

**Possible Ecodesign and Energy Labelling
requirements for electronic displays**

EXPLANATORY NOTES

(updated)

1. CONTEXT OF THE PROPOSAL

1.1. Legal framework

The Ecodesign Directive 2009/125/EC establishes a framework for laying down ecodesign requirements for energy-related products. It is a key instrument of EU policy for improving the energy efficiency and other aspects of the environmental performance of products in the internal market. Article 16 of the Ecodesign Directive lists products identified by the Council and the European Parliament as priorities for the Commission for implementation, including consumer electronics, office equipment and domestic appliances. Electronic displays therefore belong to the priority product groups considered for implementing measures under the Ecodesign Directive.

The application of the Ecodesign Directive is complemented by the Energy Labelling Directive 2010/30/EU, which establishes a framework for developing Delegated Regulations which lay down energy labelling requirements for the priority product groups. The labelling requirements ensure that consumers make well informed purchase decisions, provide a dynamic incentive for manufacturers to improve energy efficiency of their products and accelerate the market take-up of energy-efficient models.

The application of ecodesign and energy labelling requirements is complementary, i.e. ecodesign pushes and energy labelling pulls the market. In this context, a proposal for an ecodesign Regulation on a specific product group is often accompanied by a proposal for a Delegated Regulation laying down energy labelling requirements for that product group (provided that there is a positive outcome of the Impact Assessment).

1.2. Grounds for and objectives of the proposal

Televisions (TVs) are widely used in European households and other electronic displays, such as computer monitors, are used in any office. In 2014 the EU stock of TVs and computer monitors amounted to 598 million units. The annual sales of televisions peaked in 2010 and then started gradually to decline. In 2030, an average ownership of approximately 3 TVs per household is expected, next to one or more computer monitors. The replacement rate ("apparent" service life) of TVs was reduced from 9 to 6 years between 1990 and 2010, but has since been rising to more than 7 – 7.5 years.

The energy consumption of all electronic displays in 2014 is estimated at 75 TWh, resulting in a total electricity bill of 13.5 billion euros (assuming an EU average cost of 0.20 euros/kWh).

After the entry into force of the current Regulations in 2010, a dramatic technology and market change has been taking place, which needs to be addressed:

1. the gradual switch across Europe from analogue to digital broadcasting;
2. the change in aspect ratio from 4:3 to 16:9;
3. the move from a resolution of 576 lines to HD (1208x720 pixels) and soon after to full HD (1920x1080);
4. the introduction of flat-screens, with less weight, volume and better perceived image quality displays (LCD panels initially backlit with fluorescent lamps, then LEDs);
5. a massive switch to smart televisions, connected to the Internet, and, more recently;

6. the introduction of new picture enhancement technologies with possibly huge impact on energy use¹ but not captured by current testing methodologies, and thus, providing unreliable information to consumers. This technology evolution is continuing, e.g. with a move to UHD-8K for televisions and computer displays used for graphics or video editing and with new self-emitting technologies such as Organic LED (OLED) and Quantum Dot LED (QLED).
7. A steady increase in the demand for larger screen-sizes (Figure 1) has been observed as well, with a drop in small televisions and computer monitors (e.g. <20 diagonal inches) that may reflect the end-user shifting to watch video content on computers (or tablets).

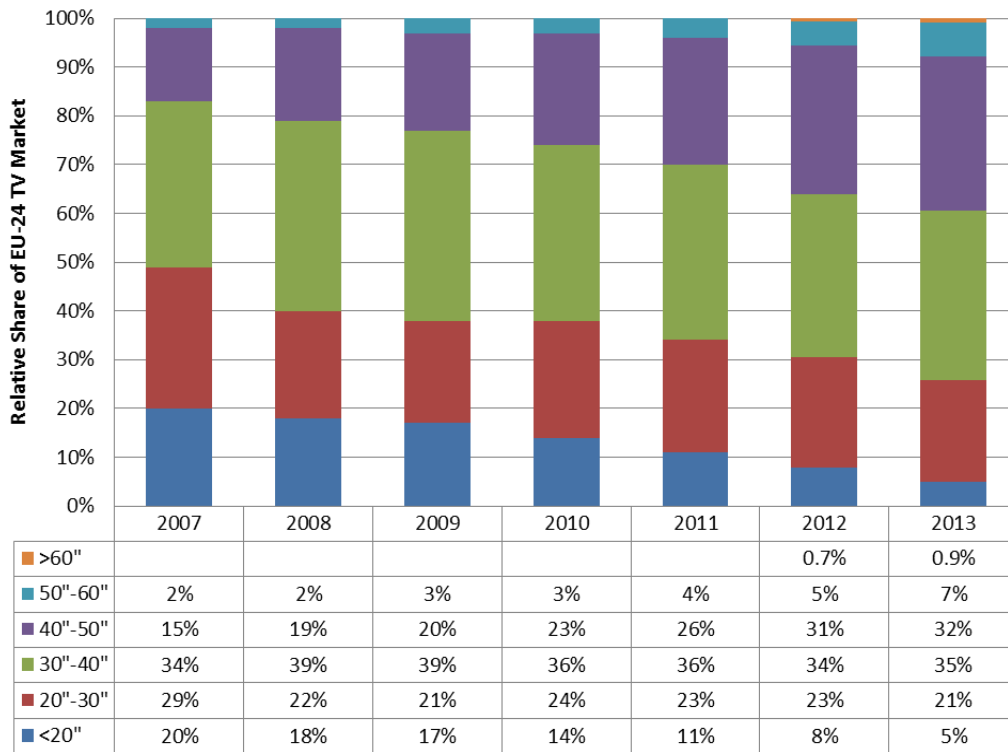


Figure 1: Increasing screen size market share for televisions (EU-24, GfK data referred to by CLASP, 2014)

Figure 2 provides more detail on the trend towards bigger displays for the years 2012 and 2013, with a breakdown of the millions of units sold by size. 32 inch TVs were the most popular size category in 2012/13, followed by 40-43 inch TVs. Smaller screens tended to have lower sales in 2013 than in 2012, and larger screen sizes increased.

¹ Up to twice as much when using High Dynamic Range (HDR) content on HDR-enabled displays.

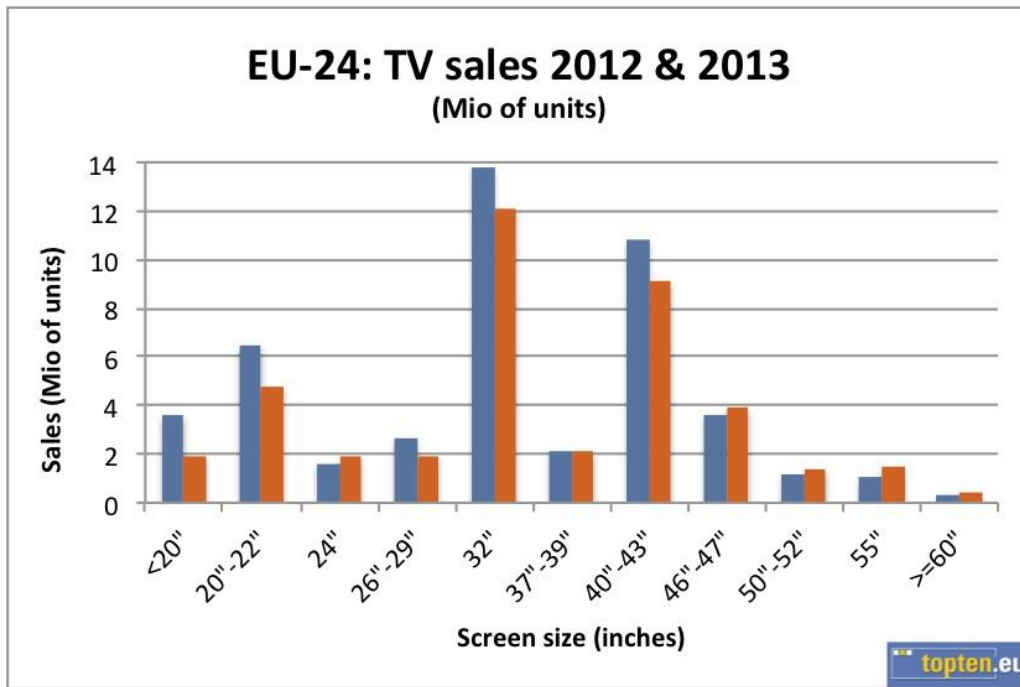


Figure 2: EU-24 TV sales, millions of units, in 2012 and 2013 (GfK data published by Topten)

At a recent consumer electronics conference in Berlin, GfK published sales information on television screen sizes from the 17 Western European countries. Sales of larger TVs are increasing, year-on-year, but the 32" category is still the dominant size in terms of unit sales and increased its share in 2016.

