulemaking that were to came into force subsequently (i.e. February 2016). They questioned the timing of the tiers, in particular the benefit of a closely-timed second tier, preferring future requirements to be postponed to the next revision of the regulation and coordinated with US DOE. They raised concerns around the timing and coverage of the information requirement on efficiency at 10% loading levels, as well as the language relating to spare parts. Further input was also received on the treatment of indirect operation EPS (which are defined in the US requirements), the impact of EU-US voltage differences on efficiency measurements, and various testing considerations.
- Environmental NGOs and consumer associations supported a second tier with more stringent requirements and inclusion of multiple voltage output EPS within scope. They also asked for a requirement on active efficiency at 10% load to be included and for greater consideration on material efficiency aspects.
- There was general support amongst MSs to harmonise EPS requirements with US DOE requirements in the first tier and the inclusion of a second tier aligned with CoC Tier 2. Some MSs (Belgium and Sweden) proposal including an additional third tier. One MS (Germany) stressed the need to balance the burden for the industry against the potential savings of a second tier. MSs supported the inclusion of multiple voltage output EPS and information requirements on efficiency at 10% loading levels.

5. IMPACT ASSESSMENT PROCESS

An Impact Assessment is required when the expected economic, environmental or social impacts of EU action are likely to be significant. The initial IA for the review of the Regulation was carried out between December 2014 and November 2015 followed by an update between February and May 2018. The update represents an important overhaul that was needed for: (i) adding significant updates with regard to the datasets used and the technical analysis employed, and (ii) bringing the previous draft report in line with the most recent requirements regarding IA methodology. The present report is the result of these sustained updating efforts.

The data collected in the review study served as the starting point for the IA. It was supplemented with additional data and information that was collected and discussed by the consultancy team supporting the IA process with industry and other stakeholders, including detailed discussions with DIGITALEUROPE, which represents an important number of key primary load product manufacturers, as well as Siemens (power supply manufacturer) and Texas Instruments (power supply and component manufacturer).

Direct input requests were sent to the European Power Supply Manufacturer Association (EPSMA[5]) and a range of international EPS manufacturers and companies involved in the production of semiconductors and integrated circuits for EPS including ST Microelectronics and Power Integrations. Consultation responses were obtained directly from Wahl (manufacturer of professional and home grooming products), Nokia (manufacturer of mobile phones, network products, etc.), Technicolor (manufacturer of media players, set-top boxes, etc.), Nintendo (manufacturer of game consoles) and EPS manufacturers Salcomp and FRIWO.

During this process, web-based and physical meetings were held with stakeholders and electronic questionnaires were circulated. The additional data and information collection focused on:

[5] http://www.epsma.org

- Market data, efficiency and efficiency distribution data, and price data;
- Additional information on multiple voltage output EPS;
- Information on certification and testing costs;
- Technological developments and efficiency potentials;
- Possible SME (Small and Medium Size Enterprises) impacts.

All the information collected was duly analysed and factored into the IA process.

6. KEY ISSUES HIGHLIGHTED BY STAKEHOLDERS

6.1. Issues provided by stakeholders

Scope coverage: Direct and indirect operation EPS: Industry (via DIGITALEUROPE) requested full harmonisation with the US DOE requirements, which include a distinction between direct and indirect EPS and exclusion from scope of the indirect EPSs. Indirect EPSs cannot operate an end product without assistance from a built-in rechargeable battery, whereas the direct operation EPS can operate the end product (with rechargeable battery) both with and without the battery. The argument from the industry was that the EPS average efficiency is less important for this product type, as it is mainly used to charge the battery.

Conclusion: US DOE EPS requirements exclude indirect operation EPS because these EPSs are covered by the requirements on battery chargers and the exclusion is necessary to avoid double regulation. Exclusion of indirect EPSs in EU regulation could result in many EPSs for devices that include a rechargeable battery, such as mobile phones and laptops, being excluded from scope and thus creating a loophole. As there is no EU regulation on battery charges and therefore full alignment in the Regulation of the EPS definitions with the US DOE approach would result in a considerable reduction of scope and savings potential, would impact market surveillance and would require changes to the test method. This was fully explained in the memo provided with the second draft of the working document sent out on 16th April 2015.

Scope coverage: Power over Ethernet (PoE) injectors: The industry requests to clarify if PoE injectors (also called "PoE adaptors") are in scope of the regulation. Power over Ethernet is a technology for wired Ethernet local area networks that allows the electrical current necessary for the operation of device connected to the network to be delivered by the same Ethernet cables that transport the data rather than by separate power cords (minimising the number of wires and AC mains sockets required to install the network).

Conclusion: The current regulation does not specify which type of cable should connect the EPS to the primary load device. Therefore, an EPS that connects to a primary load product via an Ethernet cable should still be considered in the scope. The US DOE provides a similar interpretation of PoE injectors[6].

However, PoE injectors with built-in circuitry for data switching, which is additional to the power injection to an Ethernet network, are considered not to be in the scope. This is because they could supply power to several devices and because the injector would also be a primary load built in the EPS. In cases where a separate EPS is delivering power to a detachable PoE injector, that EPS would be in the scope (because in such cases the PoE injector is considered a primary load device like any other device connected to an EPS).

Testing considerations: Impact of voltage difference of 115 V in the US vs. 230 V in the

[6] https://www.regulations.gov/document?D=EERE-2014-BT-TP-0043-0001

EU: Industry expressed concerns that the efficiency values in some databases may be based on measurements made at an AC input voltage of 115 V, 60 Hz (United States) rather than at 230 V, 50 Hz (European), resulting in the efficiency values varying when tested at the different voltage levels. According to DIGITALEUROPE, some EPSs may be more efficient at 115 V, and others may be more efficient at 230 V[7].

Conclusion: The impact assessment has concluded that it is not possible to account for this variability. Furthermore, the dataset collected and used for this impact assessment (www.digikey.com) did allow for certain level of separation of data for Europe, because the dataset included "Region Utilized" to filter for products used in Europe. As such, the data modelled for this impact assessment analysed compliance with the EU CoC T2, implying that it was tested at European voltages.

Taking all these considerations into account it was concluded that a direct harmonisation with the US DOE requirement levels was sufficient. The different voltage levels used for testing are described in the relevant measurement standards, but should not affect the requirement levels (values) proposed in the draft Regulation.

Testing considerations: Adaptive EPS: Adaptive EPSs are capable of providing different output voltages (via the same output) – usually between two to four output voltage levels are available via the USB Power Delivery standard. Industry suggested that meeting the regulatory requirements at the same performance level across the different output levels could be challenging as the EPS would not be optimised for all levels of operation, but rather for the highest voltage output.

Conclusion: Rather than setting different requirement levels for adaptive EPSs (which would be inconsistent with the US DOE approach), such issues can be handled via revisions to the testing methodologies to describe how adaptive EPS can be tested for compliance with the requirements.

The US DOE test procedure requires that the average active-mode efficiency for adaptive EPS is measured by testing the unit twice – once at the highest achievable output voltage level and once at the lowest. The DOE subsequently granted a test procedure waiver for six specific adaptive EPS from four manufacturers (in 82FR34294[8]), to allow the testing at the lowest voltage level to be carried in a modified way (i.e. at a lower power than the nameplate power) because that would reflect better the real-life usage of those EPSs.

The conclusion is that, while there is no need to change the current regulation, the European test standard EN 50563:2011 should be updated to cover adaptive EPSs in a similar way with the DOE test method. A transitional method should be included in the revised Regulation.

Testing considerations: Differences in test methodologies USA-EU: The Commission Regulation (EC) No. 278/2009 recommends using EN50563:2011+A1:2013 (referenced in the OJEU as a harmonised standard). The US test standard is "2011-06-01 Energy Conservation Program for Certain Consumer Appliances: Test Procedures for Battery Chargers and External Power Supplies; Final rule."

Conclusion: In terms of alignment, there are no substantive differences in approach between the EU and US. Both test standards are based on the original EPRI test method previously referenced under ENERGY STAR, and both use the loading points of 25, 50, 75 and 100%.

The EU test standard should be updated regarding:

[7] DIGITALEUROPE input March 2018
[8] https://tinyurl.com/y8ekp5wf

- Testing of adaptive EPSs (see previous section);
- Testing of multiple output voltage EPSs;
- Testing at 10% load for information purposes.

Testing considerations: Output cable consistency: It was highlighted that the DC resistance of the output cable used during the measurement can have a major input on results. The EU test method EN50563:2011 specifies that the output measurements shall be made using the longest output cable provided by the organisation taking responsibility for the product, if one or more cables are provided. If no cable is provided, the measurements shall be made at the output terminals of the EPS.

Industry expressed concern about second tier requirements based on the EU CoC, where in order to reach compliance it may require to replace the output cable delivered with the EPS with one of less DC resistance. The gain would allow reaching compliance with the more stringent requirements, but the downside would be increasing the amount of copper used in the cables. This would both increase the production cost and increase the environmental impact.

Conclusion: No EU intervention is needed on this matter. The manufacturers can freely decide on what design changes are necessary to comply with the regulation. However, the potential losses of material efficiency were duly noted (and in fact constitute one more argument to not propose PO3 and opt for PO2 instead).

6.2. Conclusion on the key issues

The conclusion is that only the test standard EN 50563:2011 needs to be updated regarding:

- Testing of adaptive EPSs (see previous section);
- Testing of multiple output voltage EPSs;
- Testing at 10% load.

Regarding the other issues stakeholders have highlighted, guidance can be provided through an update of the guide for revised Regulation. However, no immediate changes to the Regulation need to be operated based on the above-mentioned issues.

7. MEETING MINUTES

Meeting minutes of the Consultation forums of 18 April 2013[9] and 29 May 2015[10] are included below.

[9] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=12543&no=2
(The title of the published minutes contains a typo - the date is stated 18/3/2012 instead of 18/3/2013)
[10] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=19524&no=2

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY

Directorate C - Renewables, Research and Innovation, Energy Efficiency
C.3 - Energy efficiency

MINUTES

Meeting of the Consultation Forum under Article 18 of Directive 2009/125/EC on energy-related products

External Power Supplies

Brussels, 18 April 2013 (10.00 - 15.30)

Participants: See “Attendance List" attached.

At the beginning of the meeting, the chairman gave an up-date on the Ecodesign/Labelling measures to be adopted in 2013 as well as on the Review of the Energy Labelling Directive and the on-going study on consumer understanding.

Turning towards the review of Regulation 278/2009 on External Power Supplies (EPS), the relevant aspects were presented and discussed in six blocks:

1) Context, saving potential and proposed procedure

2) Upgrade of existing requirements

3) New requirement for active efficiency at 10%-load

4) Extension of scope

5) Up-date/clarifications of definitions

6) Material efficiency

1) Context, saving potential and proposed procedure

The Commission services outlined the general context, in particular emphasising the conclusions drawn from the horizontal Consultation Forum of April 2012 to prioritise work and to opt for "fast-track"-reviews in cases for which only modest additional saving potential could be expected. The Commission services explained that the internal procedures would need to be fine-tuned according to the extent of the revision.

The review study which could rely on extensive data from different sources had concluded on a potential additional saving of just under 3 TWh by 2025 for the on-going review of EPS, spread across different improvement options. The study had also related the potential additional savings to the feasibility of the different improvement options (see table in Annex).

On that basis, the Commission services proposed to focus on the most important improvement options to reap most of the saving potential and to refrain from options that would involve

major data collection efforts while not delivering substantial savings.

Feedback received: Stakeholders were generally in favour of a clear prioritisation and a comparably lean process given the moderate savings potential.

In the following, the Commission services presented the main issues to be discussed under the review and their proposals for the revision of certain elements.

2) Upgrade of existing requirements

For a possible up-grade of requirements established in Regulation 278/2009, there are two main references:

- the voluntary EU Code of Conduct (EU CoC), developed by JRC (Joint Research Centre) together with industry, Member States and other stakeholders, for which "Version 5" of September 2012 had been sent to the stakeholders[11];
- the rule making that the US department of Energy (DOE) had proposed in March 2012 and reopened for technical input with a deadline of 28 May 2013.

The Review study had concluded that the requirements of the EU CoC reflected an appropriate level of ambition which would not bring about major additional costs; already more than half of the products on the market in 2012 fulfilled the Tier1-requirements while 90% of the 2012-models would need to be re-designed or re-sourced to meet the Tier2-requirements.

On that basis, the Commission had proposed in their working document to enhance the requirements along the EU Code of Conduct with more generous transitional periods and a third tier requiring a further improvement of 2.5% in efficiency, subject to review. The Commission services emphasised that while it would be useful to harmonise the EU- and US-requirements, it was difficult to judge at that stage where the US-process was heading for.

Feedback received:

DE felt that the Tier II requirements might be too ambitious but that more information from German manufacturers would be sought. **IT** criticised that the LLCCs had not been fully established and that the Commission's proposal was not well substantiated while **NL** stressed that LLCCs were of major importance for white goods but less for electronics. **UK** and **IT** emphasised that they were not in favour of a third tier after revision as a matter of principle, while other representatives (**BE**, **SE** and **ECOS**) supported a third tier. **Digital Europe**/Philips said that for some applications with infrequent usage (e.g. electric shavers) additional manufacturing costs could hardly be recovered. **SI** suggested using a wording which is more in line with the standard ("nameplate output power").

Regarding the harmonisation with DOE-rule making, **BE** pointed out that it was desirable but not absolutely necessary to align the requirements, more important was that measurements were done in the same way. Industry on the other hand, suggested studying the alignment with up-coming DOE-ruling on EPS.

Following that debate, the consultants presented a rough calculation of the LLCCs for mobile phone EPS based on information previously obtained from chipset manufacturers. The calculation showed that the savings achieved through the proposed up-graded requirements

[11] a newer version with slightly more ambitious parameters was only available in April 2013

would outweigh the additional costs by far, even with quite a wide variation in electricity price.

3) New requirement for active efficiency at 10%-load

Requirements for active efficiency at 10%-load are included in the EU Code of Conduct but not in the DOE-rule making. The Commission presented advantages (relevant for future applications, particularly for products spending a lot of time in network standby) and disadvantages (lack of data, potentially additional costs, not relevant for all products) of such a requirement. The Commission services drew the conclusion that a 10%-requirement should not be implemented at this stage but be subject to the next review.

Feedback received: Most of the participants supported the Commission's view to have a requirement at a later stage also because the 10% loading level had not been specified in test standards to date. Against this background, the Consultation Forum discussed the introduction of an information requirement in order to have the data available in time for the next review. There were different opinions about when the information requirements should apply, together with Tier 1 **(NL**) or together with Tier 2 **(DE**). **ECOS** advocated for a 10%-active efficiency requirement under the present Review.

4) Extension of scope

The Review study had outlined options to extend the scope of the regulation to do justice to new types of application and technological developments. The degree of complexity towards implementation and the impact on industry vary considerably across the options.

Possible sub-products to be included in the scope would be:

- Multiple voltage output EPS (EPS with a multiple output of different voltages). An inclusion of these devices would bring about a good additional saving potential; a requirement would be rather easy to implement. However, a testing method would need to be specified;
- High power EPS: There is only a small amount of products in the market, thus savings would remain minimal. A requirement at this stage would involve some need for research while DOE-data could be used at a later stage.
- (Low Voltage) Wireless chargers: There might be a high potential in the future, e.g. in the context of electric vehicles, while they play a minor role at the moment. It would require major research efforts to address them properly in the regulation.

The Commission proposed to include Multiple voltage output EPS in the scope of Regulation 278/2009 but to refrain from including High power EPS and Wireless chargers at this stage.

To include Multiple voltage output EPS in the scope, criterion b) of the regulation would need to be removed:
"(b) it is able to convert to only one DC or AC output voltage at a time;"

Feedback received: Stakeholders generally supported the Commissions' proposals.

5) Clarifications/ up-date of definitions

a) Clarifications to ensure that new product types are in the scope

The review should also be used to review and clarify the existing definitions to make sure that the wording is unambiguous also for more recent technological developments. This would be the case for the following types of EPS:

- Multiple voltage single output EPS (agile charging), i.e. EPS that can deliver output of different voltages and adapt to the primary load device's needs.
- USB-adaptor-plugs;
- EPS with integrated back-up batteries.

On this basis, the Commission proposed to give clarifications in the guidelines and possibly to slightly edit the EPS definition to clarify that these types of EPS are included in the scope.

Feedback received: Stakeholders generally supported the Commission's proposals.

b) Definition of Low voltage EPS

The definition of Low voltage EPS has a particular relevance as electric and electronic household and office equipment which is placed on the market with a low voltage external power supply is exempted from the scope of the Standby-Regulation 1275/2008.

Originally, this exemption had been established to keep mobile phones out of the scope that were per se deemed to be very efficient. In the meantime, more and more products are being developed that rely on a low voltage EPS but that might not be equally energy efficient. The Commission put this issue up for discussion.

Feedback received: **DE** and **NL** both argued for closing this loophole. However, while **DE** were in favour of exploring and addressing the issue along with the review of the Standby Regulation in 2016, **NL** argued that with an adaptation of the definitions (i.e. inclusion of an upper limit for the output current, see below), a good and relatively quick improvement could probably be achieved:

"low voltage external power supply' means an external power supply with a nameplate output voltage of less than 6 volts and a nameplate output current greater than or equal to 550 *and lower than 2000* milliampères)."

6) Material efficiency

The Commission services put the aspect of material efficiency up to discussion and outlined three possible approaches:

- a compatibility requirement;
- a requirement on detachable cables;
- a requirement on weight.

Regarding compatibility, the Commission stressed the fact that it has been argued that such a requirement would have disproportionate effects on a whole range of products. It also explained that the Commission intended to launch a new Memorandum of Understanding with industry that would address EPS for mobile phones but might extend to other mobile products.

For the detachable cable, the Commission pointed to risks linked to detachable cables (e.g. safety issues, wrong use, standardisation problems and additional costs to manufacturers for components and design rights).

For a requirement setting limits for weight, the Commission services stressed that the energy efficiency requirements of 278/2009 had already contributed substantially to reduce the average weight of the EPS and that more data was needed to judge the actual potential and the implications linked to a weight requirements. They proposed to tackle material efficiency in the next review process in three years' time and on the basis of a thorough assessment.

Feedback received: **ECOS** and **ANEC**/**BEUC** argued for a requirement on material efficiency and for action to decouple EPS from the primary load device; **BE** supported an information requirement on weight. **DE** requested to push standardisation through a mandate. **NL** reminded of the opinion of the legal service and called upon industry to progress on the route of standardisation; the representative argued for an in depth-analysis and an information requirement on the parameter weight to allow for a requirement with the next review. **IT** refused to have a material efficiency requirement at this stage, stressing that this could also imply measurement problems. The representative also pointed to packaging issues linked to separate chargers.

CONCLUSIONS:

At the end of the meeting, the following conclusions were drawn:

1) Regarding the general approach and proposed procedure, there is general support to aim for a fast-track procedure and to focus on the revision options that would realise most of the potential.

2) Regarding the up-grade of existing requirements, there is general support for tightening the requirements. The EU Code of Conduct was acknowledged as a good reference; however, more information on impacts/costs, on the most recent modifications within the EU CoC-process and on parallel initiatives (DOE) is needed. To establish a third tier would require more preparation and research than possible within a fast-track process; this is why the review should involve only two tiers for which references do exist.

3) Regarding a new active energy efficiency requirement for 10%-load, there was a broad agreement not to have a requirement at this stage but to include an information requirement (timing to be determined).

4) Regarding the inclusion of products into the scope, there was support for the Commission's proposal to include Multiple output voltage EPS in the scope (with measurements to be specified). For High power EPS, it was decided to use data from DOE for the next review. The potential of Wireless chargers should also be further explored under the next review.

