Preparatory study for the Ecodesign and Energy Labelling Working Plan 2020-2024

Assistance to the European Commission

TASK 2 IDENTIFICATION OF PRODUCT GROUPS AND HORIZONTAL MEASURES

FINAL

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LEGAL NOTICE

ACRONYMS

ABS	Acrylonitrile butadiene styrene	EPD	Environmental Product Declaration
AC	Alternate current/Direct current	EPR	Extended Producer Responsibility
AI	Artificial Intelligence	EPS	External Power Supply
ASTM	American Society for Testing and Materials	EPS	Expanded Polystyrene (foam)
BAT	Best Available Technology	EPTA	(Greek consultant)
BFR	Brominated Flame Retardants	ErP	Energy related product
BLDC	Brushless Direct Current	ETFE	Ethylene Tetrafluoroethylene
bn	Billion	EU	European Union
BNAT	Best Not yet Available Technology	EVA	Ethylene Vinyl Acetate
BOM	Bill of Materials	EVA	European Vending Association
BST	Base stations	EVA-EMP	European Vending Association - Energy Measurement Protocol
CAD	Computer Aided Design	FCM	Food Contact Materials
CBI	Coffee Business Intelligence	FDM	Fused Deposition Modelling
CECED	Conseil Européen de la Construction d'appareils Domestiques (predecessor of APPLIA)	FEM	Finite Element Modelling and Simulation
CEN	Comité Européen de Normalisation	FP7	Seventh Framework Programme (European Union research and development funding programme)
CENELEC	Comité Européen de Normalisation Électrotechnique	GER	Gross Energy Requirement
CFD	Computational fluid dynamics	GHG	Greenhouse Gas
CLASP	Collaborative Labelling and Standards Program (NGO)	GJ	Gigajoules
CLC/TC	Comité Européen de Normalisation Électrotechnique/Technical Committee	GPS	Gel Permeation Chromatography
CLP	Classification, Labelling and Packaging Regulation	GPS	Global Positioning System
CO2e	Carbondioxide equivalent	GPSD	General Product Safety Directive
CoC	Code of Conduct	GRP	Glass-fiber reinforced polyester
CPR	Construction Products Regulation	GS	Geprüfte Sicherheit (Tested Safety)
CRT	Cathode Ray Tube	GWh	Gigawatthours
DC	Direct Current	ha.	Hectares
DIN	Deutsches Institut für Normung (German Standardisation Organisation)	HALE	High altitude, long endurance
DOE	Department of Energy (USA)	HDPE	High-density polyethylene
DR	Drying Rate	HEPS	High Efficiency Performance Standards
DSC	Differential Scanning Calorimetry	HFRs	Halogenated Flame Retardants
EAP	Environment Action Plan	HIPS	High Impact Polystyrene
EASA	European Aviation Safety Agency	HKI	Industrieverband Haus-, Heiz- und Küchentechnik e.V.
EC	Electricity Consumption	HORECA	Hotel, Restaurant, and Catering / Café business
EC	European Commission	ibid.	ibidem (at the same place)
EC	European Community	IC	Integrated circuit
ECHA	European Chemicals Agency	ICAO	International Civil Aviation Organisation
ECOS	European Environmental Citizens Organsation	ICP	Inductively Coupled Plasma mass spectrometry
EEC	European Economic Community	IEC	International Electrotechnical Commission
EEE	Electrical and electronic equipment	IGU	Integrated Glazing Unit
EFCEM	European Federation of Catering Equipment Manufacturers	ISO	International Standardisation Organisation
EIA	Ecodesign Impact Accounting	kton	Kilo tonnes (metric, 1000 tonnes)
EMC	Electromagnetic Compatibility Directive	kW	Kilowatts
EN	European Norm	kWh	Kilowatthours
ENAK	(Swiss association for energy efficiency in the hospitality industry)	LASE	Low altitude, short endurance
EPA	Environmental Protection Agency (USA)	LCA	Life Cycle Assessment
EPBD	Energy Performance of Buildings Directive	LCC	Life Cycle Cost
LCD	Liquid crystal display	PRODCOM	Production Communautaire (database)

LDPE	Low density polyethelene	PS	Polystyrene
LED	Light emitting diode	PUR	Polyurethane
LIDAR	Light detection and ranging	PVC	Polyvinylchloride
LLCC	Least Life Cycle Costs	RAN	Radio Access Network
LVD	Low Voltage Directive	REACH	Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals
M	Million	RED	Radio Equipment Directive
MAV	Micro-air vehicle	RoHS	Restriction of Certain Hazardous Substances Directive
MEErP	Methodology for the Ecodesign of Energy-related Products	SCIP	Substances of Concern In articles as such or in complex objects (Products)
MEMS	Micro-electromechanical systems	SD	Smart Dust
MEPS	Minimum Efficiency Performance Standards	SEM	Scanning electron microscopy
MJ	Megajoules	SFOE	Swiss Federal Office of Energy
ML	Machine learning	SMEs	Small & medium size entreprises
MoU	Memorandum of Understanding	SVHC	Substances of Very High Concern
MSA	Market surveillance authority	SVHC	Substances of Very High Concern
MSP	Manufacturer selling price	SW	Solid Works (software)
MSW	Municipal Solid Waste	TEC plastics	Technical plastics
Mt	Million tonnes (metric)	TGA	Thermal Gravimetric Analysis
Mt CO2 eq./yr	Megatonnes of CO2 equivalent per year	TGL	Thai Green Label
MWh	Megawatthours	TOTEM	Tool to Optimise the Total Environmental impact of Materials
NAV	Nano-air vehicle	TWh	TeraWatthour
NEMS	Nano electromechanical systems	UA	Unmanned aircraft
NIR	Near Infrared Radiation	UAS	Unmanned aircraft system / Unmanned aerial system
NMR	Nuclear Magnetic Resonance	UAV	Unmanned aerial vehicle
OCS	Office Coffee Service	UK	United Kingdom
PA6	Polyamide (nylon)	USB	Universal Serial Bus
PAH	Polycyclic Aromatic Hydrocarbons	UV	Ultraviolet Radiation
PAR	Photosynthetic Active Radiation	Uw	U-value (insulation value) of window
PAV	Pico-air vehicle	VFF	Verband Fenster + Fassade
PBB	Polybromated Biphenyle	VHK	Van Hosteijn en Kemna
PBDE	Polybromated Diphenyle Ether	VOC	Volatile Organic Compounds
PC	Polycarbonate	W	Watts
PC-ABS	Polycarbonate/acrylonitrile butadiene styrene	WEEE	Waste electrical and electronic equipment
PCR	Polycarbonate recycled	WG	Working Group
PE	Poly-ethylene	Wh	Watthours
PEF	Primary Energy Factor	WP	Working Plan
PEF	Product Environmental Footprint	XRF	X-Ray Fluorescence
PEFCR	Product Environmental Footprint Category Rule	XRM	X-ray microscopy
PET	Polyethylene Terephthalate	µUAV	Micro-unmanned aerial vehicle
PJ	PetaJoules		
PMMA	Polymethyl methacrylate		
PoE	Power over Ethernet		
POP	Persistent Organic Pollutants		
PP	Polypropylene		
PPS	Polyphenylene Sulfide		

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1 INTRODUCTION

This report presents the results of Task 2 'Identification of product groups and horizontal initiatives' of the Preparatory study for the Ecodesign and Energy Labelling Working Plan 2020-2024. Task 2 provides lists of potential product groups and horizontal initiatives through screening and assessment techniques. The study team in dialogue with the Commission and with input from stakeholders has made a selection of these product groups and horizontal initiatives as the basis for the analysis work in Task 3.

Stakeholder comments have been received and taken into account when preparing this final version. Some comments provided on Task 2 description of individual product groups and horizontal initiatives have been treated under Task 3 assessment of these products / initiatives.

