

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 requested 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 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 \(biois.eu\)](#)

³ Clarification questionnaire available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](#)

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



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), 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"

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General information

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Number of employees: 20

Areas of sales activities: worldwide

The company Uviterno AG is based in Eastern Switzerland and has more than 35 years of experience in the UV business. Uviterno AG is a manufacturer of high-quality UV systems and – to a smaller extent – of UV LED systems.

We supply our UV systems to thousands of customers worldwide, including leading Original Equipment Manufacturers (OEM) as well as end users in the following industries:

- Production and decoration of food, cosmetic, medical, and pharmaceutical packaging, and containers (UV curing of high-end printing inks and lacquers on cups, lids, tubes, bottles, other plastics metal/aluminium, glass, ceramic)
- Label and narrow web printing (production and decoration of labels, foils, flexible packaging, paper, and cardboard packaging, etc. for consumer goods and industrial products)
- Graphic industry – screen-, offset-, flexography-printing
- Furniture and architecture industry (curing of coated boards and panels on various materials like wood, composite materials, vinyl ...)
- 3D printing (e.g., curing of Covid-19 swabs and testing tools)
- Adhesive processing (UV-controlled adjustment of tack, peel adhesion, and shear strength)
- Hard protective coatings of front lights and other parts for the automotive industry
- Plastics industry, coating of metallized extrusion and moulded parts for various applications (fittings, control knobs, front panels, instrument panels, etc.)
- In-line UV disinfection of irradiated goods (built-in functionality)
- And many more

The percentage of UV-based products in our total production is more than 95 %.

Over the past decades, we have produced and supplied several thousands of UV systems worldwide.

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 requested duration of the exemption. To support your views, please provide detailed technical argumentation / evidence in line with the criteria⁴ in Art. 5(1)(a).

The wording should be retained, and an extension should be requested at least until 2026 and beyond. The reasons are:

Reference to RoHS Art. 5(1)(a): Exemptions for materials and components may be considered, if:

- “*their elimination or substitution via design changes or materials and components [...] is scientifically or technically impracticable*” → We fully agree with this point. For most industrial applications we do not see an alternative to the mercury-based UV lamps. Moreover, it is economically and technically not feasible to retrofit used machinery with new UV LED installations. Mercury-lamp based UV curing is the work horse for numerous industrial applications.
- “*the reliability of substitutes is not ensured*” → This is true. We are witnessing severe drawbacks and shortcomings with most projects to substitute existing UV lamps with other light sources or technologies. We have our own experience, and that of our clients. For the use of other light sources such as UV LED, the formulations of inks and varnishes must be different, perfectly adapted to the specific emission spectrum/wave lengths of the available UV LED systems. So far, there is no evidence that the quality of these substitutes meets the requirements in terms of scratch resistance, long-term durability, etc. Moreover, many of the new formulations suiting the process are under restriction by the REACH directive.
- “*the total negative environmental, health and consumer safety impacts caused by substitution are likely to outweigh the total environmental, health and consumer safety benefits thereof*” → This is also true. The negative impact on the environment caused by a cease of use of mercury-based UV technology will be huge (necessary scrapping of raw materials, consumables, machinery, and equipment). On the other hand, health and consumer safety concerns with mercury-based UV technology is zero, if applied properly and according to the manufacturer’s specifications.

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

It is not possible to reasonably replace most existing mercury-based UV technologies with any sort of alternative. The reason being that in many cases, compatible alternatives simply

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do not exist or have severe disadvantages or shortcomings. We therefore don't suggest any change to the wording or duration. On the contrary, we believe that the stipulated mercury-ban in regard of the UV curing and UV disinfection industry has likely been formulated based on missing knowledge of the abundance and diversity of applications in this field. We would support an unlimited exemption or a much longer time frame for individual exemption durations.

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.

We do not see a 100% substitute for mercury-based UV lamps. Neither the light sources nor the suitable photochemistry exists for the broadness of applications found in the field.

