

# Response To Öko-Institut

regarding the

## 1st Questionnaire Exemption Request No. 1(a-e)

*Exemption for “ Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):*

- *(a) For general lighting purposes < 30 W: 2,5 mg may be used after 31 December 2012*
- *(b) For general lighting purposes  $\geq$  30 W and < 50 W: 3,5 mg may be used after 31 December 2011*
- *(c) For general lighting purposes  $\geq$  50 W and < 150 W: 5 mg*
- *(d) For general lighting purposes  $\geq$  150 W: 15 mg*
- *(e) For general lighting purposes with circular or square structural shape and tube diameter  $\leq$  17 mm: 7 mg may be used after 31 December 2011 ”*

Date of submission: September 15, 2015

### Name and contact details

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### Abbreviations and Definitions

CFL            Compact fluorescent lamp

Hg             Mercury

LED            Light Emitting Diode

## Background

The Oeko-Institut has been appointed within a framework contract<sup>1</sup> for the evaluation of an application for granting an exemption to be included in or deleted from Annexes III and IV of the new RoHS Directive 2011/65/EU (RoHS 2) by the European Commission.<sup>1</sup>

LightingEurope (LEU) has submitted the above mentioned request for exemption which has been subject to a first evaluation. The information you have referred has been reviewed and as a result we have identified that there is some information missing and a few questions to clarify concerning your request.

## General Questions

1. In the renewal applications submitted regarding the exemption entries mentioned above, among others, use is made of the following terms: general lighting purposes; special purposes<sup>2</sup>; professional lighting purposes; residential lighting;
  - a. For each of these terms, please provide a definition to clarify what scope of lamp purposes falls under each of the terms. Alternatively, please provide a clarification of these terms in the context of each exemption entry.

**Answer of LightingEurope:** Following definitions are recognized in European regulations:

1. General lighting lamps<sup>3</sup>: lamps are marketed or commercialised primarily for the production of visible light for normal human vision. They have standard shape, dimensions and cap. General lighting lamps are lamps, which are not covered by the “special purpose” lamp definition.
2. Special purpose lamps<sup>4</sup>: Special purpose lamps have documented and communicated application-specific features. They generally manufactured in accordance with general-purpose lamp making technology. The use of special design, materials and process steps provide their special features, e.g.:

Where non-visible radiation has importance, for example:

- Medical/Therapy lamps
- Sun tanning lamps
- Black light lamps (e.g. for diazoprinting reprography, lithography, insect traps, photochemical and curing processes)
- Black light blue lamps (e.g. for entertainment, forensics, dermatology, banknote validation)
- Disinfection lamps
- Pet care lamps (e.g. aquaria or reptile lamps)

Where different applications require specific lamps, for example:

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<sup>1</sup> Contract is implemented through Framework Contract No. ENV.C.2/FRA/2011/0020 led by Eunomia

<sup>2</sup> See also your Request to renew Exemption 3 “Mercury in cold cathode fluorescent lamps and external fluorescent lamps (CCFL and EEFL) for special purposes not exceeding per lamp”

<sup>3</sup> LE Position paper Globally Harmonized Limits on Mercury for Lighting , Annex D, page 8 [http://www.lightingeurope.org/uploads/files/LE\\_PP\\_Global\\_Mercury\\_limit\\_20131002\\_final.pdf](http://www.lightingeurope.org/uploads/files/LE_PP_Global_Mercury_limit_20131002_final.pdf).

<sup>4</sup> LE Position paper Globally Harmonized Limits on Mercury for Lighting , Annex D, page 8 [http://www.lightingeurope.org/uploads/files/LE\\_PP\\_Global\\_Mercury\\_limit\\_20131002\\_final.pdf](http://www.lightingeurope.org/uploads/files/LE_PP_Global_Mercury_limit_20131002_final.pdf).

- Technical lamps for colour comparison
  - Coloured lamps (incl. saturated colours)
  - Lamps used in horticultural lighting
  - Lamps designed for eye-sensitivity of birds and other animals
  - Projector lamps
  - High colour rendering index lamps like food lighting applications, bakeries, etc.
  - Lamps with special ignition features (e.g. external ignition strip)
3. Professional lighting purposes: Professional Lighting is all lighting other than Residential Lighting and includes among others Office Lighting<sup>5</sup> and Public Street Lighting<sup>6</sup> as defined in Regulation EC/245/2009. Next to that McKinsey<sup>7</sup> defined six application types: six professional office, hospitality, shop, industrial, architectural, and outdoor.
4. Residential lighting: Defined by McKinsey<sup>8</sup>: “The residential application includes both permanently installed fixtures (such as recessed sconces, under cabinet lights, and residential outdoor lights) as well as portable plug-in fixtures (pendants, table lamps, and floor lamps, for example). It also includes small-scale home offices and bed-and-breakfast accommodation/guesthouses that are similar in structure to residential house“.
- b. For each of the exemption entries, LEU mentions briefly if lamps are mainly used for residential uses, for office buildings, for street lighting etc. Please provide a quantified estimation for each exemption entry as to how the respective market share is distributed between the various use types (i.e. what share is related to residential uses: what share is related to office building uses, etc.) – please ensure that this data corresponds to the definitions clarified in your answer to Question 1a.