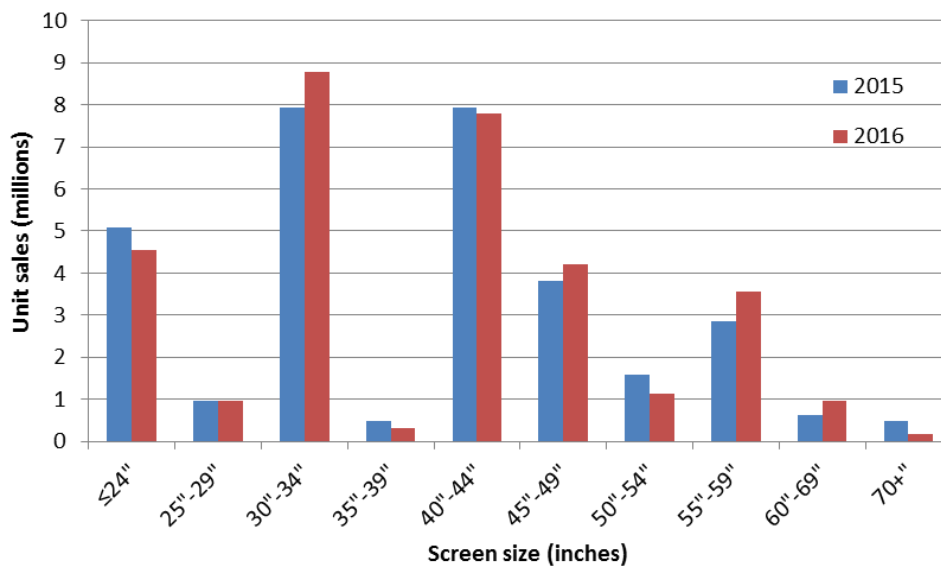


Figure 3 : WEU-17 TV sales, millions of units, in 2015 and 2016 (GfK data, replotted)

So far, of all electronic displays, only TVs and TV monitors have been covered by a mandatory ecodesign requirements (established by Commission Regulation 642/2009) and an energy labelling scheme (set up under Commission Delegated Regulation 1062/2010). In 2012, the Commission undertook a first review study of the two television regulations and presented its conclusions to stakeholders at the meeting of the Consultation Forum (CF, held on 8 October 2012) established under Article 18 of the Ecodesign Directive 2009/125/EC. The review showed that regulatory gaps and market failures, preventing the full realisation of the identified energy savings potential, including:

- Insufficiently stringent minimum ecodesign requirements applying to TVs that were exceeded by an unpredicted industry-led technological change;
- Rapid functional convergence between electronic displays, such as televisions, computer monitors and digital photo frames, creating a possible regulatory loophole. TVs have been increasingly enabled for web browsing, and other displays, mainly computer monitors, have been used to watch content traditionally viewed on TVs. It is more and more difficult to distinguish between different product categories;
- Lack of requirements on new energy-intensive features, such as network connectivity;
- Lack of requirements on resource efficiency aspects that have a significant environmental impact (e.g. no requirements aiming at recovery of rare, precious and critical raw materials), or of requirements on recyclability of common metals and plastics to recover embodied energy and carbon.

In 2012 half the models already qualified for the highest available 'A' energy class² and in 2013 nearly 70% of the sold TVs were in class A or better³. Data for the Belgian market showed that during the first half of 2014, 94% of TV sales were in classes A or above⁴. The introduction of A+ and higher classes on the energy label during the last review of the Directive in 2010 have reduced the effectiveness of the label for consumers⁵ and there is untapped potential for energy savings and reducing other environmental impacts⁶. Well-known flaws of the current labelling regulation include:

- i. the coexistence of labels with different class ranges⁷;
- ii. the fact that consumers are less motivated to buy more energy-efficient products when considering the difference between A+ and A+++ compared to the difference between C and A⁸, and

2 Distribution (data base ca. end 2012): 'A' 49% (of which 35% current 'A' and 14% future 'A+' and a few models in the future 'A++' and 'A+++'), 'B' 27%, 'C' 20%, 'D' 3%, 'E' 1%.

3 According to the current regulation the 'A+' class is available only per 1.1.2014, 'A++' in 2017 and 'A+++' in 2020.

4 With the remaining 6% being B class and C and D classes with less than 0,5%.

5 Elke Dünhoff, Alexandra Palm (2014) Comprehensibility of the EU Energy Label – Results of two focus groups and a representative consumer survey Verbraucherzentrale - Rheinland-Pfalz e.V., Funded by Ministry of Economic Affairs, Climate Protection, Energy and Regional Planning, Mainz, 15.10.2014

6 Ecofys, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive, June 2014

7 According to Article 3 of regulation 1062/2010, suppliers are allowed to anticipate the use of a label foreseen for a subsequent period: this resulted, since 2014, in coexistence of products displaying a label A+ -F and A++ -E, although the latter had been expected to replace the former from 2017, thus providing confusing information to consumers.

8 i.e. false perception of the "A-plus classes" as subclasses of class A

- iii. the impossibility of indicating the power use in ultra high definition (UHD) resolution or with high dynamic range (HDR) active. Finally, the label provides for annual energy use based on 4-hours/day, 365 days/year which seems far from being realistic, and does not account for power consumption in standby, which for "connected" TVs (i.e. in network standby) it is not irrelevant.

An updated version of the ecodesign and energy labelling requirements was presented and discussed with stakeholders at the Consultation Forum meeting on 10 December 2014.

Concerning the Ecodesign proposal, the text was already subjected to an inter-service consultation in November 2016. It was subsequently submitted to the 'Better Regulation' Feedback mechanism and the WTO in January 2017. Given the feedback received and the fact that the text has substantially changed since the last Consultation Forum in 2014 (in particular as regards to resource efficiency requirements), the text needs further improvements and updates.

As regards the Energy Labelling proposal, the ongoing review of the Labelling Directive 2010/30/EU necessitated a delay until the legislative process for a new Framework Labelling Regulation was concluded. The attached draft proposal, therefore, is aligned with the text as voted in the Parliament on 13 June and adopted by the Council on 26 June 2017.

The Commission is proposing to correct existing market and regulatory failures thus contributing to realising the cost-effective potential for reducing electricity consumption and associated GHG emissions and to saving natural resource.

The aim of these proposed regulations for electronic displays is to strengthen the existing regulatory framework by introducing revised requirements that will more appropriately reflect recent technology developments in the electronic displays sector, to extend the application of the requirements to computer displays (and thus to remove possible regulatory loopholes), to address new energy-intensive features such as networked standby, and to tackle resource efficiency aspects having significant impact. For the first time, requirements are proposed to enhance repair and reuse, and facilitate recycling with higher yields of recovered materials (Ecodesign). Consumers would be provided with an updated label, rescaling the existing and overcrowded classes above A and giving additional information as regards the most relevant new features (Labelling).

1.3. Existing provisions in the area of the proposal

The following Regulations are relevant to the energy and environmental aspects of the electronic display products placed on the EU market:

- 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, and networked standby, electric power consumption of electrical and electronic household and office equipment⁹.
- 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

⁹ OJ L 339, 18.12.2008, p. 45

requirements for no-load condition electric power consumption and average active efficiency of external power supplies¹⁰

- Commission Regulation (EC) No 642/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions¹¹
- Commission Regulation (EC) No 617/2013 of 26 June 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for computers and computer servers¹²
- 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 televisions¹³
- Commission Delegated Regulation (EU) No 1062/2010¹⁴ of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of televisions.

Additionally, the resource-efficiency requirements in this proposed measure are in line with the provisions of the Directive 2012/19/EU of 4 July 2012 on waste electrical and electronic equipment (WEEE). Finally Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) is relevant in electronic equipment production.

