DIGITALEUROPE

Follow-up position on the proposed energy efficiency requirements in the display regulations

Brussels, 31 August 2017

DIGITALEUROPE thanks the European Commission for organizing a meeting of the Consultation Forum, to discuss with multiple stakeholders various aspects of the proposed Ecodesign and Energy Labelling drafts for electronic displays. As detailed in our previous position papers, DIGITALEUROPE has strong reservations with some of the proposed requirements, and as a follow-up to the Consultation Forum wishes to provide additional feedback to address the specific energy efficiency and labelling requirements discussed during the meeting.

Executive summary

DIGITALEUROPE reiterates its strong concerns on the on-mode energy requirements defined in the Ecodesign and Energy Labelling draft regulations. Under the current proposal, energy efficiency limits will restrict market access for a disproportionate number of displays, whilst also limiting the effectiveness of the energy label as a decision making tool for consumers.

An analysis performed on over 2500 TVs models, placed on the market between the years 2011 and 2017, demonstrates that:

- In 6 years, energy consumption has decreased by 41% following a non-linear behaviour.
- Between 2011 and 2012 energy efficiency improved significantly as a result of the phase-out of CCFL lamps and of the increasing maturity of LED backlight technology.
- The reduction in energy consumption continued, at a slower pace, until 2015. From 2015, average energy consumption first stagnated and then slightly increased.
- While energy efficiency continued to improve, the energy consumption increased as a result of the introduction of better quality and feature-rich displays.
- Overall, there is an increasing demand for high-end displays and the margin for even more improvements in energy efficiency is now limited.

DIGITALEUROPE can state with confidence that display technology, supported by LED backlight technology, will not be able to achieve the unrealistic 7% continuous annual improvement rate in forthcoming years. Given the current state of the technology, an implementation of the EEI limits proposed by the EU Commission will result in the following impacts:

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- The Tier 1 proposal will immediately remove almost 40% of TVs and monitors from the European market. This percentage will almost double to 78% in Tier 2, and will then will continue to increase resulting in removal of almost all displays by Tier 3. The impact will be greater among high-end models, new display technologies, and large-size models. High performing monitors will be particularly impacted.
- The large majority of TVs and monitors (estimated at 89%) will fall in the bottom categories of the energy label (F and G), restricting the consumer's capacity to differentiate products on the basis of energy efficiency.

Significant improvements in energy consumption will only occur when new technologies, such as quantum dot emissive displays, become available. It should be noted however that quantum dot technology is still at an experimental stage and there is no accurate way to predict when it will become dominant in the market. In addition it is essential for regulatory conditions to allow some degree of flexibility for new technologies to manoeuvre, until their full potential is reached.

To lessen the negative impact of the proposed EEI limits on market / technology evolution and consumer choice, DIGITALEUROPE suggests that:

- **Ecodesign EEI limits should be eased sufficiently between 10% and 20%, depending on the resolution or Tier, and EEI intervals for the energy label should be modified accordingly** (see EEI limits and Energy classes proposed in section4.1).

- **Alternatively, DIGITALEUROPE would support removal of Tier 3 in favour of a more dynamic revision system, which is able to adjust more efficiently to technological developments, when the option is combined with sufficient additional allowances and for particular product features and longer transition periods for Tier 1 and Tier 2.**

In a scenario where the EU Commission fails to take these suggestions into consideration, a serious market disruption is likely to occur.

Additionally, DIGITALEUROPE would like to stress the need to modify the following points in the regulatory drafts:

- Off mode limit should remain at 0.3W. A reduction to 0.25W implies a technical challenge and a re-design for certain displays, while the cost-saving ratio is not justified.
- To avoid confusion and preserve consistency with previous EU regulations and guidance documents, the reactivation triggered by a connection between the monitor and a host (i.e. computer) should still be considered network reactivation.
- DIGITALEUROPE supports the proposal for two scales on the label to inform consumers on HDR power consumption. However, if this will result in a label that is not easily understood by consumers, it is suggested that HDR information is provided in the product information sheet only.