**Answer of LightingEurope:** The VHK report<sup>9</sup> as referred to in exemption requests 1a-e indicates a split between Residential and non-Residential used lamps in 2013 and a split into CFL integrated (CFL-i) and the non-integrated version (CFL-ni). These data can be found in tables 3 and 4 and indicate the following for the total CFL range in 2013 (all exemptions):

- Residential: 184 Mpcs (54%) of which 162Mpcs CFL-i and 22 Mpcs CFL-ni
- Non-Residential (Professional): 158 Mpcs (46%) of which 108 Mpcs CFL-i and 50M pcs CFL-ni

As indicated in all exemption requests (clause 5.2) market data on the split of the volume towards the exemptions is not available and made based on the experience of LE members. The split applied is:

1a: 85%  
 1b: 10%  
 1c: 3%

<sup>5</sup> ‘office lighting’ means a fixed lighting installation for office work intended to enable people to perform visual tasks efficiently and accurately, ref: Regulation EC/245/2009, page 3

<sup>6</sup> ‘public street lighting’ means a fixed lighting installation intended to provide good visibility to users of outdoor public traffic areas during the hours of darkness to support traffic safety, traffic flow and public security; ref: Regulation EC/245/2009, page 3

<sup>7</sup> Lighting the way: Perspectives on the global lighting market – McKinsey & Company, Second Edition, August 2012, page 42

<sup>8</sup> Ibidem

<sup>9</sup> Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements (‘Lot 8/9/19’). Draft Interim Report, Task 2 by Prepared by VHK, in cooperation with VITO and JeffCott Associates, Date: 19 November 2014, Tables 3 & 4

1d: 0.5%  
 1e: 0.5%  
 1f: 1%

The installed based, indicated in the VHK report as 'Stock' can be found in a similar split as explained before in tables 23 and 24.

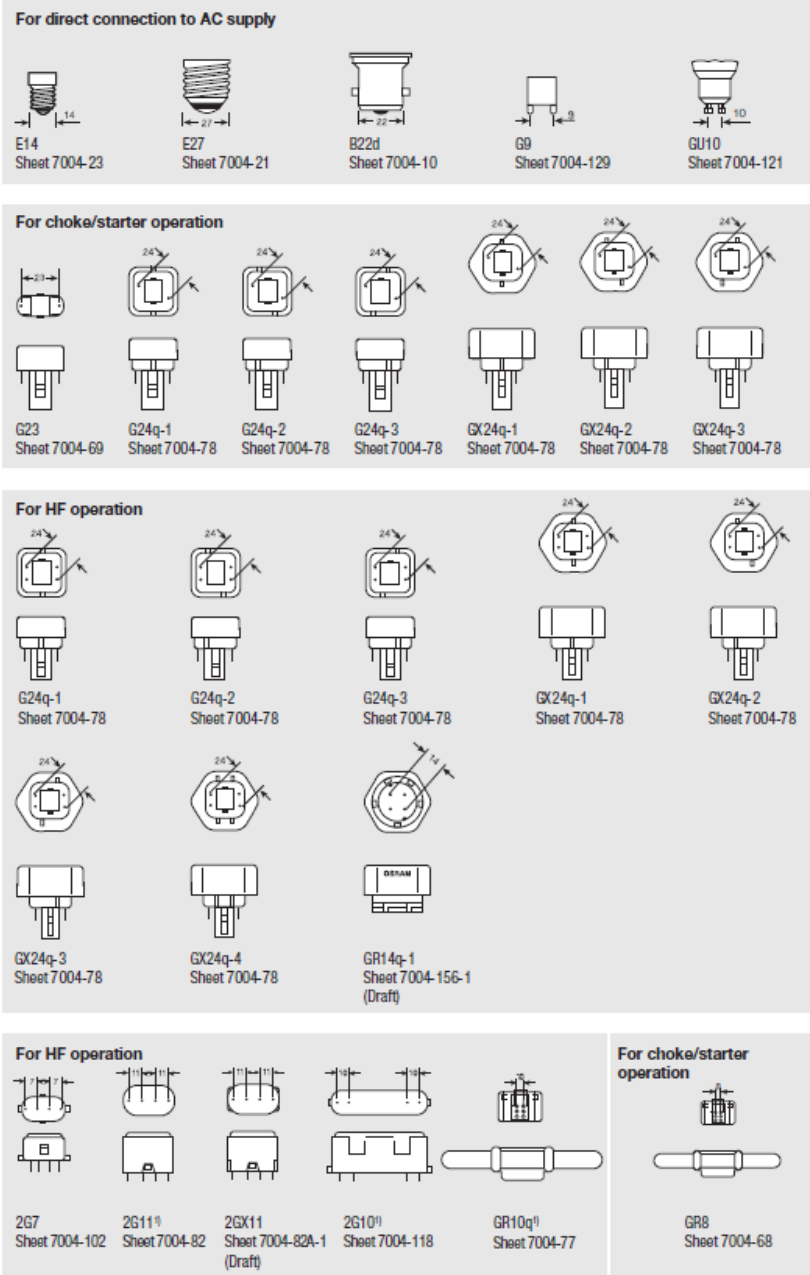
5. Compact fluorescent lamps ( $\geq 50$  W and  $< 150$  W) are mostly lamps for professional use with high lumen packages. They can either have the electronic control gear integrated in the product (self-ballasted CFLs or CFLi-s) or their control gear is external to the lamp and built as part of the luminaire (plug-in CFLs or CFLni-s). Please describe the differences between these sub-groups (e.g., CFLs-s, CFLni-s, etc.) in more detail, also providing data on the relative market share of these subtypes.