5) Regarding the up-dating of definitions, there was general support for the Commission's proposal to provide for clarification that Multiple voltage single output EPS, USB-adaptor-plugs and EPS with integrated back-up batteries are in the scope of the regulation. For Low voltage EPS, the Commission proposed to look more deeply into the feasibility of an adaptation of the definition, and otherwise to address this issue in the context of the review for Regulation 1275/2008.

6) Regarding Material efficiency, it was concluded that the data material was not sufficient to include a requirement for weight in this review but that a strong message should be included in the revisions clause that material efficiency should be covered in the next regulation.

ATTENDANCE LIST

Commission Services
Belgium
Bulgaria
Czech Republic
Germany
Spain
Finland
France
Hungary
Ireland
Italy
The Netherlands
Slovenia
Turkey
Sweden
United Kingdom
VMAS
SEA GREEN TREE
ANEC / BEUC
AVAYA
CECED
CLASP
DIGITALEUROPE
ECOS

Change	Saving (TWh) per year in 2025	Test method available?	Requirement basis?
Revised requirements, three Tiers	1.461	Yes	Yes
High power (>250W) EPS in scope	0.002	Yes	Yes
Multiple Voltage Output EPS in scope	0.839	Yes	Yes
Low voltage wireless Chargers in scope	0.538	**No**	**No**
10% loading active efficiency requirement	0.125	**No**	Yes
Total savings	2,965		

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY
Directorate C - Renewables, Research and Innovation, Energy Efficiency
C.3 - Energy Efficiency

Brussels, 1 July 2015
ENER/C3/PH (2015)

MINUTES

Meeting of the Consultation Forum under Article 18 of Directive 2009/125/EC on energy-related products

Horizontal matters

Brussels, 29 April 2015 (10.00 – 16:00)

Participants: See "Attendance List" in Annexes

1. WELCOME AND PRESENTATION

The **Chair** welcomed the participants and indicated that the purpose of the meeting was to discuss several horizontal topics regarding to Ecodesign and Energy Labelling.

The minutes of the previous Consultation Forum meeting on electric compressors were adopted without comments.

ECOS asked for an update on the state of play regarding the Ecodesign and Energy Labelling measures currently under development. The **Commission services** indicated that the update would be given under AOB.

2. REVIEW PROCESS OF THE DIRECTIVES

The **Commission services (GROW)** indicated that under the Circular Economy package high expectations have been placed on Ecodesign. In this context, the bundling the Ecodesign Working Plan 2015 – 2017 and a mandate on resource efficiency with the Circular Economy package is currently being discussed although no final decisions have been taken. The Circular Economy package (for which **GROW** and **ENV** are co-responsible) has two main elements; a review of waste legislation and a non-legislative part analysing the current barriers towards a more circular economy as well as sectorial initiatives. Member States and stakeholders are invited to take an active role in the process and participate in the stakeholder conference planned for 25 June.

The **Commission services (ENER)** added that the review studies on Ecodesign and Energy Labelling were finished last year and that under the 2015 Commission Work Programme a further review was taking place. The current thinking is that the Energy Labelling Directive should be reviewed while the Ecodesign Directive is still fit for purpose but a final political decision on how to move forward with the review process still needs to be taken.

DK considered that the review of the Energy Labelling Directive should not be included in the Circular Economy package to avoid further delays. This was supported by **DE. ANEC/BEUC** requested further information on whether there will be a link between the EU Energy Labelling revision proposal and the circular economy goals.

3. PRELIMINARY DISCUSSION ON "MARKET SURVEILLANCE OF BIG PRODUCTS"

NL made a presentation on the challenges related to market surveillance for big products. It indicated that defining a big product needs to be done on a case by case basis and proposed different possible solutions (single test, on-site testing, etc.). A general approach should be discussed.

EVIA indicated that for big industrial fans, third party certification would add costs and that witness testing was already general practice. **BE** indicated that the preparatory studies should give more details about the testing facilities available in Europe. **IT** invited the **Commission services** to analyse how the issue is dealt with in other jurisdictions like AU or the US, adding that in the case of bigger products, if less products are going to be tested, to ensure a strong statistical basis maybe the product should be tested more than once. A specific study analysing the issue should be considered. **EPEE** mentioned that market surveillance is a general concern and that on-site testing for cooling equipment is not possible as the relevant ambient conditions cannot be ensured. **SE** supported **IT** and **EPEE**. **ORGALIME** asked for alignment regarding the market surveillance provisions between Ecodesign and other relevant pieces of legislation. **EUROPUMP** indicated that third party certification can lead to increased costs and longer times for putting new products on the market. **EHI** offered to share their experience regarding third party certification, which is mandatory under the heater regulations. **ECOS** wondered if a product registration database could help.

The **Commission services** summarized the discussion, indicating that a case by case analysis is appropriate and that a more detailed assessment of the issue would be considered.

4. DISCUSSION ON "PRODUCTS IN PRODUCTS"

The **Commission services** presented the discussion paper on "Ecodesign for energy-related products integrated into other energy-related products" that was submitted to the Consultation Forum before the meeting.

IT welcomed the discussion and suggested to split up the problem: i.e. what is the date of placing on the market and who is responsible for what? It also indicated that "double Regulation" (i.e. applying Ecodesign requirements to components integrated into products covered by other Ecodesign requirements) should be avoided and that using the most efficient components does not necessarily lead to the most efficient product. It also invited the **Commission services** to share the working document with ADCO.

DE shared the interpretation of the Commission provided in the discussion paper. **BE** supported this comment and added that the explanatory memorandum accompanying the current Regulation on fans already indicated that fans integrated into other products need to be covered in order to avoid loopholes.

NL also shared the interpretation given in the discussion paper but asked to be careful when comparing the "Blue Guide" with the Ecodesign Directive as the language is not always the same. The interpretation provided was positive for market surveillance authorities as it would allow them to address the original equipment manufacturer. Products covered can be tested independently and if the products integrated into other products would be exempted large loopholes would be opened. **DK** and **SE** supported this comment. **ANEC/BEUC** said that, as nobody can tell where a product will end up, if integrated products are not covered market surveillance would be hindered. **ECOS** also agreed on the importance of avoiding loopholes.

CECED said to be against overlapping Regulations for components integrated into other products. It claimed that it is not possible to carry out market surveillance for these components. Moreover, the current interpretation leads to additional work for assembling technical documentation as well

as for the testing and measurements to substantiate this. For instance a motor into a washing machine would need to be tested twice, once alone and another time when integrated into the washing machine. Improving the efficiency of a part has in many occasions only marginal impacts and the effort to achieve these gains could have been placed somewhere else. They added that they do not see a loophole when exempting components intended to be integrated into an ErP regulated product, because it is also not considered a loophole to exempt a component intended to be integrated in a product that leaves the EEA. They asked the Commission to assess this point and substantiate the possibility of a loophole by evidence. **EPEE** and **DIGITAL EUROPE** also considered that products integrated into other energy related products covered by Ecodesign should be exempted from minimum requirements and that using the best components does not necessarily lead to the least life cycle cost for the whole product. **ORGALIME** said it was important to provide legal certainty to the market and asked for flexibility for innovation. **EPEE** also asked for an alignment of dates for the coming into force of the requirements within different regulations.

EVIA said that multiple Regulations are a reality, fans also use components such as bearings, cables, etc. that are covered by other pieces is legislation.

The **Commission services** concluded that while most Member States supported the interpretation given in the discussion paper, most industry stakeholders expressed different views. A case by case analysis is in any case needed based on the least life cycle cost as prescribed by the Ecodesign methodology. Further comments are welcome within one month after the meeting.

5. UPDATE ON REVIEW OF THE EPS REGULATION

The **Commission services** gave an update on the proposed approach for the review of Regulation 278/2009 on External Power Supplies. An updated working document had already been sent to the Consultation Forum for written comments.

The Commission services propose to align the first tier with the ruling of the US government that was adopted in 2014 and to add a second stage in line with the second tier of the European Code of Conduct (timing January 2017 and July 2018). Moreover, the results of the additional assessment requested by industry and several Member States in the context of the EPS-Consultation Forum in April 2013 were presented.

In their comments, **ANEC/BEUC** and **ECOS** expressed their disappointment about the delay in the process. **DE** enquired about the MoU for a common charger and ongoing standardisation activities in this field. The Commission services pointed out that the MoU was foreseen to continue and that, if deemed necessary, legislative action could be considered under the Radio Equipment Directive. **Digital Europe** challenged the results of the impact analysis and criticised the Commission for proposing a second tier in line with the EU CoC instead of developing a common policy with the US. In response to this, **NL** stressed that the EU had made an important step in that direction but that the processes were entirely different and a fully harmonised policy would be difficult to achieve. The **Commission services** agreed with this and, in reply to **Digital Europe's** criticism on the impact analysis, emphasised the efforts that were made by the consultants to validate the data. On request, the deadline for written comments was extended to end of May. The next steps are the Impact Assessment and a Regulatory Committee by the end of 2015.

6. AOB

The **Commission services** gave an overview of the state of play of the different Ecodesign and Energy Labelling files.
The **Chair** ended the discussion, thanked participants and requested any further feedback and data from stakeholders by 29 May 2015 at the latest.

ANNEX – Attendance List

Commission Services
Austria
Belgium
Czech Republic
Germany
Denmark
Finland
France
Hungary
Ireland
Italy
The Netherlands
Portugal
Sweden
Slovakia
The United Kingdom
Norway
Switzerland
AMCA
ANEC/BEUC
CECED
CECIMO
CEN/CENELEC
CLASP
DIGITAL EUROPE
EEA
ECOS
EEB
EED
EHI
EHPA
EPEE
EPTA
EUNITED CLEANING
EUROCOMMERCE
EUROFUEL
EUROPUMP
EUROVENT
EVIA
HKI
LIGHTING EUROPE
ORGALIME
PNEUROP
VHK

ANNEX 3: WHO IS AFFECTED AND HOW?

This annex explains the practical implications of a potential ecodesign revised regulation, based on implementation of the preferred policy option (see Sections 5.2.1 to 5.2.4).

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

Ecodesign implementing measures aim to create a level playing field in the EU as they establish requirements which need to be met by all products placed on the EU market, independently from the manufacturers' origin and production sites.

Harmonisation with the requirements in the United States represents an important means of reducing manufacturers' costs in the global as well as internal market. The adoption of further, more stringent requirements would remove barriers to market take up of more advanced performance EPS, but this needs to be balanced in terms of savings brought to the end-users and added burden to the industry.

The revised EPS Regulation would have the following key practical implications for manufacturers:

For EPS manufacturers:

1. Manufacturers would need to pull the non-compliant EPSs out from the EU market and redesign those products;
2. Manufacturers need to re-test and re-issue EC-declarations, technical documentations etc. to prove compliances;
3. Manufacturers need to carry out each test for several minutes longer to account for 10% loading measurement and for measurement the multiple-output voltage EPSs;
4. Manufacturers would need to publish information including efficiency and no-load power of EPS on websites and user manuals (where applicable);
5. Manufacturers would benefit from aligning requirements with other large markets (such as US) as they would only need to comply with one set of requirements, minimizing the testing and design improvement costs imposed by several different levels of requirements in different regions of the world.

For manufacturers of primary load product:

1. Manufacturers who buy in EPS, already frequently (1-2 times a year) will only have to redefine the EPS specifications provided to their EPS manufacturers, so no significant change from business-as-usual here;
2. Manufacturers need to re-test and re-issue EC-declarations, technical documentations etc. to prove compliance with the Standby Regulation of their products equipped with the newly sourced EPSs;
3. Manufacturers would need to publish information on their websites, to include the consumption in standby mode for their products equipped with the new EPSs.

The preferred option will result in substantial benefits for citizens, the society, manufacturers and wholesalers. The citizens will receive benefits in the form of saved electricity consumption leading to financial savings over the product life time. The society will receive benefits in terms of reduction of the GHG emissions. In addition, manufacturer and wholesalers will benefit from increased turnover and employment. The

requirements will also imply some costs for consumers as increased product price, compliance costs for manufacturers to improve products and administrative costs for testing and certification. The estimated costs and benefits are described in more details below the summary tables.

2. SUMMARY OF COSTS AND BENEFITS

Overview of benefits total for the preferred option – PO2 Global alignment. All benefits that are quantifiable are direct benefits.

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
Reduced energy consumption	4.26 TWh per year in 2030.	The energy consumption of EPSs sold in the EU will be reduced, therefore the overall energy consumption in the EU will decrease accordingly.
Reduced environmental impact (less GHG emissions)	1.45 Mt CO2-eq per year in 2030	The reduced energy consumption will result in reduced GHG emissions.
Less life cycle cost for consumers of products with EPSs	0.11 € - 11.4 € savings per unit over their entire life cycle. Overall end-user expenditure savings of 787 million € in 2030.	The consumer will experience lower electricity consumption due to the reduced EPS energy losses and will thereby pay reduced electricity bills. This will outweigh slightly higher purchase costs for EPSs, resulting in consumer savings over the entire life cycle of products.
Level playing field for manufacturers, and avoided additional energy costs for consumers that use multiple-voltage output EPSs	Consumer avoided electricity costs of ca. 9 – 13 € per unit of multiple-voltage output EPS over its lifetime, which is equivalent to ca. 104 million € savings for the EU projected sales of 11 million units in 2030. This is included in the end-user expenditure saving above.	By including multiple voltage output EPS in the scope, a level playing field will be ensured because an EPS will no longer be exempted when it delivers power simultaneously to e.g. a notebook and a mobile phone.
Increased turnover in industry	73 million € in 2030. It is estimated that 14% will be in the EU, i.e. 10 million €.	Manufacturer, wholesalers will have this benefit due to the increase product prices of more efficient EPS.
Increased employment	Indicatively 255 more jobs in 2030. It is estimated that 14% will be in the EU, i.e. 35 additional jobs.	Jobs will be created to handle the additional work of adapting the EPSs to the requirements and of testing etc.
Indirect benefits		
Better understanding and enhanced data available regarding EPS efficiency at 10 % loads	N/A	The knowledge will allow: (i) informed consumers to include this additional load level in the selection criteria at purchase, (ii) manufacturers to compete on a voluntary basis in marketing more efficient products, and (iii) regulators to set at a later stage, where appropriate, minimum efficiency requirements on this parameter.

Certain caveats apply to the figures above. The financial savings per unit of product depend on the improvement (compliance) costs considered (see explanations in Section 6.4 and Annex 4, point 4). The model used assumes that additional costs incurred by the manufacturers are passed in totality to the end users through EPS purchase costs. Thus, the creation of jobs is only indicative and cannot be guaranteed in practice. The assumptions used in calculations are explained in Section 6.5 and Annex 4, point 9.

Overview of compliance and administrative costs (all costs are direct costs) compared to baseline are shown in the table below. Where no figures are mentioned, no extra cost are considered to apply.

II. Overview of costs – Preferred option							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Scope extension to multiple voltage output EPS	Direct costs	20 mil. €[12]		20 mil. €[13]			
Provide information on the efficiency at 10% loading	Direct costs				Negligible		
Provide information on websites and user manuals	Direct costs			Negligible			
Energy efficiency requirement	Direct costs	74 mil. €		40 mil. € for efficiency improvement	10.5 mil. € for testing		

The one-off costs presented above largely depend on the assumptions made with regard to additional costs for compliance (See Annex 4, point 4) and the mechanisms by which it is assumed that all these costs are passed to the consumers. The recurrent costs for testing are based on figures provided by the industry, that were averaged over different product types and the sales figures (see details in Section 6.6.2).

[12] For 6 million units sold in 2030 in the preferred option PO2 (instead of 11 million units in BAU, due to proposed scope extension that closes the current loophole for multiple voltage output EPS).

[13] The costs incurred by the businesses are considered to be passed in their entirety to consumers.

ANNEX 4: ANALYTICAL METHODS

GENERAL INTRODUCTION

Availability of reliable data for the EPS sector is relatively poor. This is no central database for all the EPS sold in the EU, as they are usually bundled with primary products and sold together. EPS are used by a large variety of electronic and electrical products, therefore the statistical information on EPS are largely based on the primary product data, such as sales, stock and usage profile. This is also consistent with the method used by industry stakeholders[14] in their own modelling exercises.

Most of the data used in the model e.g. sales, output power, average power, active hours, no-load hours and lifetime etc. have been supplied and verified by industry stakeholders represented by DIGITALEUROPE. Global market research companies like IHS and Statista are a valuable source to confirm trends, in some cases, sales data were obtained through these companies for the primary products and therefore assumed the same sales for EPS bundled and sold together. Prices and price increase of EPS due to Ecodesign measures are based on stakeholder consultation and checked against online research. Employment impacts are derived from revenue per employee, again checked against reported revenue totals for the sector.

Efficiency distribution of EPS on the market are derived from datasets obtained from NRCAN (>4200 models) and website www.digikey.com (>2300 models), and checked against the estimates by industry stakeholders such as DIGITALEUROPE, Friwo, and component supplier's expert.

For greenhouse gas emissions, the emission rate (in kg CO2 eq./kWh) does vary over the projection period in line with overall EU projections used in Ecodesign Impact Accounting 2016.

As regards the various monetary rates, all energy prices were obtained from PRIMES 2016 model (scenario REF2015f) and corrected with inflations rates from Eurostat. All product prices and costs are kept constant and expressed in Euro 2015.

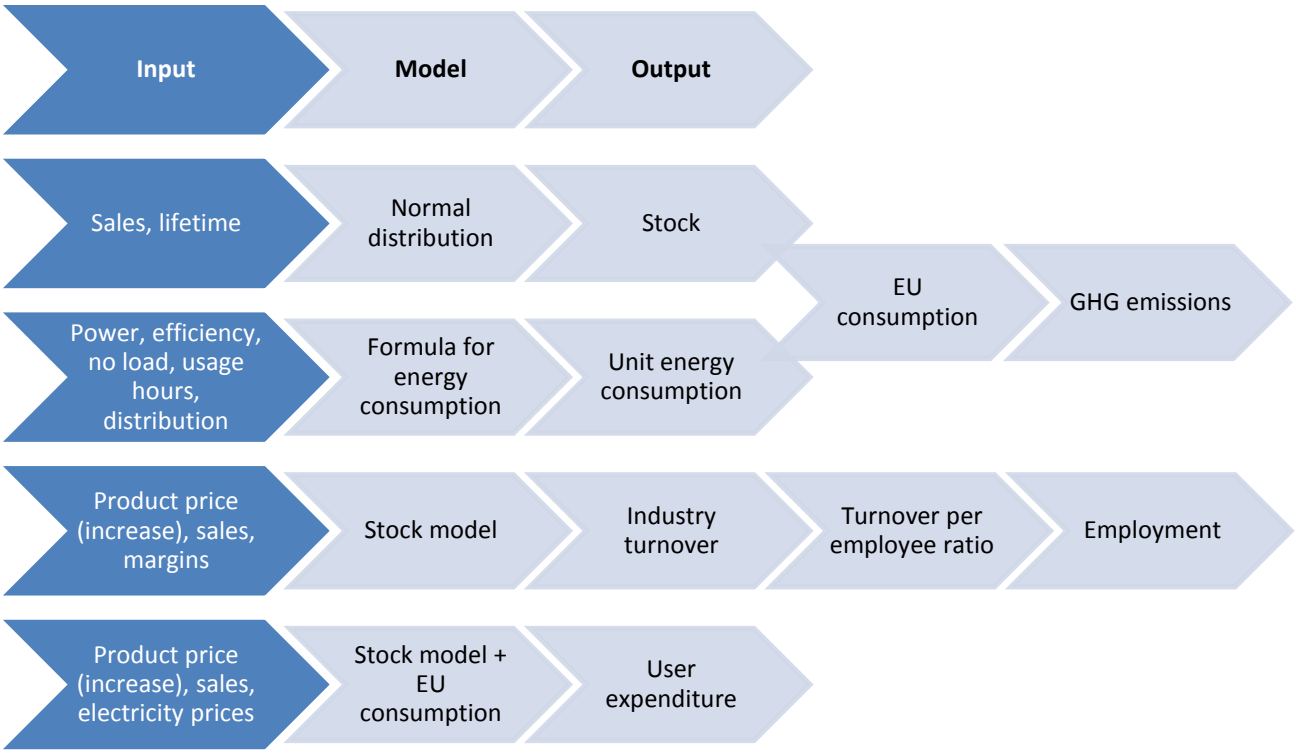
MODEL STRUCTURE

The impact assessment uses a stock model developed by Viegand Maagøe, the stock model is largely based on the same principles as the one developed by VHK in the context of the MEEuP 2005 methodology and then for MEErP 2011 and the VHK EIA-studies for the Commission as well as for over 20 impact assessments.