Finally, DIGITALEUROPE would like to emphasize that the methods to be used for compliance testing would have a significant impact on whether products will meet the proposed energy efficiency requirements. Testing methods should be clarified before the regulation is finalized, and they should take into account existing internationally recognized methods.

1. Inappropriate ambition level of on-mode requirements

DIGITALEUROPE is highly concerned with the unrealistic level of ambition of the on-mode requirements set by this draft regulation. With Ecodesign being a market access condition, such strict requirements can seriously limit the capacity of state-of-the-art technologies to come to market in Europe. Instead of removing the least efficient models, the proposed requirements will prevent a substantial amount of products from being sold on the EU market, and will significantly limit the range of choices to consumers. The impact will be disproportionate on high-end televisions and monitors with superior functionality and features.

1.1. Impact on televisions

When analysing the compliance rates of 2017 television models with the proposed EEI limits, it becomes clear that the current Commission proposal will result in very high percentages of products being denied market access, as shown in the table below:

	Resolution up to HD		Resolution above HD		Total
Total	94		287		381
Tier 1	37	39.4 %	113	39.4 %	39.4 %
Tier 2	87	92.5 %	222	77.3 %	81.1 %
Tier 3	91	96.8 %	286	99.6 %	98.9 %

Table 1: Fail rates for 2017 Television models

The impact is disproportionate on high-end models, new display technologies, and large-size models, with only one UHD television passing Tier 3. It should also be pointed out that the Commission proposal takes a step back from the necessity of harmonizing display energy efficiency requirements at a global level. Considering that ENERGY STAR on-mode specifications are calculated in a significantly different manner, resulting in values up to 40% lower than those declared under the EU Ecodesign methodology, a large number of certified models are likely to be denied EU market access.

In addition, DIGITALEUROPE is apprehensive with the stringency of the proposed energy classes. As it was already pointed out in our previous position paper, Annex I to the Energy Labelling draft, defining the EEI intervals for each energy class, contains a gap between classes F and G. Assuming that class G will actually contain displays with EEI ≥ 0.9, Table 2 below provides a breakdown of the numbers and percentages of television models included in each energy class.

	Class A	Class B	Class C	Class D	Class E	Class F	Class G
2017 TVs	0	0	0	3	5	114	259
Percentage	0 %	0 %	0 %	0.79%	1.31 %	29.92 %	67.98 %

Table 2: Distribution of 2017 Television models in the proposed energy classes

We were surprised to find out that apart from classes A and B, class C will also remain empty, and that only 0.8% of the models will fall in energy class D, 1.3% in E, with the remaining 97.9% in the bottom energy classes. This is particularly concerning since the current state of technology development shows that there can be no certainty that in the next 10 years any display will be able to reach class A category. Moreover, the majority of displays will remain in the bottom classes for a significant amount of years, which will negatively impact the ability of consumers to differentiate products based on their energy efficiency.

It should be also pointed out that the approach proposed by the Commission to grey out the bottom energy class at the date of coming into force of each Ecodesign tier is contradictory to the logic of the EEI limits in the Ecodesign draft, which take into account display resolution. As can be seen in Table 2 above, eliminating class G at Tier 1 would result in a fail rate of about 68%, significantly higher than the 39% calculated based on the proposed EEI limits (Table 1). Similar situations are encountered for Tiers 2 and 3. DIGITALEUROPE requests the Commission to eliminate this inconsistency by renouncing the proposal to grey out the bottom energy classes.