**Answer of LightingEurope:** From lamp technical point of view for all CFL lamps (including  $< 50$ W) CFLni's and CFLi's are not so much different, except that the first ones use an external ballast (EM or HF) and have different caps. However looking from technical driver point of view those two groups (CFLni's and CFLis) are quite different. The presence of a driver in CFLi's is a very big differentiator. CFLni's cannot be tuned for optimal cathode operation with a specific driver as it happens for CFLi's, which have specific ballasts for the lamp. The ni versions need to be designed for a variety of drivers available on the market which causes a lot of spread on the cathode condition. This is to a certain extend solved by using specific lamp bases (see Figure 1). This image illustrates the variety of lamp bases existing in the market today for CFL lamps and it needs to be noted that this is not a complete overview. More examples of the variety of CFL types, e.g the lamp shapes can be found in Annex 1. Both lamp versions can be dimmable when specific designed ballasts are used. Inherent for the CFLi lamps is that lamps and ballast are tuned to each other, where for the ni lamps again a range of ballast versions is available complicating the diversity even further. For both CFLi as well as CFL-ni types there are specific lamp – luminaire combinations. CFLni's in many cases are installed in luminaires containing 2-4 lamps, which implicates higher temperature of the lamp during burning. Typical examples of products are given in exemption request 1c, clause 4.1.1.

A more specific split in market share of these types then already given in answer 1b is not available. A complicating factor in this is that the lamps are sold via wholesalers and DIY, which makes it invisible for LE where the customers exactly install the lamps.

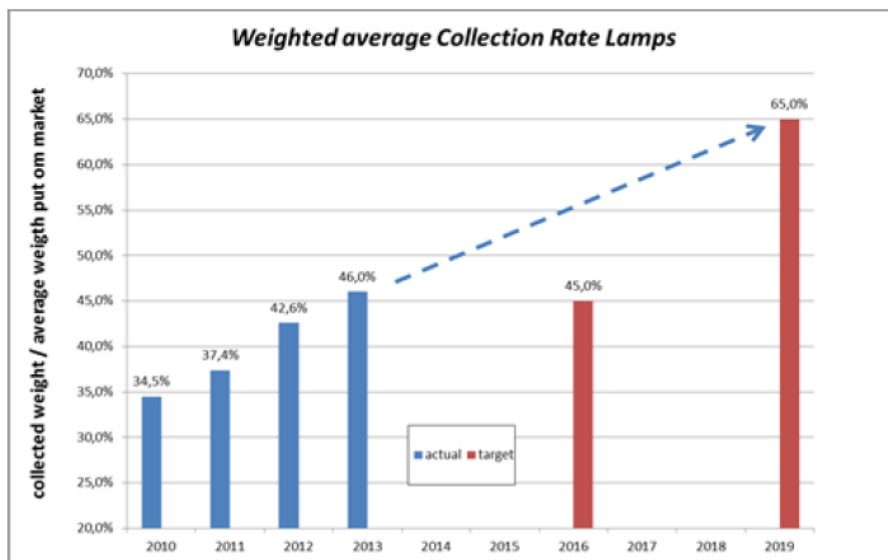
**Figure 1: Compact Fluorescent Bases** - <http://catalogue.osram.info/en/Lighting-Program-2014-2015/index.html#200>

**Bases IEC/EN 60061-1**



6. Information is provided regarding the total collection and recycling rates of lamps. Data is not specified regarding these rates for every lamp category (entries a-e of Ex. 1) on a quantitative basis, though various estimations are provided regarding the amount of lamps placed on the market per year and how they are expected to decrease between now and 2020. Among others the following diagram is presented:

**Figure 2: Weighted average Collection Rate Lamps (all lamps): 2010 – 2013 (blue) and targets 2016-2019 (red)**



- a. Regarding the estimated collection rates, please provide the definition of the denominator, as it is clear that the number of lamps at end-of-life in a specific years is a result of lamps placed on the market in the past and their respective service-life;

**Answer of LightingEurope:** The WEEE recast directive (Directive 2012/19/EU<sup>10</sup>) describes how the collection rate should be measured in Article 7: “The collection rate is to be based on the total weight of WEEE collected in accordance with Articles 5 and 6 in a given year in the member state concerned and expressed as the percentage of the average weight of EEE placed on the market in the preceding three years in the member state”. For example the data point from 2010 is based on data from 2007, 2008 and 2009.

- b. Please explain the discrepancies between these numbers and between the numbers mentioned in the VITO & VHK<sup>11</sup> report regarding collection rates, which provides data in Table 52 showing that the collecting rates of “lighting equipment except for discharge lamps” are around 5% whereas for “discharge lamps... The fraction collected is around 30% for all years.” If your data basis shows that higher collection rates are achieved for discharge lamps of various sorts, please provide evidence of your numbers.