The model is built in MS Excel, using a 1-year time step. There is an Excel file for each policy scenario, having the structure as shown in Figure 19 below. This means that there is a total of five excel files used for this impact assessment: 0 BAU (without regulation), 1 BAU (with current regulation), PO2, PO3 and PO4. There is finally a summary excel file that collects the outputs from each scenario and compare the differences in energy consumption, GHG emissions, turnover employment in the industry, and user expenditure, with the 1 BAU scenario.

[14] DIGITALEUROPE, excel file: DE EPS energy savings overview calculation V14, June 2015.

Figure 19 Model structure for each policy scenario



Source: Viegand Maagøe

1. STOCK AND SALES

In order to estimate the total sales and stock of EPSs in the EU, it was necessary to define a few base cases of primary load products that are sold or operated with an EPS. Based on industry association DIGITALEUROPE's inputs for review study[15] and technological development, ten base cases have been defined, see Table 30.

Sales data were obtained for 2013 and 2017. For the periods in between sales data, the figures have been interpolated. Beyond 2017 sales were projected. Sales data for EPS in period of 2013 were derived from stock data outlined in the Fraunhofer / CEA report[16] combined with sales insights from the RPA report on the MoU on Harmonisation of Chargers for Mobile Telephones[17]. This data was provided and supported by industry stakeholders. Data that refers to the US market was adjusted to the EU situation using GDP per capita and population. In 2018, the sales data was updated with more recent data up to 2017 from Statista[18] and VGChartz[19].

Annual sales beyond 2017 is projected based on population growth rate and assumptions on sales shift:

[15] DIGITALEUROPE Input To The EU EPS Discussion And Feedback Towards The EU Consultant", 11 November 2013

[16] "Energy Consumption Of Consumer Electronics In U.S. Homes In 2013," Final Report To The Consumer Electronics Association (CEA®) Fraunhofer USA Center for Sustainable Energy Systems, June 2014, Bryan Urban, Victoria Shmakova, Brian Lim, and Kurt Roth

[17] "Study on the Impact of the MoU on Harmonisation of Chargers for Mobile Telephones and to Assess Possible Future Options
Final Report" prepared for DG Enterprise and Industry by RPA, 22nd August 2014

[18] statista.com

[19] http://www.vgchartz.com/yearly/2017/Europe/

- To account for the technology development and the increasing uptake of, smartphones, tablets and other portable devices[20], some of the mobile phones (base case a) sales are shifted to smartphones, tablets (base case b) and other portable devices (base case d) from 2017 and increasingly up to 2030. This is to account for more users replacing (non-smart) mobile phones with other technologies in the future.

- The emerging market of multiple voltage output EPSs, used e.g. for charging simultaneously notebook and mobile/smartphones, can be assumed to shift some of the sales from base case e) to f). As such, by 2030, 20% of the 30 W notebook computers EPS sales is shifted to multi-device universal chargers in all policy scenarios (PO2 – PO4). In BAU scenario, 50% of the 30 W notebook computers EPS sales is shifted to multi-device universal chargers (where this increased percentage was used for accounting for the current legislative loophole being exploited by EPS manufacturers).

- Lastly, 120 W notebook EPS (base case h) slowly shifts all its sale by 2030 to 65 W notebook EPS (base case g) due to better energy efficiency of products and improved battery technology, as well as the trend towards more USB Type-C connections compliant with the USB 3.1 standard that enable agile charging at higher voltages.

See estimated annual sales of EPS in the EU-28 in table below.

Table 30 Annual sales in million units for the base cases

Power range	**Base case description**	2010	2015	2020	2025	2030
≤ 6W	a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	77	54	37	27	14
6–10 W	b. 10W normal voltage (e.g. tablets, smart phones etc.)	220	237	251	263	277
10–12 W	c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	122	145	155	157	158
15–20 W	d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	1	5	9	10	11
20–30 W	e. 30W normal voltage (e.g. notebook computer)	15	15	14	14	13
30–65 W	f. 36W multiple voltage output (e.g. e.g. multi-device universal chargers etc.)	0	0	2	2	3
30-65 W	g. 65 W normal voltage (e.g. high-end notebooks computers)	0	0	4	5	5
65–120 W	h. 120W normal voltage (e.g. high-end notebook computers)	5	5	1	1	0
65–120 W	i. 120W Multiple voltage output (e.g. stationary game consoles)	24	9	3	3	3
12–15 W	j. 15W normal voltage (e.g. loudspeakers and sound systems)	11	23	28	28	28
	Total annual sales (million units)	**476**	**493**	**504**	**509**	**512**

The installed base (also known as stock) was calculated using a stock model which takes into account the product lifetime as the median, the standard deviation of lifetime, and a

[20] For example, camera, video recorders etc.

normal distribution of product survival. Life times can be found in Table 32. See estimated total stock for EU-28 in table below.

Table 31 Total stock in million units for the base cases

Power range	Base case description	2010	2015	2020	2025	2030
≤ 6W	a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	158	211	140	103	64
6–10 W	b. 10W normal voltage (e.g. tablets, smart phones etc.)	437	814	868	911	953
10–12 W	c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	240	614	692	703	708
15–20 W	d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	1	13	29	33	37
20–30 W	e. 30W normal voltage (e.g. notebook computer)	30	82	81	76	72
30–65 W	f. 36W multiple voltage output (e.g. multi-device universal chargers etc.)	0	0	4	11	15
30-65 W	g. 65 W normal voltage (e.g. high-end notebooks computers)	0	0	13	25	27
65–120 W	h. 120W normal voltage (e.g. high-end notebook computers)	11	29	16	4	2
65–120 W	i. 120W Multiple voltage output (e.g. stationary game consoles)	51	87	22	14	14
12–15 W	j. 15W normal voltage (e.g. loudspeakers and sound systems)	21	96	147	155	156
	Total stock (million units)	**948**	**1946**	**2012**	**2034**	**2049**

2. USAGE AND LIFETIMES

The lifetime and usage profiles are obtained from industry association DIGITALEUROPE[21] and crosschecked with the Fraunhofer / CEA document[22] and other information provided by stakeholders. The data were mapped on the EPS types as shown in Table 32. The usage profile combined with the efficiencies and no-load power consumptions presented in the following paragraph are used to find the energy consumption of the primary product including EPS. The calculation method was aligned with the calculation examples supplied by the industry[23]. The following formula is used for calculating annual energy consumption per unit of primary product using EPS:

$$Annual\ energy\ consumption(kWh) = active\ power(kW) \times active\ hours\ per\ year \div active\ efficiency + no\ load\ power\ (kW) \times no\ load\ hours\ per\ year$$

[21] Stakeholder inputs, May – June 2015, Excel file:DE EPS energy saving overview calculation V14

[22] "Energy Consumption Of Consumer Electronics In U.S. Homes In 2013," Final Report To The Consumer Electronics Association (CEA®) Fraunhofer USA Center for Sustainable Energy Systems, June 2014, Bryan Urban, Victoria Shmakova, Brian Lim, and Kurt Roth

[23] DIGITALEUROPE, excel file: DE EPS energy savings overview calculation V14, June 2015.

Table 32 Basic inputs to model in this assessment by EPS type

EPS type	Name plate power (W)	Active power (W)	Active hours (hours /day	No-load (hours /day)	Unplugged (hours /day)	Lifetime (years)
a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	3.5	1.1	5.20	9.80	9.00	3.0
b. 10W normal voltage (e.g. tablets, smart phones etc.)	10	2.0	5.20	9.80	9.00	3.0
c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	12	7.7	21.40	2.60	0.00	4.0
d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	18	3.1	7.00	10.00	7.00	3.0
e. 30W normal voltage (e.g. notebook computer)	30	7.6	20.72	0.00	3.28	5.0
f. 36W multiple voltage output (e.g. multi-device universal chargers etc.)	36	9.7	20.72	0.00	3.28	5.0
g. 65W normal voltage (e.g. high-end notebooks computers)	100	7.8	20.72	0.00	3.28	5.0
h. 120W normal voltage (e.g. high-end notebook computers)	120	7.6	20.72	0.00	3.28	5.0
i. 120W Multiple voltage output (e.g. stationary game consoles)	120	9.7	24.00	0.00	0.00	5.0
j. 15 W normal voltage (e.g. loudspeakers and sound systems)	9.5	2.3	24.00	0.00	0.00	5.0

3. EFFICIENCY LEVELS

The sales of EPS are grouped into four levels of efficiency: 1) current ecodesign 278/2009 level ("ERP EFF"), 2) US DOE, 3) EU CoC Tier 2, 4) mid-way between EU CoC Tier 2 and BAT (or "Half BAT"). The maximal efficiencies considered at different levels in Table 33 are derived using formulae from Ecodesign Regulation, US DOE rulemaking and EU CoC Tier 2 and the base case power output.

As the efficiency levels are based on the minimum requirements of the above-mentioned regulations and voluntary agreement, this means that the efficiencies of the EPS are slightly conservative as in practice the EPSs on the market could be more efficient than these minimum values.

The market shares of sales grouped into each efficiency level vary in different policy scenarios, depending on the various stringency of requirements. This attempts to model how efficient the EPSs on the EU market are in different scenarios, see more details in sections about policy options.

Table 33 Efficiency levels used for the base cases

	Efficiency level				No-load power (W)			
EPS type	ERP EFF	US DOE	CoC Tier 2	Half BAT	ERP EFF	US DOE	CoC Tier 2	Half BAT
a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	0.682	0.736	0.738	0.741	0.3	0.1	0.075	0.046
b. 10W normal voltage (e.g. tablets, smart phones etc.)	0.767	0.819	0.822	0.843	0.3	0.1	0.075	0.046
c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	0.779	0.830	0.833	0.859	0.3	0.1	0.075	0.058
d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	0.804	0.850	0.855	0.859	0.3	0.1	0.075	0.058
e. 30W normal voltage (e.g. notebook computer)	0.836	0.869	0.877	0.885	0.3	0.1	0.075	0.058
f. 36W multiple voltage output (e.g. multi-device universal chargers etc.)	0.830	0.830	0.830	0.858	0.995	0.3	0.3	0.3
g. 65W normal voltage (e.g. high-end notebooks computers)	0.870	0.880	0.890	0.902	0.5	0.21	0.15	0.096
h. 120W normal voltage (e.g. high-end notebook computers)	0.870	0.880	0.890	0.902	0.5	0.21	0.15	0.096
i. 120W Multiple voltage output (e.g. stationary game consoles)	0.860	0.860	0.860	0.873	0.995	0.3	0.3	0.3
j. 15W normal voltage (e.g. loudspeakers and sound systems)	0.793	0.841	0.845	0.841	0.3	0.1	0.075	0.058

4. COSTS AND PRICE

The equivalent consumer price and the price difference for each efficiency level for each EPS type is listed in table below. The differences in price express the incremental price increase for each additional stringency level in the requirements.

Table 34 Equivalent consumer purchase price per efficiency level in 2010 (per product)

	Equivalent consumer price by efficiency level €/unit				Price difference between efficiency levels, €/unit			Certification /testing cost, €/unit
EPS type	ERP EFF	US DOE	CoC Tier 2	Half BAT	ERP EFF to US DOE	US DOE to CoC Tier 2	CoC Tier 2 to Half BAT	Per level
a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	€ 3.81	€ 4.54	€ 4.56	€ 5.54	€ 0.72	€ 0.02	€ 0.98	€ 0.00
b. 10W normal voltage (e.g. tablets, smart phones etc.)	€ 7.05	€ 7.27	€ 7.31	€ 8.12	€ 0.21	€ 0.03	€ 0.80	€ 0.01
c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	€ 10.54	€ 10.88	€ 10.92	€ 12.21	€ 0.34	€ 0.04	€ 1.29	€ 0.00
d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	€ 7.63	€ 8.25	€ 8.33	€ 10.65	€ 0.61	€ 0.07	€ 2.31	€ 0.01
e. 30W normal voltage (e.g. notebook computer)	€ 12.84	€ 13.94	€ 14.31	€ 18.43	€ 1.10	€ 0.36	€ 4.12	€ 0.01
f. 36W multiple voltage output (e.g. multi-device universal chargers etc.)	€ 16.36	€ 16.85	€ 16.87	€ 17.40	€ 0.47	€ 0.00	€ 0.51	€ 0.02
g. 65W normal voltage (e.g. high-end notebooks computers)	€ 23.44	€ 24.08	€ 25.24	€ 26.17	€ 0.63	€ 1.17	€ 0.92	€ 0.00
h. 120W normal voltage (e.g. high-end notebook computers)	€ 25.92	€ 26.56	€ 27.74	€ 28.67	€ 0.63	€ 1.17	€ 0.92	€ 0.01
i. 120W Multiple voltage output (e.g. stationary game consoles)	€ 35.78	€ 37.81	€ 37.85	€ 40.06	€ 1.99	€ 0.00	€ 2.16	€ 0.04
j. 15W normal voltage (e.g. loudspeakers and sound systems)	€ 12.04	€ 12.30	€ 12.42	€ 13.16	€ 0.17	€ 0.03	€ 0.66	€ 0.09

Equivalent consumer price: EPSs are not usually sold separately, but as a component supplied together with the main product. Therefore there is no clear initial consumer purchase price for EPS. However, for the purposes of the modelling, it was necessary to determine a theoretical price per EPS unit. Various sources, such as purchase prices for EPS as spare parts (recognising that spare parts have a different cost structure as they require separate packaging, stock transport, storage over longer period etc), US DOE rulemaking analysis technical documentation[24], insights from integrated circuit supplier were used to arrive at an approximate average consumer price. These calculations took account of the mark-up[25] on Manufacturer Selling Price (MSP) [26]of 2.56 provided by industry[27].

[24] US DOE Rulemaking analysis: Figures 5.40 and 5.41 for Multiple Voltage Output, figures 5.30 to 5.37 for normal EPS, and tables 5.24 to 5.32 of the "Technical Support Document: Energy Efficiency Program For Consumer Products And Commercial And Industrial Equipment: Battery Chargers And External Power Supplies" March 2012, US DOE

[25] Mark-up is the amount added to the cost of manufacturing goods to cover overhead and profit.

Additional costs of changes (as additional consumer price): Costs for efficiency improvements were derived from the US DOE rulemaking[28]. US DOE data comprised combined costs for no-load and efficiency for each representative EPS for each performance level (Candidate Standard Level or CSL). The data was used to calculate the improvement costs as follows:

(i) For PO2 a conservative linear cost increase was assumed. From US DOE data, the costs per each percentage point of increased efficiency was found. This increased cost per increased efficiency was used as a multiplier at each efficiency level for deriving the additional incremental costs for each (additional) level of ambition in the requirements set;

(ii) For PO3, as the efficiency improvements are very small compared with PO2, the same linear model for the price increase was assumed. However, this is a rather optimistic assumption, as stakeholders pointed out that departures from a global approach might entail more expensive redesign. In order to address this concern a sensitivity analysis was carried out (see Annex 8);

(iii)For PO4, which marks already a leap in the stringency of requirements by nearing BAT, and possibly in related improvement burden, the costs were modelled preserving the same cost increase factor used in the DoE data for passing to the penultimate level of requirements (i.e. the level before BAT).

For the multiple voltage output EPS, data for efficiency levels in Europe was outside the range of the US DOE cost calculations, so it was necessary to backward interpolate (estimate) the costs from the upper efficiency/cost data points assuming a reduction factor (a rapid decrease factor of 10 was assumed in order to fit the cost curve). There are no costs for these EPS to meet CoC Tier 2 requirement, as there is no more ambitious requirement. Technologies to achieve the efficiency levels have been identified in consultation with industry component supplier[29] and presented in Table 35.

Table 35 Technologies to achieve US DOE and EU CoC Tier 2 efficiency levels and approx. price increase associated

	Used to get from ErP (Level V) to US DOE (level VI)	Used to get from US DOE (level VI) to EU CoC T2
Average active efficiency:		
Better synchronous rectification (SR) control (with more precise timing).	SR control	SR control with more precise timing
Active-clamp topologies with zero-voltage switching (for power outputs over 100W)		yes
Better field effect transistors (FETs) and power device technologies.	yes	yes
No-load condition power consumption:		
Ultrafast recovery diodes for the bias winding rectifier	yes	yes
Lossless input undervoltage / overvoltage (UV/OV) sensing.		yes

[26] Manufacturer selling price (MSP) is the price of goods manufacturer sell to wholesaler or end-product manufacturer, this includes the cost of manufacturing the goods and the profit margin for manufacturer.
[27] Digital Europe comments, 2015
[28] Technical Support Document: Energy Efficiency Program For Consumer Products And Commercial And Industrial Equipment: Battery Chargers And External Power Supplies" March 2012, US DOE
[29] Industry stakeholder consultation, February - March 2018

Multi-mode switching,	Yes for active efficiency and no-load	Yes for active efficiency and no-load
Quasi-resonant (i.e. valley-mode) switching,		yes
Control schemes with on/off or burst modes	yes	yes
Total Price increase	Between 0.21 € and 1.10 € depending on EPS type and technical solution	Between 0.02 € and 1.17 € depending on EPS type and technical solution

5. CERTIFICATION AND TESTING COSTS

Industry feedback[30] stated that CE certification costs for primary load products would be incurred by the change in EPS. This is because an EPS change may impact EMC and safety performance, and consequently require a partial product redesign in order to comply with such requirements. When a product design is updated, it requires re-certification with all the EPSs required in order to be compliant in the global market. Additionally, if the EPS supplied with the primary load product changes, there might be a need for re-testing the off mode and standby consumption for proving compliance with the Ecodesign Regulation on standby. The re-testing & re-certification costs vary depending on the complexity of each product, from around 5,000 € for a very simple gateway (a device sometimes referred to as a router that connects multiple computers to a cable line for Internet access) or a basic complex set top box (used to access digital television) to around 35,000 € for a more complex gateway or set top box.

It was explained that re-certification costs will be incurred for the second tier of the proposed regulation for products that have longer lifetimes. This is because an EPS tier cannot be anticipated for more than one year for legal / technical / sourcing / business reasons (e.g. for product categories which have a 3-year commercial lifetime, 50 % of models will have to be certified; for products having a 4-year lifetime, 62.5% will have to be certified). CE re-certification costs are never less than 80% of initial certification cost.

Assuming that the stated certification costs include: resourcing, redesign, retesting, and documentation, this information was used to model the cost per large company and cost per SME of certification in relation to the proposed regulation (including re-certification for the second tier). Taking into account the number of models per company type, and the total number of companies, a per unit certification cost was derived and included in the costs in Table 36 and Table 37.

