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Report to the Ecodesign Consultation Forum on the Review of the Stage 6 Requirements of Commission Regulation (EC) No 244/2009

Contents

1. CONTEXT

It was agreed in the Horizontal Consultation Forum of 19 April 2012 that priority should be given to completing new ecodesign and energy labelling implementing measures that are already well advanced, to focus the Ecodesign Working Plan 2012-2014 on a few key measures, and to use the required reviews of existing ecodesign and energy labelling implementing measures to identify and focus on those with the most significant potential.

The TV Regulation[1] review was reported to the Ecodesign Consultation Forum on 8 October 2012. The results of the external power supply review under Regulation 278/2009[2] were presented to the Ecodesign Consultation Forum on 18 April 2013.

Following the agreement to prioritise and focus the review process, the Commission separated the review of Regulation 244/2009[3], amended by Regulation 854/2009[4], into two parts: a detailed review of the stage 6 requirements to examine the appropriateness of these provisions in light of unforeseen technological developments, and a review of the other aspects of this Regulation as part of the 'Omnibus Review'[5], which is a combined review of several regulations and one directive foreseen for the first half of 2014.

This report fulfils the Commission's obligation to review the stage 6 requirements of Regulation 244/2009, and to report on this to the Consultation Forum by 7 April 2014.

This report starts with a general introduction to the background of Regulation 244/2009 and other Commission actions on efficient artificial lighting. In the next chapter, the current market transformations are reviewed, and the results of the technical review study presented. The report closes with policy recommendations.

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[1] 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 televisions

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

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

[4] Commission Regulation (EC) No 859/2009 of 18 September 2009 amending Regulation (EC) No 244/2009 as regards the ecodesign requirements on ultraviolet radiation of non-directional household lamps

[5] The 'Omnibus Review' evaluates Commission Directive 96/60/EC, Commission Regulation (EC) No 107/2009, the remaining aspects of Commission Regulation (EC) No 244/2009, Commission Regulation (EC) No 245/2009, Commission Regulation (EC) No 643/2009, Commission Regulation (EC) No 1015/2010, Commission Regulation (EC) No 1016/2010, Commission Regulation (EC) No 1059/2010, Commission Regulation (EC) No 1060/2010, Commission Regulation (EC) No 1061/2010, Commission Regulation (EU) No 547/2012, and including all amendments of these.

2. BACKGROUND

2.1. Scope of Regulation 244/2009

Regulation 244/2009 establishes ecodesign requirements for the placing on the market of non-directional household lamps. All inefficient non-transparent (also known as pearl or frosted) lamps were phased out on 1 September 2009. Most non-clear lamps are required to be A-class according to the EU lamp energy label Regulation[6].

Inefficient transparent lamps were phased out progressively, starting with the most power consuming conventional incandescent bulbs. From 1 September 2009, lamps equivalent in light output to 100W and above had to be at least of the energy efficiency class C.

By the end of 2012, the other wattage levels followed and all transparent lamps now have to reach at least class C: the 60W remained available until September 2011 and 40 and 25W bulbs until September 2012.

The last stage, stage 6, is due to come into force on 1 September 2016, further increasing minimum efficiency requirements to the energy efficiency class B for some transparent lamps. Figure 1 gives an overview of the transparent lamps to which this does not apply.

Phased out in 2016 by stage 6 B-class requirement	**Still available in 2016** exempted from stage 6	
		
Halogen bulb (C-class today)	Halogen capsule [G9 socket]	Linear halogen lamp [R7s socket]

Figure 1: Overview of the non-directional mains-voltage halogen incandescent lamps exempt from the stage 6 requirements.

Improved incandescent bulbs with halogen technology, commonly known as halogen lamps, were able to reach the energy efficiency class C, and replaced some of the phased-out incandescent light bulbs. Other consumers switched to compact fluorescent lamps (CFLs) or light emitting diode (LED) lamps.

[6] Commission Delegated Regulation (EU) No 874/2012 of 12 July 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of electrical lamps and luminaires

In 2009 during the drafting of the Regulation, halogen lamps were predicted to reach the B-class before 2016 through innovation and technological development. Indeed, some B-class halogen lamps were placed on the market in the years after the Regulation came into force. Today, however, no B-class mains-voltage halogen lamps can be found on the European market. Foreseeing that the original predictions might need to be adapted in light of technological progress, the Regulation provided for a review by 7 April 2014 especially taking account of the development of new technologies such as LEDs, compare these with the predictions during the drafting and adoption of the Regulation, and evaluate the appropriateness before the ban on C-class halogens would come into force[7].