<sup>10</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0019&from=EN>

<sup>11</sup> Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements (‘Lot 8/9/19) Draft Interim Report, Task 3(revision 1), April.2015, VITO, VHK

**Answer of LightingEurope:** The report from the VITO & VHK study (Task 3<sup>12</sup>) was issued after the renewal requests were submitted to DG environment. The first percentage mentioned in the question (5%) refers to luminaires and does not apply to lamps. The explanation provided in the report below table 52 indicates that data are lacking and numbers used in the report are partly based on interpretation. LE numbers (which are the basis for the indicated graph) can be traced to the individual member countries in Europe and are followed over a long period.

Since 13th of August 2005 the European lamp industry has founded dedicated Collection & Recycling Service Organizations (CRSO's) to fulfill the producer responsibility deriving from both EU and National legislation. Information on collection and recycling is available in the respective EU Member States. This can be presented at aggregated EU level. The underlying data can be supplied confidentially to Öko since the individual data are the property of the individual CRSO's. Separate information per category at EU level cannot be provided as this is not being measured in all Member States. The collection organisations do not separate lamps according to RoHS relevant categories so no data are available at the level of exemptions.

7. Please evaluate CFL sales as a share of all sales of domestic lamp types. Please estimate how this breaks-down among the various CFL sub-categories that fall under Ex. 1(a-e).

**Answer of LightingEurope:** Assuming with 'domestic lamp types' the residential lamps are meant, the VHK report as referred to in exemption requests 1a-e provides a split in all lamp types in table 3<sup>13</sup>. Summarized the table indicates:

Lamp type in Residential	Sales 2013 in million units
LFL	22
<b>CFL</b>	<b>184</b>
Tungsten (HL)	617
GLS	127
HID	0
LED	68

As indicated in answer 1b, a further split towards the CFL exemptions is made very roughly based on LE member experience.

8. According to your request the total amount of mercury entering the EU market in compact fluorescent lamps covered by this exemption will decrease significantly between 2013 and 2020, based on both, the decrease in the total volume of CFLs to be placed on the market in these years as well as the average quantities of Hg per lamp sub-category. The decrease in the total volume of CFLs to be placed on the market is explained to result from the increased penetration of LED-lamps. Furthermore you also state that the lighting market is rapidly changing from discharge lamp technology to LED technology and no major development efforts have been taking place anymore for discharge lamp technology. Please provide a roadmap for substitution of the Ex. 1(a-e) applications with LED- lamps that are or that shall become available on the EU market.

<sup>12</sup> Ibidem

<sup>13</sup> Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements ('Lot 8/9/19'). Draft Interim Report, Task 2 by Prepared by VHK, in cooperation with VITO and JeffCott Associates, Date: 19 November 2014, Table 3.



**Answer of LightingEurope:** As LE we are not able to share the individual road maps the member companies have planned for their LED portfolio. There is no general roadmap to develop LED replacements for all existing CFL lamp types in the market. McKinsey indicates in its report<sup>14</sup> that by 2020 still 48% of total General lighting will be in conventional technology. Specific data per application is given, e.g. in Residential Lighting 40% of the light sources will still be of conventional technology, in Professional Lighting (e.g. Offices, Streets) this number is even higher.

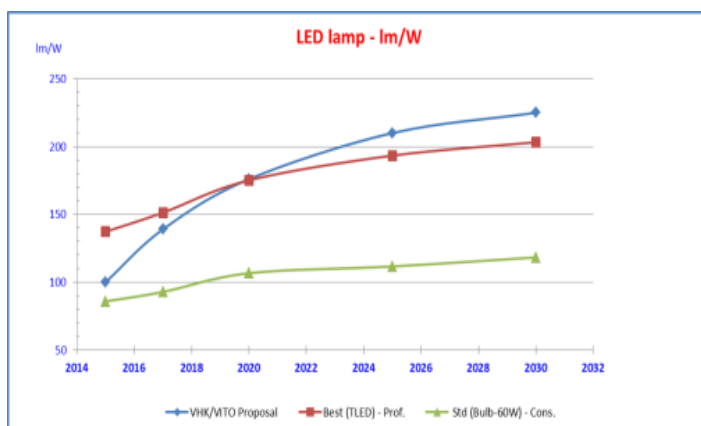
a. What changes in trend can be observed since the last evaluation of this exemption?

**Answer of LightingEurope:** We kindly refer to the Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements ('Lot 8/9/19') Draft report, Task 4 Technologies prepared by VITO in cooperation with VHK Date 10 May 2015, which reviews per technology the developments. The focus in the LED development is on reaching certain price points in the significant volume type of lamps and less on completing the total variety of lamp types available in conventional lamps. The other trend that can be observed on the market is innovation in integrated LED solutions.

b. What changes are expected over the next 10 years in this transformation process? Please clarify in your answer in relation to which exemption entries or to which replacement routes the availability of substitutes is expected to grow each year;

**Answer of LightingEurope:** In LED development there is a focus on reaching price levels, leading to a compromise between costs and performance, especially lifetime and lm/W (figure 2<sup>15</sup>).