The costs to EPS manufacturers were also considered, but these were very low per unit, and as very few of these manufacturers were based in Europe the cost was insignificant. The EPS manufacturers can bear compliance costs associated with testing, certification and documentation, however at the component level of EPS and simpler testing than primary product, the testing cost is estimated 500-1000 € per model[31], summing up all 28 of EU 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.

The number of EU SMEs and large companies and the average number of models in each SME or large company are found via online research of EU companies producing

[30] Digital Europe comments, 2015

[31] 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.

products falling into one of the ten base cases.

The sum of compliance costs of SMEs and large companies per each base case divide by annual sales to arrive at the additional costs per unit of EPS, see the last column of Table 34. This additional cost is transferred to the consumers as embedded in the increased product price in policy option 2, 3 and 4.

Table 36 Compliance costs of primary product produced by SMEs

EPS type	Number of EU SMEs	# models in SME	Certification cost per model	Total cost per SME	Total cost all SME
a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	1	1	5,000 €	5,000 €	5,000 €
b. 10W normal voltage (e.g. tablets, smart phones etc.)	6	2	5,000 €	10,000 €	60,000 €
c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	2	1	5,000 €	5,000 €	10,000 €
d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	1	1	5,000 €	5,000 €	5,000 €
e. 30W normal voltage (e.g. notebook computer)	1	1	5,000 €	5,000 €	5,000 €
f. 36W multiple voltage output (e.g. e.g. multi-device universal chargers etc.)	0	0	5,000 €	- €	- €
g. 65 W normal voltage (e.g. high-end notebooks computers)	0	0	35,000 €	- €	- €
h. 120W normal voltage (e.g. high-end notebook computers)	0	0	35,000 €	- €	- €
i. 120W Multiple voltage output (e.g. stationary game consoles)	0	0	35,000 €	- €	- €
j. 15 W normal voltage (e.g. loudspeakers and sound systems)	19	6	5,000 €	30,000 €	570,000 €
SMEs - Total compliance costs					**655,000 €**

Table 37 Compliance costs of primary product manufactured by large companies

EPS type	EU company count	# models in large company	Certification cost per model	Total cost large company	Total cost all large companies
a. 5W low voltage (e.g. mobile phone and rechargeable grooming products)	6	2	5,000 €	10,000 €	60,000 €
b. 10W normal voltage (e.g. tablets, smart phones etc.)	36	13	5,000 €	65,000 €	2,340,000 €
c. 12W normal voltage (e.g. small network equipment and set-top boxes etc.)	3	3	5,000 €	15,000 €	45,000 €
d. 18W normal voltage (e.g. portable devices and portable game consoles etc.)	5	2	5,000 €	10,000 €	50,000 €
e. 30W normal voltage (e.g. notebook computer)	4	4	5,000 €	20,000 €	80,000 €
f. 36W multiple voltage output (e.g. e.g. multi-device universal chargers etc.)	1	3	5,000 €	15,000 €	15,000 €
g. 65 W normal voltage (e.g. high-end notebooks computers)	0	1	35,000 €	35,000 €	- €
h. 120W normal voltage (e.g. high-end notebook computers)	1	1	35,000 €	35,000 €	35,000 €
i. 120W Multiple voltage output (e.g. stationary game consoles)	3	1	35,000 €	35,000 €	105,000 €
j. 15 W normal voltage (e.g. loudspeakers and sound systems)	25	15	5,000 €	75,000 €	1,875,000 €
Large companies - Total compliance costs					**4,605,000 €**

6. GHG EMISSIONS AND PRIMARY ENERGY CONSUMPTION

The greenhouse gases (GHG) emissions are calculated by using the emission rate for electricity in Ecodesign Impact Accounting status report 2016[32] to convert the electricity consumption in TWh to CO2-eq in Mt. It can be noted that there is no one-to-one ratio between energy consumption and GHG emissions, because the CO2 conversion factor shown in the Impact Accounting report decreases from 0.43 Mt CO2/TWh in 2000 to 0.39 Mt CO2/TWh in 2016 and further to 0.34 Mt CO2/TWh by 2030. This is due to the increasing share of renewable energy present in the grid electricity in EU countries.

The primary energy consumption is found by converting secondary electricity into primary energy using a primary energy factor of 2.5, according to MEErP methodology Part I, 2011.

7. END-USER EXPENDITURE AND ELECTRICITY PRICE

End-user expenditure is the sum of purchase costs and energy costs of any given year for the whole EU. The purchase costs for the given year is found as the number of units sold multiplied by the product price per unit. The energy costs are the electricity price per kWh multiplied by the energy consumption of the given year.

The electricity prices used are 2013 constant prices from PRIMES[33] model provided for each 5th year and corrected with inflation to 2015 constant prices used for all economic calculations. The prices are divided into household and service industry, it is derived ca. 75% of the EPS are used in households and ca. 25% in the service/office sector based on the stock of EPS product groups. See the electricity prices used in the model in Table 38.

Table 38 2015 electricity prices from PRIMES model, percentage of EPS products used in household and service sector to derive final electricity prices for the model

	2010	2015	2020	2025	2030
Households, €/kWh	0.175	0.194	0.207	0.213	0.217
%	75%	76%	76%	75%	76%
Services, €/kWh	0.151	0.160	0.174	0.180	0.183
%	25%	24%	24%	25%	24%
Final electricity price, €/kWh	0.169	0.186	0.199	0.205	0.208

8. INDUSTRY REVENUE

Industry revenue is the sum of the revenue or turnover of manufacturers and wholesalers (or primary product manufacturers). The turnover is estimated as the product of manufacturers' or wholesalers' selling price and annual sales. Based on information provided by DIGITALEUROPE in Figure 20, using the cost price, margin and selling prices at each level to divide by the final product price, the percentage of the final product price that make up the manufacturer selling price and wholesaler selling price were found, see Table 39.

[32] https://ec.europa.eu/energy/sites/ener/files/documents/eia_ii_-_status_report_2016_rev20170314.pdf
[33] https://ec.europa.eu/clima/policies/strategies/analysis/models_en#PRIMES

Figure 20 Manufacturing cost price, selling price, wholesale selling price and retail selling price and margins

		Butler consultants
Equipment manufacturer	cost price manufacturer (68,02%)	€ 68,02
	margin manufacturer (31,98%)	€ 31,98
	revenue (=selling price) manufacturer (100%)	€ 100,00
Wholesale trade	buying price wholesale (77,3%)	€ 100,00
	margin wholesale (22,70%)	€ 29,37
	revenue (=selling price) wholesale (100%)	€ 129,37
Electronics store	buying price retail (69,24%)	€ 129,37
	margin retail (30,76%)	€ 44,43
	revenue (=selling price) retail (100%)	€ 173,79
	multiplying factor (selling price retail/cost price manufacturer)	256%

Source: DIGITALEUROPE, Revision of Lot 7 External Power Supplies Regulation, Brussels, 16 June 2015

Table 39 Calculation of manufacturer and wholesaler selling price as a fraction of final product price

	DE input/Bulter consultants	% of final product price
Cost price manufacturer	€ 68.02	39%
Margin manufacturer	€ 31.98	18%
Manufacturer selling price	€ 100.00	58%
Buying price wholesale	€ 100.00	58%
Margin wholesale	€ 29.37	17%
Wholesale selling price	€ 129.37	74%
Buying price retail	€ 129.37	74%
Margin retail	€ 44.43	26%
Retail selling price/final product price	€ 173.79	100%

The EPS manufacturer production cost is 39% of the final product price, and manufacturer selling price is 58% of final product price (with 18% profit margin), multiplied by the annual sales to arrive at the annual turnover. The wholesaler's selling price is 74% of the product price (with 17% margin) and multiplying by the annual sales to arrive at the wholesale turnover. The turnover of the retailer (26% margin) is usually the actual product price multiplying annual sales.

However, the majority of EPS as well as primary products that are bundled with EPS are not manufactured in the EU, it is most likely the research and development, sourcing and design tasks are carried out in the offices within EU. The turnover for EU is assumed 14% of the total industry turnover calculated. This is based on facts and figures of global electrical and electronic industry from ZVEI[34], which indicated the EU accounts for 14% of the global market (in terms of bn. €).

9. EMPLOYMENT

Employment is calculated with a widely used method by impact assessments of ecodesign and energy labelling regulations. The average ratio of turnover per employee is found via Eurostat statistics of the sector turnover and the employed persons. Using the annual turnover for manufacturers and wholesalers and divide it by the ratios, the

[34] 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.

employment in a given year is found. This method is used, as there is currently no alternative that would be obvious, and it should be noted that there is inevitably a large gap of the employment between the observed reality and the economists' estimation by whichever method.

For EPS manufacturer, the turnover per employee is calculated at 0.254 million €/year. Eurostat statistics turnovers for manufacture of computer, electronic and optical products was turnover 290 billion € and the sector employed 1141000 persons = 0.254.

Wholesaler turnover per employee is calculated at 0.51 million €/year. The entire wholesale sector turnover is 5.3 trillion € with 10.4 million employees as indicated by Euro Commerce[35].

10. OPTION 1 BAU – BASELINE SCENARIO

The efficiency distribution of the sales in the BAU scenario is based on the analysis of the existing databases[36], assumptions and consultation with industry stakeholders. Unlike in US and Canada, there is not (yet) a central product database in the EU, this is why data from the Canadian data base was used and adapted according to stakeholder and expert inputs.

The assumption is that without further strengthening of the requirements, there will be little natural development towards more efficient EPS, and a proportion of EPS with low efficiency that cannot be placed on the market in the US due to the implementation of their rule making will continue to be sold in the EU market. The figures below show the BAU scenario efficiency distribution and its projection up to 2030.

[35] https://www.eurocommerce.eu/retail-and-wholesale-in-europe/facts-and-figures.aspx, accessed 2015.

[36] Natural Resources Canada, NRCAN database in 2015 http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6909

Figure 21 BAU efficiency distribution 2009 – 2030 for base case a, 5W low voltage (e.g. mobile phone and rechargeable grooming products)

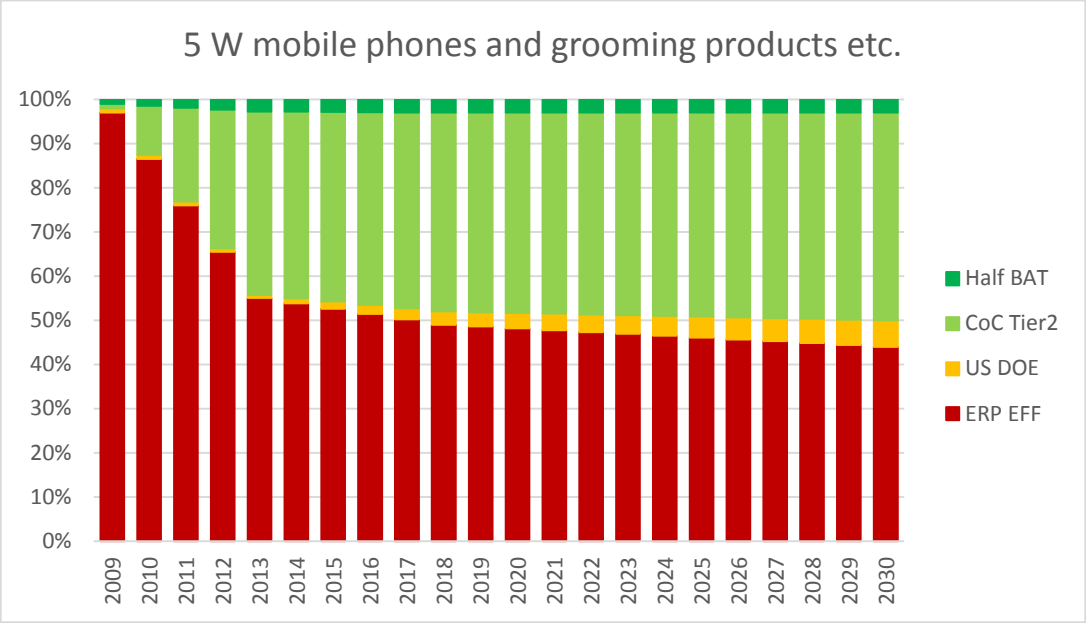


Figure 22 BAU efficiency distribution 2009 – 2030 for base case b, 10W normal voltage (e.g. tablets, smart phones etc.) and base case d, 18W normal voltage (e.g. portable devices and portable game consoles etc.)

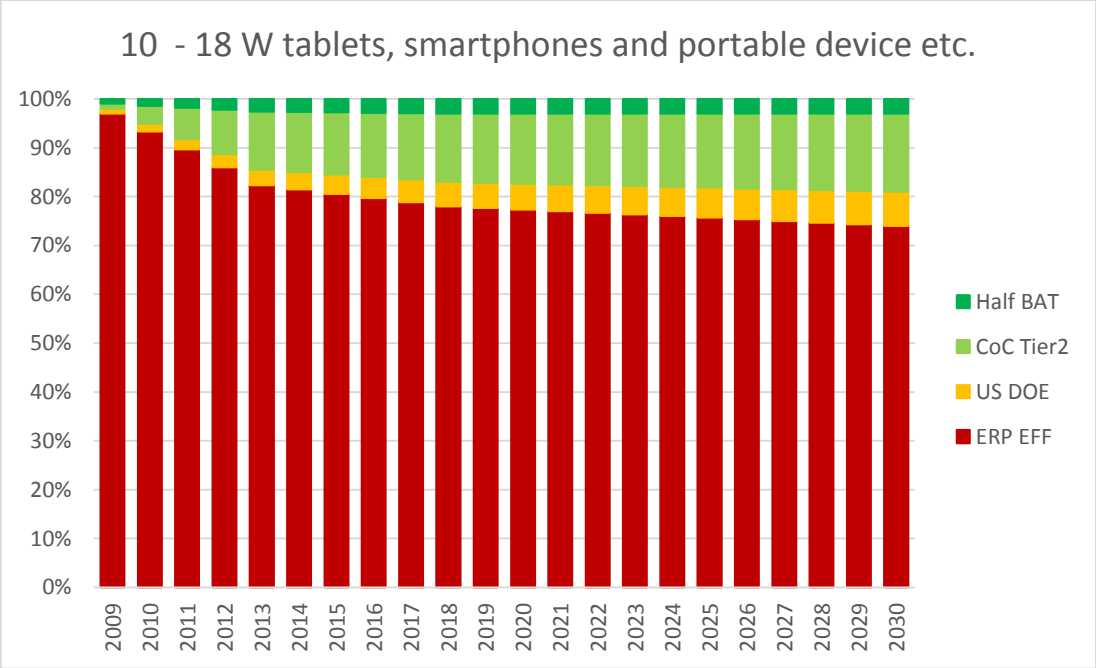


Figure 23 BAU efficiency distribution 2009 – 2030 for base case e, 30W normal voltage (e.g. notebook computer) and base case f, 36W multiple voltage output (e.g. e.g. multi-device universal chargers etc.)

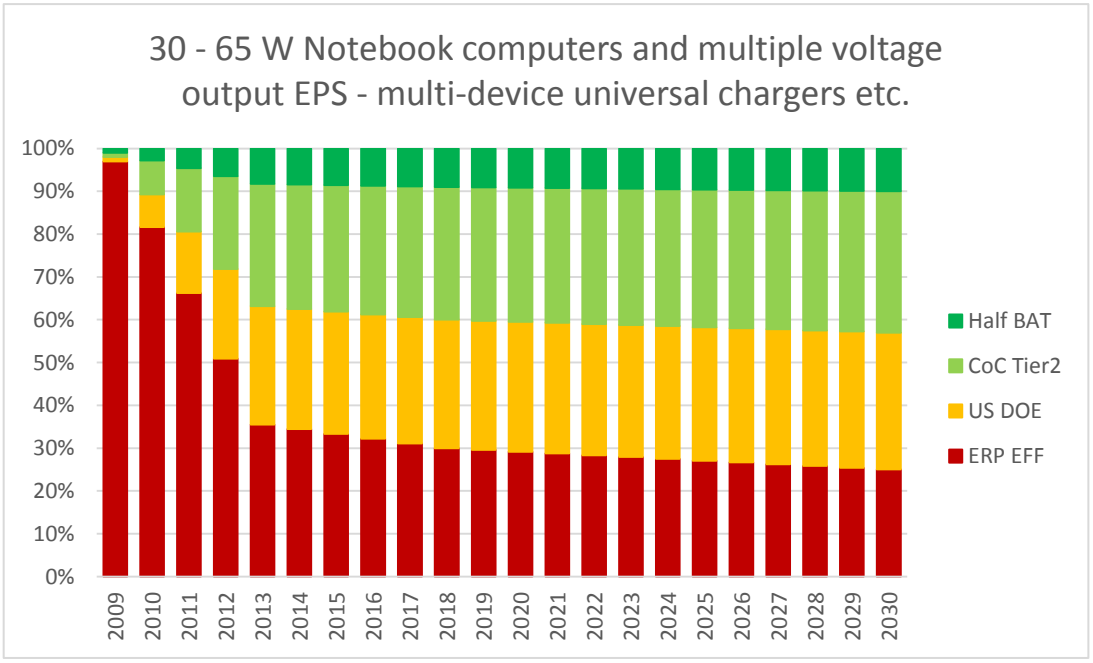


Figure 24 BAU efficiency distribution 2009 – 2030 for base case c 12W normal voltage (e.g. small network equipment and set-top boxes etc.) and base case j, 15 W normal voltage (e.g. loudspeakers and sound systems)

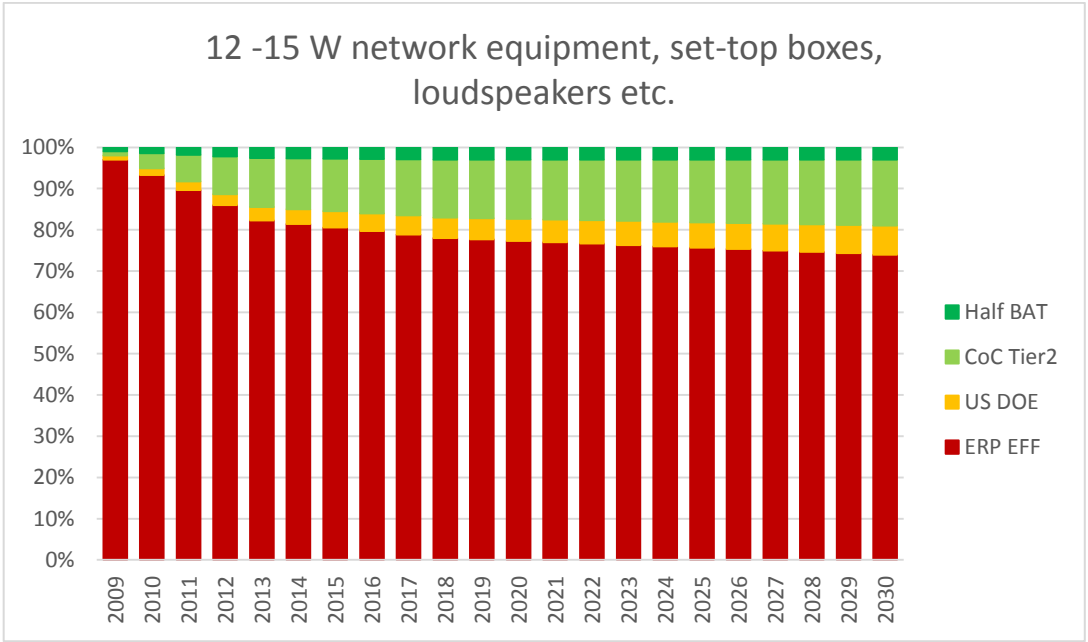


Figure 25 BAU efficiency distribution 2009 – 2030 for base case g and h 65 – 120 W normal voltage (e.g. high-end notebooks computers)