2.2. Further Commission Actions on Efficient Lighting

Regulation 244/2009 is not the only instrument to improve the efficiency of artificial lighting products; Regulation 245/2009[8] and Regulation 1194/2012[9] set further ecodesign requirements for products like fluorescent lamps, directional lamps, LEDs, and certain luminaires, acting on the supply side of efficient products. The demand side is supported through the energy labelling Regulation 874/2012, giving consumers information on the actual and relative electricity consumption of most artificial lighting products. The EU Ecolabel for lamps[10] is a voluntary marking to identify the most environmentally friendly and efficient lighting products on the market.

The Commission also provides financial support for research and technological development of efficient lighting solutions. The development of solid-state lighting such as LEDs has been proactively influenced by Commission investments and research grants. The Commission's 2011 "Green Paper on Lighting the Future"[11] highlighted research that was already receiving 135 million EUR of EU funding. The "Horizon 2020" will provide further investments to facilitate the development and uptake of LED technology in the EU.

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[7] See recital (20) of Commission Regulation (EC) No 244/2009 defining the scope and purpose of the review

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

[9] Commission Regulation (EU) No 1194/2012 of 12 December 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment

[10] 2011/331/EU: Commission Decision of 6 June 2011 on establishing the ecological criteria for the award of the EU Ecolabel for light sources (notified under document C(2011) 3749)

[11] COM/2011/0889 final: GREEN PAPER Lighting the Future - Accelerating the deployment of innovative lighting technologies

Further financial instruments exist for cities to finance investments in sustainable and energy efficient infrastructure and products, including lighting, at local level. Examples are the ELENA technical assistance facility[12] and the European Energy Efficiency Fund (EEE-F)[13]. These instruments can be combined with 'Green Public Procurement', which allows authorities from Member States to concentrate public spending on efficient and environmentally friendly technologies.

3. ASPECTS OF THE REVIEW

3.1. Organisation of the Review Process

The Commission services started the stage 6 review in February 2013; the review process included a technical review study and two meetings involving stakeholders.

3.2. The Review in the Context of Lighting Market Transformations

Lighting represents a significant share of the EU's energy consumption. It accounts for approx. 12% of electricity and almost 2% of primary energy consumption of the EU. Existing ecodesign and energy labelling measures have reduced annual consumption by over a quarter; but lighting is currently undergoing one of the greatest transformations in decades and new lighting technologies offer the potential to lower energy consumption much further.

Solid-state lighting such as LEDs and organic light emitting diodes (OLEDs) promises up to 20 times higher efficiency than the old incandescent light bulbs while offering over 25 times the product lifetime. With these advantages, it is expected that LEDs will soon dominate the market. Price levels in Europe are still high for LEDs. But they are falling and are expected to continue to do so (McKinsey[14] forecasts price falls of 16% per year). The choice of an LED rather than a CFL currently pays for itself in 5 years. This is expected to decrease to 1.7 years by 2016 and half a year by 2020.

The arrival of LEDs and OLEDs continues to change the market (see Figure 2). This transition creates challenges for manufacturers in Europe– the main ones being Osram, Philips Lighting, GE Lighting, Havells Sylvania, and Trilux - which employ over 110,000 people in the EU. LED modules are mainly produced in Asia. On the other hand, the EU is the main manufacturer of halogen lamps.

[12] ELENA (European Local ENergy Assistance) is a joined investment programme by the Commission and the European Investment Bank - http://www.eib.org/infocentre/publications/all/elena.htm

[13] The European Energy Efficiency Fund is a public-private-partnership supporting energy efficiency measures in Member States - http://www.eeef.eu/

[14] McKinsey&Company (2012) report "Lighting the way: perspectives on the global lighting market", second edition