1.1 The Working Plan study

The European Commission has launched a preparatory study that will inform and assist the Commission in preparing the Ecodesign and Energy Labelling Working Plan 2020-2024 as part of the implementation of the Ecodesign Directive 2009/125/EC[1] and Energy Labelling Regulation (EU) 2017/1369[2]. The study is carried out by Viegand Maagøe, VHK and Oeko-Institut for the European Commission, DG GROW. The study started in March 2020 and is anticipated to be completed by the end of April 2021.

Formally, this is the first combined Ecodesign and Energy Labelling Working Plan to be undertaken following the changes contained in the Energy Labelling Regulation (EU) 2017/1369 (Article 15). However, it should be noted that previous Ecodesign Working Plans informally always kept in mind the possibility of combining Ecodesign and Energy Labelling, where judged appropriate on a product-by-product basis.

The Working Plan study is the first step in a process aiming at publishing implementing measures and acts in the Official Journal. Figure 1 shows a brief overview of the process.

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[1] https://eur-lex.europa.eu/eli/dir/2009/125/2012-12-04 (consolidated text)

[2] https://eur-lex.europa.eu/eli/reg/2017/1369/oj
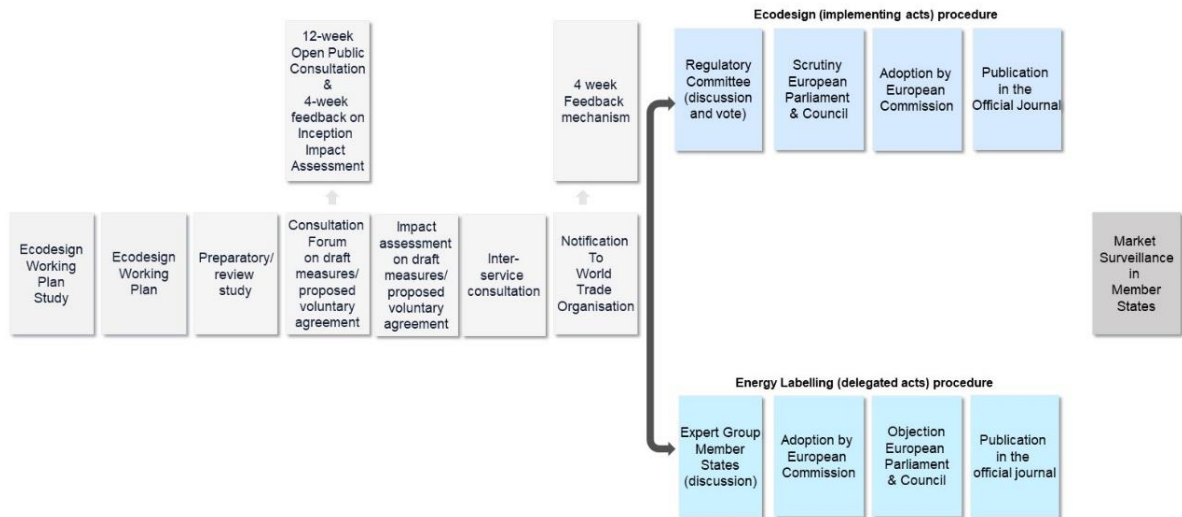
Figure 1: Process for establishing Ecodesign and Energy Labelling implementing measures and delegated acts.

1.2 Objectives

The following objectives of the Ecodesign and Energy Labelling Working Plan 2020-2024 preparatory study have been established:

1. Develop the approach for identification and prioritisation of product groups and horizontal initiatives for the working plan with a view to better take into account environmental impacts in all life-cycle stages and circular economy aspects such as products durability, reparability, upgradability, recyclability and/or recycled content.

2. Analyse the product groups and horizontal initiatives regarding sales, stock, resource consumption, improvement potential, environmental impacts, regulatory coverage and feasibility, market surveillance impact and industrial competitiveness.

3. Inform and assist the European Commission in its decision-making process to compile the Ecodesign and Energy Labelling Working Plan 2020-2024 with a strong and transparent evidence base derived from scrutinising regulations and available studies, together with a thorough consultation process of relevant stakeholders.

1.3 The study team

The Preparatory study for the Ecodesign and Energy Labelling Working Plan 2020-2024 is carried out by a consortium consisting of:
- Viegand Maagøe A/S (lead)
- Oeko-Institut e.V.
- Van Holsteijn en Kemna BV

The collective experience of the consortium used for this study stems from involvement in European product policy & policy instruments during more than 20 years including:

- Ecodesign directive and energy labelling regulation since the preparatory phases
- Development of the MEEuP / MEErP (Methodology of Energy-using / Energy-related Products)
- Carried out more than 50 preparatory and review studies and impact assessments
- Two previous working plan studies
- EU Energy Star, Green Public Procurement, standardisation
- National Market Surveillance activities
- Ecodesign Impact Accounting
- ICT Impact Study for ENER (included in current Working Plan and a basis for the current study)
- Product design, technical knowledge, circular economy, LCA, scenario modelling, stakeholder consultations, policy instruments, etc.

1.4 Acknowledgements

The study team would like to express our appreciation to the European Commission (DG GROW and the Inter-Service Group (GROW, ENER, ENV, CNECT, JUST)) and to all stakeholders and other persons and organisations we have been in contact with during the study for all input, information and dialogue, which have been very useful for the quality of the work.

1.5 Disclaimer

The information and views set out in this study and in the study reports are those of the authors and do not necessarily reflect the official opinion of the European Commission.

All assumption, estimations, assessments and analyses have been made on the basis of data and information available and the study team's knowledge and experience, and reflecting the aim of the study i.e. to inform and assist the European Commission in its decision-making process to compile the Ecodesign and Energy Labelling Working Plan 2020-2024. Due to the amount of analyses made and the relatively limited resources available for each product group and horizontal initiative, obviously the study team had to focus on the main topics for each product and initiative and to recognise a certain level of uncertainties.

For product groups and horizontal initiatives selected for the Working Plan, detailed analyses will be carried out before any implementing measure will be established and a further policy process will be carried out.

2 METHODOLOGY AND PROCESS

2.1 Aim of Task 2

In Task 2, the study team established a long list of potential product groups and horizontal initiatives. This was done through screening the market, policies, initiatives, previous working plans etc. followed by scoring each potentially interesting product and initiative on a variety of dimensions including sufficiently high potential, being within the product and policy areas prioritised by the Commission; and based on stakeholder input and consultation with the Commission Inter-Service Group.

31 products and initiatives were selected for analyses in Task 3. The process is detailed in the following.

2.2 Methodology and process

2.2.1 Long list of products and horizontal measures

The first step consisted of establishing a long list of products and horizontal measures to be scored afterwards. This took place via defined groups of products and measures provided in the technical specifications of the study and detailed with the Commission during the study kickoff. These groups are detailed in the following. See the list in the Annex.

Remaining product groups from previous Working Plans and Working Plan studies
This group contains product groups included in previous Ecodesign Working Plans and in preparatory studies informing previous Working Plans, but for which no implementing measures or self-regulations have been established.

Part of the study team has been involved in the two previous Working Plan studies and they have therefore extensive insight the product groups studied. The focus has mainly been on the most recent working plan study because it also screened the previous working plan studies.

Complex product groups
The "complex product" group contains combined products in one product. Typical examples include pump + motor + variable speed drive + regulating device or luminaire products with a variety of sensors and controls.

Other examples of complex products seen on the market are two-function products made as one product, such as a washer-drier or a light source with wireless speaker built-in.

Products with interactive and interoperable IT solutions
This product group overlaps partly with the above-mentioned complex products group. It contains more broadly interconnected products (regulated or still not regulated products) with interactions or automations, where an environmental improvement can exist through this interaction.

Examples include home network connections, which go into network standby, when no activity from the connected devices take place; Building Automation and Control Systems (BACS), where building components, control systems, meters, IoT (Internet of Things) devices, etc. are linked together; and voice activated assistants connected to other devices.