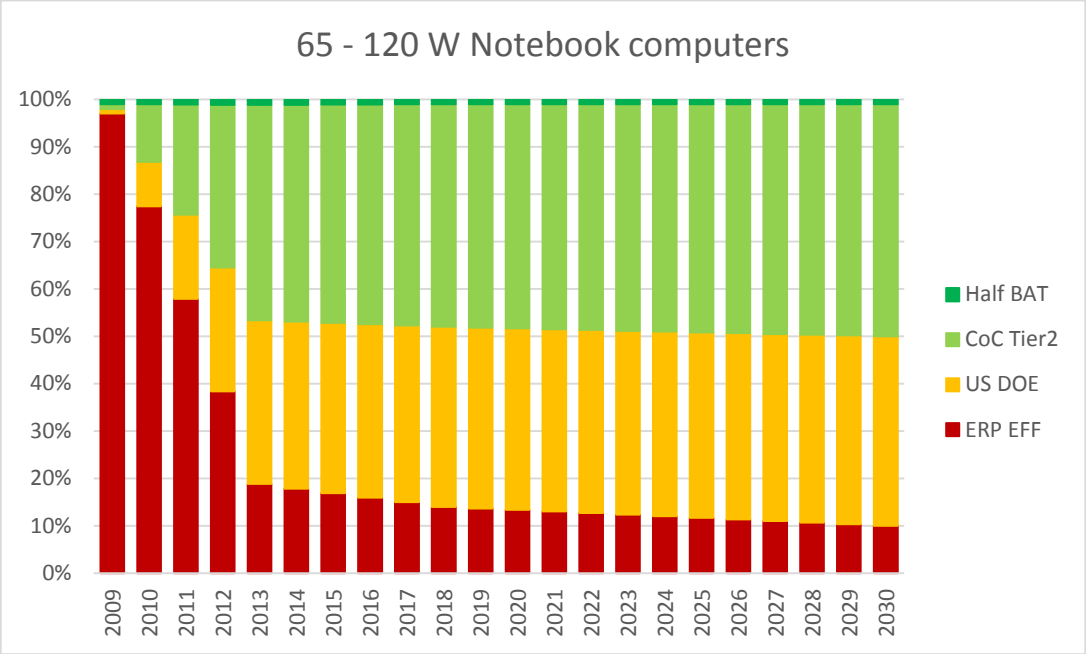
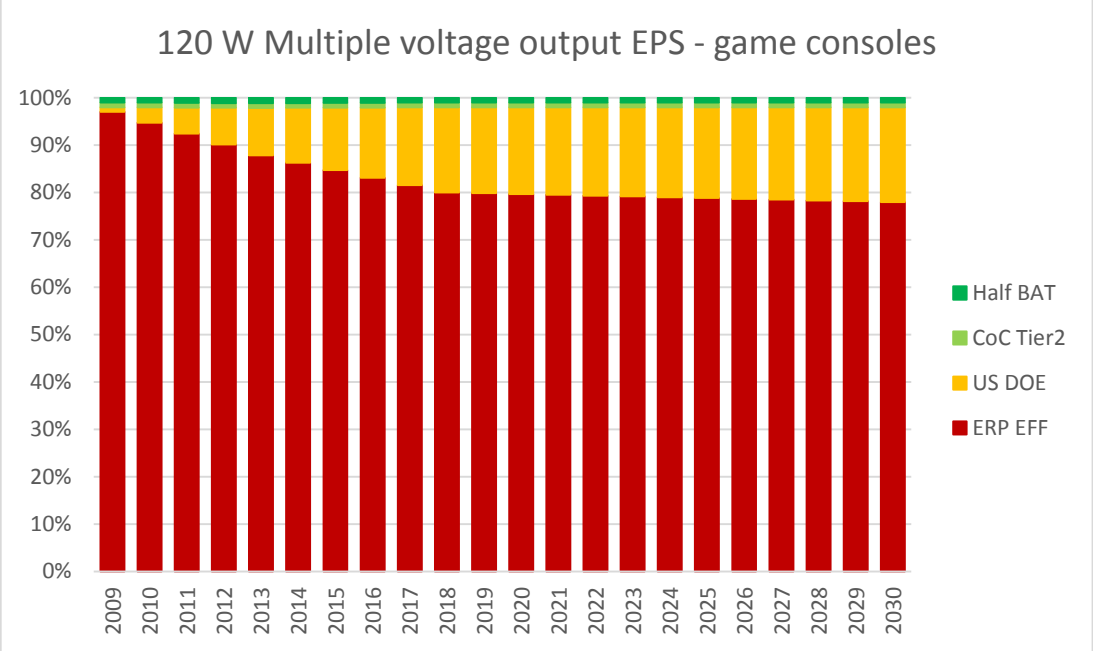


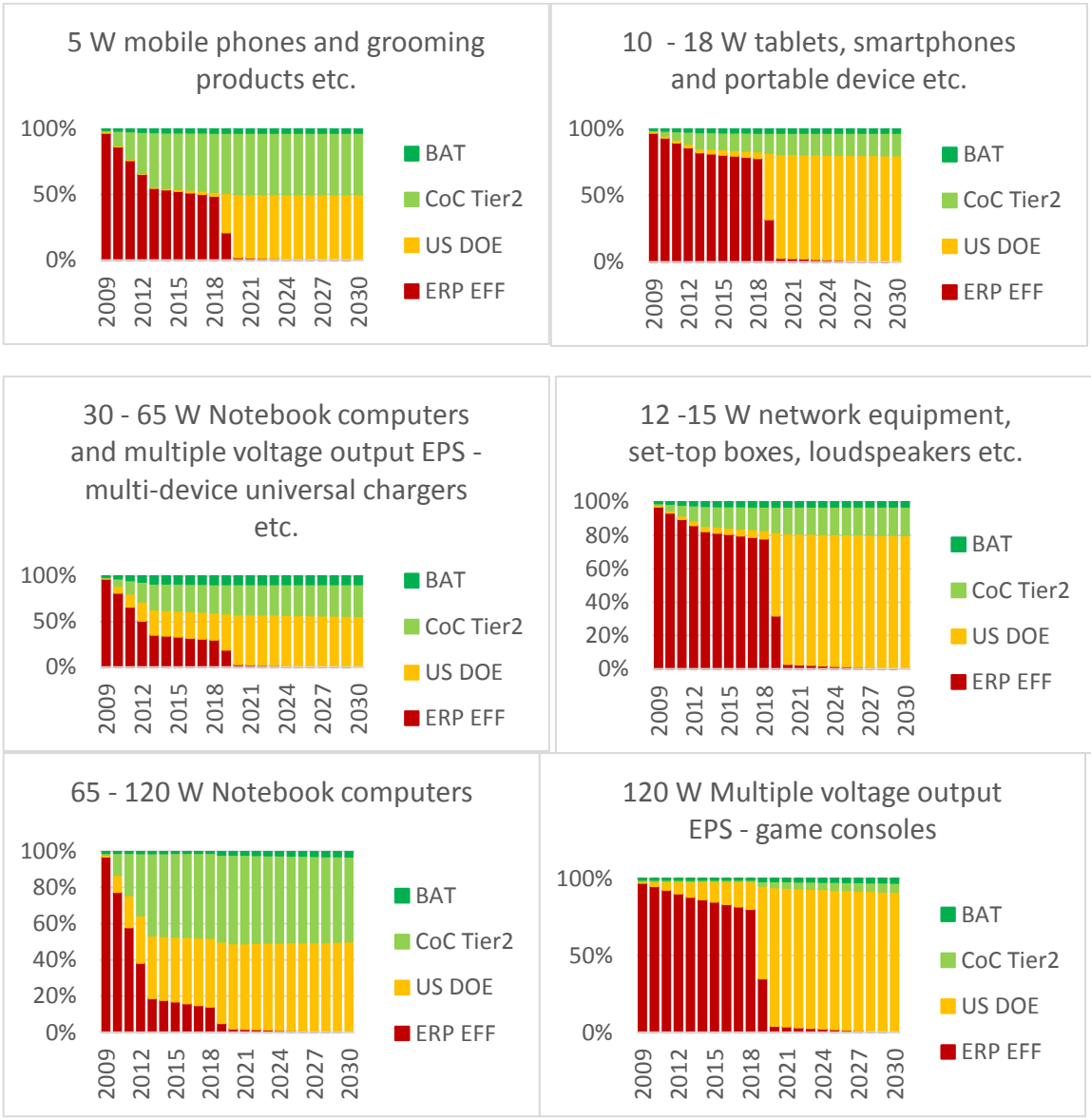
Figure 26 BAU efficiency distribution 2009 – 2030 for base case i, 120W Multiple voltage output (e.g. stationary game consoles)



11. OPTION 2 – GLOBAL ALIGNMENT

In this scenario, ca 70 % of the EPS are removed from the EU market (sales weighted) or shifted to a higher efficiency level by 2020. This is similar to the effect of current Ecodesign Regulation had on the market when it first was adopted in 2009, see more in Annex 7. Depending on the product group, the market share varies, approx. 14% of notebooks EPS are to be removed from the market, as much as 80% of multiple voltage output EPS and EPS for tablets, smartphones and portable devices, set-top boxes network equipment and loudspeakers, 29% of multiple device universal chargers and 36W notebook EPS and 48% of 5W EPS for mobile phones and grooming products etc. are removed from the market or rather shifted to higher efficiency level.

Figure 27 Efficiency distribution for PO2 – Global alignment



12. OPTION 3 – AMBITIOUS EU MEASURE

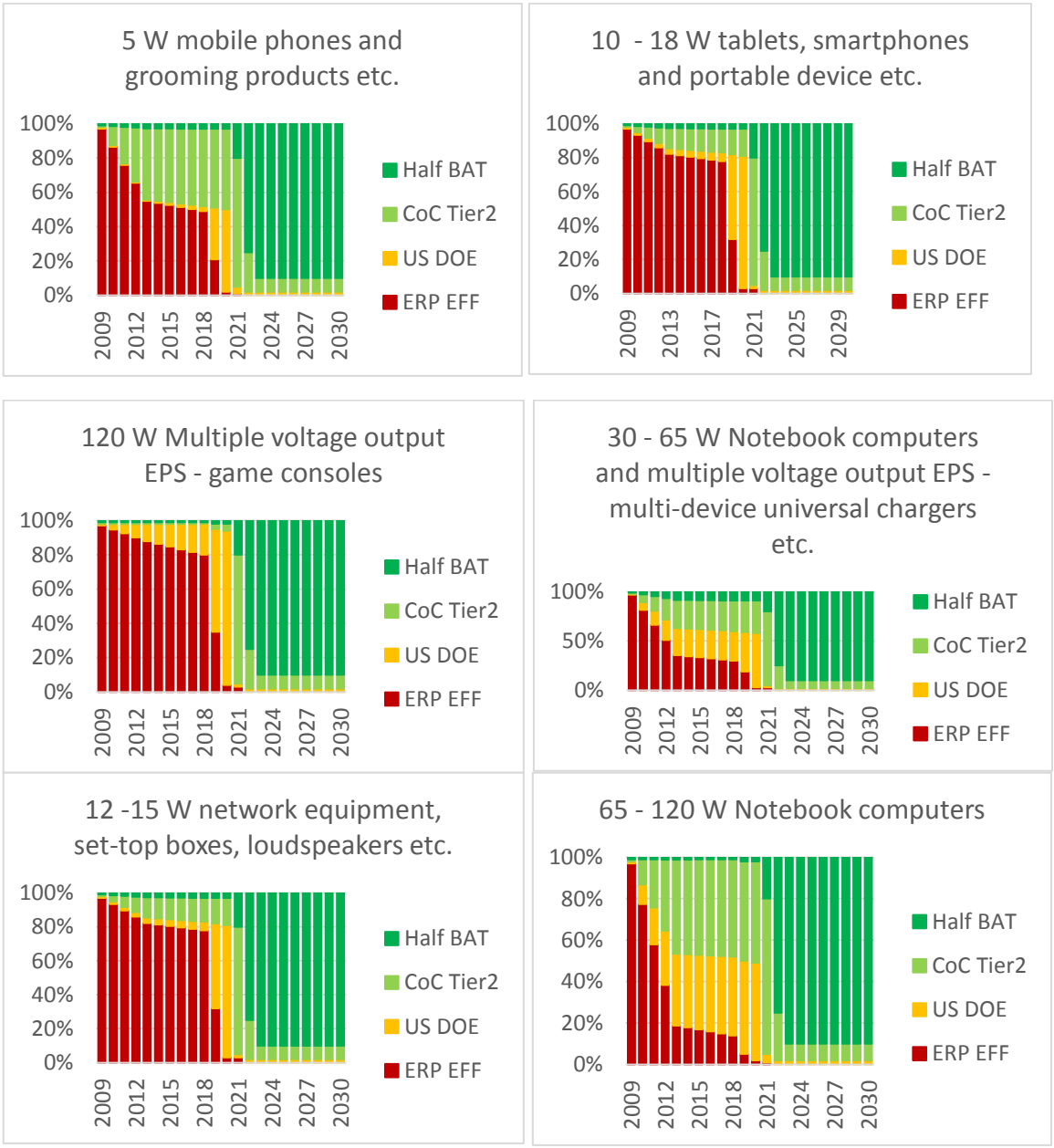
In this scenario, for the first tier that is mirroring PO2, in average around 70% of the EPS are removed from the EU market or shifted to a higher efficiency level by 2020. Subsequently, with the introduction of the second tier, an additional 9% of the market can be removed or shifted. However, for some products that already well populated at US DOE efficiency level, such as notebook EPS 65 – 120 W, instead of removing 14%, an additional 38% of the EPS would be removed or shifted to a higher efficiency level in 2022 when the second tier of requirement comes into effect. The same applies for notebook EPS in the range of 30 – 65 W, tier 1 removes ca. 29 % of the market, and tier 2 removes an additional 30% of the market. See Figure 28 for efficiency distributions.

Figure 28 Efficiency distribution for PO3 – Ambitious EU measure

13. OPTION 4 – VERY AMBITIOUS EU MEASURE

In this scenario, mirroring option 2, in average around 70% of the EPS are removed from the EU market or shifted to a higher efficiency level by 2020. However, the introduction of second tier having a very ambitious requirement at "Half BAT" level would mean that at least 20 % more of the market would be removed or redesigned to meet the requirements by 2022, this scenario would change almost the entire EPS market. See efficiency distributions Figure 29.

Figure 29 Efficiency distribution for PO4 – Very ambitious EU measure



14. OUTPUTS

Based on the above various inputs, the model developed for this impact assessment has generated the following outputs for electricity consumption, GHG emissions, industry turnover, consumer expenditures and industry employment (see the tables below).

The electricity consumption and the annual savings and cumulative savings are presented below, more details are presented in section 6.1.1 of this report.

Table 40 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

Using the emission rates and the electricity consumption from above, GHG emission are calculated (as presented in section 6.1.2).

Table 41 Greenhouse gases emission in CO2-eq and savings compared with BAU for different policy options

Policy options	CO2-equivalent emissions, Mt CO2-eq/year				Saving vs. BAU, Mt CO2-eq/year				Cumulative saving, Mt CO2-eq/year			
	2015	2020	2025	2030	2015	2020	2025	2030	2015	2020	2025	2030
1 BAU	28.1	27.3	26.2	25.1	-	0.00	0.00	0.00	-	0.0	0.0	0.0
2 Global alignment	28.1	26.8	24.8	23.6	-	0.53	1.42	1.45	-	0.74	6.85	14.1
3 Ambitious EU measure	28.1	26.8	24.7	23.5	-	0.53	1.55	1.55	-	0.74	7.25	15.0
4 Very ambitious EU measure	28.1	26.8	24.2	23.0	-	0.53	2.05	2.12	-	0.74	8.61	19.3

The business impacts of the policy options in terms of manufacturer and wholesaler turnover are presented in section 6.2.

Table 42 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	2023
Policy options	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Manu-facturer	Wholesale	Industry	Industry	Industry	Industry
1 BAU	2,576	758	2,567	756	2,612	769	2,653	781	-	-	-	-
2 Global alignment	2,576	758	2,631	775	2,672	787	2,709	798	-	83	78	73
3 Ambitious EU measure	2,576	758	2,631	775	2,685	790	2,720	801	-	83	94	87
4 Very ambitious EU measure	2,576	758	2,631	775	2,961	872	2,996	882	-	83	452	444

Using the energy consumption and electricity prices, the energy costs for consumers are found, The product prices and annual sales are used for calculating the purchase costs for consumers. The sum of energy and purchase costs is the consumer net expenditure. The savings compared with BAU are presented in section 6.3.

Table 43 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
1 BAU	17,696	18,783	19,471	19,940	-	-	-	-
2 Global alignment	17,696	18,614	18,766	19,153	-	169	705	787
3 Ambitious EU measure	17,696	18,614	18,716	19,108	-	169	755	833

4 Very ambitious EU measure	17,696	18,614	18,910	19,240	-	169	561	700

The manufacturer and wholesaler turnovers and sector turnover per employee are used for calculating the employment (as presented in section 6.4).

Table 44 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
1 BAU	10,141	10,107	10,283	10,445	-	-	-	-
2 Global alignment	10,141	10,359	10,521	10,667	-	252	238	222
3 Ambitious EU measure	10,141	10,359	10,569	10,710	-	252	286	265
4 Very ambitious EU measure	10,141	10,359	11,656	11,796	-	252	1,373	1,351

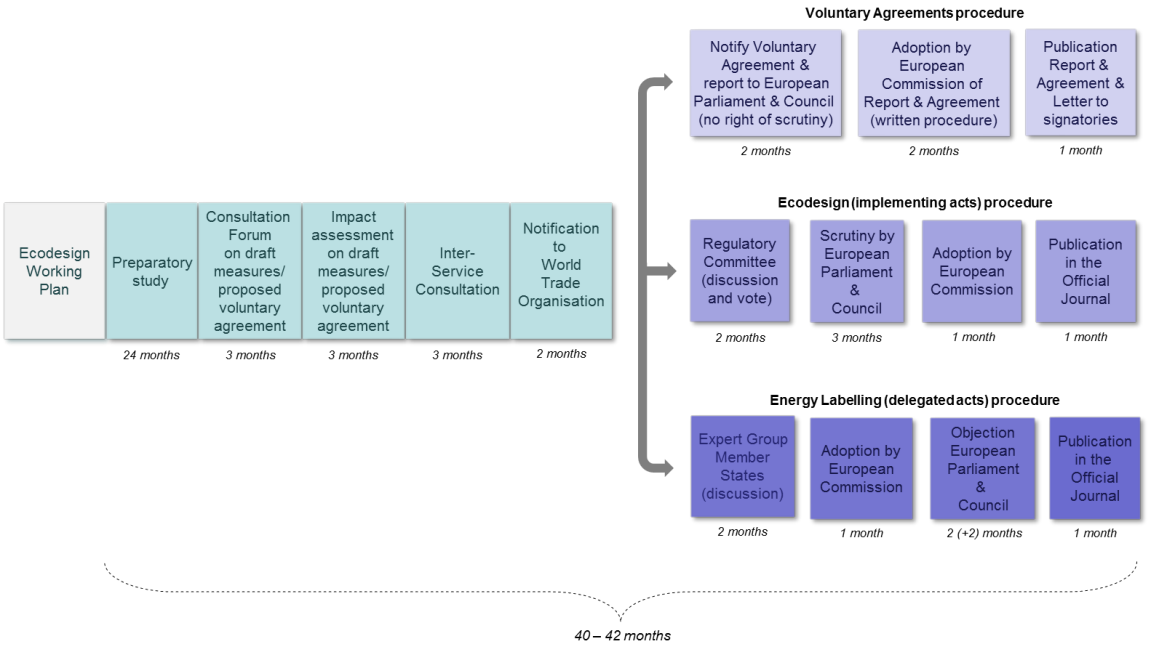
Table 45 Wholesaler employment and extra job creation compared with BAU for policy options

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

ANNEX 5: THE ECODESIGN AND ENERGY LABELLING FRAMEWORK

The Ecodesign Framework Directive[37] and Energy Labelling Framework Regulation[38] are framework rules, establishing conditions for laying down product-specific requirements in regulations adopted by the Commission. The Commission's role in the implementation of delegated and implementing acts is to ensure a maximum of transparency and stakeholder participation in presenting a proposal, based on generally accepted data and information, to the European Parliament and Council for scrutiny. Figure 30 gives an overview of the legislative process.