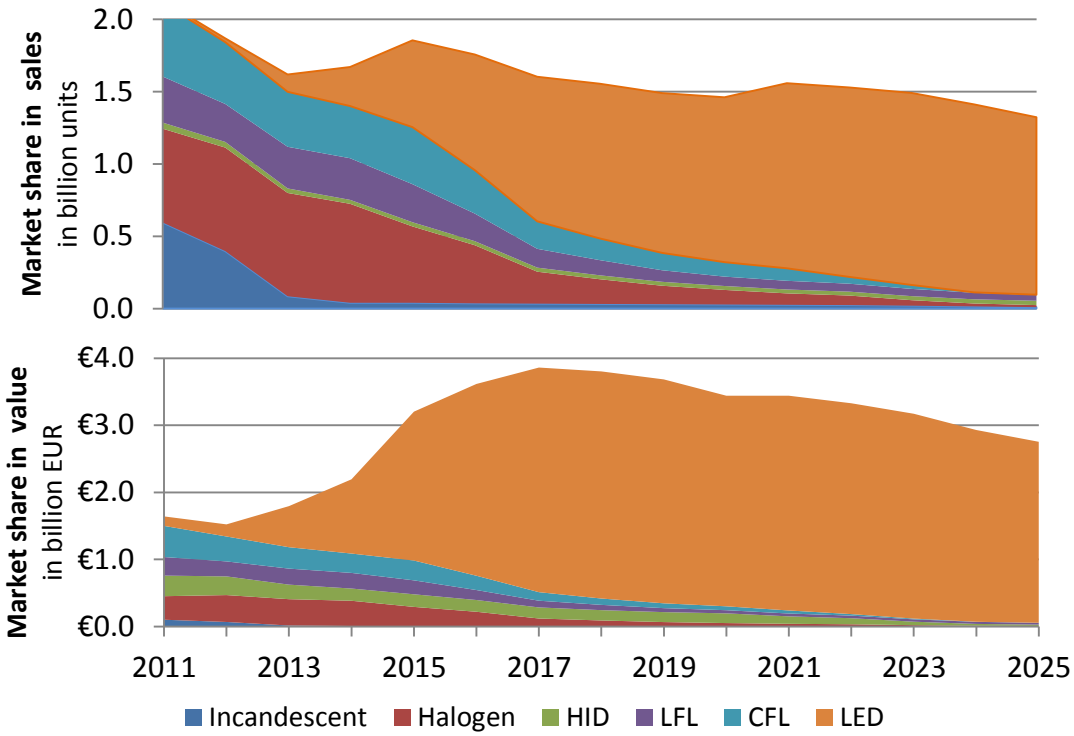

Figure 2: Estimated market share of selected lighting technologies in the EU from 2011 to 2025 in a business-as-usual scenario (no changes or additions to existing legislation). The overall number of lamp sales will decrease, because LEDs have a longer lifetime and need fewer replacements, but the market value increases due to the higher sales price of LEDs. This estimate is based on data from McKinsey&Company[13] and VHK[15].[16]

LEDs are mainly produced in Asia by companies with experience in computer chip production, because their manufacturing requires chip wafer technology and expertise similar to that used in the silicone industry. Major producers are companies like Nichia, Samsung LED, LG Innotek and Seoul Semiconductor. While Osram Opto Semiconductors was the world's third biggest supplier of LED components in revenue terms in 2011, it mostly specialises in high value LED and SSL-Laser technology used in special applications such as surgical instruments. The absence of a strong chip industry in the EU is therefore one of the major obstacles to relocating general LED production to Europe.

3.3. Results from the Review Process

In 2009 during the drafting of the Regulation, halogen lamps were predicted to reach the B-class before 2016 through innovation and technological development. To gather knowledge on this issue and predict future market transitions, the Commission issued a

[15] VHK (2013) review study on the stage 6 requirements of Commission Regulation (EC) No 244/2009

[16] HID: high intensity discharge lamp; LFL: linear fluorescent lamp; CFL: compact fluorescent lamp; LED: light emitting diode lamp

technical review study to an external contractor[15]. Interested participants from industry, citizens' organisations, Member State authorities and the European Parliament were involved in two meetings in April and June 2013, presenting a wide range of arguments and data to be considered. The review study has been made public and distributed to Members of the Ecodesign Consultation Forum.

The results of the review are as follows:

I. Availability of B-class Halogen Lamps or Replacement Lamps

The technical review shows that it is possible to produce halogen lamps which would fulfil the minimum efficiency requirements of stage 6 (B-class). Indeed, B-class mains-voltage halogen lamps were previously introduced to the market, but disappeared shortly after due to alleged technical difficulties and high consumer prices. This left the market without any B-class mains-voltage non-directional halogen lamps.

The review indicates that the widespread (re-)appearance of B-class halogen lamps no longer seems likely to happen. It is expected that manufacturers will not produce such lamps, because the necessary investments in new technology would not be economically feasible given the expected retail price of these halogens and the expected general market transition to LEDs.

LED technology will likely be technically ready to replace halogen lamps in 2016. Currently, there are a number of limited functional deficiencies in LED colour rendering, or LED compatibility with dimmers and other lighting controls in existing installations. These can put consumer acceptance of LEDs as the sole replacement option for mains-voltage halogen lamps at risk. However, it is expected that technological development continues, removing these functional deficiencies while further increasing the energy efficiency potential and life time of LED lamps and reducing their costs.