2. CONSULTATION OF INTERESTED PARTIES AND IMPACT ASSESSMENT

2.1. Consultations

European and international stakeholders and Member States' experts have participated in this process from the beginning.

A first proposal for ecodesign and labelling requirements was discussed on 8 October 2012 in the ecodesign Consultation Forum (CF) that comprises Member States' experts and other stakeholders, including the representatives of manufacturers, environmental non-governmental organisations ('NGOs') and consumer organisations.

Following this meeting, stakeholders were given an additional thirty days for submitting written comments that were subsequently published on the CIRCA website.

Furthermore, the initiative was discussed between Commission staff of different services and various stakeholders at several bilateral and multilateral post-CF meetings held in 2013.

¹⁰ OJ L 93, 7.4.2009, p. 3

¹¹ OJ L 191, 23.07.2009, p. 42

¹² OJ L 175, 27.6.2013, p. 13

¹³ OJ L 225, 23.8.2013, p. 1

¹⁴ OJ L 314, 30.11.2010, p. 64

Delays in the policy process required an update of the available data, and a revised proposal for both ecodesign and energy labelling requirements was discussed in a second CF with all relevant stakeholders on 10 December 2014.

Following this second meeting, stakeholders were given an additional thirty days for submitting written comments that were subsequently published on the CIRCA website.

The adoption of the Circular Economy package in December 2015 suggested further updates, in particular of the non-energy related ecodesign requirements. Additional bilateral and multilateral meetings took place, particularly with industry, to discuss these requirements, which found general support with recyclers and NGOs, but mixed opinions expressed by suppliers. A proposal was then subjected to inter-service consultation in November 2016 after which the amended text was submitted to the 'Better Regulation' Feedback mechanism and the WTO.

Main organisations/experts consulted

The process of preparing the proposed regulation was conducted in an open process, taking into account input from all relevant stakeholders, including the representatives of national authorities, manufacturers and their associations, environmental NGOs, consumer organisations and technical experts.

Input from scientific expertise

In addition to the consultation process mentioned above, the Commission acquired external expertise to support the proposed measure on ecodesign (and associated energy labelling) measure. The expertise was gathered mainly through a review study that was carried out (with a full involvement of stakeholders) in 2012, before the CF meeting. The review study provided the Commission with technical and market data used to evaluate the existing television regulations and to support the development of the new ecodesign and energy labelling proposals for electronic displays. Furthermore, market and technical data was acquired through several bilateral and multilateral meetings with stakeholders held in 2013.

Industry data

The Commission established a first dataset in 2013 containing information about the environmental performance of electronic displays to support the development of the proposed ecodesign and energy labelling measures. The dataset was created to ensure that the proposed requirements have a proper ambition level and that they reflect recent technology developments.

The dataset was updated in July 2014 with new data provided by industry organisations. A second update was undertaken in April 2015, mostly with data collected from published product fiches available on the Internet. A further collection of publicly available data in 2017 and laboratory tests (only on computer monitors) indicate a current verification of continued technology evolution in respect to energy-efficiency.

Results of the CF of 2012

In principle, the proposed ecodesign requirements for electronic displays were supported by Member States and stakeholders.

An overwhelming majority of Member States and NGOs agreed on a proposed extension of the requirements to electronic displays other than televisions, including but not limited to computer monitors¹⁵. Manufacturers requested exceptions for specialised displays with distinct characteristics, such as signage (public) displays, and broadcast monitor, as well as for plasma displays (PDP) and displays using emerging technologies, i.e. ultra-high definition displays (UHD) and organic light emitting diode displays (OLED). Medical monitors are covered by regulation on medical products. Furthermore, following the extension of the scope, several stakeholders requested the Commission to amend mandate 477 and to ensure that CENELEC develops one standard that would provide proper measurement methods for all displays covered by the scope of the proposed measure.

The majority of stakeholders accepted the proposed approach for regulating the on-mode power demand of electronic displays and was in favour of a proposal that was based on a logarithmic regression line¹⁶.

The majority of stakeholders was in favour of including in the proposal the requirements on non-energy related aspects, including recyclability. At the same time they noted a need for proper measurement methods and highlighted the enforceability of the requirements.

The proposed measure (presented in a greater detail in section 3 of this explanatory memorandum) fully incorporates comments expressed by Member States and stakeholders during and after the CF meeting of 8 October 2012 (and thus differs on a number of aspects from the Commission original proposal prepared for the consultation process).

Results of the CF of 2014

The proposed ecodesign requirements for electronic displays were supported by Member States and stakeholders, based on an alternative formula for setting the energy efficiency index (EEI) of displays. However, some industry representatives objected to the new formula considering it to be excessively penalising for the largest displays (e.g. above 85 inches).

The proposal for possible labelling requirements was rejected by a majority of stakeholders because of the ongoing revision of the energy labelling framework legislation¹⁷.

Interservice Consultation of 2016

Only the ecodesign proposal was examined in an Interservice Consultation (ISC) held in November 2016, where a new, slightly more ambitious formula for calculating the EEI (albeit less penalising for the biggest displays) was suggested. Language was also suggested on specific requirements to facilitate recycling.

¹⁵ Digital photo frames were a concern at that date but are now a declined and irrelevant market.

¹⁶ Requirements laid down in Regulation 642/2009 were based on linear regression line

¹⁷ Industry was in favour of the proposal, however the ongoing review process of the Energy labelling Directive necessitated a delay in coming forward with an updated labelling proposal to include rescaling.

Public consultation (feedback portal and WTO)

The feedback mechanism and the WTO consultation on the ecodesign proposal suggested further improvements, in particular as regards the scope for end-of-life requirements and a general exclusion for displays integrated into other products, particularly if not mainly used in the domestic or office sector. Industry stakeholders (including component suppliers and producers of glue and sealing products) were strongly in favour of less prescriptive requirements for dismantling. The Consultation Forum where the new Labelling proposal will be discussed is another opportunity for stakeholders to express their views on these issues.

2.2. Impact assessment

An impact assessment of the possible policy measures was carried out pursuant to Article 15(4)(b) of Directive 2009/125/EC. Several policy options for achieving a market transformation fulfilling the appropriate level of ambition were considered, including: (option 1) no new EU action ('business-as-usual' case; (option 2), termination of the existing television regulations (option 3), a self-regulation measure concluded by industry and (option 4), revising the existing television regulation.

Given that the eligibility criteria laid down in the Ecodesign Directive (i.e. economic significance, significant environmental impact and significant savings potential) were still fully met and because the industry had not submitted any proposal for a valid self-regulation measure, options 2 and 3 were discarded and the analysis concentrated on the revision of the existing ecodesign and energy labelling television regulations.

The impacts of a policy option consisting of new ecodesign requirements for televisions and other electronic displays together with a new energy label was assessed against the 'business as usual' scenario. Two proposals, with different levels of ambition, were analysed including: (1) the first proposal presented before the CF meeting of 8 October 2012 and (2) the second proposal prepared after the CF meeting that incorporated stakeholder comments.

Based on an assessment of costs and benefits, a combination of ecodesign and energy labelling requirements emerged as the preferred option to address regulatory and market failures existing in the electronic displays sector.

This combination of ecodesign and energy labelling requirements has the following outcomes:

- the ecodesign requirements achieve cost-effective improvements in the energy efficiency of electronic displays;
- the labelling scheme creates market transparency for consumers and provides incentives for manufacturers to innovate/invest in energy efficiency;
- the life-cycle environmental impact of electronic displays relating to the use-phase energy consumption and to resource efficiency is significantly reduced;
- establishes a clear legal framework to ensure fair competition;
- results in positive impacts on the competitiveness of industry;

- harmonises the placing on the EU market of electronic displays, leading to the lowest possible administrative burdens and costs for economic operators and
- no disproportionate burdens or significant additional costs for manufacturers will result from the proposed measure, sufficient time is allowed for re -design cycles and the pace of innovation have been fully taken into account.

The impact assessment was updated in 2015 with new market data and to more fully include aspects related to the end-of-life treatment of electronic displays.

2.3. Review of the measures

For several reasons the proposals were not brought forward as expected. Because of the quick technology and market evolution, the Commission decided to revise the technology and market analysis through an update of the review study and, as requested by the industry representatives, to run an additional consultation of technical experts. A second dataset was created with updated market data from 2014, combining data from industry associations and from single companies. This data has been used to review the appropriateness of the curves previously devised and a first analysis suggested the identification of an improved function description, more in line with other labelling schemes, such as the US Energy Star and the Super-Efficient Equipment and Appliance Deployment (SEAD) initiative¹⁸.