Figure 30: Overview of the legislative process



Energy labelling delegated acts are usually adopted in parallel with ecodesign implementing measures laying down minimum energy efficiency requirements for the same product group. This is done to ensure a coherent impact of the two measures: energy labelling should reward the best performing products through mandatory rating, while ecodesign should ban the worst performers.

The process starts with establishing the priorities for Union action in this area. Priority product groups are selected based on their potential for cost-effective reduction of greenhouse gas emissions and following a fully transparent process culminating in working plans that outline the priorities for the development of implementing measures.

A first list of priority product groups was provided in Article 16 of the Ecodesign Framework Directive in force at that time[39]. Subsequently, the (first) Ecodesign Working

[37] 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 product. OJ L 285, 31.10.2009

[38] 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

[39] Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of ecodesign requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council. OJ L 191, 22.7.2005

Plan 2009-2011[40], the (second) Ecodesign Working Plan 2012-2014[41] and the Ecodesign Working Plan 2016-2019 were adopted by the Commission after consultation of the Ecodesign Consultation Forum (composed of MS and stakeholder experts).

The products listed in the three plans (1st working plan: 1-10; 2nd working plan: 11-18; 3rd working plan: 19-25) can be found in Table 46.

Table 46: Overview of products listed in the three working plans

1. *Air-conditioning and ventilation systems (commercial and industrial)*	14. *Enterprises' servers, data storage and ancillary equipment*
2. *Electric and fossil-fuelled heating equipment*	15. *Smart appliances/meters*
3. *Food preparing equipment (including coffee machines)*	16. *Lighting systems*
4. *Industrial and laboratory furnaces and ovens*	17. *Wine storage appliances (c.f. Ecodesign regulation 643/2009)*
5. *Machine tools*	18. *Water-related products*
6. *Network, data processing and data storing equipment*	19. *Building automation control systems*
7. *Refrigerating and freezing (professional)*	20. *Electric kettles*
8. *Sound and imaging equipment (incl. game consoles)*	21. *Hand dryers*
9. *Transformers*	22. *Lifts*
10. *Water-using equipment*	23. *Solar panels and inverters*
11. *Window products*	24. *Refrigerated containers*
12. *Steam boilers (< 50 MW)*	25. *High-pressure cleaners*
13. *Power cables*	

There were also a number of conditional products listed in the 2nd Working Plan that the Commission committed to study closer before deciding to launch full preparatory work (such as thermal insulation, power generating equipment). In the 3rd Working Plan, the Commission committed to assess certain ICT (Information and Communication Technology) products in a separate track to determine the best policy approach for improving their energy efficiency and wider circular economy aspects and a potential inclusion in the Ecodesign working plan.

Once the product group has been selected, a preparatory study is undertaken by an independent consultant, also involving extensive technical discussions with interested stakeholders. The preparatory study follows the MEErP (Methodology for the Ecodesign of Energy-related Products). Subsequently, the Commission's first drafts of ecodesign and energy labelling measures are submitted for discussion to the Ecodesign Consultation Forum consisting of MSs' and other stakeholders' representatives.

After the Ecodesign Consultation Forum, the Commission drafts an impact assessment, which, after the approval of the RSB, is taken forward to the inter-service consultation together with draft implementing measures. In this and subsequent steps, the Parliament's functional mailboxes for delegated/implementing acts are copied on each message from the Commission services. After the inter-service consultation, stakeholders are alerted when the draft measures are published in the WTO notification database.

[40] Communication from the Commission to the Council and the European Parliament - Establishment of the working plan for 2009-2011 under the Ecodesign Directive. COM/2008/0660 final. 21 October 2008**.** (Ecodesign Working Plan 2009-2011)

[41] Commission Staff Working Document Establishment of the Working plan 2012-2014 under the Ecodesign Directive - SWD(2012)434/F1 (Ecodesign Working Plan 2012-2014)

After the WTO notification phase is completed, the two procedures follow different paths. The draft energy labelling delegated act is discussed in a MS Expert Group where opinion(s) are expressed and consensus is sought but no vote is taken. The draft ecodesign measure is submitted for vote to the Regulatory Committee of MS experts.

The European Parliament and Council have the right of scrutiny for which a period of up to four months, if requested, is foreseen. Within this time the co-legislators can block the adoption process by the Commission. Parliament committees sometimes discuss draft objections to measures (e.g. light bulbs and fridges in 2009) or vote to reject a measure (e.g. vacuum cleaners in 2013[42]). On one occasion an objection was even adopted in plenary, blocking the measure for televisions in 2009[43]

Today, 30 Ecodesign Regulations, 17 Energy Labelling Regulations, 3 voluntary agreements and 2 tyre labelling regulations have been implemented. An overview of these measures can be found in Table 47.

Table 47: Overview of applicable measures

Framework legislation	
2017/1369	*Energy labelling Framework Regulation*
2009/125/EC	*Ecodesign Framework Directive*
1222/2009/EC	*European Parliament and Council Regulation on the labelling of tyres with respect to fuel efficiency and other essential parameters*
30 Ecodesign implementing regulations	
1275/2008	*Standby and off mode electric power consumption*
107/2009	*Simple set-top boxes*
244/2009	*Non-directional household lamps (amended by 859/2009/EC)*
245/2009	*Fluorescent lamps without integrated ballast, for high intensity discharge lamps and for ballasts and luminaires (amended by 347/2010/EU)*
278/2009	*External power supplies*
640/2009	*Electric motors (amended by regulation 4/2014/EU)*
641/2009	*Circulators (amended by regulation 622/2012/EU)*
642/2009	*Televisions*
643/2009	*Household refrigerating appliances*
1015/2010	*Household washing machines*
1016/2010	*Household dishwashers*
327/2011	*Fans*
206/2012	*Air conditioning and comfort fans*
547/2012	*Water pumps*
932/2012	*Household tumble driers*
1194/2012	*Directional lamps, light emitting diode (LED) lamps and related equipment*
617/2013	*Computers and servers*
666/2013	*Vacuum cleaners*
801/2013	*Networked standby electric power consumption*

[42] This objection was defeated in ENVI committee by 43 votes against and 4 in favour.

[43] The motivation of the objection was that the EP wanted to delay the discussion of the draft labelling measure so that it would have to become a delegated act under the recast post-Lisbon Energy Labelling Directive in 2010. The measure was indeed subsequently adopted as a delegated act.

813/2013	*Space heaters*
814/2013	*Water heaters*
66/2014	*Domestic cooking appliances (ovens, hobs and range hoods)*
548/2014	*Power transformers*
1253/2014	*Ventilation units*
2015/1095	*Professional refrigeration*
2015/1188	*Solid fuel local space heaters*
2015/1189	*Local space heaters*
2015/1189	*Solid fuel boilers*
2016/2281	*Air heating products, cooling products, high temperature process chillers and fan coil units*
2016/2282	*Use of tolerances in verification procedures*
17 Energy labelling supplementing regulations	
1059/2010	*Household dishwashers*
1060/2010	*Household refrigerating appliances*
1061/2010	*Household washing machines*
1062/2010	*Televisions*
626/2011	*Air conditioners*
392/2012	*Household tumble driers*
874/2012	*Electrical lamps and luminaires*
665/2013	*Vacuum cleaners*
811/2013	*Space heaters*
812/2013	*Water heaters*
65/2014	*Domestic cooking appliances (ovens and range hoods)*
518/2014	*Internet energy labelling*
1254/2014	*Domestic ventilation units*
2015/1094	*Professional refrigeration*
2015/1186	*Local space heaters*
2015/1187	*Solid fuel boilers*
2017/254	*Use of tolerances in verification procedures*
3 Voluntary Agreements (Report to the EP & Council)	
COM (2012) 684	*Complex set top boxes*
COM (2013) 23	*Imaging equipment*
COM(2015) 178	*Game consoles*
2 tyre labelling amending regulations	
228/2011	*Wet grip testing method for C1 tyres*
1235/2011	*Wet grip grading of C2, C3 tyres, measurement of tyres rolling resistance and verification procedure*
Previous legal acts still in force	
92/42/EEC	*Hot-water boilers efficiency Council Directive (Ecodesign)*
96/60/EC	*Household combined washer-driers (Energy labelling)*
2002/40/EC	*Household electric ovens Commission Directive (Energy labelling) – will be repealed on 1/1/2015*

MSAs (Market Surveillance Authorities), designated by the MSs, will verify the conformity of the products with the requirements laid down in the implementing measures and delegated acts. These can be done either on the product itself or by

verifying the technical documentation. The rules on Union market surveillance and control of products entering the Union market are given in Regulation (EC) No 765/2008[44]. Given the principle of free movement of goods, it is imperative that MSs' market surveillance authorities cooperate with each other effectively.

[44] Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93**.** OJ L 218, 13.8.2008, p. 30

ANNEX 6: EXISTING POLICIES, LEGISLATION AND STANDARDS AFFECTING EXTERNAL POWER SUPPLIES

A number of directives and regulations affect household refrigerating appliances.

1. EU ECODESIGN REGULATION

The current Ecodesign Regulation sets minimum requirements on the average energy efficiency and the no-load power consumption for EPSs. The scope includes EPSs used with electrical and electronic household and office equipment. It however excludes EPSs with output power exceeding 250 W, 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.

Ecodesign and energy labelling regulations on components - In addition to ecodesign and energy labelling regulations on the final products, some ecodesign requirements might be applicable on product parts. Parts that are regulated under ecodesign and/or energy labelling are the following:

- External power supplies (Ecodesign Regulation (EC) No 278/2009[45])
- Electric motors (Ecodesign Regulation (EC) No 640/2009[46]);
- Circulators (Ecodesign Regulation (EC) No 641/2009[47]);
- Fans (Ecodesign Regulation (EU) No 327/2011[48]);
- Water pumps (Ecodesign Regulation (EU) No 547/2012[49]);
- Lamps (Ecodesign Regulation (EC) No 244/2009[50] and (EC) No 245/2009[51] and

[45] 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

[46] Commission Regulation (EC) No 640/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors. OJ L 191, 23.7.2009, p. 26.

[47] Commission Regulation (EC) No 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products. OJ L 191, 23.7.2009, p. 35.

[48] Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW. OJ L 90, 6.4.2011, p. 8.

[49] Commission Regulation (EU) No 547/2012 of 25 June 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water pumps. OJ L 165, 26.6.2012, p. 28

[50] Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps. OJ L 76, 24.3.2009, p. 3.

[51] Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council. OJ L 76, 24.3.2009, p. 17.

Energy Labelling Regulation (EU) 874/2012[52]).

The EPSs are in fact covered by the first regulation mentioned above, and are not in the scope of the other regulations.

Horizontal ecodesign regulations - In addition to those requirements, some horizontal aspects of energy using products are regulated. Horizontal measures are:

- Electric power consumption standby and off mode (Ecodesign Regulation (EC) No 1275/2008[53]);
- Networked standby (Ecodesign Regulation (EU) No 801/2013[54]), that amends the Regulation 1275 on standby.

EPSs are not in the scope of these regulations, but their primary load products generally are. The compliance tests performed for the Regulation 1275 have to include the EPSs, in cases where the primary load products have those. A change in the performance of the EPS supplied with the main product will entail re-doing the tests. Furthermore, the Regulation 1275 currently exempts products that are having low-voltage EPSs (as defined in the EPS Regulation). Therefore, there are strong synergies between the EPS and the Standby Regulations.

1. OTHER EU POLICIES

The **Low Voltage Directive** [55] regulates health and safety aspects including e.g. mechanical, chemical, noise related or ergonomic aspects. Apart from this, the directive seeks to ensure that the covered equipment benefits fully from the Single Market. The LVD covers electrical equipment operating with a voltage between 50 and 1000 V for alternating current and between 75 and 1500 V for direct current. Falling under this category, EPSs are covered by the scope of the LVD, but there is no overlapping in terms of the type of requirements.

The **WEEE Directive**[56] set requirements on e.g. recovery and recycling of Waste of Electrical and Electronic Equipment to reduce the negative environmental effects resulting from the generation and management of WEEE and from resource use. The WEEE Directive applies directly to EPSs. Ecodesign implementing measures can complement the implementation of the WEEE Directive by including e.g. measures for material efficiency, thus contributing to waste reduction, instructions for correct

[52] Commission Delegated Regulation (EU) No 874/2012 of 12 July 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of electrical lamps and luminaires. OJ L 258, 26.9.2012, p. 1

[53] 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.

[54] Commission Regulation (EU) No 801/2013 of 22 August 2013 amending Regulation (EC) No 1275/2008 with regard to ecodesign requirements for standby, off mode electric power consumption of electrical and electronic household and office equipment, and amending Regulation (EC) No 642/2009 with regard to ecodesign requirements for televisions. OJ L 225, 23.8.2013, p. 1.

[55] Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits. OJ L 96, 29.3.2014, p. 357 (LVD)

[56] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), OJ L 197, 24.7.2012, p. 38

assembly and disassembly, thus contributing to waste prevention and others.

The **RoHS Directive**[57] restricts the use of six specific hazardous materials and four different phthalates found in electrical and electronic equipment (EEE). EPSs are directly covered by the RoHS Directive. There is no overlapping requirement with a proposed ecodesign regulation.

The **REACH Directive**[58] restricts the use of Substances of Very High Concern (SVHC) to improve protection of human health and the environment. The REACH Directive applies directly to EPSs. There is no overlapping requirement with a proposed ecodesign regulation.

The **EMC Directive** [59] sets requirements for the Electro-Magnetic Compatibility performance of electrical equipment to ensure that electrical devices will function without causing or being affected by interference to or from other devices. The EMC Directive applies directly to EPSs. There is no overlapping requirement with a proposed ecodesign regulation.

The **ETS** sets a cap on the total amount of certain greenhouse gasses that can be emitted by installations. This cap reduces over time, so that the total emissions fall. Within this cap companies receive or buy emission allowances which they can trade with one another as needed. They can also buy a limited amount of international credits. The ETS does not directly apply to EPSs, however, it does apply to electricity production. Hence, if the electricity consumption of EPSs reduces, the electricity companies will have to trade less or the price of carbon will reduce under the cap system. Consequently, the price of electricity will slightly drop.

2. EU CODE OF CONDUCT ON ENERGY EFFICIENCY OF EXTERNAL POWER SUPPLIES - VERSION 5

The EU Code of Conduct is a voluntary scheme, which has been 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 most recent version is Version 5[60], published on 29 October 2013 and taking effect on 1 January 2014. The Tier 2 requirements took effect on 1 January 2016 and they are more stringent than the current most stringent level of the International Efficiency Marking Protocol for External Power Supplies Version 3.0 (see point 6 below). Extracts of the performance requirements are presented in Figure 31.

[57] Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment**.** OJ L 174, 1.7.2011, p. 88. (RoHS Directive)

[58] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. OJ L 396, 30.12.2006, p. 1–849 (REACH Regulation)

[59] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility. OJ L 96, 29.3.2014, p. 79 (EMC Directive)

[60] https://e3p.jrc.ec.europa.eu/sites/default/files/documents/publications/code_of_conduct_for_eps_version_5_-_final.pdf

Signatories of the CoC commit themselves to design and/or manufacture EPSs that comply with the requirements (see Figure 32). The commitment applies to the models they place on the market after the date they have adhered to the CoC.

Figure 31 Performance requirements in the EU Code of Conduct on Energy Efficiency of External Power Supplies - Version 5.

Table 1.1: No-load Power Consumption

Rated Output Power (P_{no})	No-load power consumption	
	Tier 1	Tier 2
≥ 0.3 W and < 49 W	0.150 W	0.075 W
≥ 49 W and < 250 W	0.250 W	0.150 W
Mobile handheld battery driven and < 8 W	0.075 W	0.075 W

Table 2.1: Energy-Efficiency Criteria for Active Mode (excluding Low Voltage external power supplies)

Rated Output Power (P_{no})	Minimum Four Point Average Efficiency in Active Mode		Minimum Efficiency in Active Mode at 10 % load of full rated output current	
	Tier 1	Tier 2	Tier 1	Tier 2
0.3 ≤ W ≤ 1	≥ 0.500 * P_{no} + 0.146	≥ 0.500 * P_{no} + 0.169	≥ 0.500 * P_{no} + 0.046	≥ 0.500 * P_{no} + 0.060
1 < W ≤ 49	≥ 0.0626*ln(P_{no}) + 0.646	≥ 0.071*ln(P_{no}) – 0.00115 * P_{no} + 0.670	≥ 0.0626*ln(P_{no}) + 0.546	≥ 0.071*ln(P_{no}) – 0.00115 * P_{no} + 0.570
49 < W ≤ 250	≥ 0.890	≥ 0.890	≥ 0.790	≥ 0.790

"ln" refers to the natural logarithm. Efficiencies to be expressed in decimal form: an efficiency of 0.88 in decimal form corresponds to the more familiar value of 88% when expressed as a percentage.

Table 2.2: Energy-Efficiency Criteria for Active Mode for Low Voltage external power supplies

Rated Output Power (P_{no})	Minimum Four Point Average Efficiency in Active Mode		Minimum Efficiency in Active Mode at 10 % load of full rated output current	
	Tier 1	Tier 2	Tier 1	Tier 2
0.3 ≤ W ≤ 1	≥ 0.500 * P_{no} + 0.086	≥ 0.517 * P_{no} + 0.091	≥ 0.500 * P_{no}	≥ 0.517 * P_{no}
1 < W ≤ 49	≥ 0.0755*ln(P_{no}) + 0.586	≥ 0.0834*ln(P_{no}) – 0.0011 * P_{no} + 0.609	≥ 0.072*ln(P_{no}) + 0.500	≥ 0.0834*ln(P_{no}) – 0.00127 * P_{no} + 0.518
49 < W ≤ 250	≥ 0.880	≥ 0.880	≥ 0.780	≥ 0.780

"ln" refers to the natural logarithm. Efficiencies to be expressed in decimal form: an efficiency of 0.88 in decimal form corresponds to the more familiar value of 88% when expressed as a percentage.

3. POLICIES AT EU MS LEVEL

There are no other measures and policies at MS level for EPSs.

4. MEASUREMENT METHODS

The harmonised standard for measuring EPS' performance was communicated by the European Commission[61]. The standard developed by CENELEC is EN 50563:2011 and it was subsequently amended by EN 50563:2011/A1:2013. The measurement standard describes the determination of the no-load power and the average active efficiency of active modes of external AC-DC and AC-AC power supplies within the scope of the current regulation.

Extending the scope of the current Regulation for including multiple voltage output EPSs would require specifying a measurement method for these, as the current method is only

[61] https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/ecodesign/powersupplies_en#This%20is%20the%20first%20publication

for single voltage output EPSs. Such a method has been developed by the US DOE in relation to their rulemaking, which include in scope the multiple voltage output EPSs[62]. This method could be used as a transitional method until the European standard is updated.

The new requirement on measuring the active efficiency at 10% load will also need to be introduced in an updated European measurement standard. However, the existing standard could be used as a transitional method supplemented with a comment about the 10 % load measurement, as the measurement methodology included there could be equally used for testing the efficiency at 10% load.