**Figure 3: LED lamp Efficacy development**



*Note: The graph illustrates projected lm/w values for a typical LED consumer bulb (A60) and a typical high end LED double-capped linear fluorescent lamps replacement product for the professional market. Both with complete different product specifications and corresponding*

<sup>14</sup> Lighting the way: Perspectives on the global lighting market – Second edition August 2012 by McKinsey & Company - Exhibit 27, page 52

<sup>15</sup><http://ecodesign-lightsources.eu/sites/ecodesign-lightsources.eu/files/attachments/2nd%20Stakeholder%20comments%20from%20LE%20-%202020150710.docx> – Page 5



*price levels. The curves presented on the graphs show technically possible based on LED package Lm/W development, but will not be realized in products in all applications since the lm/\$ will be optimized rather than lm/W.*

Next to that there is a focus on interesting high volume lamp types, ignoring many parts of the fragmented market (see figure 1 on page 3).

- c. Please also clarify aspects that may impact the implementation of LED-lamps, for example, how would the supply of the CFL product range influence the development of more efficient LEDs, especially in light of the price comparability?

**Answer of LightingEurope:** As stated in exemption 1a clause 6.2.3.4: Focus of the current lighting industry is already on the further development of LED technology (paragraph 6.1). An extension of the exemption will have a positive effect on the efforts to further innovate in LED, as CFL is the benchmark to be outperformed by LED. When CFL is removed from the market, there is no other technology to challenge LED.

- 9. Please describe impacts expected should the requested exemption not be renewed:

- a. How does LEU estimate that the market shares of Hg-free technologies (LED, Halogen) would develop over the next 10 years under such a scenario?

**Answer of LightingEurope:** Taking into account stage 6 Requirements of Commission Regulation EC/ 244/2009, banning Halogen bulb solutions, going into force per Sept 2018, the estimated share of LED lamps sold per January 1 2019 is 100% in case only Hg free technologies are allowed on the market.

- b. Please provide a description of the impacts to arise over the next 10 years, of a non-renewal scenario of the requested exemption, in terms of:

- i. Total energy consumption;

**Answer of LightingEurope:** The expected effect is minimal, because efficacy of CFL is just a bit lower than LED. Big impact as change from incandescent to CFL (80% energy saving) will not be reached anymore. LE wants to comment that CFL lamps are very energy efficient lamps. The lamps concerned in this exemption request for professional use are subject to application specific norms and requirements e.g. building norms for offices EN 12464-1. A change of a conventional solution to a LED replacement adhering to these norms may require a new lighting plan because e.g. the required illuminance levels can't be reached with the same number of light points. This can influence the total energy use negatively. Additionally it should be noted, that energy savings can be also achieved through smart solutions with conventional lighting, e.g. dimming, presence detection, daylight link, etc.).

- ii. Environmental impacts;

**Answer of LightingEurope:** Please refer to the arguments used in the LE exemption requests clause 6.2.3.1: various LCA's show different results and are as such inconclusive regarding the comparison of LED technology versus CFL technology on their total environmental impact. Next to that non-renewal of this exemption will lead to unnecessary waste of luminaires that cannot be used, due to lack of a replacement lamps (premature refurbishment). Next to that it is clear that the Collection and Recycling rate of mercury containing lamps is increasing in EU (figure 11 on page 5), which reduces the environmental impact also in case the exemptions are renewed.

- iii. Health and safety impacts;

**Answer of LightingEurope:** Please refer to the arguments used in the LE exemption requests clause 6.2.3.2.

Please specify in each case the assumptions made and the data basis used to arrive at your estimations;

- c. Please explain if the argumentation related to “the feasibility of the alternatives” (see application for Ex. 1(a), p.25 ff.) is relevant for the full range of available LED substitutes (relevant to this exemption) or only for specific parts of the lamp supply?

**Answer of LightingEurope:** The variety in types, lamp bases and dimensions of lamps covered by this exemption is very big, and the amount of available luminaires to use them in is even bigger. The range of available LED alternatives is growing, but not complete. Next to that, there are numerous LED suppliers in the market, each of them trying to mimic the conventional lamps with the LED technology not bounded by any standards. The issues indicated in clause 6.2.1 can therefore be found in the full range of the LED substitutes.

10. You maintain that a renewal of the exemption will have a positive effect on the efforts to further innovate in LED, as CFL is the benchmark to be outperformed by LED. Please describe this argument as precise as possible.

**Answer of LightingEurope:** Please refer to answer on 6b: In the lighting industry a big fight for market share is ongoing in the LED arena. This fight is played along the price axis where performance is sacrificed to come to a lower price point (e.g. lifetime, efficacy, light output, size, lumen maintenance, colour quality). As long as there are alternative products on the market there is a ‘threat’ that users will buy the alternative when too much of the performance is sacrificed. So CFL will be the backstop for LED quality. LE wants to stress again that currently and not expected for the near future for all CFL lamps a LED replacement will become available.

11. You state “The following replacement issues in existing luminaires will not be solved by the LED technology on short notice: size, form factor, light distribution, light output, weight, heat management. Next to these issues lamps operated on separate ballasts can face problems with electrical compatibility, because many different types of gears (both conventional ballast and electronic control gear) are installed in the European market.”

- a. Please estimate how these problems are reflected in the respective market share of each Ex. 1(a-e) lamp sub-category, i.e., what part of the lamps falling under the scope of a specific entry would have substitution issues in light of each aspect (or in light of multiple aspects)? If possible please provide appropriate data/estimations of the annual refurbishment/modernisation rate.