1.2. Impact on computer monitors

An analysis of compliance information for monitor models placed on the EU market in 2017 shows that monitors will have significant challenges in meeting the proposed EEI limits. This has also been confirmed by the results of the testing activities conducted by the Commission and presented during the meeting of the Consultation Forum. Table 3 below shows the fail rates of 2017 monitor models for the 3 proposed tiers:

	Resolution up to HD		Resolution above HD		Total
Total	134		85		219
Tier 1	37	27.6%	49	57.6 %	39.3%
Tier 2	90	67.2 %	79	92.9 %	73.9%
Tier 3	126	94 %	85	100.0 %	96.3%

Table 3: Fail rates for 2017 Monitor models

It is important to note that only monitors that are currently covered by the Lot 5 regulation have been taken into account in this analysis. Considering the expanded scope, the percentages of monitors failing the proposed requirements is expected to be even higher.

The impact is most severe on high resolution monitors (all are removed at Tier 3, and as early as Tier 1 the fail rate is over 57%), gaming monitors and curved or wide monitors. These types of monitors contain high performance features and generally have more powerful backlights to compensate for the decreased transmittance of their display panels. Currently there are very limited technical solutions to improve energy performance for these products. Thus, an overall adjustment of the EEI requirements and a range of on-mode allowances for certain displays facing additional challenges due to design/functionality are absolutely necessary to avoid major market disruptions.

The proposed energy efficiency classes are excessively strict for monitors too. Table 4 shows the numbers and percentages of monitor models in each energy class. Similarly to the case of televisions, no monitor model falls in classes A, B and C. Furthermore, class D is populated only with small size and low resolution monitors. All UHD monitors and the vast majority of curved and wide-screen monitors are in class G.

	Class A	Class B	Class C	Class D	Class E	Class F	Class G
2017 Monitors	0	0	0	8	36	59	116
Percentage	0 %	0 %	0 %	3.65 %	16.44 %	26.94 %	52.97 %

Table 4: Distribution of 2017 Monitor models in the proposed energy classes

1.3. Evolution of display technology and energy efficiency improvements

The EEI limits proposed in the Ecodesign draft were developed based on an incorrect assumption that energy performance of displays is improved by 7.5% annually. Industry has repeatedly explained that this perceived improvement is an average resulting from a reduction of power consumption that can be attributed to the phase-out of CCFL lamps, and therefore it should not be considered a constant technology improvement rate. Now that CCFL lamps have been almost completely replaced with LED backlights and new technologies such as OLED are yet to mature, industry does not foresee any new significant upgrades that could provide a continuation of the energy improvement trend in the near future. On the contrary, the increasing demand for displays with high performance features is expected to result on average in a slight increase in the energy consumption in the short term. Because high performance features require increased power consumption, industry is concerned that high performance TVs and monitors will not be able to comply with the limits proposed in the Ecodesign draft.

Figure 1 below reflects the non-linear evolution of television energy efficiency and has been obtained by analysing DIGITALEUROPE television data from 2011 to 2017.

