

Consultation Questionnaire Exemption No. 4(f) of RoHS Annex III

Current wording of the exemption:

Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex

Requested validity period: Maximum (5 years and 7 years (cat. 8 and 9) respectively)

ACRONYMS AND DEFINITIONS

UV	Ultra Violet
LED	Light-Emitting-Diode
Hg	Mercury
LEU	LightingEurope

1. INTRODUCTION

1.1. Background

Bio Innovation Service, UNITAR and Fraunhofer IZM have been appointed¹ by the European Commission through for the evaluation of applications for the review of requests for new exemptions and the renewal of exemptions currently listed in Annexes III and IV of the RoHS Directive 2011/65/EU.

VDMA and Lighting Europe submitted requests² for the renewal of the above-mentioned exemption. The request has been subject to a first completeness and plausibility check. The applicant has been re-quested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation³.

The stakeholder consultation is part of the review process for the request at hand. The objective of this consultation and the review process is to collect and to evaluate information and evidence according to the criteria listed in Art. 5(1)(a) of Directive 2011/65/EU.⁴

To contribute to this stakeholder consultation, please answer the below questions until the 27th of May 2021.

1.2. Summary of the Exemption Request

According to VDMA: *“The application for prolongation of the existing exemption refers to mercury-containing UV discharge lamps which are used for curing (e.g. of layers of inks and coatings, adhesives and sealants),*

¹ It is implemented through the specific contract 070201/2020/832829/ENV.B.3 under the Framework contract ENV.B.3/FRA/2019/0017

² Exemption request available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu/rohs-annex-iii-exemption-evaluation-stakeholder-consultation)

³ Clarification questionnaire available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu/rohs-annex-iii-exemption-evaluation-stakeholder-consultation)

⁴ Directive 2011/65/EU (RoHS) available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>

for disinfection (e.g. of water, surfaces and air) and for other industrial applications (surface modification, surface activation) The application includes the following lamp types:

- **UV medium-pressure discharge lamps (MPL) for curing, disinfection and other industrial applications** (internal operating pressure > 100 mbar). The UV medium-pressure lamps can be doped with iron, gallium or lead in addition to the mercury they contain.
- **UV low-pressure discharge lamps for special purposes in the high power range.** [...]

Typical applications to be covered by this application include curing, e.g. of inks and coatings, disinfection of water etc., and other industrial applications like surface activation and cleaning.

It is technically not possible to replace mercury in special UV lamps with other materials/chemicals in order to achieve the same widespread radiation distribution. LED-based technologies are increasingly being used, which in certain applications (e.g. curing) also offer many advantages over mercury-containing UV lamps. Nevertheless, LED technologies cannot be used as an equivalent replacement in many applications. ”

According to LightingEurope, “[...]The renewal application concerns lamps and UV light sources defined as:

- High Pressure Sodium (vapour) lamps (HPS) for horticulture lighting,
- Medium and high-pressure UV lamps for curing, disinfection of water and surfaces, day simulation for zoo animals, etc...
- Short-arc Hg lamps for projection, studio, stage lighting, microlithography for semiconductor production, etc...

Replacement of mercury and mercury containing lamps is impracticable:

- The lamps covered by exemption 4(f) must remain available on the EU market:
 - o For new equipment for certain applications where no functionally suitable alternatives are available
 - o As spare parts for in-use equipment as replacing end-of-life lamps avoids having equipment become electronic waste before due time”

General statement:

The Ushio Group with its headquarter in Japan, has garnered a worldwide reputation as the specialist in industrial light sources, covering the entire light spectrum from Ultraviolet over VIS (visible light) to Infrared. Its European entities include Ushio Europe B.V., with HQ in Oude Meer (NL), Ushio Germany GmbH (development & production), Ushio Poland Sp. z o.o. (production), Ushio France S.A.R.L., and Ushio U.K., LTD, employing more than 200 people.

Ushio is developing, producing and selling light sources for a wide range of industrial applications, such as water treatment, disinfection, lithography, semiconductor manufacturing, optical inspection and analysis, optical cleaning, curing, pipe renovation, movie screenings in cinemas, tanning, daylight simulation and vitamin D production for animals in terrariums and zoos, horticulture, and sports facilities.

Most of these light sources contain mercury and cannot be replaced by other light emitting technologies in the existing technical environments of our customers (systems, equipment, luminaires). A ban of mercury containing light sources would therefore not only directly affect Ushio Europe’s business and put a couple of hundreds of jobs at risk. The business of our many OEM customers is also depending on the future availability of these light sources.