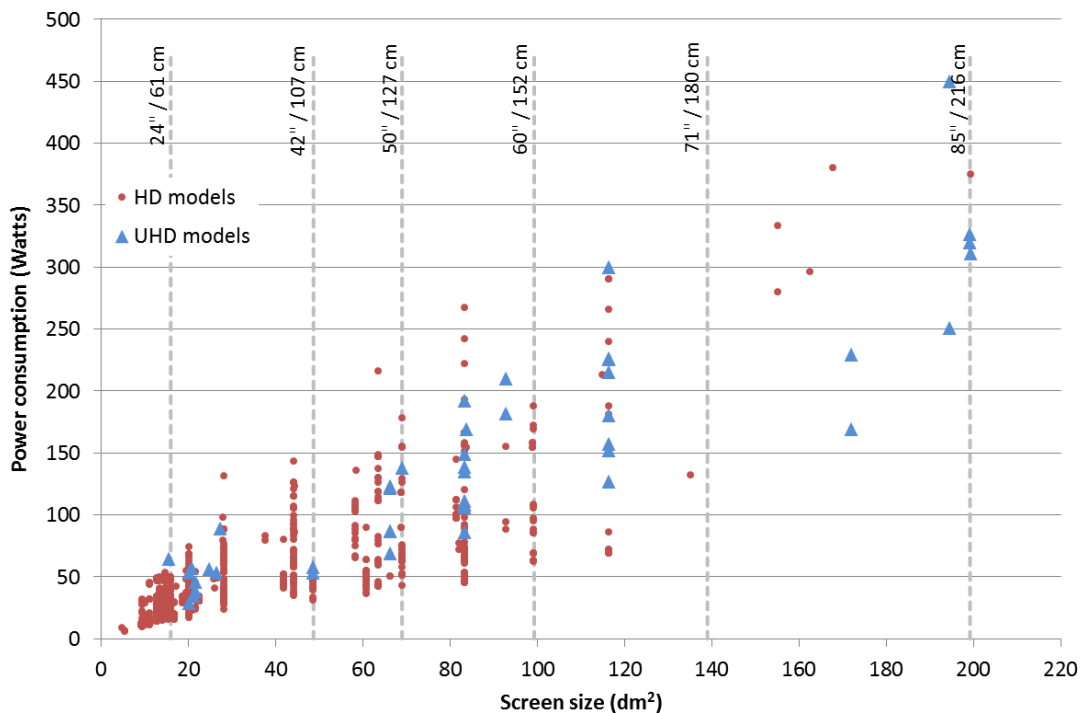


Figure 4: Scatter plot for power vs. screen size (2014 dataset): UHD/4K displays are blue triangles

The review focused on UHD televisions and in general on displays with resolution above HD. UHD 4k televisions were already widely available in the market with

¹⁸ <http://www.superefficient.org/>

affordable prices and new models are offering resolutions even beyond 4k. The updated data analysis has highlighted that already several models of 4k televisions are in energy A and A+ class and there is no objective reason not to include these displays in the scope of the proposed measures (Figure 4).

Figure 5 shows the average power consumption of electronic displays from the model database, compared with the requirements currently in force (Tier 1 is the blue line and Tier 2 is the red line). The graph shows how the efficiency levels for the biggest displays were already far below the Tier 2 requirements in 2014.

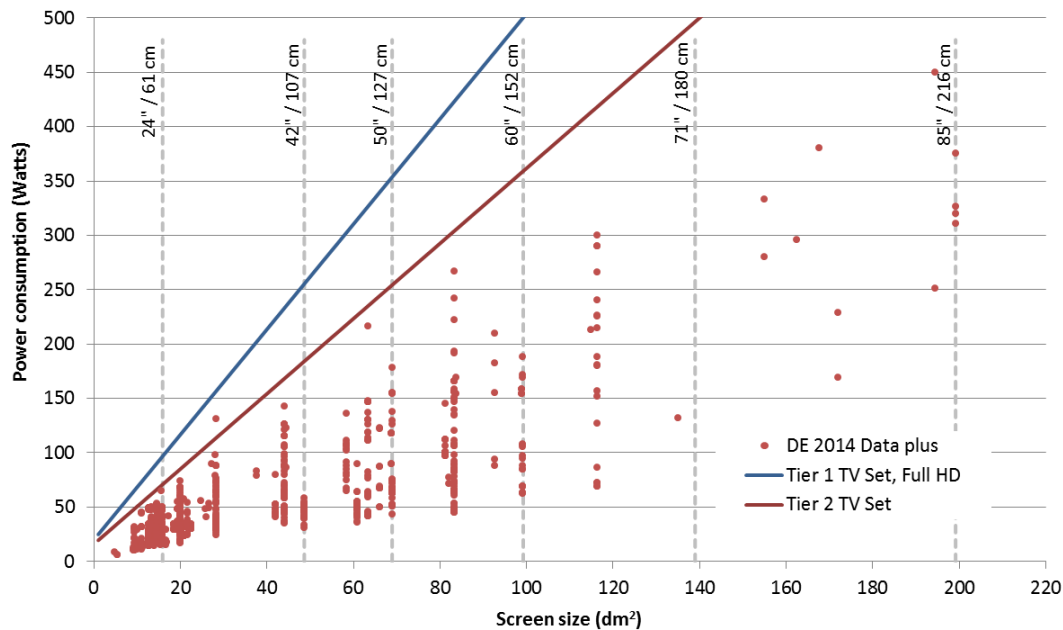


Figure 5: Comparison between the data on display models data and requirements included in Tier1 and Tier 2 of the current ED regulation 642/2009 (CLASP, 2014)

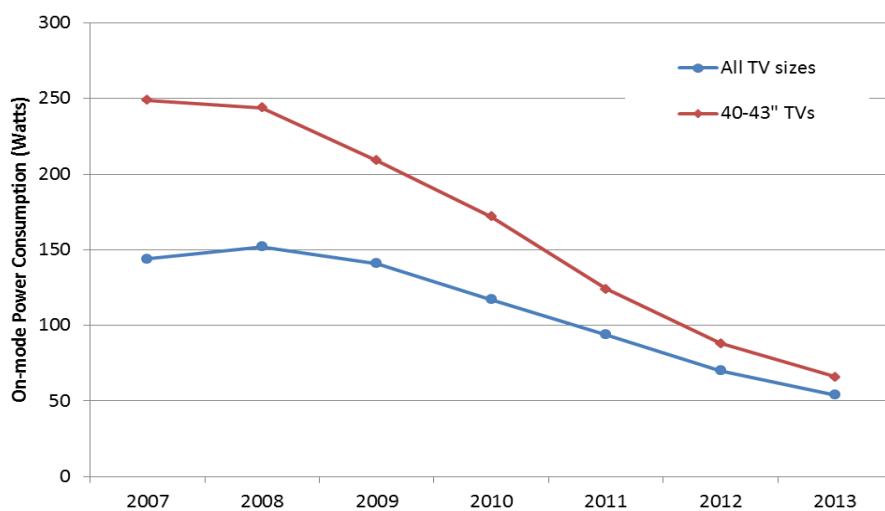


Figure 6: Average power consumption trend 2007-2014 comparing 40-43" TVs with all sizes (CLASP, with Topten data).

Furthermore, when comparing the power consumption reductions achieved in small vs.

large displays over time, the big improvement in the largest displays becomes even more evident. Thus, a linear regression line such as that used in EC No. 642/2009 is no longer appropriate and a different approach is required.

With respect to the labelling aspects, a television in E class in 2010 was already in A class in 2012 for a comparable life-cycle cost (Figure 7).