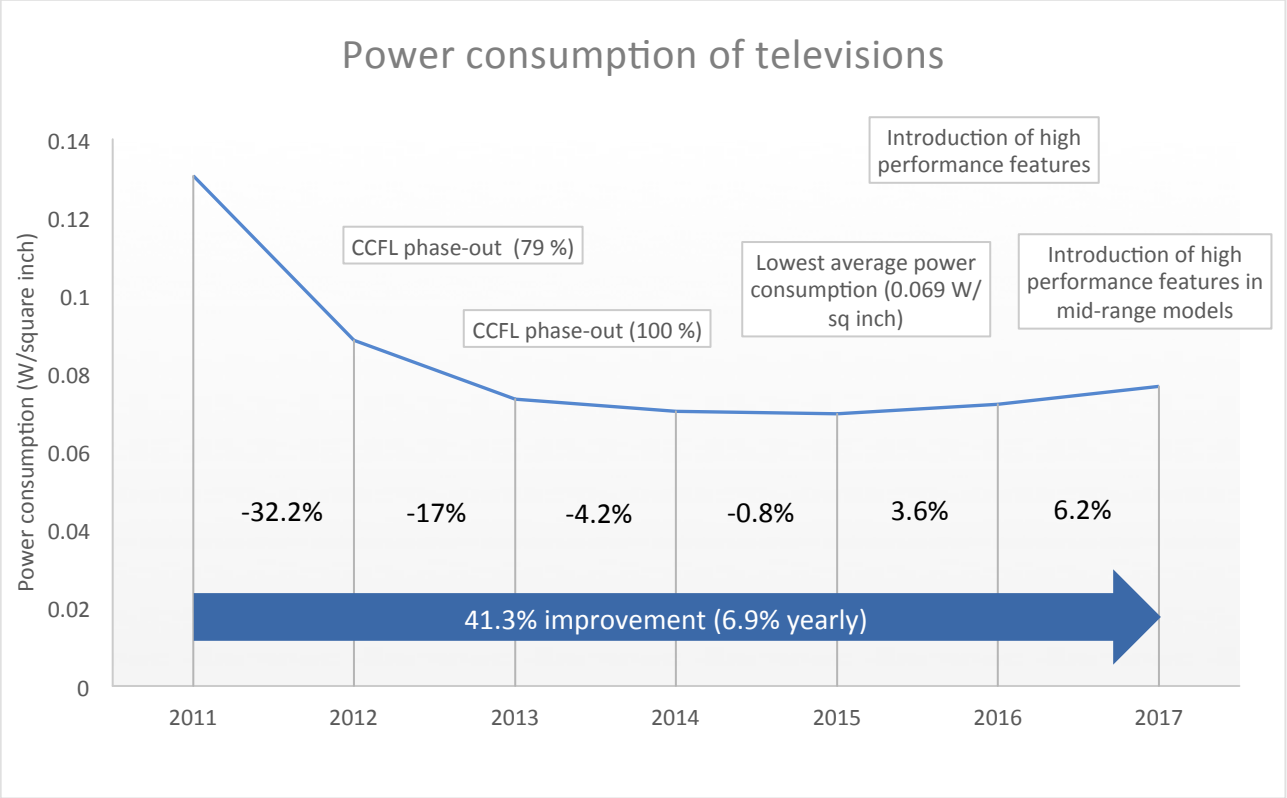

Figure 1: Power consumption of televisions between 2011 and 2017

It can be noticed that between 2011 and 2012 a significant drop in power consumption per square inch occurred. In 2011 the industry was already in the process of replacing CCFL lamps with LED backlights, and by 2012 the percentage of televisions with CCFL lamps was down to 5% of the total number of television models placed on the market, decreasing the average power consumption to 0.088 W/square inch, a reduction of over 32% of the average recorded in the previous year.

The decrease of the average power consumption continues between 2012 and 2013 (a 17% improvement of efficiency), with 2013 recording a 100% phase out of televisions with CCFL lamps. Starting 2014, we see a stabilization of the power consumption around 0.07 W/square inch, with the introduction of UHD technology offsetting additional improvements of display modules. The lowest average power consumption is recorded in 2015, at 0.069 W/square inch.

From 2016, due to the uptake of UHD technology, increased display luminance and improved colour and picture quality required to display HDR content, the trend started to reverse, registering a 3.6% increase of the power consumption in 2016, and a further 6.2% in 2017.

The overall improvement from 2011 to 2017 amounts to 41.3% within 6 years. If this improvement had been linear, we could calculate a yearly improvement rate of 6.9%, a figure that is close to the assumption used by the Commission in developing their proposal. However, when the actual non-linear evolution of technology is taken into account, we can clearly see that we are at a point where energy efficiency has reached close to a limit beyond which further efficiency improvement is not achievable with currently available technology.

While it is certainly difficult to estimate based on past evolution how energy efficiency will evolve in the future, the observed increase of consumer demand for high-end displays is expected to result in a slight increase of power consumption over the next couple of years, after which it will most likely remain constant over a longer period of time. Significant improvements will only occur when new technologies become available. One technology with a promising improvement potential is quantum-dot emissive displays, however this technology is still in experimental stage, and has years of development before it will be available on the market. Even more, industry expects that first generations of quantum dot emissive displays will not be able to meet the EEI limits proposed by the Commission and for this reason requests their exemption, alongside OLED displays, at least from Tier 1 requirements.