Product groups with potential for circular economy related requirements
The product group may contain both existing Ecodesign and/or Energy Labelling product regulations with potential for increased circular economy related requirements and new products, where circular economy related requirements could be relevant.

The first Ecodesign and Energy Labelling regulations are more than 10 years old and even though these have been updated through amendments and recast regulations, there may still be untapped circular economy improvement potentials that should be assessed. These potentials may be due to the technological developments and due to a much larger focus on circular economy aspects including due to the new Circular Economy Action Plan. For many of the current regulations, circular economy aspects have not been studied or at least not been studied at the depth requested most recently for preparatory and review studies.

Additionally, material efficiency in the production phase and the end-of-life phase has an increasingly higher percentual impact on the full life cycle phase due to many gains achieved in reducing energy consumption in the use phase as a result of the ecodesign and energy labelling regulations.

Material efficiency may include longer lifetimes; more recycling opportunities; design for less material and less CRM (Critical Raw Materials) used as well as unbundling of combined products the individual products in the combination with different lifetimes for.

These areas may be looked at horizontally, but adapted and implemented vertically i.e. for individual product groups.

Energy-related products
Energy-related products, for the purpose of this study, are products, which do not consume energy in the use phase or only marginally, but which impact the consumption of other products or systems.[3] No implementing measures have yet been adopted. Examples include windows, thermostats and luminaries.

ICT product groups from dedicated study
In the Working Plan 2016-2019, a separate track was proposed for ICT products due to:
- difficulties to make a reliable estimate of their energy savings potential, given the uncertainty about future market developments;
- uncertainty of the suitability for the fast moving ICT product sectors of the Ecodesign and Energy Labelling process (which takes on average around 4 years) for establishing minimum energy and resource efficiency criteria;

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[3] The Ecodesign Directive itself uses the term "Energy-related product" as a generic term for both products that consume energy and that do not consume themselves energy but affect the energy consumption of others. In this study, we use the term in the more restricted sense explained above.

- the voluntary agreements that have been recognised for some electronic product groups (i.e. imaging equipment, game consoles and complex set-top boxes) as alternatives to regulatory measures, not always have proven to be faster in achieving the objectives of Ecodesign;
- expiry in 2018 of the prior EU-US Energy Star Agreement; and
- the increased connectivity of products – whether in the home or in industry – and the advent of smart appliances as well as their impact on overall system efficiency.

The Commission has launched a study ("the ICT Study") to assess product groups under this separate track, which is currently ongoing. Based on the preliminary results, relevant products may be included in the long list of product groups and horizontal measures.

Product groups in the ICT Study are:
- Data centres
- Telecommunication networks
- Electronic displays
- Audio and video
- Personal ICT equipment
- Imaging equipment
- Home and office equipment
- ICT in public spaces
- Building automation
- Industrial sensors

New product groups not studied previously

This product group comprises all other product groups not studied previously. Reasons include that they were previously seen as product groups without sufficient improvement potential, or that any other legislation associated to the product did not allow the inclusion of this product group. For some of the product groups, this may have changed, both the legislative barrier, if any, and improvement potential due more focus on material efficiency and circular economy and due to technological developments. Furthermore, novel product types might exist that only entered the mass market a few years ago, such as drones.

Horizontal IT solutions to facilitate improved market surveillance

This horizontal measure does not have a focus on the specific energy and environmental requirements for the products, but on horizontal requirements (may be adapted to and implemented for specific product groups), which could facilitate improved market surveillance and thereby release a further potential. It may concern already regulated products and new products. Examples include greater use of electronic labelling or tagging, microchip identifiers for component types or plastic types or Critical Raw Materials, electronic linkages between components and exploded diagrams for repair, reuse and recycling e.g. via QR codes; and ability for the products to report continuously their power and energy consumption and usage pattern.

While each of the categories described above provides a specific reason to evaluate the suitability of the product group or horizontal measure for Ecodesign or Energy labelling, the groups are not mutually exclusive. A number of product groups may fall into more than one category.

Totally, about 160 product groups and horizontal initiatives were identified. See the list in the Annex.

2.2.2 Selection for Task 3 analyses

The study team developed a screening and scoring matrix in Excel as a tool for assessing the product groups and horizontal measures identified. The matrix tool allows to:

- set product characteristics thus being able to filter the long list according to the above-mentioned subgroups and to other characteristics such as being a horizontal measure;
- set individual scorings according to parameters regarding:
    - circular economy relevance
    - interactive and interoperable IT relevance
    - market surveillance relevance
    - scope criteria of the Ecodesign Directive 2009/125/EC and the Energy Labelling Regulation (EU) 2017/1369; and
- include descriptive comments e.g. from saving potentials from previous studies as a background for the scorings.

The specific areas assessed were:

- Product and initiative characteristics
    - In WP (Working Plan), still without regulation
    - Recommended for WP, but not included
    - Not recommended for WP
    - Products with regulation
    - New products
    - Energy-related (only) products (i.e. where the main energy impact is not for the product itself, but a related product, it has an impact on)
    - Complex products
    - Industrial products
    - ICT / CE products
    - Buildings related
    - Horizontal product groups and initiatives

- Circular economy relevance
    - Lightweight design
    - Extended lifetime through increased repairs and upgrades
    - Extended lifetime through reduced SW & other obsolescence
    - Extended lifetime through increased durability
    - Increased recyclability & reuse of materials and components
    - Reduced amounts of critical & scarce raw materials
    - Post-consumer recycled content

- IT
    - Interactive / interoperable IT initiatives

- Market surveillance relevance
    - Electronic labelling
    - Product & component passport

- Improved ICSMS / EPREL
- Appliance resource consumption reporting
- Demand flexibility control
- Intelligent resource management

- Economic significance
  - Significant volume of sales

- Environmental significance
  - Production (materials, recycled content)
  - Use (energy, carbon, emissions, auxiliaries)
  - Reuse, repair, life
  - EoL recycle, recover, waste

- Significant saving potential
  - Significant environmental saving potential
  - Absence legislation or market failure
  - Wide disparity in environmental performance

The eligibility scorings were made according to this scale based on available studies and the study team's knowledge of the areas:
- very positive: ++
- positive: +
- neutral: #
- negative: -
- very negative: --

The scorings were used as a tool for assisting the study team and the Commission in selecting the product groups and horizontal initiatives in a consultative dialogue. Stakeholder input received in relation to and after the first stakeholder meeting held on 10 July 2020 was also taken into consideration for the final selection.

The selections were made in batches allowing the study team to initiate the Task 3 analyses in parallel with the selection process. See an illustrative overview of the process in Figure 2.

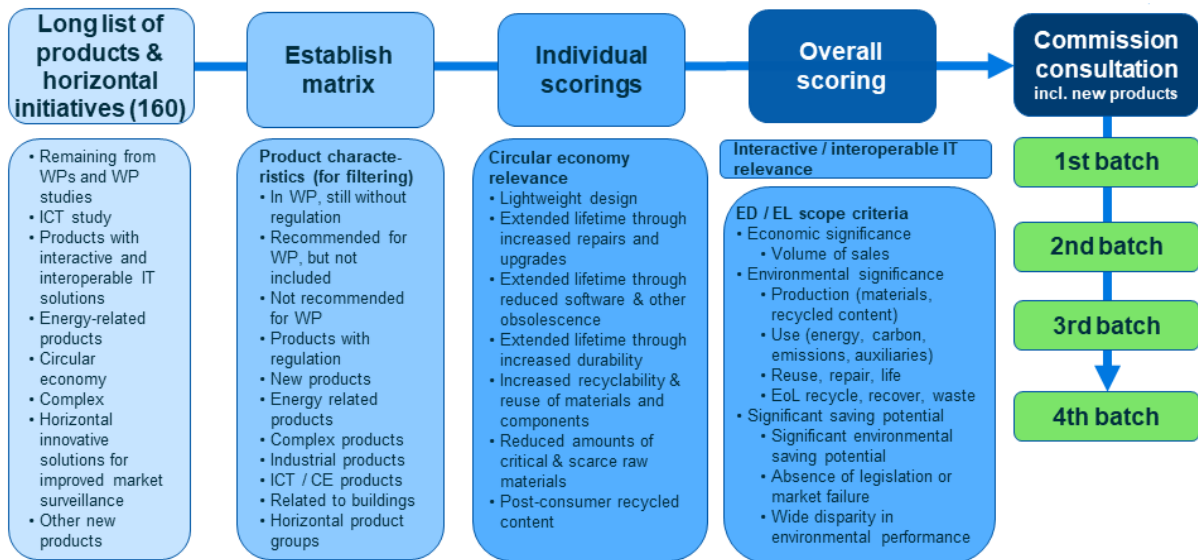| Long list of products & horizontal initiatives (160)	Establish matrix	Individual scorings	Overall scoring	Commission consultation incl. new products