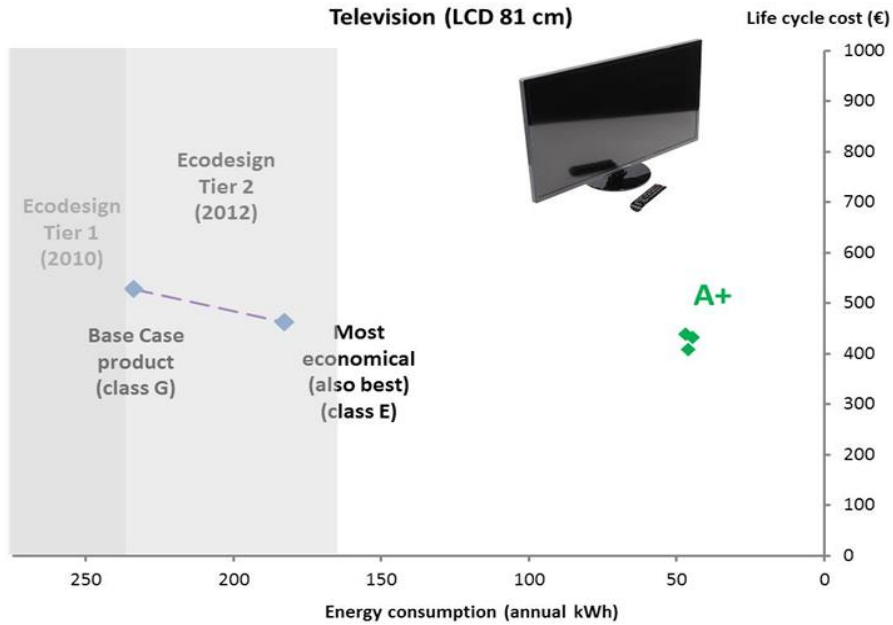


Figure 7: Energy class evolution of televisions for comparable life-cycle cost (Topten presentation¹⁹)

Although the 2014 dataset includes displays and television models in energy label classes C and D, when analysing the market share by energy class, inefficient displays reveal a negligible market penetration from 2014, as the market data study from GfK suggests (Figure 8 for the Belgian market).

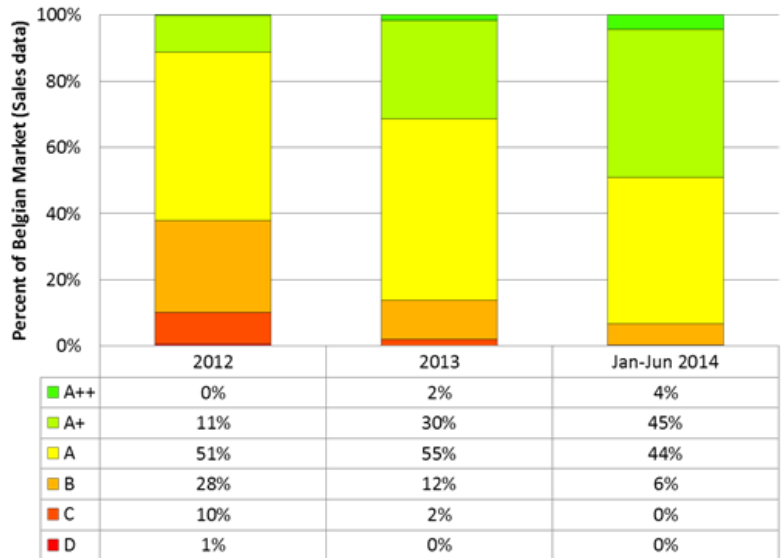


Figure 8: Market share evolution of sales data for televisions in Belgium (GfK, 2014)

¹⁹ International trends in Ecodesign and Energy Labelling, Brussels, 21 February 2014, WS 2)

Although EU No. 1062/2010 had only foreseen needing the 7 classes A+++ to D in January 2020, an overcrowding of the top energy classes could be expected to occur sooner (Figure 9).

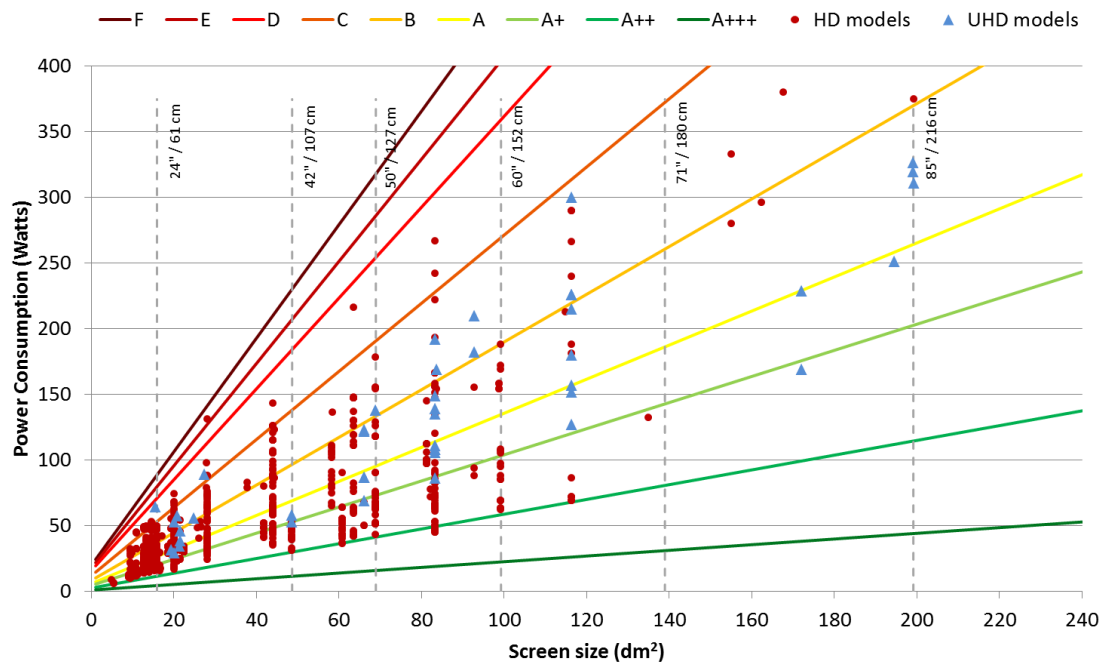


Figure 9: The 2014 models dataset compared with the current energy classes.

2.4. Resource efficiency aspects

Electronics manufacturing is highly resource and energy-intensive. Using recycled plastics is one way of “closing the loop”, facilitating a more circular economy and ensuring that resources recovered from waste products are partially used in new products. Embedded energy and carbon from manufacturing is lost when e-waste is dumped, and resources are wasted that are far more energy intensive to extract as raw materials as they are to recycle. Some companies report on their use of post-consumer content (PCC) recycled plastic as a way of reducing waste, saving energy used for raw materials processing and moving towards a circular production cycle. Recycling is more difficult and less efficient if waste plastics are contaminated with hazardous substances. Therefore there is a clear need to design them out and ensure minimal residual contamination of products.

According to a recent study²⁰, the share of TVs observed at the recycling plant containing Brominated Flame Retardants (BFR) plastics in the housings is around 18% (i.e. relevant but not dominant). As discussed in the study, it was found that a substantial share of the analysed TVs had a plastic marking that did not correspond to the plastic composition. Some automated techniques for sorting plastics containing BFR have been developed, but their efficiency and feasibility is still unknown. Miscibility of plastics is an issue (Figure 10). “X-ray fluorescence spectral analysis” seems actually the most efficient technology for sorting dark plastics used in TVs.

²⁰ Peeters et al., Closed loop recycling of plastics containing Flame Retardants, Resources, Conservation and Recycling 84 (2014) 35–43

	ABS	ABS BFR	HIPS	HIPS BFR	PET	PC	PMMA	PC/ABS PFR	HIPS/PPE PFR
ABS	G								
ABS BFR	G	G							
HIPS	Y	Y	G						
HIPS BFR	Y	Y	G	G					
PET	O	O	O	O	G				
PC	G	G	O	O	G	G			
PMMA	O	O	O	O	Y	O	G		
PC/ABS PFR	G	R	O	R	R	G	O	G	
HIPS/PPE PFR	O	O	G	G	R	O	O	Y	G
G	Good miscibility (contamination>5%, properties>80%)								
Y	Reasonable miscibility (contamination=2-5%, properties>80%)								
O	Limited miscibility (contamination=0.1-2%, properties>80%)								
R	Bad miscibility (contamination<0.1%, properties<80%)								

Figure 10: Miscibility preference scheme for plastics commonly used in LCD TVs (source Peeters et al., 2014)

Electronic displays using LCD-cold cathode fluorescent (CCFL) technology contain a fluorescent lamp containing mercury (Hg) vapour that is extremely fragile and should be removed with care (depollution phase, as required by the WEEE Directive) if the displays is recycled using shredding techniques. A clear indication of the absence of such a lamp could dramatically accelerate recycling procedures.