1.4. DIGITALEUROPE proposal for EEI limits and Energy Classes

To address the points mentioned in the previous chapters, the following on-mode requirements were proposed in a DIGITALEUROPE position paper dated February the 3rd:

	Resolution up to HD	Resolution above HD
Tier 1	$EEI_{max} = 1.0$	$EEI_{max} = 1.3$
Tier 2	$EEI_{max} = 0.85$	$EEI_{max} = 1.1$
Tier 3	$EEI_{max} = 0.65$	$EEI_{max} = 0.85$

Table 5: DIGITALEUROPE proposal for on-mode requirements

Associated fail rates for 2017 television and monitor models are as presented in Table 6:

	Resolution up to HD		Resolution above HD		Total
Total	228		372		600
Tier 1	44	19.30 %	49	13.17 %	15.5 %
Tier 2	107	46.93 %	162	43.55 %	44.83 %
Tier 3	211	92.54 %	340	91.40 %	91.83 %

Table 6: Fail rates for DIGITALEUROPE proposal for EEI limits

It is absolutely necessary for manufacturers to have a sufficient transition period to these new requirements, especially when taking into account the extended scope. The timeline for enforcement of the tiers should be 2020 for Tier 1, 2022 for Tier 2, and 2024 for Tier 3.

Keeping the original European Commission proposal is seen as risky approach given that technological development for the next 10 years is highly uncertain and the foreseen impacts from the proposal are very significant including an extremely high failure rate estimated for Tier 3. Therefore, DIGITALEUROPE makes two proposals for dealing with this uncertainty.

The first proposal is a relaxation in the stringency of the energy efficiency limits, as presented in Table 5 above. The second proposal is the removal of Tier 3 altogether. In this approach DIGITALEUROPE could support keeping the original Tier 1 and Tier 2 proposals, IF they are supported by a series of allowances for displays with specific features and longer timings between tiers. The allowances required are:

- Alignment of the ABC allowance in the Ecodesign draft with the 15% proposed in the Energy Labeling draft.
- For televisions, additional allowances should be set for high performance features such as increased luminance, contrast ratio or wide color gamut, as well as for large-size models (above 80 inch).
- For monitors, allowances should be set for models with curved screens, wide screens, and for touch capabilities.
- Tier 1 exemptions for on-mode requirements are still critical for OLED displays and displays with a resolution above UHD. DIGITALEUROPE proposes this exemption to be extended also to QLED displays.

While we do understand that the new Energy Labelling framework requires classes A and B to remain empty when a new energy label is defined, the fact that no television or monitor models fall in class C should be an indication that the energy classes need to be further re-assessed in order to accommodate more models. DIGITALEUROPE also wants to point out that the impact on UHD remains disproportionately negative if the EEI intervals are defined regardless of resolution and suggests a differentiation between energy classes for HD and UHD displays. An improved proposal for the EEI intervals for each energy class can be seen in Table 7.

Energy Efficiency Class	Energy Efficiency Index (EEI)	
	Up to HD	Above HD
A	EEI ≤ 0.35	EEI ≤ 0.5
B	0.35 < EEI ≤ 0.45	0.5 < EEI ≤ 0.6
C	0.45 < EEI ≤ 0.55	0.6 < EEI ≤ 0.7
D	0.55 < EEI ≤ 0.65	0.7 < EEI ≤ 0.85
E	0.65 < EEI ≤ 0.85	0.85 < EEI ≤ 1.1
F	0.85 < EEI ≤ 1.0	1.1 < EEI ≤ 1.3
G	1.0 < EEI	1.3 < EEI

Table 7: DIGITALEUROPE proposal for energy efficiency classes

The proposal above would still keep classes A and B empty, but would result in a more even distribution in the rest of the classes, as can be seen in Table 8 below.