• Remaining from WPs and WP studies
• ICT study
• Products with interactive and interoperable IT solutions
• Energy-related products
• Circular economy
• Complex
• Horizontal innovative solutions for improved market surveillance
• Other new products
	Product characte-ristics (for filtering)
	• In WP, still without regulation
	• Recommended for WP, but not included
	• Not recommended for WP
	• Products with regulation
	• New products
	• Energy related products
	• Complex products
	• Industrial products
	• ICT / CE products
	• Related to buildings
	• Horizontal product groups
		Circular economy relevance
		• Lightweight design
		• Extended lifetime through increased repairs and upgrades
		• Extended lifetime through reduced software & other obsolescence
		• Extended lifetime through increased durability
		• Increased recyclability & reuse of materials and components
		• Reduced amounts of critical & scarce raw materials
		• Post-consumer recycled content
			Interactive / interoperable IT relevance
			
			ED / EL scope criteria
			• Economic significance
			  • Volume of sales
			• Environmental significance
			  • Production (materials, recycled content)
			  • Use (energy, carbon, emissions, auxiliaries)
			  • Reuse, repair, life
			  • EoL recycle, recover, waste
			• Significant saving potential
			  • Significant environmental saving potential
			  • Absence of legislation or market failure
			  • Wide disparity in environmental performance
				1st batch
				
				2nd batch
				
				3rd batch
				
				4th batch

Figure 2: Illustrative overview of methodology and process for establishing the lists of product groups and horizontal initiatives to be assessed in Task 3.

Table 1 provides an overview of the selected product groups and horizontal initiative for Task 3 indicating the related type of product group and initiative.

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Table 1: Overview of the 31 selected product groups and horizontal initiatives for Task 3 indicating the related type of product group and measure. ● indicates belonging to the group and (●) as partly belonging.

Product / initiative	Remaining from WPs	Complex	Interactive/ interoper- able IT	Circular economy	Energy- related	ICT Study	New	IT for mar- ket surveil- lance
Uninterruptible Power Supplies	●					●		
Professional laundry appliances	●							
Professional dish-washers	●							
Windows	●			●	●			
Non-tertiary coffee machines	●							
Interconnected home audio and video			●			●	(●)	
Small network equip-ment for home and of-fice use			●			●	(●)	
Low temperature emit-ters					●		●	
Aircurtains		●			(●)		●	
Small-scale cooking products							●	
Unmanned aircrafts (drones)		●		●			●	
Water decalcifiers / softeners					●		●	
Base stations		●	●			●	●	
Industrial smart sen-sors					●	●	●	
Hair dryers							●	
Tertiary hot beverage equipment							●	
Greenhouse covers					●		●	
Lightweight design				●	●		●	
Durability				●			●	
Post consumer recy-cled content				●			●	
Universal external power supply				●	●		●	
Universal batteries for battery products				●	●		●	
Ecological profile				●			●	
IT solutions for im-proved market surveil-lance			●				●	●
Professional cooking appliances							●	
Swimming pool heat-ers	(●)						(●)	
Street lighting systems via PV							●	
Enterprise network equipment	●		●			●		
Electric vehicle chargers							●	
Firmware and soft-ware		●		●			●	
Scarce and critical raw materials				●			●	

3 PRODUCT LISTS

The following section describes in more detail the product groups and horizontal measures that have finally been selected for study in Task 3, and the rationales for selecting them. Furthermore, we describe product groups from previous studies that we did not propose for Task 3, and explain our reasons for not proposing them.

3.1 Remaining from previous working plans

This section contains product groups, which were included in previous Ecodesign Working Plans but where no regulation has yet been adopted or is expected to be adopted in near future, and which the study team recommends to assess further in Task 3.

3.1.1 Professional laundry appliances

Professional laundry and dishwashing appliances were the subject of an ecodesign preparatory study by Bio Intelligence with Oeko-Institut in 2011. On the basis of that study and a preliminary impact analysis, the Commission discussed the results in the Ecodesign Consultation Forum 29 November 2013, concluding that there was a significant energy, carbon and water saving potential; no existing measures addressing that potential and that the product group would also otherwise be eligible for measures. The main problem was the lack of appropriate measurement standards for this complex and diverse product group. A subsequent ECF of 5 May 2014 decided to postpone measures until such test standards were developed. The Commission issued a Standardisation Request and test standards are now available for measures.

3.1.2 Professional dishwashers

See the rationale provided above for professional laundry appliances.

3.1.3 Window products

Windows for buildings were subject of an ecodesign preparatory study by VHK and ift Rosenheim[4] for the European Commission, DG Energy, which ran from July 2013 to May 2015. Windows are energy-related products in the sense that they do not consume energy, but their characteristics have significant impact on related energy systems such as space heating systems, space cooling systems and ventilation systems of buildings.

The preparatory study concluded that, while it would not be useful to have an Ecodesign measure for windows as efficiency requirements are covered by Member States' implementation of the Energy Performance of Buildings Directive, an EU energy label could be considered in order to realise further energy savings and emission reductions.

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[4] Martijn van Elburg (VHK), Norbert Sack (ift Rosenheim), Sarah Bogaerts e.a. (VITO); LOT 32 / Ecodesign of Window Products. TASK 7 – Policy Options & Scenarios, Final report, consolidated version of 22 June 2015; 22 June 2015; Specific contract No ENER/C3/2012-418-Lot1/03

Regarding energy savings, the preparatory study concluded that depending on the market response on a possible window energy labelling, savings for both residential and non-residential windows and roof windows could range from about 40 TWh fuel eq. to almost 118 TWh fuel eq. with relatively small cost impacts as higher purchase costs can be compensated by lower energy costs.

An Ecodesign Consultation Forum held 30 September 2015 highlighted that there was broad support for going forward but that a traditional product-related energy label may not be appropriate as the energy performance of windows depends significantly on where and how they are installed (e.g. climate, orientation of the building, and many other parameters that go beyond the simple product boundaries).

Due to a focus on other product groups, the Commission has not finalised an impact assessment for windows under the energy-labelling framework[5]. A draft Impact Assessment was used as input to the Ecodesign Consultation Forum meeting.

3.1.4 Non-tertiary coffee machines

A preparatory study from 2012 is available. Several improvement options were proposed that can reduce the environmental impacts of non-tertiary coffee machines, and especially those related to electricity consumption, without a significant negative effect on functionality or taste. The improvement potential according to the preparatory study was 42-66% depending on the basecase, or 26 TWh cumulative for the years 2010 to 2020 compared to a Business as Usual (BAU) scenario. Also, the need of policy action related to the environmental impacts of the manufacturing and disposal of consumables such as capsules was discussed in the preparatory study. However, no action was taken for emotional reasons i.e. a fear for public resistance to regulation. They are only regulated in standby so far, on-mode is not regulated. At the time being, there was a lack of standards. Today, standard EN60661 exists and there is an energy label in Switzerland since 2015 which shows the feasibility of labelling[6]. Currently, the non-tertiary coffee machines market is still relevant, witnessing a steady rise.

3.1.5 Enterprise network equipment

This product group was included in the assessments in Ecodesign Preparatory Study on Enterprise Servers and Data Equipment (July 2015), but it was discarded after Task 4.