II. Environmental Impact

The estimated environmental impact is in favour of keeping stage 6 in place compared to a scenario where such requirements will be lifted. Confirming the ban would yield annual electricity savings of approx. 9.4 TWh and related greenhouse gas saving of 3.4 $MtCO_2$ equivalent by 2020. The accumulative savings up to 2025 are around 43.2 TWh in electricity consumption and 15.2 $MtCO_2$ equivalent.

Nonetheless, keeping the current stage 6 rather than abolishing it is not the environmentally optimal solution. While predicting the make-up of the future lighting market is prone to uncertainty, the review showed that deferring the coming into force of stage 6 is on balance the best option. LED technology will still benefit from efficiency improvements after 1 September 2016. LEDs purchased in 2016 will not be replaced with more efficient ones for years to come due to their long life-time, slightly diminishing the overall savings potential of the LED technology. The environmentally optimal solution is thus a (limited) postponement of the stage 6 requirements.

III. Socioeconomic Impact

Halogen lamp production is mainly EU-based with a share of 72% on the European market with 234 million unit sales in 2012. Employment dependent on the current production in the EU is estimated at a maximum of 7,300 industrial jobs. With the knowledge of today, the industrial activities linked to LED replacements - imported from outside the EU - are expected to bring 500 new EU jobs.

Hence, it is estimated that a maximum of 6,800 jobs related to halogen production will eventually be lost. These job losses will happen in any case due to the market transition to LEDs. All stakeholders agree that abolishing the stage 6 requirements would postpone these job losses by a small number of years – it would not prevent them. On the other hand, while LED module production is unlikely to be re-located back to Europe, the increased manufacture of luminaires and lighting systems compatible with LEDs or including built-in LEDs could offer high value creation and employment opportunities in the EU. Hence, the best business opportunities for European manufacturers are in luminaires and lighting systems that are compatible with, or incorporate, LEDs – rather than in the LED modules themselves. Deferring the coming into force of the stage 6 requirements would give manufacturers the time to create replacement jobs in these areas. The study signals that this wider but as yet unrecognised positive employment impact, though not easily quantifiable and highly dependent on manufacturers' strategy and management decisions, should be taken into account.

The net saving in consumer life cycle costs, including higher upfront costs of LEDs and lower costs through decreased electricity consumption when keeping versus abolishing the stage 6 requirements is projected to be around 9 billion EUR, in constant 2016 EUR. Overall, the net monetary savings for the EU up to 2025 result in approx. 8.2 billion EUR.

However, keeping the current stage 6 rather than abolishing it is also not the financially optimal solution. The continued maturing of LED technology after 1 September 2016 will result in continued price decreases. Therefore, a later entry into force of the stage 6 requirements is favourable compared to the current entry into force date, and even more compared to removing the stage 6 requirements at all.

IV. Possible Loopholes and Obstacles to an Implementation of Stage 6

The technical review study reveals that the exception of certain halogen lamps with a G9 and R7s socket from stage 6 creates a loophole, which some manufacturers have already started exploiting with adapter-kits. These adapter kits allow consumers to use G9 socket halogens with a wide range of other sockets and are already available today. Given the low price of these adapter kits, in conjunction with the small retail price of G9 halogen lamps, it is likely that this loophole could significantly undermine the success of the stage 6 requirements as a significant portion of consumers might choose the presumably 'cheaper' option while paying more through non-realised energy savings.

Furthermore, halogen lamps with an R7s socket are usually the halogen lamps with the highest power consumption, often in the range around 500W. Here, the total energy savings potential per light bulb is the highest, and the exception of these socket types should therefore be reconsidered in the light of more efficient replacement option.

Some luminaires currently on sale are not compatible with future solid-state technologies, creating a 'lock-in' effect to old technologies such as halogen lamps. This might happen through design options limiting the dimensions of possible replacement lamps too much, or through the inclusion of functional elements such as control gear not compatible with LEDs. This creates an unnecessary obstacle to efficiency improvements and a burden to consumers. It is therefore crucial for the wide-spread acceptance of LEDs – and the overall transition to energy efficient lighting – to guarantee that new luminaires are ready for the future.

V. Impact on Health Risks Associated to Artificial Lighting

The review study examined the available knowledge on the impact of artificial lighting on human health from scientific publications. The update on health aspects did not identify any significant negative or positive impacts from the stage 6 requirements, or from a possible ban of halogen technology, due to the availability of suitable replacement options and the inclusion of certain information requirements in EU legislation.