Based on the knowledge gained from our intense cooperation with customers requiring ultraviolet radiation for their processes, we experienced and firmly believe that the emission generated by mercury-based lamps cannot be replaced by current state-of-the-art technology. In particular the specifically high UV-C output, which cannot be reached by other technologies in a comparable manner, is advantageous in many aspects, keeping in mind e.g. the disinfecting and surface treating properties (e.g. material penetration depth depends on wavelength).

Although Ushio is producing and offering UV LEDs itself, we need to realise that these solutions currently are restricted to take a supportive/hybrid role within most fields of mercury-based lighting technology and a change in this fact is not foreseeable right now. Disinfection of water, pool, spa, ballast water, etc. will further depend on UV lamps with mercury as UV LEDs cannot be used for water disinfection with high flow rates for a long time to come.

For some applications, e.g. horticultural lighting, there are mercury-free alternatives available to the widely used HPS and MH lamps, e.g. based on LED. However, these LED light sources do not simply replace the mercury containing lamp but instead require a new luminaire. The existing systems were designed for mercury containing HPS lamps and there is no alternative chemistry capable of producing a suitable spectral output and photosynthetic efficiency required for high greenhouse productivity. A greenhouse is usually equipped with 1.000 light points per 10.000 m². An average greenhouse may have 5.000 light points in operation. The need for HPS end-of-life replacement lamps is massive (millions of lamps per year). If - due to a ban of mercury containing HPS lamps - greenhouses were forced to switch their entire lighting installations to LED, many of them would go out of business instantly because they simply could not afford the investment. In addition, it would produce a huge amount of pre-mature electronic waste of control gears etc. which is in contrast to the environmental goals of the European Union.

Within the Ushio group and its customers, a massive loss of jobs and a loss of international competitiveness would follow upon mercury ban.

2. QUESTIONS

1. VDMA and LightingEurope² requested the renewal of the above exemption for the maximum validity periods with the same scope and wording for all EEE of cat. 3 and 5 (VDMA) and cat. 1-10 (LEU).
 - a. Please let us know whether you support or disagree with the wording, scope and re-quested duration of the exemption. To support your views, please provide detailed technical argumentation / evidence in line with the criteria⁴ in Art. 5(1)(a).

We agree with the wording, and an extension should be requested at least until 2026 and beyond.

- b. If applicable, please suggest an alternative wording and duration and explain your proposal.

Especially for UV lamps containing mercury a shortening of the period of validity does not make sense from our point of view. The development on the basis of UV LEDs requires a lot of time and especially the development in the UV-C sector still faces great challenges. UV LEDs with a power density that our customers need will not be available for a long time yet.

It can also be assumed that not all specific UV applications are well-known to VDMA and LightingEurope and have therefore been neglected to be investigated and considered in detail. New applications keep emerging in which mercury-based lamps are useful and in which alternative technologies will not do the job. Therefore a restriction to certain fields and/or replacement parts does not make sense, let alone a ban.

The current wording of the exemption: "Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex" should therefore be retained unchanged.

With regard to the following current and future applications, processes and products, the availability of UV lamps containing mercury is indispensable for our company: air/water/surface disinfection, pipe/sewer renovation, specific curing processes, surface treatment, tanning/sunbeds, daylight simulation/vitamin D production.

2. Please provide information concerning possible substitutes or elimination possibilities at present or in the future so that the requested exemption could be restricted or revoked.
- a. Please explain substitution and elimination possibilities and for which part of the applications in the scope of the requested exemption they are relevant.

Substitution of mercury in the lamps covered by this exemption is scientifically and technically impracticable. The periodic system of the elements offers no alternative to mercury in discharge lamps (i.e., an alternative filling) that would be a direct 100% compatible replacement. The physical properties of mercury make this material quite unique and ideally suited for discharge lamps (high vapour pressure, low boiling point, specific spectral lines in areas that are ideal for disinfection and photochemical reactions). Scientific and industrial approaches to compatibly replace mercury with an alternative substance while maintaining the specific beneficial properties of mercury discharge lamps have been ongoing for decades and have all failed. There are other mercury-free types of discharge lamps and other light sources like UV-LEDs available with very severe limitations:

- Direct replacement (exchanging only the lamp) is in most cases technologically not possible
- Replacement of existing machines/processes with alternative light sources (if available) usually requires additional steps

- With respect to UV disinfection (water/air/surfaces), there currently is no real replacement available with a similar efficiency or with less impact on the environment. The affected markets include general (drinking) water treatment plants, the beverage industry (bottling plants for PET bottles, glass bottles, or other containers), the food industry (sterilizing and packaging), fish farming plants, health industry, Covid-19 countermeasures, vessel ballast water treatment, and many more.