	Class A	Class B	Class C	Class D	Class E	Class F	Class G
2017 displays	0	0	7	42	280	178	93
Percentage	0 %	0 %	1.17 %	7 %	46.67 %	29.67 %	15.50 %

Table 8: Distribution of 2017 Display models (TV & monitor) according to DIGITALEUROPE proposal

1.5. Testing Protocols: additional clarification required

A clear testing protocol for televisions and computer monitors is important to ensure products are tested consistently and meet the requirements. State of the art testing protocols such as Energy Star, for TVs and for computer monitors are not the same and that is fine. However, the testing method as described in the current draft regulation is unclear, especially when it comes to testing computer monitors with Automatic Brightness Control (ABC) feature enabled by default. The test method in Annex V, paragraph 2 of the draft regulation states the following: "*iv. Measurements shall be made with the ABC function, if such a function exists, made inactive. If the ABC function exists but cannot be made inactive or disabled, then the measurements shall be performed with the light entering directly into the ambient light sensor at a level of 300 lux.* ***Where the ABC function can be disabled by switching off there should be no difference in Pmeasured with the ABC on or off in the 300 lux ambient light condition.***"

This statement seems to be a comment that may not always be true, as it depends very much on how you set up the monitor before the test and can cause variation in results. Further clarity on that statement should be provided or, alternatively, the statement should be removed in its entirety.

2. Consideration on the proposed requirements for low power modes

2.1. Off-mode and Standby limits

While DIGITALEUROPE welcomes the Commission proposal to keep the standby mode limit at 0.5 W based on the input provided on the technical limitations to go any lower, we cannot support the proposed modification of the Off mode limit from 0.3W to 0.25W. We believe such a modification would constitute considerable technical challenge for certain displays, while the savings achieved won't justify the cost of redesign.

Regarding the technical limitations that would come into play for this newly proposed requirement, we would like to highlight the trend towards the use of External Power Supplies due to the diminishing thickness of displays which restricts the use of internal power supplies. The no-load consumption of these EPS would then become an important limitation to the off-mode consumption of the product. As an example, for a highly efficient EPS the no-load power consumption is minimum 0.17 W, while the power consumption of the main board while waiting for power on is about 0.11 W. This amounts to a total power consumption of 0.28 W, which is not low enough to meet the proposed requirement. Table 9 below shows the detailed Off-mode power consumption of the relevant components of a monitor with EPS.

	Power consumption	Circuit Block	Power consumption per each block
Main Board	0.11 W	DC-DC	0.04 W
		Scaler	0.07 W
EPS	0.17 W	PWM Control	0.055 W
		PFC circuit	0.055 W
		X-CAP discharge	0.02 W
		Feedback sensing	0.01 W
		Output rectifier	0.03W

Table 9: Off-mode power consumption of a monitor with EPS

The newly proposed 0.25W limit would also considerably impact the use of soft-off solutions in benefit of hard-off switches, which hamper consumer experience and limit product design. DIGITALEUROPE strongly recommends the Commission to include the originally proposed 0.3W Off-mode limit in the final Ecodesign regulation.

DIGITALEUROPE is also concerned with the Commissions recent proposal to set standby limits specific for signage displays. In particular, signage displays are designed to operate continuously for relative long periods of time (24/7), compared to TVs or monitors, with little or no user interaction expected. Any automatic power down requirement that would force a transition from on-mode to any other state, after a certain time without user interaction, would interfere with the usability of the device.

In addition, certain types of modular signage displays are operated using a centralized control unit and centralized power supply. In such cases, the control function of the system is a complex one, where the efficiency of one display unit is influenced by the presence of other units in the system. Moreover, the intrinsic low efficiency of the large power supplies at low power modes, have a negative impact on the energy consumption of each module. Standardization work for standby and off mode power consumption for signage displays would certainly be required.