2.5. Environmental significance

The impact assessment undertaken in 2013 had estimated the annual electricity consumption related to electronic displays in the EU at about 55 TWh in 2020 and 66 TWh in 2030, corresponding to 21 and 25 Mt CO₂ emissions respectively. The savings potential for the two revised regulations, with their scopes extended to ‘electronic displays’ that are primarily intended for use in households and/or offices and digital photo frames, were estimated at 32 TWh electricity (by 2020), 12 Mt CO₂ equivalent and 8 billion euros in lowering the consumer energy bill. The savings potential in 2030, was estimated to reach 35 TWh, 13 Mt CO₂ equivalent and almost 13 billion euros. Additional benefits can be expected from measures promoting a higher recovery rate of rare and precious material resources.

A further update of the impact assessment will be undertaken after the Consultation Forum.

2.6. Currently covered products

The current regulation, EC No 642/2009, covers TVs and TV monitors (ENER Lot 5). Computer displays (ENER Lot 3) are not currently covered by any regulation, with the exception of displays integrated into computers (integrated desktop computers) for which the total mercury content has to be declared²¹. Article 9 of Regulation 642/2013 mentions the "potential to address energy consumption of integrated displays" in a future revision of the computer regulation itself.

²¹ Annex II, point 7.1.1(y)

2.7. International legislation

US-EPA Energy Star covers both televisions²² and computer²³ displays. Annex C of the EU-US Energy Star Agreement only applies to computer displays²⁴. The European Commission is involved in the preparation of new specifications for Energy Star, as well as in the SEAD initiative.

3. PROPOSED MEASURES

The review study has shown that significant energy savings can be achieved by implementing a number of policy options which are explained in this chapter. An overview of the projected savings can be found below.

3.1. Ecodesign

The 2012 proposal applied a best-fit linear curve for small displays and a natural log function for large displays. This same approach, applied to the new 2014 database was not considered satisfactory anymore.

Subsequent delays required further amendments and the curve finally retained was suggested by CLASP in October 2016:

$$EEI = \frac{\text{Power}_{\text{measured}} - 3}{2 \times [90 \times \tanh(0.02 + 0.006 \times (\text{Area} - 11)) + 4] + 6}$$

where *Area* is the display area in dm², and *Power_{measured}* is the measured power resulting from the current test video clip according to standard EN 62087.

Pass rates in Table 1 are based on product fiche data compiled from manufacturers' websites in September 2016 (578 models) and shows the pass rates of the 2016 television models, against minimum EEI for HD and UHD models, separately as per the Ecodesign proposal submitted to the WTO.

²² Current revision version 6.1, effective from 06/01/2013. Version 7.0 is in preparation with the involvement of the Commission.

²³ Current Version 6.0 effective from 06/01/2013.

²⁴ Commission Decision (2014/202/EU) of 20 March 2014.

		Ecodesign						Energy Labelling						
		HD			UHD			HD and UHD are treated the same (no power allowance on label)						
Proposed EEI		0.90	0.75	0.60	1.10	0.90	0.75	1.10	0.90	0.75	0.60	0.50	0.40	0.30
Tier/Label Class:	n =	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3	G	F	E	D	C	B	A
# of HD Models Passing	304	202	82	7				286	202	82	7	0	0	0
# of UHD Models Passing	274				145	82	24	145	82	24	2	0	0	0
# of Models Passing	578	347	164	31	347	164	31	431	284	106	9	0	0	0
% Models Passing		60%	28%	5%	60%	28%	5%	75%	49%	18%	2%	0%	0%	0%
% of Models Passing	304	66%	27%	2%				94%	66%	27%	2%	0%	0%	0%
10 to < 25 dm ²	26	77%	31%	0%				100%	77%	31%	0%	0%	0%	0%
≤ 25 to < 50 dm ²	142	49%	7%	1%				88%	49%	7%	1%	0%	0%	0%
≤ 50 to < 75 dm ²	66	88%	39%	3%				100%	88%	39%	3%	0%	0%	0%
≤ 75 to < 100 dm ²	64	81%	56%	5%				98%	81%	56%	5%	0%	0%	0%
≤ 100 to < 150 dm ²	5	40%	40%	20%				100%	40%	40%	20%	0%	0%	0%
≥ 150 dm ²	1	0%	0%	0%				100%	0%	0%	0%	0%	0%	0%
# of Models Passing	274				53%	30%	9%	53%	30%	9%	1%	0%	0%	0%
10 to < 25 dm ²	0				0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
≤ 25 to < 50 dm ²	35				34%	26%	0%	34%	26%	0%	0%	0%	0%	0%
≤ 50 to < 75 dm ²	55				44%	31%	0%	44%	31%	0%	0%	0%	0%	0%
≤ 75 to < 100 dm ²	96				57%	32%	8%	57%	32%	8%	0%	0%	0%	0%
≤ 100 to < 150 dm ²	71				68%	34%	23%	68%	34%	23%	3%	0%	0%	0%
≥ 150 dm ²	17				35%	6%	0%	35%	6%	0%	0%	0%	0%	0%

Table 1: Pass-rates of the HD and UHD models in Europe from the 2016 database, using the new equation.

To account for the additional power consumption found for UHD displays, different EEI requirements for HD and UHD displays are proposed under Ecodesign. However, for energy labelling the threshold values for the label classes are proposed to be the same for both HD and UHD displays (Figure 11: Scatter plot of the HD and UHD models in Europe from the 2016 database, using the new equation.).

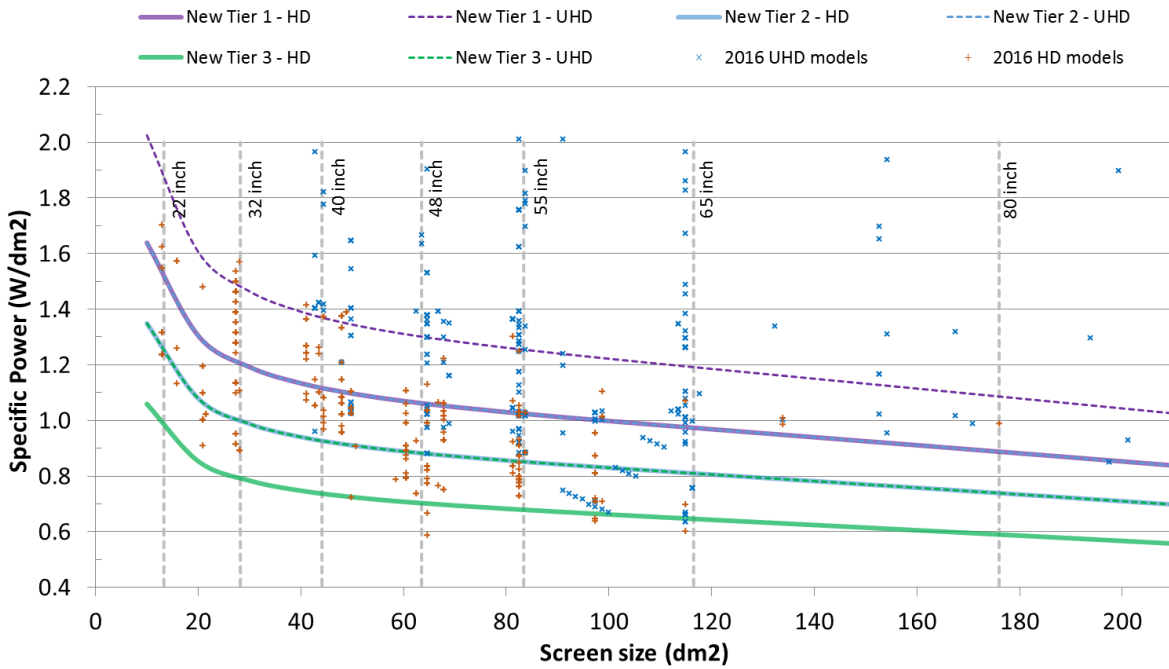


Figure 11: Scatter plot of the HD and UHD models in Europe from the 2016 database, using the new equation.