- b. Please provide information as to research to find alternatives that do not rely on the exemption under review (substitution or elimination), and which may cover part or all of the applications in the scope of the exemption request.

Although Ushio is producing and offering UV LEDs itself, we need to realise that these solutions currently are restricted to take a supportive/hybrid role within most fields of mercury-based lighting technology and a change in this fact is not foreseeable right now. Disinfection of water, pool, spa, ballast water, etc. will further depend on UV lamps with mercury as UV LEDs cannot be used for water disinfection with high flow rates for a long time to come.

LED solutions as alternatives for horticultural applications are available, however, the need for HPS replacement lamps is massive (millions of lamps per year). If - due to a ban of mercury containing HPS lamps - greenhouses were forced to switch their entire lighting installations to LED, many of them would go out of business instantly because they simply could not afford the investment. This would result in a breakdown of the supply chain of greenhouse produce of fruit, vegetables and flowers.

For the application "tanning/sunbeds" Ushio has developed lamps using zinc instead of mercury with quite promising results. However, zinc lamps require a much higher ignition voltage than mercury-based lamps, meaning that simple 1:1 re-lamping for existing sunbeds or tanning systems is not possible. Even a change of control gears will not be possible in most cases, as different air and creeping distances need to be considered.

- c. Please provide a roadmap of such on-going substitution/elimination and research (phases that are to be carried out), detailing the current status as well as the estimated time needed for further stages.

Ushio is not aware of a general roadmap for substituting mercury in UV-, HPS- or MH lamps. As stated above, we do not believe in the existence of a substance that can replace mercury without compromising the desired product properties.

3. Do you know of other manufacturers producing devices of comparable features and performance like the ones in the scope of this exemption request that do not depend on RoHS-restricted substances, or use smaller amounts of these substances compared to the applications in the scope of this exemption?

We are not aware of such manufacturers.

4. As part of the evaluation, socio-economic impacts shall also be compiled and evaluated. For this purpose, if you have information on socioeconomic aspects, please provide details in respect of the following:

- a. What are the volumes of EEE in the scope of the requested exemptions which are placed on the market per year?

Unfortunately, statistical data accurately describing the total market 4(f) is not available.

- b. What are the volumes of additional waste to be generated should the requested exemption not be renewed or not be renewed for the requested duration?

All existing luminaires on the market running with mercury discharge lamps would have to be considered as additional waste and would have to be disposed of, including the built-in ballasts or electronic power supplies. Detailed information on the environmental impact of this can only be evaluated by the producers and users of the equipment in which the lamps are used.

A complete ban of mercury-based lamps and cutting the supply of replacement lamps would result in taking thousands of sunbeds out of operation. This will not only result in many small businesses going bankrupt but also in a huge amount of waste.

In many cases, it is technologically not feasible to retrofit existing equipment with alternative light sources. This applies even more for equipment and machinery using UV lamps, since they are even more complex than luminaires. We as lamp manufacturer and supplier to the system providers, however, cannot quantify the volumes of waste generated by taking the existing equipment out of operation. We can only assume that they will be massive.

Additional waste will also be generated by taking our own lamp production equipment out of operation, worth a couple of million Euros.

- c. What are estimated impacts on employment in total, in the EU and outside the EU, should the requested exemption not be renewed or be renewed for less than the re-requested time period? Please detail the main sectors in which possible impacts are expected – manufacturers of equipment in the scope of the exemption, suppliers, re-tail, users of MRI devices, etc.

Ushio as a producer of mercury containing lamps would lose about 60% of its products and its productivity, resulting in a massive layoff of employees. In Europe alone this would affect approx. 200 people, outside Europe possibly a few thousand.

Many of our OEM customers totally depend on the availability of mercury-based lamps. There is a high chance that they will go out of business should the requested exemption not be renewed.

- d. Please estimate additional costs associated should the requested exemption not be renewed, and how this is divided between various sectors (e.g. private, public, industry: manufacturers, suppliers, retailers).

Surviving companies in the need of UV solutions would face tremendous investment costs for developing and building new machinery and production methods. At the same time they would be facing costs for disposal of no longer usable machines and equipment.

Greenhouses would have to perform significant investments in new luminaires.

Impacts on private/public or retail sectors are probably negligible.

5. Any additional information which you would like to provide?

Please note that answers to these questions can be published in the stakeholder consultation, which is 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.

Please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that the project team can contact you in case there are questions concerning your contribution.