The ICT Impact Study (initiated under the current Working Plan) assessed network equipment in datacentres and revealed large differences in efficiencies and that the saving potential may not be marginal.

Enterprise network equipment is covered by an Energy Star specification.

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[5] https://www.europarl.europa.eu/doceo/document/E-9-2019-002916-ASW_EN.html [EC reply of 8 Nov 2019 in response to question from EP of 23 Sep 2019: https://www.europarl.europa.eu/doceo/document/E-9-2019-002916_EN.html]

[6] See also https://www.bfe.admin.ch/bfe/de/home/news-und-medien/publikationen/_jcr_content/par/externalcontent.external.exturl.pdf/aHR0cHM6Ly9wdWJkaYi5iZmUuYWRt aW4uY2gvZW4vcHVibGljYX/Rpb24vZG93bmxvYWQvODgzMy5wZGY=.pdf

Network equipment is also energy related products impacting cooling systems for both data centres and in some cases also enterprise products.

Some stakeholders recommended to include enterprise network equipment in the current study.

3.1.6 Uninterruptible Power Supplies

An Uninterruptible Power Supply (UPS) secures the continuity of power supply to equipment in the case of input power failure. They are often used for servers and storage equipment, telecommunication networks, computers, emergency lighting etc. but can also be used with other devices. A UPS contains a combination of electronic power converters, switches and energy storage devices (such as batteries).

UPSs were the subject of an ecodesign preparatory study by Ricardo-AEA Ltd in 2014 concluding there was a large energy and CO2 saving potential and no existing measures addressing that potential. Besides energy and CO2 savings, uninterruptible power supplies consist of different types of valuable and scarce resources in the printed circuit boards and the batteries.

No further activity was performed after the preparatory study due a change in market because UPSs for home and office desktop computer in areas with unreliable power supply were disappearing due to the switch to notebook computers with built-in battery securing the power supply in case of outage.

Since the preparatory study, there has been a substantial growth in UPS usages in datacentres.

3.1.7 Not selected product groups

Below, we sum up the product groups from previous studies that we did not propose for Task 3, and explain our reasons for not proposing them.

In addition to the product groups described in the previous section, a further range of product groups were **included in the Ecodesign Working Plan 2016-2019 without being subject to a regulation to date**, such as smart appliances, elevators, escalators and moving walkways, medical equipment, Building Automation and Control Systems, inverters and converters and high pressure cleaners. Most of those have been or are still subject to a preparatory study. Some of product groups are awaiting the next regulatory steps and some have been discarded due to a too low saving potential. The study team has assessed these product groups and based on current situation, none of these have been recommended to be included in the Task 3 assessment.

Other product groups had been **recommended by the preparatory study behind the Ecodesign Working Plan 2016-2019 but had not been included by the Commission in the actual Working Plan**. These were also screened for possible inclusion in Task 3. Some of these products have been selected, and the remaining ones are other domestic kitchen appliances such as toasters and food processors; wireless chargers and some telecommunication edge equipment such as satellite phones and cordless phones. These have

either small saving potentials or experience low sales. Only wireless charging may be interesting, however, measurement standards are still not in place.

The last and big group of screened products contains products that were **neither included in the Working Plan nor recommended to be included by the previous preparatory study.** This product group contains a mixture of many different products such as hot food presentation and storage equipment, domestic and commercial steam ovens, personal care equipment, textiles dry cleaning equipment, construction products, district heating equipment, detergent and industrial process equipment. Previous reasons for not recommending them include, for example, low sales, low data quality, too broad scope with many diverse product types, coverage by other regulation scheme (CPR (Construction Products Regulation) and ETS (Emission Trading System)), lack of standards, or too specialised and taylor-made equipment.

However, in this group, there are also product groups, for which **the situation has changed**, so that the previous reasons had become obsolete. E.g standards developed, technological developments, intensified policy focus such as circular economy etc. These product groups include interconnected home audio and video, small network equipment for home and office, professional cooking appliances and small-scale cooking products, which have been included in the following section.

3.2 New product groups

This section contains new product groups and horizontal measures, which the study team recommends to assess further in Task 3.

3.2.1 Professional cooking appliances

Professional cooking appliances were discussed in Task 2 of the previous working plan study, where the product groups were domestic and commercial fryers, steam ovens, domestic portable ovens, domestic and commercial grills. It was decided to only flag the issue of portable ovens as a review for Reg. 65/2014 and 66/2014. Steam ovens did not have relevant market size by then and grills were assumed to be dealt with during a review.

The review study of Ecodesign and Energy Labelling of domestic cooking appliances (Regulation (EC) No 66/2014 and Regulation (EC) No 65/2014) is currently being carried out by Joint Research Centre, Seville[7]. According to the first draft of preparatory study, significant energy savings of professional cooking appliances through minimum energy efficiency requirements are possible: "Considering the reasoning above provided by relevant stakeholders, it has been concluded that regulation for commercial/professional cooking appliances is necessary, since it is potentially a high impact energy consumption sector with possibilities for improvement. Regulation in the commercial/professional sector could boost innovation and be a driver for efficiency. In order to provide appropriate ecodesign requirements, the regulation for commercial/professional cooking appliances is proposed to be specific and separated from the domestic cooking appliances regulation. This will ensure that every requirement and energy labelling category defined are suitable and meaningful, considering sector-specific user needs."

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[7] https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/424/home

The product group has furthermore been proposed by stakeholders.

3.2.2 Tertiary hot beverage equipment incl. free-standing hot beverage vending machines

They were analysed in the previous working plan study. Products were free-standing hot vending machines, table-top full automatic machines and porta-filter espresso machines. Estimated energy savings were for all product groups up to 11 PJ per year in 2030. However, they were not taken forward as a whole group because projected savings were slightly below the threshold. Only free-standing hot vending machines were recommended because a window of opportunity was seen to regulate them together with cold vending machines but not taken up by the Commission (lower priority due to relatively low savings). The group is recommended to be included because Europe is a leading market and half of all coffee machines are tertiary[8]. Furthermore, in many Member States there has been an increase in number of coffee shops focusing on high-quality coffee. Further, circular economy aspects with regard to durability and reparability could be of relevance.

3.2.3 Small-scale cooking products

There are a variety of small-scale individual domestic cooking products with a heating element that conducts heat via air, water, steam, oil or a combination of these to the food to be processed. They include rice cookers, sous vide cookers, multi-cookers, pressure cookers and fryers. Total stock is about 290 million units[9]. Some of those have long run time such as sous vide, slow cookers and rice cookers, while others have short run time and may be used more rarely.

Some stakeholders have recommended to include this product group.

3.2.4 Air curtains

Air curtains are products that have **not been studied** before in any working plan preparatory study. They create a uniform stream of directed air, whether heated, cooled or unheated across an opening to create a barrier inhibiting the transfer of heat and particulate matter from one zone to the other.

While allowing unhindered and unobstructed passage through the opening, air curtains help preserve the indoor temperature by forming a barrier to resist the ingress of outdoor air. Although air curtains do contribute to the heating of space, their primary function is a thermal replacement for a door.

The efficiency of aircurtains depends on the airflow uniformity which again depends on the physical design of the products. The efficiency also depends on the quality of the control system.

Some stakeholders have recommended to include this product group.

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[8] https://www.grandviewresearch.com/industry-analysis/coffee-machine-market
[9] Statista

3.2.5 Water decalcifiers / softeners

Calcium in water is important cause of product failure and increased energy consumption during use (water heaters, coffee makers, boilers, etc.) and the issue seems to increase. Decalcifiers uses large quantities of decalcifying salt. There are inefficient products on the market consuming energy without much effect.

There are two common types of systems available in order to treat hard water: water softeners, and descaling systems. Water softeners change the chemical composition of water; descaling systems do not alter the chemical composition but neutralise the minerals to prevent the formation of scale. Water softeners are more commonly used, therefore the scope is restricted to this type of appliance.