**Answer of LightingEurope:** The issues mentioned in the exemption requests are existing in all sub-categories due to the vast variety of lamp types as indicated in answer to question 6c.

- b. Alternatively, please estimate for each Ex. 1(a-e) lamp sub-category the percentage of the current installed luminaires which could be not retrofitted by the LED technology.

**Answer of LightingEurope:** Due to the even bigger variety of luminaire types in the sub-categories of CFL lamps, providing such estimation is not possible. Specific lamp – luminaire combinations have been developed in the past. There is no generic incentive in the industry to develop 1:1 replacements in LED technology. The VHK report as referred to in exemption requests 1a-e provides an overview of ‘stock’, being the installed base of CFL lamps in 2013<sup>16</sup>. This shows that in Residential 2580 million CFL lamps are installed of which 2296 million units CFLi lamps and 283 million CFL-ni versions. The Non-Residential (Professional) area consisted in 2013 of an installed park of 1881 million CFL lamps of which 1531 million pieces CFLi and 350 million pieces CFL-ni.

12. LEU states “*Currently there is no electrical interface described for LED lamps replacing CFL with external control gear. Standardisation bodies are working on interface standards (related to linear LED based replacement lamps), but it is not expected that these will also become available in the near future for CFL (with external control gear). As a result an end-user, both consumer and professional customer, needs to either have a broad technical knowledge or reach out to professionals to ensure that replacement is safe and the luminaire operates in a proper manner. It requires case-by-case feasibility and measurements*”. Please clarify the relevant parameters that such standards need to address in the future for clarifying what LED parameters and performance are needed to ensure that alternatives are compatible with performance requirements of CFLs which they are to substitute. Please refer among others to aspects related to light output and lumen package, etc.

**Answer of LightingEurope:** The aim of the comment is to indicate the lack of standards for electrical interface and as such electrical compatibility for CFL (with external control gear), not a lack of performance criteria which should be in line with existing ones. For example in linear fluorescent such standard was recently developed, but only for retrofitting solution (one-on-one lamp replacement, without luminaire/installation changes).

### **Specific Questions Regarding Ex. 1(a)**

13. The LED technology developments also address one-on-one replacements of CFL lamps, but according to LEU this will not result in a situation which would allow for full replacement of the current Ex. 1(a) discharge lamp portfolio within the timeframe of the current exemption. In this regard, the application mentions a number of aspects regarding the feasibility of alternatives (see pg. 25-30):
- a. Please provide a quantitative estimation to which part of the total market share these arguments correspond;

**Answer of LightingEurope:** Please refer to answer on question 6c.

- b. Please clarify for what range of lamps falling under this entry a drop-in alternative exists– please clarify in which cases LEDs provide such alternatives and in which cases halogen lamps;

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<sup>16</sup> Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements (‘Lot 8/9/19’). Draft Interim Report, Task 2 by Prepared by VHK, in cooperation with VITO and JeffCott Associates, Date: 19 November 2014, Table 23 & 24, page 33 & 34

**Answer of LightingEurope:** As indicated in answer 6a: Taking into account stage 6 Requirements of Commission Regulation (EC) No 244/2009 which goes into force per September 2018, Halogen bulb solutions will be banned. As a result, halogen should be considered as just temporarily available alternative. In other words, when conventional CFL is not allowed the only solution left for all installations is a LED. This means that all types, shapes, etc. have to be available in the market. LE wants to emphasise that various CFL lamps have no LED replacement. There is no quantitative data available on coverage of all lamp types.

- c. Please clarify where retrofit LEDs are expected to become available over the following 5 years;

**Answer of LightingEurope:** As indicated in the answer to question 5, LE is not able to share the LED roadmaps of its individual members. Additionally referring to 5a, the VITO&VHK study (Task 4<sup>17</sup>) mentions: “In recent years CFLi sales are decreasing, and the impression is that this regards in particular the sales in the low wattage range, where LED lamps are increasingly used.” “CFLi’s are available up to 320 W (23000 lm) in cap E40 and 100 W (6365 lm) in cap E27. The maximum lumen output of LED retrofit lamps with integrated control gear is limited and high lumen output LED retrofit lamps are relatively more expensive. Consequently, direct LED retrofit solutions for high-capacity CFLi’s are expected to be scarce.” “No LED retrofit lamps for CFLni have been found in the catalogues of major lighting manufacturers as Philips, Osram, General Electric, Havells Sylvania and Megaman. This is interpreted as a sign that this market is not sufficiently interesting, and that for many consumers the substitution of CFLni’s by LED retrofits may not be an attractive option.<sup>18</sup>” For an LED to be a retrofit solution for the total variety of CFL lamps (refer to the answer on question 2), all the varieties have to be taken into account.

- d. Please provide information and data as to the annual replacement / retrofitting / rewiring rate of the luminaire park; If actual data is not available please provide a rough estimation, explaining the assumptions made to arrive at the various conclusions;

**Answer of LightingEurope:** Such data is not available and because of the complexity of the portfolio as explained in earlier questions, estimation cannot be provided by LE members. However it should be noted that luminaires for professional applications can exist for up to 30 years.

- e. What is currently the best available LED technology (BAT) on the market regarding their parameters, Energy Efficiency Index (EEI) and indicate the unit price?