An update of the European standard would need to describe the method for testing the 'agile' chargers (i.e. the ones that are able to scale their output voltage depending on the needs of the primary load product). However, here too the DOE measurement method could be used on a transitional basis until the new European standard will be published.

5. NON-EU POLICIES

International Efficiency Marking Protocol

The International Efficiency Marking Protocol for External Power Supplies Version 3.0[63] developed by the U.S. Environmental Protection Agency and now maintained by the U.S. Department of Energy (DOE) provides a system for seting specific minimum energy performance of EPSs. It sets active efficiency and no-load requirements for different levels, which are marked by Roman numerals: I, II, III, IV, V, VI etc. The higher the numeral is the higher energy efficiency is required. Level VI is the most stringent level in the most recent version of the protocol (i.e. Version 3.0 of September 2013). The marking protocol demonstrates the performance of the EPS when tested to the internationally supported test methods.

This marking is not mandatory and does not serve as a consumer information label, but rather demonstrates the performance of the EPS when tested to the internationally supported test methods. The EPS manufacturers indicate the level of performance on the EPS nameplate (preferable), product packaging or accompanying documentation.

In Figure 32, a table from the marking protocol with the most recent version of the performance requirements is provided.

[62] https://www.regulations.gov/document?D=EERE-2014-BT-TP-0043-0001
[63] https://www.regulations.gov/document?D=EERE-2008-BT-STD-0005-0218

Figure 32 Performance requirements in the International Efficiency Marking Protocol for External Power Supplies Version 3.0, September 2013[64].

Mark	Performance Requirements				
	Nameplate Output Power (P_{no})[2]	No-Load Mode Power[3]	Nameplate Output Power (P_{no})	Average Efficiency in Active Mode[4]	Power Factor
I	Used if none of the other criteria are met.				
II	0 to ≤ 10 W	≤ 0.75	0 to < 1 W	≥ 0.39 * P_{no}	Not Applicable
	> 10 to 250 W	≤ 1.0	1 to < 49 W	≥ 0.107 * ln(P_{no}) + 0.39	
			> 49 W	≥ 0.82	
III	0 to < 10 W	≤ 0.5	0 to 1 W	≥ 0.49 * P_{no}	Not Applicable
	10 to 250 W	≤ 0.75	> 1 to 49 W	≥ 0.09 * ln(P_{no}) + 0.49	
			> 49 to 250 W	≥ 0.84	
IV	0 to 250 W	≤ 0.5	0 to < 1 W	≥ 0.5 * P_{no}	Not Applicable
			1 to 51 W	≥ 0.09 * ln(P_{no}) + 0.5	
			> 51 to 250 W	≥ 0.85	
V	0 to < 50 W	AC-DC: ≤ 0.3 AC-AC: ≤ 0.5	0 to ≤ 1 W	Basic Voltage: ≥ 0.480 * P_{no} + 0.140 Low Voltage[5]: ≥ 0.497 * P_{no} + 0.067	EPSs with ≥ 100 watts **input** power must have a true power factor ≥ 0.9 at 100% of rated load when tested at 115 volts/60Hz.
			> 1 to ≤ 49 W	Basic Voltage: ≥ 0.0626 * ln(P_{no}) + 0.622 Low Voltage: ≥ 0.0750 * ln(P_{no}) + 0.561	
	≥ 50 to ≤ 250 W	≤ 0.5	> 49 to 250 W	Basic Voltage: ≥ 0.870 Low Voltage: ≥ 0.860	
VI	Single-Voltage				Not Applicable
	0 to ≤ 49 W	AC-DC: ≤ 0.100 AC-AC: ≤ 0.210	0 to ≤ 1 W	Basic Voltage: ≥ 0.5 * P_{no} + 0.16 Low Voltage: ≥ 0.517 * P_{no} + 0.087	
			> 1 to ≤ 49 W	Basic Voltage: ≥ 0.071 * ln(P_{no}) − 0.0014 * P_{no} + 0.67 Low Voltage: ≥ 0.0834 * ln(P_{no}) − 0.0014 * P_{no} + 0.609	
	> 49 to ≤ 250 W	≤ 0.210	> 49 to ≤ 250 W	Basic Voltage: ≥ 0.880 Low Voltage: ≥ 0.870	
	> 250 W	≤ 0.500	> 250 W	≥ 0.875	
	Multiple-Voltage				
	Any	≤ 0.300	0 to ≤ 1 W	≥ 0.497 * P_{no} + 0.067	
			> 1 to ≤ 49 W	≥ 0.075 * ln(P_{no}) + 0.561	
			> 49 W	≥ 0.860	
VII	Reserved for future use.				

[2] P_{no} is the Nameplate Output Power of the unit under test.
[3] In Australia and New Zealand, AC-AC external power supplies are not required to meet the no-load mode power requirements.
[4] "ln" refers to the natural logarithm.
[5] A low-voltage model is an EPS with nameplate output voltage of less than 6 volts and nameplate output current greater than or equal to 550 milliamperes. A basic-voltage model is an EPS that is not a low-voltage model.

US Department of Energy rulemaking on external power supplies

The US Department of Energy rulemaking on external power supplies[65] entered into force in the United States in 2016. The energy performance requirements correspond to the most stringent level of the International Efficiency Marking Protocol, level VI.

[64] http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218
[65] https://www.ecfr.gov/cgi-bin/text-idx?SID=c9dbafe3c54ecf1ee3bbb502608fca50&mc=true&node=se10.3.430_132&rgn=div8

USB Power Delivery specification

This technical specification does not refer to EPSs directly. Nonetheless, it influences the technological development of EPSs, as many of them use USB connectors for supplying power to the primary load products.

The USB Power Delivery (PD) specification from July 2012[66] extends the power and voltage specifications for power delivered over USB to up to 100 W at the voltage levels of 5 V, 12 V and 20 V. This is an important step forward, as not only allows different voltage levels (the traditional USB delivers power only at 5 V), but also greatly extends the power range that could be serviced via an USB connector. The USB connectors compatible with this specification are largely the new generation known as "USB Type-C". See illustration in Figure 33.

Figure 33 USB Type-C connector (left) and a USB micro-B (right), which Type-C typically substitutes

Source: Online research, 2018

The deployment of USB Type C compatible with the new PD specification allows two main developments:

- Creates compatibility among primary load devices that have USB Type-C connectors, so a wide range of products (from smartphones and tablets to electronic displays and high-end notebooks), using different voltage and power levels, could be charged from the same EPS, which then can be used as a common EPS for several appliances with a wide range of power and voltage levels;

- Allows a stronger deployment of multiple voltage output EPSs that are being able to deliver power and/or charge several devices in the same time. An additional driver here was the consumer demand to have a single EPS capable of charging e.g. a laptop and a phone in the same time.

This creates the conditions, on a longer term, to increase the usage of an EPS and to reduce the need for EPSs to be sold bundled with products.

[66] http://www.usb.org/developers/powerdelivery/

ANNEX 7: EVALUATION OF ECODESIGN REGULATION (EC) NO 278/2009 REQUIREMENTS FOR EXTERNAL POWER SUPPLIES

In the context of the Better Regulation policy[67]*, the Commission is committed to evaluate all EU activities intended to have an impact on society or the economy in a proportionate way.*

A joint evaluation of the Ecodesign and Energy Labelling Directives[68] was carried out by the Commission in 2015. Main findings and conclusions were presented in a Report to the European Parliament and the Council[69]. Among others it was pointed out that the ecodesign and energy labelling measures in place are effective and bring tangible and substantial energy and cost savings. The implementation of the two Directives is estimated to save 175 Mtoe primary energy per year by 2020, which corresponds to 19% savings with respect to business-as-usual energy use for those products. These policies will deliver almost half of the 20% energy efficiency target by 2020. Dependency on imports of energy would be reduced by 23% and 37% for natural gas and coal, respectively. In total, the ecodesign and energy labelling measures in place to date are estimated to save end-users of products 100 billion euro per year in 2020 through lower utility bills (translated into roughly 500 euros yearly savings in each household).

This annex presents the relevant findings of the evaluation of the current Ecodesign Regulation for EPSs. It focuses on relevance, effectiveness and efficiency. The assessment builds on the information collected during the review study, the subsequent additional assessment, and the impact assessment. The remaining two evaluation criteria (coherence and EU added value) are examining the same aspects in a similar way for all ecodesign implementing measures, therefore they are addressed in a coherent and aggregated manner at the level of the ecodesign framework directive (see the evaluation exercise of 2015 described above).

1. RELEVANCE

The evaluation of the framework Regulations has shown that the objectives (increasing energy efficiency and the level of protection of the environment; providing consumers with information that allows them to choose more efficient products; and ensuring the free movement of energy-related products in the European Union) remain very much relevant.

This section describes the relevance of the current regulation.

The review study[70] and this Impact Assessment have shown that the regulation is effectively supporting a transition towards more energy-efficient EPS, and that it is delivering important energy savings. The results also indicate that higher savings could be achieved by revising the requirements, extending the scope, and correcting imperfections in the regulation (see sections 5 and 6 of this report). This forms the basis of the proposal for an updated regulation. These changes were made not only possible, but also necessary by technical progress and international developments, e.g.:

[67] https://ec.europa.eu/info/law/law-making-process/better-regulation-why-and-how_en

[68] SWD(2015) 143 final, Commission Staff Working Document - Evaluation of the Energy Labelling and Ecodesign Directives

[69] COM(2015) 345 final, Report from the Commission to the European Parliament and the Council - Review of Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication of labelling and standard product information of the consumption of energy and other resources by energy-related products

[70] European Commission - Directorate-General for Energy. Framework Contract ENER/C3/2012-418-Lot 2. Review Study on Commission Regulation (EC) No. 278/2009 External Power Supplies. September 2013. Final Report.

development of EPS technology, tightened efficiency requirements in the US, availability of technical test methods for multiple voltage output EPS, and the increasing relevance of having readily available information (for instance on web sites) regarding EPS efficiency.

Moreover, the EPS Ecodesign Regulation only regulates the most significant environmental impacts to ensure an optimal efficiency. The environmental life cycle analysis during the review showed that the electricity consumption during use phase, and the related carbon, acidifying and other emissions at the level of power plants, is by far the most important environmental impact. Proportionality thus indicates that the setting of minimum energy efficiency requirements should remain the key focus for this product group.

As indicated in section 7 of this report, the preferred Ecodesign measure PO2 Global alignment is estimated to achieve 4.27 TWh net energy savings per year in 2030. This is the best estimate of the lost savings resulting from outdated regulation requirements and loopholes mentioned in this report.

2. EFFECTIVENESS

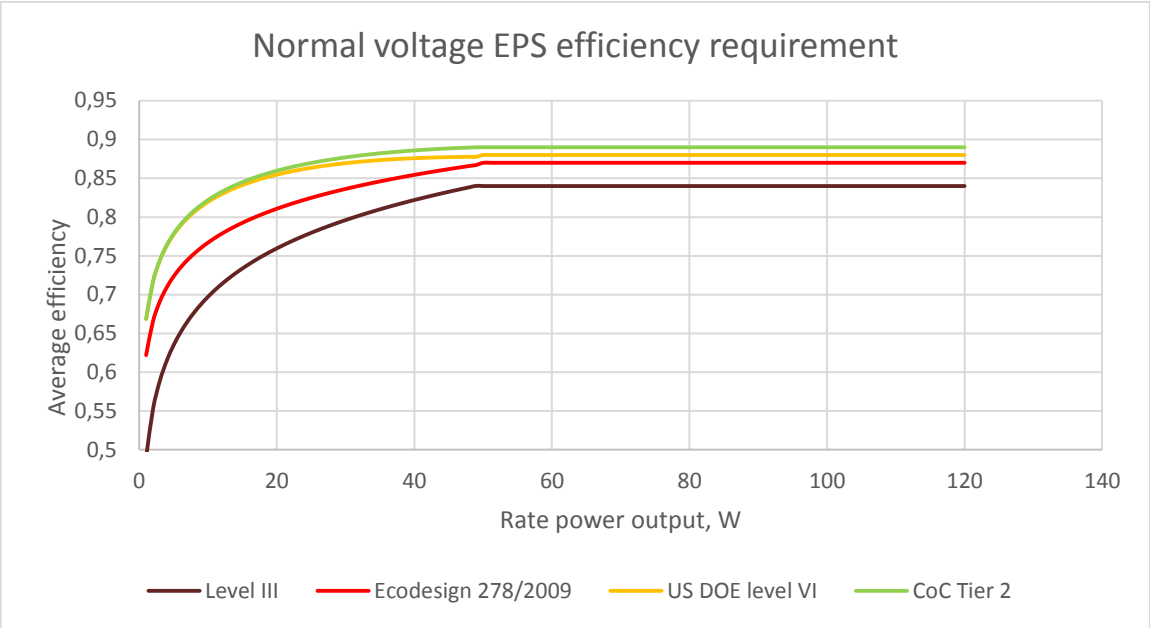
This section focuses on the key objectives of the current Regulations, i.e. ensuring a transition towards more energy-efficient EPSs, and achieving significant energy savings. Other impacts are quantified, but are not analysed in depth.

It shows that energy savings of around 10 TWh per year by 2020 are being achieved.

The average efficiency level in 2007 – 2008, before the regulation was adopted, was equivalent to Level III[71] of the International Efficiency Marking Protocol. Level III efficiency is approx. 0.635 for rated power output of 49 W and below, or 0.87 for rated power output of 49 W and above. See Figure 34 below to see how the average efficiency level (Level III) compared with the efficiency requirement from the current Ecodesign Requirement and the proposed requirements levels for preferred option.

[71] CUI, January 2018, Efficiency Standards for External Power Supplies

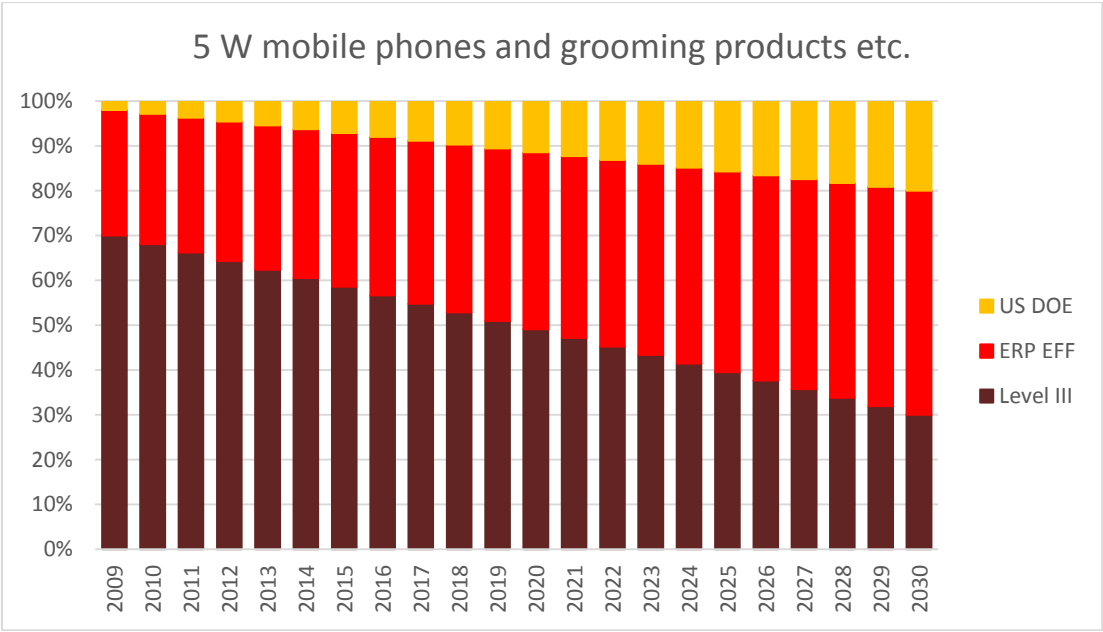
Figure 34 Normal voltage EPS efficiency level and requirements



Source: Viegand Maagøe based on efficiency metrics

In the 0 BAU scenario (before regulation scenario, considered in the first preparatory study undertaken before proposing the Regulation), the uptake of more efficient EPS (in each of the categories of efficiency - ERP EFF, US DOE) was assumed to increase by one percentage point per annum from 2009 to 2030 in the absence of policy. This was based on a comparison of two Natural Resources Canada (NRCAN) data sets from 2013 and 2015, which showed a natural improvement of one percent per annum in CoC Tier 2 efficiency levels. See Figure 35 for the efficiency distribution for 5 W EPS for mobile phones and grooming products what was projected from 2009 to 2030 in case where an Ecodesign Regulation was never adopted. Similar distribution and trend are used for the other EPS categories as there is uncertain data to show the distribution for these categories would develop differently.

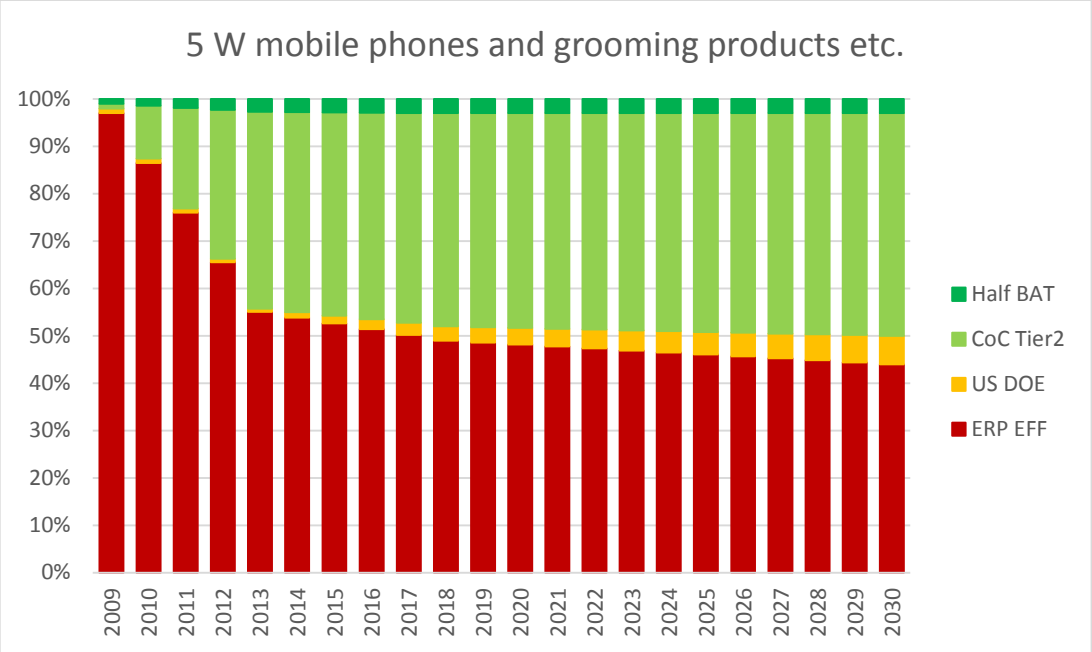
Figure 35 0 BAU before Ecodesign Regulation scenario - efficiency distribution 2009 – 2030 for base case a, 5W low voltage (e.g. mobile phone and rechargeable grooming products) and other base cases



Source: Viegand Maagøe based on consultants' expert evaluation

As a result of the Ecodesign Regulation, the majority of EPSs are now shifted to ERP EFF level (i.e. the level prescribed in the Regulation). An example is presented in Figure 36, which shows that some 95% of the 5 W EPSs for mobile phones and grooming products are now at the level required by the Regulation, while the rest have higher efficiencies. Thus, approximately 70% of the inefficient products were removed from the EU market when the Regulation came into force. See in Annex 4, BAU scenario for efficiency distribution of other product groups as an effect of the Ecodesign Regulation.