The Europe water softeners market is projected to grow at a CAGR of 6.2% from 2019 to 2026. The largest market is the residential market.

3.2.6 Swimming pool heaters

Swimming pools were discussed in Task 2 of the previous working plan 3 study and narrowed down to swimming pool heaters as they are the most important energy consumer. Private and public swimming pool heaters were studied in Task 3 and it was shown that they have significant savings potential.

However, there was legal uncertainty whether they are or could be covered by regulation 814/2013 because they do not heat drinking or sanitary water. They were therefore not carried forward to Task 4, but it was recommended to include them in the review of Regulation 814/2013 (Ecodesign requirements for water heaters and hot water storage tanks). However, the review study clarified that swimming pool heaters should not be included in an amended regulation.

3.2.7 Low temperature emitters

Low temperature emitters are mainly **energy-related products** because their energy consumption is zero or negligible compared to the transferred heat energy.

Low-temperature emitters are used for hydronic central heating systems in buidlings. The the heat transfer is increased e.g. by use of fan coils. Radiators influence the efficiency of an entire heating system: The heat transfer capacity determines the required flow temperature of the central heating system, which in turn influences the energy efficiency of the heating device. The technical specifications of heat transfer capacity in relation to the flow temperature seem to be basically laid out in standards, but not transparent enough for installers and end customers. Here, ecodesign specifications could provide transparency and better heat transfer at the same or lower flow temperatures. The principle also applies to underfloor heating systems.

The potential amount of heat savings is very large because in principle, all hydronic radiators can be replaced with low temperature emitters.

3.2.8 Greenhouse covers

The previous working plan study studied greenhouses in general and came to the conclusion that there was significant savings potential both for energy (equipment such as lighting, heating, irrigation) and for resources (durability, e.g. for polytunnels). The study later focused on the covers because an energy labelling requirement could be an opportunity. Possible requirements for other parts of the greenhouse (lighting, heating, irrigation etc.) were not followed up upon. The study concluded that there was significant savings potential, and energy labelling as well as some information requirements could be a suitable approach. Durability requirements were briefly discussed but not followed up upon because the topic did not rank so high then.

The product group was not taken up by the Commission for unknown reasons. It is recommended putting it on the agenda again, especially considering the new focus on circular economy and resources. There is already a development towards efficient and sustainable greenhouses which should be evaluated. Focus could be on labelling of cover materials which vary greatly in their technical properties, including durability and deterioration of energy properties over time[10]. In addition, to check whether elements such as lighting, heating and ventilation are regulated or fall within a gap.

3.2.9 Street lighting systems via PV

Street lighting was ruled out in Task 2 of WP 3 because it was assumed to be dealt with within lighting regulation. The Preparatory study on lighting systems did assess street lighting (without PV), however, but there were no recommendations for Ecodesign or Energy Label regulations. Instead, it was recommended to investigate inclusion in the EPBD.

As a niche market, there may be opportunities for street lighting systems via PV, also because it seems that there are several solar street lighting companies in EU and wide disparity in solar cell efficiencies and different solutions with different environmental performances offered by these companies. Buyers at community/city level may benefit from an energy label system to guide them both in efficiency and performance. It is predicted to become a very sizeable market.

3.2.10 Electric vehicle chargers

Electric vehicle chargers were suggested by several stakeholders at the first stakeholder meeting. Due to an expected high increase wall box chargers and public chargers, it was decided to include them.

3.2.11 Hair dryers

The group was suggested for regulation in the **previous working plan study** because of relevant savings potential. Data on actual usage patterns was scarce and uncertainty high, but even in the most conservative scenario the savings of 13 PJ in 2030 exceeded those of many other PGs. The group was discarded mainly for political reasons. It was therefore recommended to include this product for further assessment in Task 3 revisiting the prior data, assumptions etc.

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[10] https://farm-energy.extension.org/introduction-to-greenhouse-efficiency-and-energy-conservation/

3.2.12 Unmanned aircraft (drones)

Unmanned aircrafts or, in common language, drones, have **not been studied before**. They are unmanned flying devices that include multicopters and remote airplanes of various designs, sizes and utilisation, and may be operated with different degrees of autonomy.

According to Statista, around 23.8 million drones will be delivered worldwide in 2018. An increasing professional use of unmanned aircrafts takes place resulting in a market of heavier and more energy consuming products with higher usage time compared to consumer products. They are complex products, because they are made up of a platform / structure, the payload, and a control system.

Civil drones are used for a variety of purposes:

- remote sensing, monitoring, inspection and surveillance (e.g. in the areas of environmental monitoring, meteorology, disaster management, road traffic monitoring, infrastructure and building site inspection, border surveillance, mining, firefighting, space missions, and others;

- photography and filming;

- providing wireless coverage (including in emergency situations where traditional networks are broken down).

- precision farming (in addition to monitoring functions, e.g. for crops, moisture, soil properties, diseases or weeds, UA can also distribute pesticides, herbicides or products for biological pest control);

- search and rescue of missing persons;

- transport and delivery of goods (including in disaster relief and for medical purposes);

- hobby and leisure, including as a toy.

Drones used exclusively for means of transportation are not in scope of the Ecodesign regulation.

3.2.13 Small network equipment for home and office use

This product group was included in the **ICT Study**, which reported an energy consumption for home/office network end-use of about 17 TWh in 2020. In addition to the network equipment for internet connection and for the local area network, typically Wi-Fi, also gateways for IoT (Internet of Things) devices such as lighting and window blinds are included.

Due many end-users' focus on high quality internet e.g. for film streaming and video conferences, more focus is put on satisfactory Wi-Fi connections resulting in needs for more access points.

IoT devices are also coming more into the market. Philips Hue LED lamps and gateways have been almost a decade on the market. IKEA is a relatively new player on the market with its Trådfri product line which now includes LED lamps, electric blinds, sensors and times. The connection to the IoT devices is typically through a gateway plugged into the access point being able to control the IoT devices via smartphone or dedicated remote control. Other brands are on the market. Even when two products of different brands use

same wireless protocol such as Zigbee, it is not always the case that one gateway can be used for both when full functionality should be achieved. This risk is then that a home or office may need to use several gateways increasing the energy consumption. The IoT devices are not suggested to be in scope of this product group.

An increase is expected in number of devices, especially access points (2-3 in mesh connection for larger homes) and gateways (1 or more gateways) for controlling devices.

3.2.14 Interconnected home audio and video

This product group was included in the **ICT Study**, which reported an energy consumption for video and audio end-use of about 21 TWh in 2020.

By interconnected home audio and video systems is meant devices connected together and connected to external input devices such as mobile phones, tablets and dedicated casting devices from and through which internet and local content can be streamed. This market is anticipated to be growing steadily.

The market today includes home audio interconnected systems (e.g. mesh types speakers), portable wireless speakers (smaller and larger types used indoor and/or outdoor with rechargeable batteries, some very powerful) and streaming video devices. Alone in the loudspeaker segment, the volume market volume in 2023 is forecasted to be 66 million units (Statista).

Another home audio device coming into the homes is cloud-connected voice activated device like Alexa and Google Home. These are examples of devices with a relatively low energy consumption, typically 2-4 W in listening mode, but there are reports stating that some TVs connected to a voice service device increase their connected standby consumption up to 20 W[11].

Another example of a potential of an untended increase of energy consumtion for a TV is when a user stops streaming of video content through a Google Chromecast unit, the TV is not automatically going into standby or networked standby. This takes place only after four hours according to the electronic displays regulation.

It is therefore anticipated that there will be a substantial saving potential associated with this product group.

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Due many end-users' focus on high quality internet e.g. for film streaming and video conferences, more focus is put on satisfactory Wi-Fi connections resulting in needs for more access points.