Projected pass rates at each tier in future years, assuming a 7.5% improvement in energy-efficiency each year starting in 2016. The dates of entry into force listed in

Table 2, however, may be delayed of 18-24 months if the proposal for electronic displays will be part of a package with other measures²⁵.

	HD	UHD
Tier 1, as of September 2016	66%	53%
Tier 1 if in 2018	87%	85%
Tier 2 if in 2020	84%	82%
Tier 3 if in 2022	74%	76%

Table 2: Projected pass rates associated to possible tier dates.

Resource-efficiency requirements

The proposed ecodesign measure provides for specific requirements for manufacturers to (1) facilitate dismantling of specific components requiring separate treatment before shredding as per the WEEE directive; (2) disclose information relevant for disassembly, recycling and/or recovery at end-of-life; and (3) mark plastic parts.

These requirements are devised to help recyclers to better comply with the WEEE Directive (2012/19/EU) by providing information relevant for the depollution, disassembling and/or shredding operations and improve the yield of some recyclable materials.

These requirements are in line with the approach taken in the Ecodesign regulations that were adopted so far and with the Commission Communication "Closing the loop - An EU action plan for the Circular Economy" aimed at establishing a common and coherent EU framework to promote the circular economy²⁶. The proposed requirements should result in marginal costs to manufacturers with possibly relevant cost reduction and improved efficiency for the recycling industry.

3.2. Energy Labelling

Analysis of the 2016 European TV model database found that 41 models were already in the A++ class, whilst the introduction of the label ranging between A++ and E was only foreseen from 1 January 2017. Consistent with the guidance from the recently agreed energy labelling directive, the label classes for electronic displays are being planned for rescaling. The proposed levels for the label classes are based around the principle of aligning the label classes with the HD and UHD EEI requirements at Tiers 1, 2 and 3. The proposal then has more ambitious EEI requirements for the top label classes, keeping classes A and B empty due to the fact that this is a fast-moving technology. Furthermore, the Commission is proposing to use exactly the same EEI value for HD and UHD televisions, rather than have a less ambitious requirement for UHD. The reason for this is that the label should inform the consumer of the higher running costs associated with the more energy-intensive UHD format, should the consumer want to have UHD resolution instead of HD resolution for a given screen size.

²⁵ I.e. all those associated to the rescaling of 6 product groups, as per Article 11.5 of the new Energy Labelling Framework Regulation.

²⁶ COM/2015/0614 final

The proposed values for the energy label classes are as follows:

- Class G = UHD Tier 1 = EEI of 1.10
- Class F = UHD Tier 2 = HD Tier 1 = EEI of 0.90
- Class E = UHD Tier 3 = HD Tier 2 = EEI of 0.75
- Class D = HD Tier 3 = EEI of 0.60
- Class C = EEI of 0.50
- Class B = EEI of 0.40
- Class A = EEI of 0.30

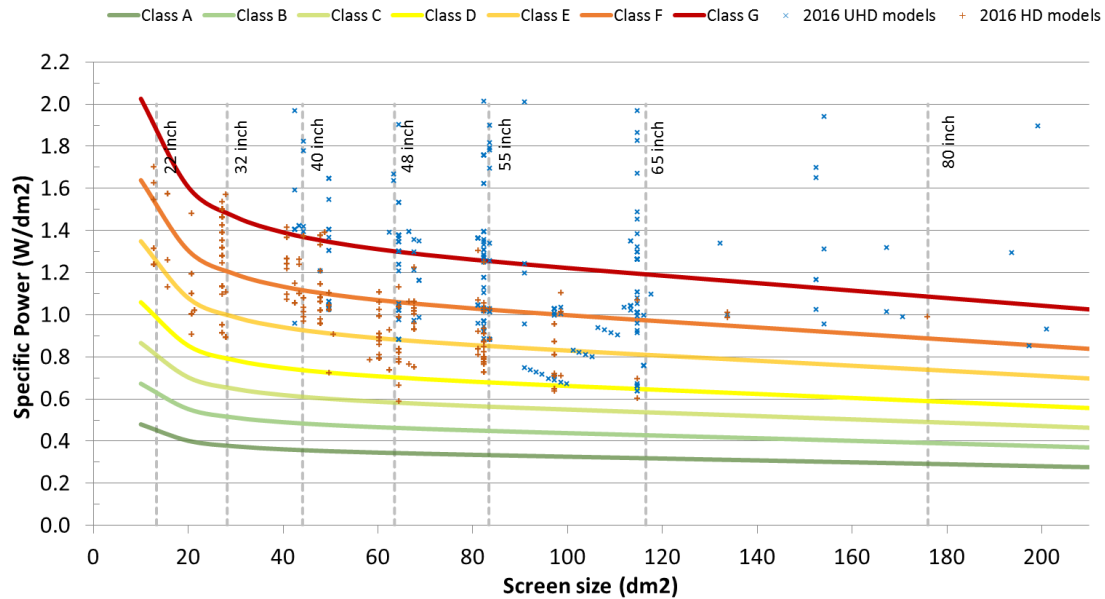


Figure 12: HD and UHD models in Europe from 2016, using the new equation and proposed label classes.

Since the adoption of the first television energy labelling regulation, many new technologies with an impact on the energy performance of TVs (and computer displays) have come to the market. The main ones have been taken into account in the proposal for a revised labelling measure as follows.

High-dynamic-range (HDR) is a technique used to reproduce images with a greater contrast ratio²⁷. Wide Colour Gamut (WCG) improves colour accuracy. Nearly all mid-range and high-end TVs for 2017 have these features. HDR content is becoming more common, for example on streaming services like Netflix and Ultra HD Blu-ray discs. These features incur additional energy consumption relative to models without them, and depending on how the algorithms are implemented, some designs can double energy consumption in HDR-mode. HDR is relatively new and no data is available for setting reliable minimum efficiency requirements. Consumers, however, must be correctly informed on the real consumption of an electronic display when HDR content is played. For this reason, a double A-G scale is proposed in the energy label, showing the display efficiency with HDR disabled and enabled.

Display luminance (or brightness) is the largest energy consuming function in electronic displays. Research on the use of televisions in households has shown that displays can

²⁷ Indicates how bright and dark the different parts of the image can be.

be dimmed when room ambient light levels are reduced, to achieve lower power consumption while improving viewer comfort. This energy-saving feature is most commonly called ‘automatic brightness control’ (ABC) and works by dimming the display’s brightness as a function of the luminance in front of the display. Whilst Ecodesign provides an allowance for the presence of ABC, a pictogram is proposed in the label to inform the customer of the presence (or absence) of such an energy saving feature.

The current (as well the proposed) ecodesign measure requires TVs to be shipped with an enabled automatic 'switch' to turn the television from on-mode to standby after at the latest 4 hours from the last interaction (e.g. changing channels or volume with a remote control), preceded by an alert so that the user can continue viewing. The rationale for this requirement is that after such a long time, it is likely that nobody is in watching the TV or they may have fallen asleep. Some high-end televisions are offering a movement sensor that provides better awareness of the presence of viewers and, thus, enables the waiting time from the last interaction to be reduced (e.g. from 4 hours to one or less), thus saving more energy. A pictogram on the label to inform the customer of this additional energy saving option is proposed.

ITU recently approved²⁸ an environmentally friendly standard for a universal external power supply (EPS) for laptops and other electronic devices in the same power range. Mobile products generally use an EPS but non mobile electronic devices with an EPS are not uncommon. The new standard²⁹ provides for improved energy efficiency and reduced greenhouse gas emissions and is expected to lead to significant reductions in electronic waste. Standardised power supplies would be shared with different electronic products in the same power range. Moreover power supplies are reported as one of the most frequently components to fail. Providing electronic displays with an EPS would make the replacement of a faulty power supply feasible for any end user. The availability of a standardised EPS (e.g. USB power supply with TYPE-C connector) would unbundle it from the product. A pictogram indicating the presence of a standardised EPS and its inclusion in the product packaging would rise consumer awareness of use of a standardised EPS³⁰.