Figure 36 1 BAU with Ecodesign Regulation - efficiency distribution 2009 – 2030 for base case a, 5W low voltage (e.g. mobile phone and rechargeable grooming products)

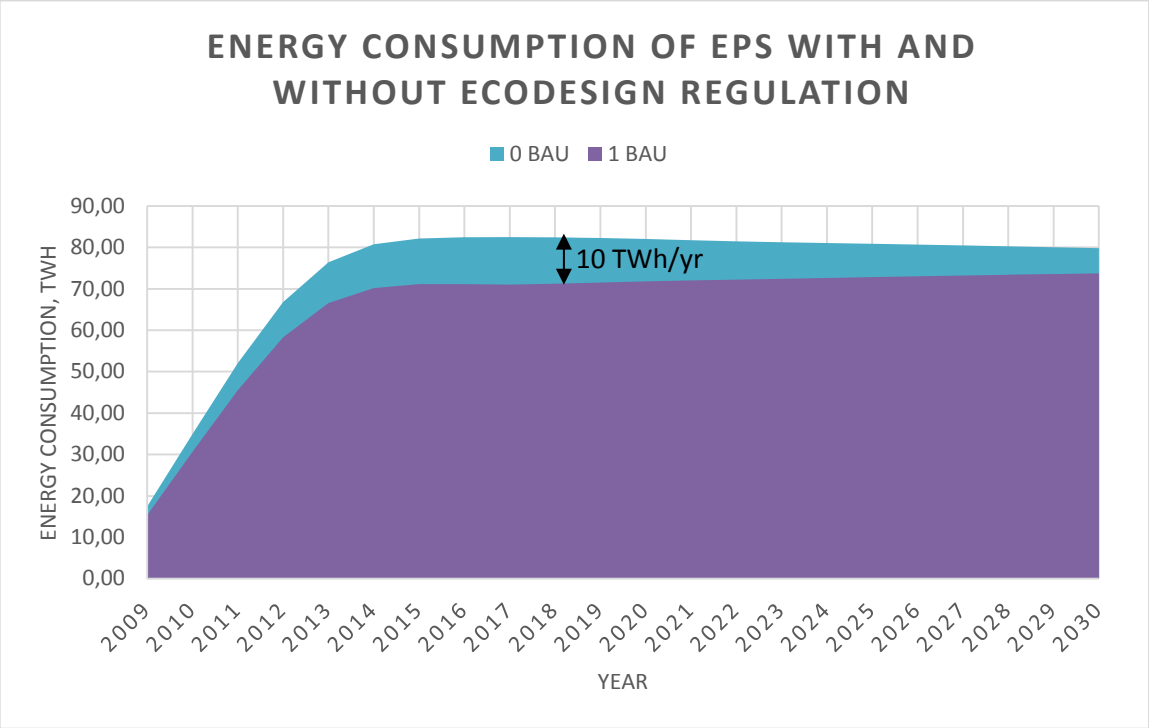


Source: Based on calculations by Viegand Maagøe (see Annex 4)

The effectiveness of the Ecodesign Regulation can be demonstrated by the amount of the energy savings it yields. The Impact Assessment carried out in 2009[72] estimated that the annual energy saving would be in the area of 9 TWh per year by 2020. The current impact assessment, based on the stock model with more recent sales and market data, estimates the annual savings in 2020 to be approx. 10 TWh per year. The main reasons for the difference in savings are the recent higher stock and sales, updated hypotheses and more sophisticated modelling in this impact assessment as compared with the earlier impact assessment. See Figure 37 for the energy consumption of products using EPS "without Ecodesign Regulation" scenario (0 BAU) and the baseline scenario with current Ecodesign Regulation (1 BAU).

[72] Impact Assessment for external power supplies {C(2009) 2452 final} https://ec.europa.eu/energy/sites/ener/files/documents/2009_fia.pdf

Figure 37 Energy consumption of products using EPS in a "without Ecodesign Regulation" scenario (0 BAU) and the current baseline scenario with Ecodesign Regulation (1 BAU)



Source: Based on calculations by Viegand Maagøe

A more comprehensive view on the other impacts of the Ecodesign Regulation (i.e. impacts on on GHG emissions, EPS purchase costs, the energy bills and user net expenditure) is presented in Table 48.

Table 48 Overview of the EPS Ecodesign Regulation (1 BAU) expected impacts versus a scenario without Regulation (0 BAU) at different points in time

Year		2015		2020		2030	
Impact	**unit**	**0 BAU**	**Difference 1 BAU – 0 BAU**	**0 BAU**	**Difference 1 BAU – 0 BAU**	**0 BAU**	**Difference 1 BAU – 0 BAU**
Electricity use	TWh/yr	82.2	-11.0	82.1	-10.2	79.8	-6.1
GHG emissions	MtCO2eq	32.5	-4.3	31.2	-3.9	27.1	-2.1
EPS purchase costs	million €	4,259	218	4,295	168	4,443	174
Costs of electricity consumed	million €	15,253	-2,044	16,352	-2,041	16,581	-1,263
User net Expenditure	million €	19,511	-1,825	20,646	-1,873	21,025	-1,089
Industry revenue	million €	3,164	162	3,191	125	3,301	129
Employment	jobs	22,585	1,159	11,130	435	11,515	450

The analytical method applied in this evaluation of current regulation is the same as described in Annex 4 for the policy options 1 BAU, PO2, PO3 and PO4, considered for this impact assessment. 2015 fixed prices were used. The difference in prices between ERP EFF and Level III was assumed to be the same as the difference between ERP EFF and US DOE, as the efficiency point differences were also similar.

3. EFFICIENCY

This section describes how efficient has the regulation been in delivering the above-mentioned benefits.

The energy efficiency requirements came along with increased industry revenue and reduced net expenditure for the end-user, as can be seen in Table 48 above. The user acquisition costs were projected to rise by 0.2 billion € for the year 2015, but are more than compensated by the reduction in the costs of electricity used (2 billion € reduction). It should be noted that this is an aggregate figure at the level of the overall EPS stock. However, it is clear that a typical household with several EPSs would have individual savings.

With the introduction of an energy efficiency requirement, the industry also obtained higher turnover due to higher investment in research and development and better components etc. The turnover of the industry was projected to increase by 0.16 billion € in 2015 which led to an increase of 1160 jobs.

The 2009 Impact Assessment assumed no transposition costs for national administrations, as it is a regulation that is directly applicable. This is still a valid assumption. There have been more difficulties than expected for market surveillance by Member States e.g. due to the lack of information on publicly accessible websites, but the proposed option for a revised regulation intends to address this issue. However, there is no evidence that these difficulties led to significant extra surveillance costs, as the consequence of these difficulties was an imperfect surveillance, where fewer products were inspected, rather than a more expensive one. It may however have resulted in lost savings due to non-compliant products.

As a conclusion, there is no doubt that the chosen policy instrument has been efficient in delivering the desired results.

ANNEX 8: SENSITIVITY ANALYSES

1. SENSITIVITY ANALYSIS FOR HIGHER COMPLIANCE COSTS FOR TIER 2 IN PO3

The cost of implementing the requirements of Tier 2 in PO3 was modelled proportional to the percentage of efficiency increase from Tier 1 (US DOE, equivalent to PO2 requirements) to Tier 2 level (CoC T2). Since the efficiency increase is small, the costs are estimated to be low as well. However, industry stakeholders have indicated that reaching Tier 2 level would not be cost-effective and the costs are disproportionate to the savings. Thus, this sensitivity analysis examines the impact of having Tier 2 improvement costs as the same level as the improvement costs needed for achieving Tier 1 when starting from the current Ecodesign Regulation level. In other words, the cost for reaching Tier 2 is now considered approximately equal with the one needed for reaching Tier 1, even if the efficiency gains are much lower, for taking into account the redesign needed for departing from solutions which are already sold in large numbers on other markets (such as US). Table 49 shows that if the cost for reaching Tier 2 is higher than assumed, PO3 becomes less attractive than PO2 as the consumer expenditure saving is lower.

Table 49 Comparison of impacts of different policy options in 2030 for sensitivity analysis of higher Tier 2 compliance costs

Changes in 2030 compared to BAU	Energy savings		GHG Reduction	Consumer cost savings			Extra turnover		Extra employment	
	Electricity	Primary	CO2eq	Overall	Purchase	Energy	Manufacture	Wholesale	Manufacture	Wholesale
Policy options	TWh	PJ	MtCO2eq	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	785	-100	885	58	17	227	33
3 Ambitious EU measure	4.57	41.16	1.55	731	-219	950	126	37	494	73
4 Very ambitious EU measure	6.25	56.24	2.12	598	-699	1298	402	118	1,581	232

Source: Based on calculations by Viegand Maagøe

2. SENSITIVITY ANALYSIS OF MORE FAVOURABLE EVOLUTION ON THE MARKET LEADING TO MORE EFFICIENT EPSS

The efficient distribution for EPS with output power in the range of 10 – 20 W have been assumed to follow the distribution of 12 – 15 W network equipment and set-top boxes due to the proximity of wattage in output power and that it is not possible to differentiate the different types of EPS in the dataset. These EPS in the range of 10 – 20 W are typically used for smartphones, tablets, other portable devices, as well as loudspeakers. These primary load products could have much higher efficiency than network equipment and set-top boxes due to the fast developments in these technologies. This sensitivity analysis investigated the impacts of underestimating the efficiency of these EPSs and whether higher efficiency in the BAU scenario would undermine the saving potential. This analysis assumes these EPS follow the efficiency distribution of mobile phones rather than network equipment. The impacts in 2030 shows that PO2 is impacted the least and retains savings of 4.25 TWh/year (0.1 TWh/year less than original saving). PO3

and PO4 obtain savings reduced by 0.5 TWh/year, i.e. 4.52 TWh/year and 6.2 TWh/year respectively.

Table 50 Comparison of impacts of different policy options in 2030 for sensitivity analysis of more efficient EPSs being brought on the market

Changes in 2030 compared to BAU	Energy savings		GHG Reduction	Consumer cost savings			Extra turnover		Extra employment	
	Electricity	Primary	CO2eq	Overall	Purchase	Energy	Manufacture	Wholesale	Manufacture	Wholesale
Policy options	TWh	PJ	MtCO2eq	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	4.25	38.24	1.44	784	-99	883	57	17	223	33
3 Ambitious EU measure	4.52	40.70	1.54	825	-115	939	66	19	259	38
4 Very ambitious EU measure	6.20	55.78	2.11	910	-377	1287	216	64	852	125

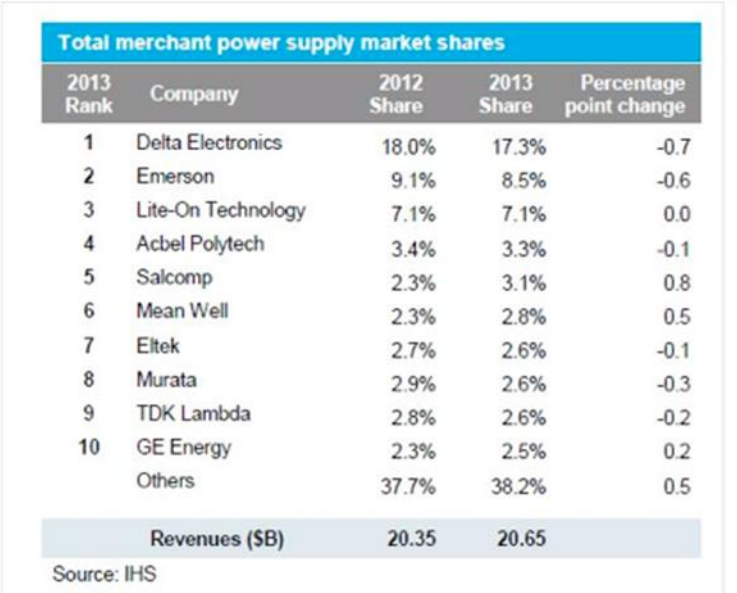
Source: Based on calculations by Viegand Maagøe

ANNEX 9: OVERVIEW ON EPS MANUFACTURERS

EPS manufacturers

The top ten power supply manufacturers world-wide are listed below (note that this list includes also manufacturers of EPS that are out of scope of the regulation such as those greater than 250 W power output, as well as manufacturers of internal power supplies). Two manufacturers, Salcomp and Eltek, have their headquarters in Europe but the majority of EPS manufacturing is done in Asia (an exception being the company FRIWO who also have smaller manufacturing facilities in Germany and Poland next to their main facilities in China and Vietnam).

Figure 38 Total merchant power supply market shares according to IHS



Total merchant power supply market shares

2013 Rank	Company	2012 Share	2013 Share	Percentage point change
1	Delta Electronics	18.0%	17.3%	-0.7
2	Emerson	9.1%	8.5%	-0.6
3	Lite-On Technology	7.1%	7.1%	0.0
4	Acbel Polytech	3.4%	3.3%	-0.1
5	Salcomp	2.3%	3.1%	0.8
6	Mean Well	2.3%	2.8%	0.5
7	Eltek	2.7%	2.6%	-0.1
8	Murata	2.9%	2.6%	-0.3
9	TDK Lambda	2.8%	2.6%	-0.2
10	GE Energy	2.3%	2.5%	0.2
	Others	37.7%	38.2%	0.5
	Revenues ($B)	20.35	20.65	

Source: IHS

In 2014, these top ten producers had a share of 52% (or 16.4 billion €) out of the total industry revenue. The share of SMEs on the EPS market is estimated to be marginal i.e. less than 1 %, mainly due to the fact that the EPS market is a high-volume market, where products are mass manufactured for a broad range of end-use products, making it very difficult for an SME to compete.

A list of all EPS manufacturers that place products within the scope of the Ecodesign Regulation on the EU market is presented in Table 51 below.

Table 51 EPS manufacturers

1	4D Systems Pty Ltd
2	Acbel Polytech
3	Artesyn Embedded Technologies
4	Asian Power Devices
5	B+B SmartWorx
6	CUI
7	Curtis Industries
8	Delta Electronics
9	Eltek
10	Emerson
11	Fairway Electronics
12	FRIWO
13	HARTING
14	Inc. / Avantech
15	Inventus Power

16	Lite-On
17	Mean Well
18	of Condor/Ault Brands
19	Phihong USA
20	PI Electronics
21	Salcomp
22	Sanken
23	Seed Technology Co. Ltd
24	SL Power Electronics Manufacture
25	SparkFun Electronics
26	TDK Lambda
27	Ten Pao
28	Triad Magnetics
29	Volgen America/Kaga Electronics USA
30	XP Power

Source: Desk research and verified by industry stakeholders[73]

[73] Consultation with Digital Europe, FRIWO, February – March 2018

ANNEX 10: GLOSSARY

Term or acronym	*Definition or meaning*
AC	Alternate Current, the type of current normally supplied by a wall power socket
ANEC	European Association for the Co-ordination of Consumer Representation in Standardisation (NGO)
APPLiA	Home Appliances Europe, trade association representing the home appliance industry in Europe (formerly known as CECED)
BAT	Best Available Technology
BAU	Business-as-usual (describing a scenario without any further policy intervention)
BEUC	Bureau Européen des Unions de Consommateurs (European Consumers Organisation, NGO)
CE	"Conformité Européene" ("European Conformity")
CLASP	Collaborative Labeling and Appliance Standards Program (NGO)
CoC	EU Code of Conduct for EPS, currently at Version 5, published in October 2013
Consultation Forum	Expert group formally established under the Ecodesign Directive. It ensures that a balanced participation of all interested parties - MSs, trade associations (such as industry), NGOs (e.g. environmental and consumer protection), etc. – take part in the development of Ecodesign regulations and energy labels
DC	Direct Current, the type of current supplied by e.g. batteries and used by portable devices (such as smartphones and tablets)
DIGITALEUROPE	Trade association representing the digital technology industry in Europe (e.g. IT, telecom and consumer electronics)
Direct operation EPS	An EPS type that can power a primary load product regardless if the latter has a built-in rechargeable battery or if it doesn't.
ECOS	European Environmental Citizens' Organisation for Standardisation (NGO)
EEB	European Environmental Bureau (NGO)
ENVI	Environment, Public Health and Food Safety Committee of the European Parliament
EPS	External Power Supplies
ETS	Emissions Trading Scheme
EU	European Union
GHG	Greenhouse gas
IEA	International Energy Agency, autonomous intergovernmental organization focusing on energy matters
IEC	International Electrotechnical Commission, global standardisation organisation
IoT	Internet of Things, the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data
Indirect operation EPS	An EPS type that cannot power a primary load product without the assistance of the product's built-in rechargeable battery
kg	Kilogram (unit of weight)
kWh	kilowatt hour, 10^3 Watt hour (unit of energy)
LCC	Life Cycle Cost, a means of comparing options and their

	associated costs (including purchase and energy costs) over the whole lifetime of a product
LLCC	Least Life Cycle Cost, indicator used to determine the energy efficiency requirements that lead to achieving the minimal cost for a product over its entire lifetime
Loading level	The amount of power supplied by an EPS at a certain moment, expressed as a percentage of its nameplate power
Low voltage external power supplies (LV EPS)	A type of EPS with a nameplate output voltage of less than 6 volts and a nameplate output current greater than or equal to 550 milliamperes
MEErP	Methodology for the Ecodesign of Energy-related Products[74]
MEEuP	Methodology for the Ecdesign of Energy-using Products (now obsolete, replaced by MEErP)
MEPS	Minimum Energy Efficiency Performance Standards
MS	Member State
MSA	Market Surveillance Authority, public authority tasked by a MS with the surveillance of its market for goods, and which checks, among others, the compliance of products with Ecodesign and energy labelling regulations
MSP	Manufacturer Selling Price, the price charged by manufacturers when selling goods to wholesalers
$MtCO_2$ eq.	Megatonnes of carbon dioxide equivalents, 10^6 kg of GHG gas having equivalent impact to CO_2 (unit of GHG emissions)
Mtoe	Million Tonnes of Oil Equivalent, the amount of energy equivalent to the one released by burning one tonne of crude oil (unit of energy)
Multiple voltage output external power supplies	EPS designed for converting mains voltage to more than one DC or AC output voltage at a time
Nameplate output (power, voltage, current)	The maximum rated output (power, voltage, current) of an EPS, as specified by its manufacturer
Networked device	An electrical or electronic product that can connect to an ITC network via a wired connection or wireless
NGO	Non-Governmental Organisation
NRDC	Natural Resources Defense Council, NGO based in the US
Primary load product	An electrical or electronic product that is charged or supplied with electricity by an EPS
R&D	Research and Development
REFIT	Regulatory Fitness and Performance
SME	Small and Medium-sized Enterprises
SVHC	Substances of Very High Concern
Tier	Term used to describe a set of ecodesign requirements. There is usually a sequence of enforcing them over time, with e.g. Tier 2 coming into force after, and being more ambitious than, Tier 1
TWh	Terawatt hour, 10^{12} Watt hour (unit of energy)
USB	Universal Serial Bus, an industry standard that was developed to define cables, connectors and protocols for connection, communication, and power supply for electrical and electronic products. An USB connector is able to handle both data and power supply.
USB PD	USB Power Delivery is a specification for delivering variable

[74] Material-efficiency Ecodesign Report and Module to the Methodology for the Ecodesign of Energy-related Products (MEErP) PART 1: MATERIAL EFFICIENCY FOR ECODESIGN - Final report to the European Commission - DG Enterprise and Industry 5 December 2013.

	power outputs (up to 100 W) and variable voltage levels (5-20 V) over USB
US DOE	United States Department of Energy
WEEE	Waste Electrical and Electronic Equipment
Working Document	Term used in the ecodesign working process for a draft version of a regulation submitted to the attention of the Consultation Forum