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[11] www.cnet.com/news/alexa-and-google-assistant-make-energy-hogs-out-of-smart-tv-nrdc-report-says/

IoT devices are also coming more into the market. Philips Hue LED lamps and gateways have been almost a decade on the market. IKEA is a relatively new player on the market with its Trådfri product line which now includes LED lamps, electric blinds, sensors and times. The connection to the IoT devices is typically through a gateway plugged into the access point being able to control the IoT devices via smartphone or dedicated remote control. Other brands are on the market. Even when two products of different brands use same wireless protocol such as Zigbee, it is not always the case that one gateway can be used for both when full functionality should be achieved. This risk is then that a home or office may need to use several gateways increasing the energy consumption. The IoT devices are not suggested to be in scope of this product group.

An increase is expected in number of devices, especially access points (2-3 in mesh connection for larger homes) and gateways (1 or more gateways) for controlling devices.

3.2.15 Base stations

Base stations were studied in Task 3 and 4 of the previous working plan study and recommended for regulation. The Commission did not include them in the Working Plan because they should be studied in a separate ICT study. Network switching subsystems were screened in the working plan study, but not selected. The ICT Study[12] revealed that the total consumption of the base stations and subsystems in the radio access network is about 11 TWh/year. The 5G development will increase the number of base stations, and sources report 2-3 higher energy consumption of a 5G compared to 4G base station[13,14]. Several stakeholders have suggested to include this product group.

3.2.16 Universal External Power Supplies

It is estimated that more than 2 billion External Power Supplies (EPSs) (also called power adapters or chargers), in the range from 0-120 Watt, are present on the European market today[15]. This is partly due to a fragmentation of EPS e.g. it is not possible to charge an electronic shaver with a power adapter for a phone or vice versa. However, it is also caused by business practice, where it is common to supply an EPS with each electronic device to make sure that the sold product is charged and supplied with the right power supply. Typically, only lower priced electronic products such as mobile phones and wireless speakers may be sold without an EPS. A potential for material efficiency exists if an EPS could be used during a longer lifetime than just for the lifetime of the product it is delivered with.

Over more than 20 years, an industry standard for data transfer and power supply for electronic devices, initially mainly for computers and connected peripherals, has been developed, namely the USB (Universal Serial Bus). Until now, there have been four generations, from USB 1.x to USB4. The standard establishes the technical specifications for cables and connectors and protocols for connection, communication and power supply. Behind this industry standard is the USB-IF (USB Implementers Forum)[16].

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[12] ICT Impact study. Prepared by VHK and Viegand Maagøe for the European Commission. April 2020. Unpublished.

[13] https://www.lightreading.com/mobile/5g/power-consumption-5g-basestations-are-hungry-hungry-hippos/d/d-id/749979

[14] https://www.fiercewireless.com/tech/5g-base-stations-use-a-lot-more-energy-than-4g-base-stations-says-mtn

[15] EIA overview report 2017

[16] www.usb.org

USB-IF has recently finalized the definition of a number of specifications that have led to the development of standards and recommendations that makes it possible to use a single EPS (or a family of complementary and interchangeable EPSs) to be used in any electric and electronic device with power requirements up to 100 Watts and voltage levels between 5 V and 20 V and thus accommodate the before mentioned problems and lower the amount of EPSs in EU. This is seen as an opportunity for universal external power supplies and promoting an unbundling of the EPS and the end device.

3.2.17 Universal batteries for battery-driven products

The rationale for this product group is the same as for the universal external power supply, just related to replaceable batteries for battery-driven products. The situation is today that most of these products can only use a battery of the same brand or even only for the same device. This means that when the product finishes its lifetime, functioning batteries have to be discarded.

Some manufacturers use the same shape, interface, voltage level etc. for batteries for different kind of products e.g. power tools and vacuum cleaners. I.e. there is no technical barriers to use batteries for several kind of products.

Ongoing activities associated with possible amendments of the battery directive should be considered.

3.2.18 Industrial smart sensors

Industrial smart sensors are part of the ICT Study (other controls). The sensors measure, process, store and communicate data on vibration, temperature and other performance parameters of new and existing industrial motors that are typically part of fans, pumps, compressors and other industrial equipment. Their purpose is to inform technical staff on sub-optimal performance in order to take measures to increase product life, reduce down-time of the processes in which the motors are engaged, lower energy use, perform optimal 'condition-based maintenance' (CBM), etc. They are usually battery-driven and use very little energy (1 button-cell every 5 to 10 years). The industrial motor stock >0.75kW in the EU is estimated to be over 100 million units and is projected to consume 1294 TWh of electricity by 2030. Even at a conservative 5-10% saving this comes down to a large saving potential from smart industrial sensors.

3.3 New horizontal initiatives

3.3.1 Lightweight design

Light-weighting of products, i.e. effecting the same functionality with less material, is un-doubtedly the most effective design strategy for material efficiency. It is the first 'R' in the waste Framework Directive: the 'R' of Reduce. Unlike the other 'R's —Re-use, Recycle, Recover, Remove - it has instant impact, there is 100% certainty that the design effort pays off, the key parameter product weight is very easy to measure and very often has beneficial side-effects in terms of extra functionality, e.g. easier transportation of mobile devices for the user and/or lower manufacturing & distribution costs.

Yet, it is the most neglected material efficiency strategy. There are no incentives like regulations, subsidies, labels, information campaigns, etc. to reinforce this concept. It is not even a topic worth investigating in the Mandate M/543, which is preparing standards for material efficiency. Probably because of the beneficial side-effects mentioned above, policy makers seem to think that there is no need for promotion: if light-weighting were possible for a certain product, the designers will do it; if not, there must be a technical/economic reason for it. However, the same argument can be used for the implementing measures and delegated acts adopted under the Ecodesign and Energy Labelling regulations and in reality, the market is not self-regulating these areas.

Lightweight design is also considered as having an energy related impact in the distribution phase and potential also in the use phase due to the lower weight.

A trade-off regarding other impacts such as product strength, recyclability, energy efficiency and consumer choice should be taken into account when assessing this initiative.

3.3.2 Post consumer recycled content

Recycled content is the amount of recycled material that goes into the manufacturing of a new product, expressed either as a fraction of the total material input (in %) or in absolute numbers (kg per unit, million tonnes Mt in aggregates). Recycled content is the demand side of recycling and just as important for the circular economy as the effort to recycle the product at its disposal.

Reduce waste through increasing recycled content in products is a central aim of the new circular economy action plan. Post-consumer recycled content has not had large focus in previous preparatory and review studies due to an assumed complexity in setting the requirement and potential market surveillance challenges. However, large environmental potentials exist.

In its drive towards a Circular Economy[17], the Commission has committed itself to a series of packages to bolster the uptake of secondary raw materials into the production of new products.

It has launched an EU-wide pledging campaign to ensure that by 2025, ten million tonnes of recycled plastics find their way into new products on the EU market each year - a figure that has also been endorsed by "The Circular Plastics Alliance" from – reportedly - an EU market of 4 million tonnes for recycled plastics in 2019 helping to deliver the circular economy with a life cycle approach.

Other impacts such as chemical contents and possibilities for market surveillance verification should also be considered.

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[17] https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy.pdf

3.3.3 Durability

Improving product durability is one of the focus areas in the new Circular Economy Action Plan, which also mentions specifically electronics and ICT products including charging cables.

There are many aspects of durability, which should be taking into account, including software-related obsolescence. Software-related obsolescence concerns mainly the permanently integrated firmware; the operating system or an app that enables the functionalities of the device. The obsolescence takes place when the hardware is still fully working but can no longer operate because the software is outdated or intentionally blocks the device.

In durability should also be considered the combination of reliability, maintenance, repair and re-use and for a variety of usage situations.

3.3.4 Ecological profile

So far, in all ecodesign regulations adopted under Ecodesign Directive 2009/125/EC, only Annex II, the method for setting specific minimum ecodesign requirements, has been applied besides some generic ecodesign requirements relating to the supply of information. According to the directive, when it is not appropriate to set limit values for the product group under examination, then the method referred to in Annex I must be applied, establishing an ecological profile to be assessed and provided by the manufacturer to evaluate alternative design solutions and the achieved environmental performance of the products against benchmarks.