**Answer of LightingEurope:** In the EEI technology characteristic are taken into account, so specific calculation rules apply to self-ballasted CFL lamps and different ones to CFL lamps with external control gear. This also means that for the different technologies and applications (residential, non-residential) different BATs should be defined. We kindly refer to the Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling

<sup>17</sup> The Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements (‘Lot 8/9/19’) Draft report, Task 4 Technologies prepared by VITO in cooperation with VHK Date 10 May 2015, p 100 - 102

<sup>18</sup> Ibidem, page 104

Requirements ('Lot 8/9/19') Draft report, Task 4 Technologies prepared by VITO in cooperation with VHK Date 10 May 2015. Although LE provided feedback on the BATs used in this report<sup>19</sup>. It is stressed again that for various CFLni lamps no real LED replacement are available in the market at this moment so neither EEI nor price should be considered here<sup>20</sup>.

### Specific Questions regarding Ex. 1(b-d)

14. It is explained in the applications for these entries that “*One of the main characteristics of the lamps in this category is that they emit high lumen packages...*” – from 2000 lumen and up depending on the entry – “*...The LED development in these high lumen packages is focussing typically on new luminaire solutions instead of retrofit lamps. As a result, not many replacement solutions for this specific category in LED are available in the market.*”
- a. For each of these entries, please clarify what range of the scope of lamps falling under the entry are considered to have high lumen packages;

**Answer of LightingEurope:** Lumen packages of 2000 lumen and more are considered as high lumen, including all lamps within the exemptions 1(b-d).

- b. What is the estimated percentage of the market volume for CFLs in the relevant Ex. 1(b-d) category (e.g.  $\geq 30$  W and  $< 50$ , etc.) for which fully compatible drop-in substitutes in LED technology are not yet available?

**Answer of LightingEurope:** Exact data on this point is not available, but it is clear that the higher the light output, the less fully compatible drop-in substitutes in LED are available. As indicated in answer 10c the big lighting companies hardly offer any LED solutions for these high lumen lamps.

- c. Can you confirm that substitution is only a problem on the level of existing installations whereas otherwise alternative luminaire solutions are available on the market? If not please clarify in what cases development of alternative luminaires is still relevant;

**Answer of LightingEurope:** This needs to be considered on case by case basis, especially due to market complexity indicated in earlier answers, LE lacks a full overview of all applications/luminaires used in EU28. For those applications where substitutions exist, still the prices (thus lm/\$) are not attractive especially taking into account cost of premature refurbishment of conventional luminaire as well as cost of installation of new luminaires which rarely fit the ceiling layout. Additional cost of ceiling refurbishment should be expected.

- d. Please provide if possible appropriate information figures of the annual retrofitting rate – if relevant, please provide information in the context of the relevant use group (i.e. residential buildings, office buildings, street lighting, etc.)

<sup>19</sup><http://ecodesign-lightsources.eu/sites/ecodesign-lightsources.eu/files/attachments/2nd%20Stakeholder%20comments%20from%20LE%20%20%2020150710.docx>

<sup>20</sup> This is also recognized by the VITO & VHK study, please refer to answer on question 10c and following reference.



**Answer of LightingEurope:** Detailed estimations are not known to LE. We would like to refer to comments made in the VITO & VHK study (Task 2<sup>21</sup>). “As regards the non-residential sector, there are hardly any reliable sources for operating hours and wattage that the study team has identified so far.” Situation on residential data is similar where the indicated study mentions, that “These measurement projects indicate, for instance, that there is a considerable difference in outcome between so-called diary- and questionnaire type of investigations, which tend to considerably overestimate hours/wattage/consumption, and hard measurement data.” Additionally “The measurement projects also confirm that there are considerable differences between the North and South of the EU in terms of operating hours /wattage /number of lamps per household /light type /consumption. The average EU energy consumption for lighting is around 450-500 kWh per year per household (2013), but could be as high as 700-800 kWh in the North and as low as 300 kWh in the South.” Next to that LE would like to refer to estimated luminaire service lifetime which for professional applications can be up to 30 years in outdoor installations, which means that several lamp replacements are needed during the application lifetime. Detailed overviews per segment are provided in the McKinsey report<sup>22</sup>.

### Specific Questions Regarding Ex. 1(c-d)

15. It seems that only because of the existing luminaire stock you have submitted the above mentioned request. Assuming that the existing exemptions no longer reflect the status of best available technologies (LED) and that an exemption for the use of mercury in lamps in future would only be limited to very specific cases or applications please provide a wording proposal.

**Answer of LightingEurope:** The original LE wording in the exemption requests may not have been sufficiently clarifying. Lamps are considered a replacement article in installed applications as luminaires or even complete ceilings are used for more than one lamp lifetime, i.e. the user assumes his installation can be used for several years (up to 30 years<sup>23</sup>) and in case lamps fail he can replace these as specific components in his existing installation. Nevertheless it must also be clarified that it is allowed in the EU to sell and install new luminaires based on conventional technology<sup>24</sup>. The LED alternatives for the lamps in these exemptions are rare and due to the high lumen packages not expected to become available soon. Therefore the extension of the exemption for these types of lamps is needed for the years to come.