Given the complexities of applying a horizontal standby limit to all signage displays, and the Commission's intention to review on-mode requirements for this product, DIGITALEUROPE recommends that all energy efficiency requirements, including standby/off mode, for signage displays are dealt with in the future revision.

2.2. Network standby considerations

DIGITALEUROPE would also like to express the disagreement towards the draft wording considerations regarding the types of connectivity that can be considered to constitute a network standby condition. In our view this is a significant departure from previous understanding provided by the Commission under the guidance for 1275/2008, of which we would like to highlight the following:

> *"Examples for conditions not being "standby":*
>
> *(…)*
>
> - *sleep mode as defined in ENERGY STAR for those conditions which, e.g., maintain network connectivity, or conditions providing enhanced reactivation functions as those defined under "reactivation function" in the Regulation."*

Additional clarification is provided under the Commission guidance document for 801/2013, as follows:

> *"A network is only present when at least two devices or two single functional units are connected to one another. A single functional unit is similar to an apparatus as defined in the EMC directive and is accompanied by a Declaration of Conformity. This means that the network cannot exist only within a single apparatus.*
>
> *Examples:*
>
> *(…)*
>
> - *Both one-way connections (e.g. between computer and monitor) and two way connections (e.g. between computer and printer) are considered to be networks"*

This guidance has been used by industry for product design for years now, therefore we don't see a justification to change such understanding in the Display regulation.

Such a change would create significant confusion without yielding any significant energy savings. To illustrate our argument, a Computer display typically only has the following modes:

- Off-mode – product does not provide any functionality other than reactivation by soft/hard off switch
- Sleep mode – product can be reactivated by a signal from the host (i.e. computer)

If the reactivation by signal of the computer won't be considered to be network reactivation, and consequently Sleep mode be considered Networked Standby, then the product would only have an Off-mode to account for, since reactivation by the host computer is a functionality outside the definition of Off-mode or Standby mode.

3. Indication of HDR power consumption on the label

DIGITALEUROPE supports the Commission's proposal to introduce separate energy efficiency information for SDR and HDR, and considers it to provide the appropriate level of transparency with regards to the increase of power consumption incurred while viewing HDR content.

High Dynamic Range (HDR) refers to the range of luminosity and colour a display can produce. A display with a high dynamic range can produce a greater range of light and dark intensity than a display with a Standard Dynamic Range (SDR). For example an HDR display could produce light levels from 0.01 cd/m^2 to 1000 cd/m^2, whereas an SDR display can only produce light levels from 0.01 cd/m^2 to 400 cd/m^2. Thus this means that with a higher Dynamic Range you can have brighter and darker details in an image and so greater contrast.

Quite often, HDR is confused with "HD" and "UHD", which are types of display resolution. High Definition and Ultra High Definition (HD and UHD) relate to the number of pixels on a screen, with HD typically from 1280 x 720 to 1920 x 1080, and UHD typically of 3840 x 2160. HD and UHD can also be referred to as the number of vertical lines (e.g. 720p, 1080p or 2160p), and are absolutely unrelated to the Dynamic Range of a display.

Because of the fundamental difference between Dynamic Range (both HDR and SDR) and resolution (both HD and UHD) of a display, the proposal for 2 separate scales on the energy label would be the most intelligible representation of display characteristics. This would allow customers to make the best informed choice at the point of purchase as it provides the clearest, most comprehensible information regarding functionality.

Using a weighted approach for Dynamic Range and Definition (i.e. combining the two different aspects into one value) does not reflect real life use. Furthermore current uptake of HDR is hard to determine therefore future evolution is unknown. This means that any weighting system would have little information to work with so would not be able to accurately represent the energy usage of the product and the cost to the customer.

If a simplification of the label is requested by consumers, the label should then contain only the reference to the SDR class, and both SDR and HDR power consumptions should be declared in the product information sheet. This would still show the energy usage of the display more accurately then a weighted method due to the inherent inaccuracy of this approach and the uncertainty in its application.

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ABOUT DIGITALEUROPE

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