Annex I, however, has not yet been used at all, although additional improvement potential would be possible compared to what is achieved by Annex II only. Annex I would be incentivising improvement potentials for products on the European market related to certain benchmarks, whereas Annex II sets restrictive minimum levels to be achieved by all products to be placed on the European market to demonstrate their compliance.

The idea of using Annex I instead of Annex II would be applicable and favourable in following cases where the setting of specific ecodesign requirements being applicable to all products placed on the market is most challenging:

- Improving the environmental performance of rather complex products and product systems
- Improving the environmental performance of products with comparably lower environmental impacts and improvement potential / energy savings during use phase but high impacts / improvement potential of raw material extraction, manufacturing and End-of-life phases.
- Improving the overall environmental performance of products with environmentally relevant use of consumables
- Improving the overall environmental performance of products with mainly indirect environmental impacts, e.g. by shifting impacts of the use phase into the cloud

Specific requirements as addressed by Annex II of the Directive are likely to have the most certain effectiveness and hence are the most powerful regulatory tool; however, as they remove products with low performances from the market they also require the greatest certainty of net benefit prior to their introduction. In cases where this is challenged by

methodological constraints, major environmental improvement potential of the Ecodesign regulatory framework will not be exploited if this leads to potentially weak implementing measures, only voluntary agreements, or, at the worst, to no regulatory measures for certain product categories at all. On the other hand, applying Annex I, i.e. setting generic ecodesign requirements based on ecological profiles in those fields of constraints as illustrated above, gives the possibility of a more flexible treatment with the ability to capture, value and encourage also (future) product specific innovations.

3.3.5 IT innovative solutions for improved market surveillance

Horizontal IT innovative solutions for improved market surveillance have interesting potentials. Several opportunities exist, where ecodesign and/or energy labelling measures could be applied both in terms of technical solutions for the products and informative solutions. It is therefore recommended to be assessed further in Task 3.

3.3.6 Firmware and software

Firmware and software and their updates are very relevant for the lifetime of electronic products, especially mobile phones and tablets, but also other computing systems. Software obsolescence is an important parameter in relation to lifetime, which has been highlighted by the circular economy action plan.

Furthermore, experience shows that the way in which software is designed and written can influence the energy consumption of a product. Against this background, corresponding requirements may be interesting. A question is whether software is covered by Art. 2(1) of the Ecodesign Directive as an energy-related product and lack of standards may also be an issue.

3.3.7 Scarce and critical raw materials

Scarce materials and critical raw materials are very relevant in relation to the circular economy action plan and also in relation to the individual product's lifecycle, especially for products with short lifetimes and low resource consumptions for the in-use phase, such as electronics.

4 ANNEX: LONG LIST OF PRODUCT GROUPS AND HORIZONTAL INITIATIVES

The list is divided into product groups and horizontal initiatives and sorted in alphabetic order.

Product groups
Aerials, antennas, radars, radio navigation and control items
Air filters for ventilation units
Air purifiers
Aircurtains
Amusement park and fairground equipment
Anti-legionella water equipment
Aquarium equipment other than pump
Base stations & subsystem
Basic electronic unit parts (capacitors, resistors, printed circuits)
Battery-powered ICT devices
Blowers
Centrifugal clothes driers
Clothes ironing products, tertiary (ironing machines and presses)
Cloud computing
Cold water applications, other equipment
Commercial lighting equipment
Common power adaptors
Construction products
Cooling towers & fans
Curtains, interior & exterior blinds, shutters, solar shadings
Decalcifiers of drinking water for home and commercial (restaurants, bars)
Defibrillators
Detergent
District heating and district cooling pipes
Domestic and commercial steam ovens, fryers and grills (not yet covered)
Domestic kitchen appliances incl. toasters
Drinking water circulators
Drones / quadrocopter
Ducts and duct systems
Electric music instruments
Electric toys
Electric vehicle chargers
Electrical insulators
Electrically operated clocks and watches
Elevators, escalators and moving walkways
Energy harvesting subsystems
Energy using equipment used in means of transport (other than refrigerated containers)
Equipment transformers
Fixed tap water heating devices

Fluid handling

Fluid power: hydraulic and pneumaticequipment

Fuels and additives

Games consoles

Gaming automates and tables

Goods transport and logistic systems

Greenhouse covers

Gymnasium or athletics articles - treadmills

Hair dryers

Handheld power tools

Healthcare products

Hot food presentation and storage equipment

Humidifiers and dehumidifiers (domestic, tertiary, industrial)

Imaging equipment and consumables

Industrial cleaning of articles

Industrial drying of articles (not materials)

Industrial equipment for special processes

Industrial machines for food manufacture (other than ovens)

Industrial process heating equipment, other than ENTR 4

Industrial robots

Industrial sensing and controlling

Industrial sensors

Infrared reflective paints ("cool roof coatings")

Interconnected home audio, video & voice service equipment (not yet covered)

Inverters and converters

IoT battery driven sensors

Large scale electrolysis equipment

Lasers

Lathes, milling machines and drilling centres

Lawn and ride-on mowers

Lighting applications not covered by existing lots

Low-temperature space heating radiators/convectors

Lubricants

Luminaires

Machinery not belonging to group "transport"

Machines and equipment for textile and clothes industry

Material processing equipment other than ENTR 5

Measuring transformers

Medical equipment not covered by SRI, Diagnostic and Therapeutic

Medium / large power generation

Medium large electric power transport and distribution

Medium/large electric power storage

Mining / tunnelling machinery

Mobile (outdoor) equipment

Mobile power generators

Non-tertiary coffee machines

Opto-chemical process equipment

Other ICT products from ICT study

Other special purpose ventilation

Packing equipment

Painting equipment, painting lines, powder coating plants

Paper production equipment, other than ENTR 5

Patio heaters

Person transport, other

Personal care: blowers (hand driers)

Personal care: equipment with motors and moving parts

Personal care: heating equipment

Personal care: suntanning equipment

Personal weighing scales

Photographic equipment

Plastics industry machines, other than ENTR 5

Power cables (domestic)

Pre-fabricated houses of small size for temporary use (garden houses)

Printing equipment incl. 3D-printers

Product design for optimising waste heat recovery

Professional cooking appliances

Professional dishwashing appliances

Professional kitchen appliances

Professional laundry appliances (washers & driers)

Professional sound and imaging equipment

Router, W-Lan-Router, Internet boxes, multimedia boxes

Safety and signaling lighting equipment

Satellites for (rural) internet

Sewing machines (domestic, tertiary)

Small network equipment for home and office use

Small scale electric power generation (<50 MW)

Small scale electric power storage (< 50 MW)

Small scale electrolysis equipment

Small-scale cooking products

Smart appliances

Smartphones and other telecom edge products

Soft starters

Solar shadings for windows

Soundbars

Space heating: ionisation heaters

Streaming services

Street lighting systems with/without PV

Swimming pool and spa equipment, permanently installed

Telecom end terminating equipment, non-portable

Tertiary hot beverage equipment incl. free-standing hot beverage vending machines

Textiles dry cleaning equipment

Thermal insulation (non building)

Thermal insulation of buildings

Uninterruptible Power Supplies

Universal batteries

Universal external power supplies

Unmanned aircrafts (drones)

Variable speed drives

Video projectors
Water cookers
Water pump units
Water, steam and sand cleaning appliances
Windows
Wired & wireless chargers (inductive chargers), other power supplies, common charger
Woodworking machinery: Thicknessing planer, jointer, sawmills etc

Horizontal Initiatives
Battery-driven products (horizontal)
Durability
Ecological profile
Firmware and software
IoT LAN/WAN initiative
Lightweight design
Market surveillance
Packaging
Packaging of medical products / disposable surgical instruments (as a substitute for sterili-sation)
Post-consumer recycled content
Scarce and critical raw materials
Software and apps (horizontal)