3.2.1. Label characteristics

Article 11 point 5(b) of the new Energy Labelling Framework Regulation requires a rescaling of several product groups³¹ to be adopted within 15 months from entry into

²⁸ <http://www.itu.int/en/mediacentre/Pages/2016-PR41.aspx>

²⁹ Recommendation ITU-T L.1002 "External universal power adapter solutions for portable ICT devices" developed by the ITU standardization expert group for ICTs, the environment and climate change, ITU-T Study Group 5.

³⁰ The review of the Computer regulation 617/2013 may include a similar proposal which would be in line with the move to the "single charger" for telephones that the Commission has been promoting since 2010.

³¹ For the following product groups the Commission shall adopt ,within 15 months from entry into force of the new framework labelling Regulation, delegated acts rescaling the labels:

1. Commission Directive 96/60/EC on energy labelling of household combined washer-driers (OJ L 266, 18.10.1996, p. 1).
2. Commission Delegated Regulation (EU) No 1059/2010 on energy labelling of household dishwashers (OJ L 314, 30.11.2010, p. 1).

force of the Regulation itself. The proposed measure repeals Regulation (EU) 1062/2010 that is included in the mentioned list. Televisions are already in scope of the proposed labelling regulation and consequently are subject to a rescaling to an A-G scale³². Based on the technology evolution observed from entry into force of Regulation (EU) 1062/2010, the EEI values proposed in Annex I should assure that at the moment of entry into force of the revised regulation:

- No products are expected to fall in energy class A(Article 11 point 8) or B (Article 11 point 9);
- When Tier 2 of the proposed Ecodesign Regulation on electronic displays will come in force, class G shall be greyed on the label for new product units placed on the market;
- When Tier 3 of the proposed Ecodesign Regulation on electronic displays will come in force, class F shall be greyed on the label for new product units placed on the market;
- Each model unit is supplied with a printed label and a product sheet. In addition, the label shall be printed on the packaging for those situations where the product itself is not displayed on a shelf;
- A double A-G scale provides real-life energy use information, depending on the view modality (normal versus HDR, using the same calculation formula);
- Pictograms about possibly relevant features for lowering the energy use, or for durability/reparability aspects, are in the bottom part of the label (ABC, presence sensor, standardised EPS). The “off-switch” present in the current version is not deemed relevant anymore (negligible difference in energy use between off-mode and stand-by mode), whilst the annual energy use indication is not considered applicable because of the extremely different use patterns for televisions and computer monitors, in the domestic or office environment.

3.2.2. *Label understanding*

As required by the new Energy Labelling Framework Regulation, a study on consumer understanding of the proposed label has been undertaken to test the design and content of the pictograms. The results of this study have been taken into account in the updated labelling proposal³³.

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3. Commission Delegated Regulation (EU) No 1060/2010 on energy labelling of household refrigerating appliances (OJ L 314, 30.11.2010, p. 17).
 4. Commission Delegated Regulation (EU) No 1061/2010 on energy labelling of household washing machines (OJ L 314, 30.11.2010, p. 47).
 5. Commission Delegated Regulation (EU) No 1062/2010 on energy labelling of televisions (OJ L 314, 30.11.2010, p. 64).
 6. Commission Delegated Regulation (EU) No 874/2012 on energy labelling of electrical lamps and luminaires (OJ L 258, 26.9.2012, p. 1).

³² According to Article 3.3(a) of Regulation (EU) 1062/2010, the televisions on the market after entry into force of the proposed Regulation will be bearing a label with a class range from A+ to F or from A++ to E, depending on the suppliers' choice.

³³ E.g. power use in standby/network standby or annual energy use.

3.2.3. *Product Database*

The proposed measure requires entering of all public and compliance information³⁴ in the product registration database as per the new Energy Labelling Framework Regulation before a product is placed on the market for the first time.

Future reviews of the regulations will make use of readily available and reliable data stored there.

3.3. Exclusions

The scope of the ecodesign and energy labelling Regulation covers televisions and computer monitors for home/office use.

Displays in game-consoles, signage displays and projectors already included in other ecodesign measures or voluntary agreements are out of scope.

Displays integrated into mobile devices are out of scope because the efficiency requirements of such devices (due to a clear need for increasing battery lifetime) mean that a specific ecodesign measure would have limited added value.

Displays integrated into equipment for the professional or business-to-business market, such as industrial processing or laboratory testing, are out of scope due to their particular characteristics.

A number of displays for use in specific or professional markets (i.e. professional displays, broadcast displays, security displays and digital photo frames) are only covered by resource efficiency requirements in the ecodesign proposal, as these displays are virtually not distinguishable from TVs or computer monitors once disposed of and delivered to a recycling plant.

For integrated personal computers, which are also difficult to distinguish from small TVs or normal computer monitors, the parallel review of the regulation 617/2013/EU on computers may propose similar end-of-life requirements.

4. POSSIBLE OVERLAP WITH OTHER ECODESIGN MEASURES

Horizontal measures including Regulation EC No.1275/2009 on stand-by, Regulation EU No.801/2013 on networked stand-by and Regulation EC No.278/2009 on external power supplies have been considered in the drafting of this measure for the possible overlap of specific articles or specific aspects. Note that all these Regulations are currently under review as well.

Inclusion of computer displays in an Ecodesign regulation may provide the opportunity of excluding, in future, displays from the EU Energy Star agreement to avoid an overlap of measures and confusing consumers.

³⁴ i.e. the Energy label, the information fiche and the compliance information

5. REVIEW OF REGULATION 642/2009

According to Article 6 of the Commission Regulation (EC) No 642/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions³⁵, the Commission shall review this Regulation in the light of technological progress by August 2012³⁶ and shall present the results of this reviews to the Ecodesign Consultation Forum. The proposed Ecodesign measure would repeal the Regulation EC No 642/2009.

5.1. Review of Regulation 1062/2010

Similarly, according to Article 7 of the Commission Delegated Regulation (EU) No 1062/2010 of 28 September 2010, supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of televisions³⁷, the Commission shall review this Regulation, i.e. by December 2015³⁸. The proposed Energy labelling measure would repeal the Regulation EU No1062/2010.

6. FORM OF IMPLEMENTING MEASURES

The implementing measure will take the form of a Regulation setting minimum ecodesign requirements directly applicable in all Member States and a delegated regulation setting energy labelling requirements.

7. MEASUREMENTS AND CALCULATIONS

Measurements and calculations of the relevant product parameters should be performed using harmonised standards established in accordance with Article 10 of Directive 2009/125/EC, the reference numbers of which have been published in the *Official Journal of the European Union*, or using other reliable, accurate and reproducible methods which take into account the generally recognised state-of-the-art and produce results deemed to be of low uncertainty.

Requirements for calculation and measurement methods are specified in Annex III to the proposed Ecodesign measure and in Annex II of the Labelling measure. Following the extension of the scope, the Commission should amend mandate 477 to ensure that CENELEC develops one single standard that would provide proper measurement methods for all displays covered by the scope of the proposed measures, in particular to update testing methods in light of new technologies with an impact on energy use, to better address possible 'defeat devices or techniques' and to improve measurement of auto brightness control.

³⁵ OJ L 191, 23.07.2009, p. 42

³⁶ According to Article 8, 3 years after entry into force, i.e. 20 days from publication on OJ L191, Vol 2, 23 July 2009.

³⁷ OJ L314, 30.11.2010, p.64

³⁸ According to Article 9, in within 5 years after entry into force, i.e. 20 days from publication on OJ L314, Vol 53, 30 November 2010.

8. CONFORMITY ASSESSMENT

When performing the market surveillance checks referred to in Article 3 (2) of Directive 2009/125/EC, the authorities of the Member States shall apply the verification procedure for the requirements set out for the Ecodesign and the labelling measure respectively in Annex V and in Annex X.

The verification tolerances set out in the Annexes relate only to the verification of the measured parameters by Member States authorities and shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation.

9. BENCHMARKS

The indicative benchmarks in Table 3 are identified for the purpose of part 3, point 2 of Annex I to Directive 2009/125/EC and refer to the best available technology at the time of drafting this document for electronic displays on the market:

Diagonal of viewing area		HD format	UHD format
<i>(inches)</i>	<i>(cm)</i>	<i>(watt)</i>	<i>(watt)</i>
22	55.9	15	
32	81.3	25	
42.5	108.0	36	51
48.5	123.2	43	57
60	152.4	62	67
65	165.1	69	73

Table 3: Indicative benchmarks

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