<sup>21</sup> Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements ('Lot 8/9/19'), Draft Interim Report, Task 2, Markets, Prepared by VHK, in cooperation with VITO and JeffCott Associates Date: 19 November 2014, page 28-29

<sup>22</sup> McKinsey, Lighting the way: Perspectives on the global lighting market, July 2011, Table 2, page 48.

<sup>23</sup> Ibidem

<sup>24</sup> Examples of luminaires based on conventional technologies:

- (1) [http://www.ecat.lighting.philips.nl/l/buitenverlichting/stads-en-straatverlichting/stads-en-straatverlichtingsarmaturen/metronomis/metronomis-torino-cds530-531/910502146918\\_eu/](http://www.ecat.lighting.philips.nl/l/buitenverlichting/stads-en-straatverlichting/stads-en-straatverlichtingsarmaturen/metronomis/metronomis-torino-cds530-531/910502146918_eu/)
- (2) [http://www.ecat.lighting.philips.nl/l/buitenverlichting/stads-en-straatverlichting/stads-en-straatverlichtingsarmaturen/iris/912300025697\\_eu/](http://www.ecat.lighting.philips.nl/l/buitenverlichting/stads-en-straatverlichting/stads-en-straatverlichtingsarmaturen/iris/912300025697_eu/)
- (3) [http://www.ecat.lighting.philips.nl/l/armaturen-binnenverlichting/downlights/fugato/fugato-performance-algemene-verlichting/910502488515\\_eu/](http://www.ecat.lighting.philips.nl/l/armaturen-binnenverlichting/downlights/fugato/fugato-performance-algemene-verlichting/910502488515_eu/)

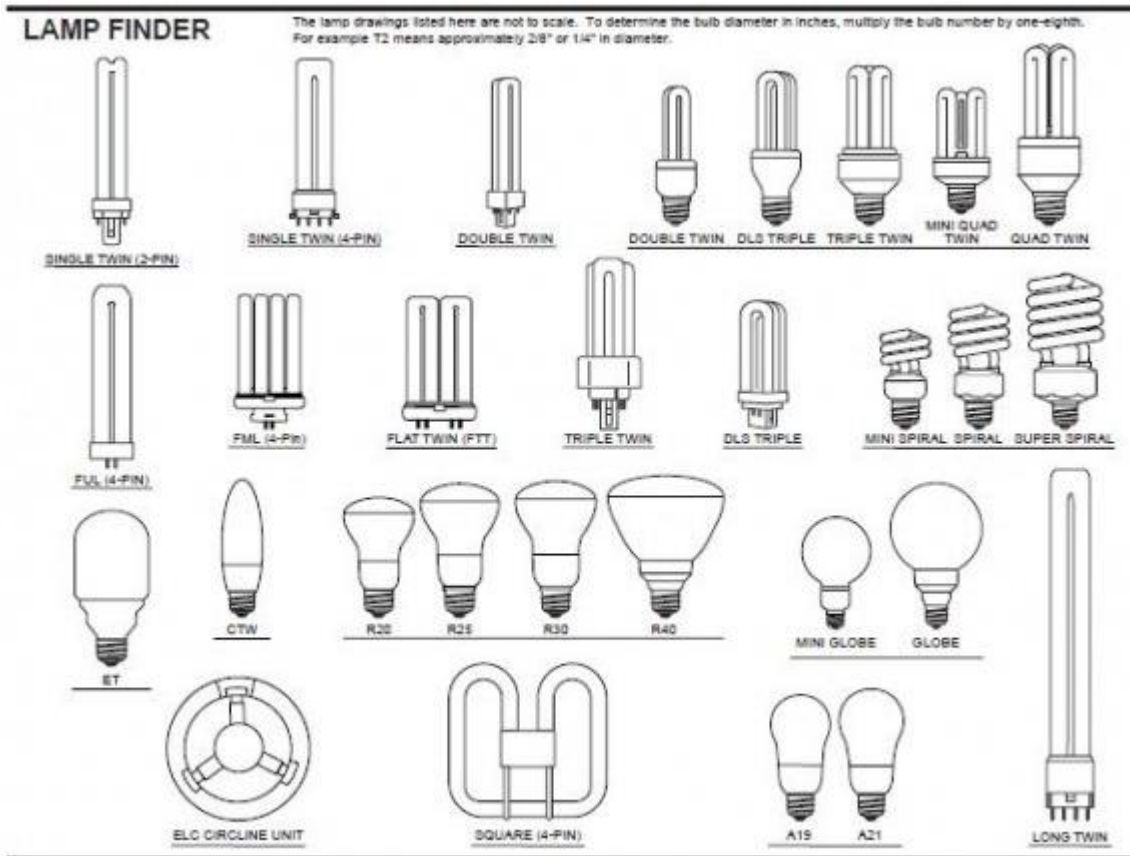
**Please note that answers to these questions are to be published as part of the available information relevant for the stakeholder consultation to be carried out as part of the evaluation of this request. If your answers contain confidential information, please provide a version that can be made public along with a confidential version, in which proprietary information is clearly marked.**



Annex 1

More examples of the variety in CFL lamps are shown in below illustration of lamp shapes (figure 3<sup>25</sup>).

Figure 4: Available CFL shapes



<sup>25</sup> <http://lampsclinic.com/compact-fluorescent-bulbs-base-guide.html>