4. RECOMMENDATIONS FOLLOWING THE REVIEW

4.1. Recommended Changes to the Regulations

Following the outcome of the review process, the Commission proposes to begin the revision procedure with the aim of adopting amendments to Regulation 244/2009 and Regulation 1194/2012. The recommended regulatory changes include:

1. changing the entry into force of the stage 6 requirements to 1 September 2018, allowing LED technology to mature further and reach an optimal time point in terms of monetary and energy savings;
2. removing the current loophole by extending the stage 6 requirements to halogen lamps with G9 and R7s socket;
3. and introducing a provision that luminaires sold after 1 September 2015 should be compatible with LED technology to prevent future obstacles to efficient lighting.

These recommended changes have an environmental and socio-economic impact. The table below gives a comparison of the Commission proposal to the option of no regulatory changes (that is keeping stage 6 in its current form) or abolishing stage 6 completely.

Action / Impact	Scenario I: Abolishing stage 6	Scenario II: No changes to current legislation	Scenario III: Regulatory changes
Environment	No legislatively induced energy or CO_2 equivalent savings.	Accumulated energy savings from stage 6 requirements up to 2025 compared to scenario I: 43.2 TWh Accumulated CO_2 equivalent savings up to 2025 compared to scenario I: 15.2 $MtCO_2$	Accumulated energy savings from stage 6 requirements up to 2025 compared to scenario I: 48.1 TWh Accumulated energy savings from including G9 and R7s up to 2025 compared to scenario I: 23.3 TWh Accumulated CO_2 equivalent savings up to 2025 compared to scenario I: 25 $MtCO_2$
Economics	No legislatively induced monetary savings for the consumer. Lock-in effect to old technologies for consumers, resulting in a prolonged transition to LEDs with risks for consumer acceptance of new technologies.	Overall monetary savings for consumers up to 2025 compared to scenario I, taking into account higher acquisition costs and lower running costs: 9 billion EUR Lock-in effect to old technologies for consumers, resulting in higher costs for luminaire replacements and risks for consumer acceptance of new technologies.	Overall monetary savings for consumers up to 2025 compared to scenario I, taking into account higher acquisition costs and lower running costs: 15.3 billion EUR No lock-in effect to old technologies for consumers with natural replacement of LED ready luminaires, facilitating the uptake rate of LED technology.
Employment	Estimated number of 6,800 jobs at risk. Prolonged transition to LEDs allows for creation of new jobs in other areas such as luminaire production.	Estimated number of 6,800 jobs at risk. Short time for market transition compared to scenario I results in fewer replacement jobs and therefore higher unemployment risk and costs.	Estimated number of 6,800 jobs at risk. Longer time for market transition compared to scenario II, in conjunction with a coherent lighting strategy, offers new job creation and lower unemployment risk and costs.

Table 1: Comparison of three different scenarios up to the year 2025: abolishing the stage 6 requirements, keeping the current stage 6 requirements in force, and the Commission proposal. The estimated impacts are based on the findings of the review process.

4.2. Policy Recommendations Towards a Coherent Strategy

The review's findings and proposed regulatory changes should be seen in the general context of Commission actions on supporting the market transformation to more efficient lighting solutions. The market will undoubtedly continue changing to solid-state lighting, slowly pushing other lighting technologies – except for some special purpose products – out of the market. This transformation is supported by multiple legislative acts and investment programmes of the EU.

Regulation 244/2009 and especially the stage 6 requirements were drafted and adopted at a time where such developments could not have been foreseen. The review of this Regulation and the recommendations following the review need to take this into account. Furthermore, such policy recommendations should be consistent with other Commission actions, and ideally enhance the effect of all other measures. The same applies to the upcoming review of Regulation 245/2009, but also other provisions established through implementing and delegated acts on artificial lighting under the Ecodesign Directive[17] and Energy Labelling Directive[18].

To achieve this aim, an updated, coherent strategy on artificial lighting is needed. This strategy should provide guidance on how to optimally support the market transition to LEDs and OLEDs while providing European citizens with high quality, affordable, yet efficient lighting solutions. This can be done on the demand side by stimulating a large SSL-lighting uptake by European users while acting on the supply side by fostering the competitiveness and global leadership of the European lighting industry. The recommendations for policy are therefore:

4. to start a discussion with stakeholders on a coherent lighting strategy;
5. and using the recently launched preparatory study on lighting systems[19] to evaluate the possibility of further supporting the market transition to LED lighting.

These actions should happen in conjunction with regulatory changes to maximise their positive impact.

[17] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

[18] Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products

[19] See the presentation of the Ecodesign Working Plan 2012-2014 at the 1 March 2013 Ecodesign Consultation Forum for an announcement of preparatory studies. The study on lighting systems is part of the 'conditional list' and has been launched due to the results presented in this report.