The properties of mercury-based UV lamps are unique and ideal for photochemical reactions. The application processes which use UV lamps have been optimized over decades.

The photon energy of currently available alternative sources, e.g., UV LEDs, is too low for many of today's photochemical reactions. Availability of sources with lower wavelength (higher photon energy), reasonable output and mixed emission spectra at an affordable price is – if even possible – many years or decades away.

In our opinion, the demand for complete substitution of mercury-containing lamps is wishful thinking. We see alternative technologies, such as UV LED technology, much more as a supplement or extension of the existing industrial application. Admittedly, there is some overlap in individual application areas, but a complete displacement of mercury-based applications cannot be achieved for physical-technical reasons. We therefore advocate the coexistence of different technologies, with the more suitable one being used in each specific application.

- 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.

A prerequisite for the further reduction of mercury-based UV technology would be not only the availability of new light sources but also the development and supply of new photochemical substances. However, we repeatedly hear from ink and coating manufacturers that the necessary raw materials either do not exist or many of them are

hazardous to health. The REACH regulation apparently restricts the scope for the development of alternative photochemical products considerably.

- 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.

To our knowledge and experience, it will not be possible to replace the reliable and high performing UV curing process based on mercury discharge lamps by alternative light sources or other technologies. We do not see this even in 10 or 20 years. The main reason lies in the physical properties of the mercury atom, which are as useful as they are unique for technical applications.

Thus, we cannot suggest any roadmap for a substitution.

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?

Uviterno AG as well as many of our competitors in Europe and overseas produce UV LED systems. In our experience, their application range is very limited compared to the breadth and versatility of mercury-based technologies. The main market for UV LEDs that can be reasonably reached is limited for physical and photochemical reasons to digital printing, some other printing processes, and adhesive applications especially in the bonding of transparent materials (e.g., glass). Especially in coating applications, UV LEDs can and will in many cases by far not fulfill the expectations placed in them.

Once again, we believe that the coexistence of different technologies is the most sensible way to have the optimal tools available for specific applications.

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?

We do not have exact figures, but the market is huge. Our clients use and replace thousands of UV lamps per year. They depend on this approved and efficient technology.

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In nearly all applications, it is impossible to just exchange the curing system on an existing production machine (e.g., replace it by UV LED). The entire machine would be useless and could only be scrapped or exported as second-hand machine to countries outside the EU.

- 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?

If UV lamps are no longer available, thousands of production lines for food packaging, woodworking, automotive parts, etc. would have to be considered as useless and would have to be disposed of.

On most existing machines, it is technically impossible and/or economically not feasible to replace the UV curing system by alternative light sources such as UV LEDs.

We assume the total value of materials and equipment that would have to be scrapped after a total mercury ban to be in the figure of many billions of EUR - only counting the European Union.

- 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 requested time period? Please detail the main sectors in which possible impacts are expected – manufacturers of equipment in the scope of the exemption, suppliers, retail, users of MRI devices, etc.

To our knowledge, thousands of companies in the EU would be affected by a final mercury ban. Many of them depend on the availability of UV technology based on mercury lamps to an extent of up to 100%.

Because of a mercury ban, EU countries would get dependent on countries like China, USA, Russia, etc. and would have to import the finished goods from there. E.g., food packaging, automotive parts, furniture, etc.

Manufacturers of UV machinery and equipment would have to close their facilities or move them to countries outside the EU.

If the exemption should not be renewed or be renewed for less than the requested period, our company as well as many of our clients in printing, coating, etc. would be threatened by a full closure.

This would cause an additional unemployment of hundreds of thousands of people in the EU.

- 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,

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suppliers, retailers).

We do not have figures available, but the following financial impact is to be expected:

- High unemployment costs for thousands of people
- High investment costs in new machinery – which, at the same time, cannot produce the full spectrum of necessary products as before
- Costs for disposal of old machinery
- Costs due to missing supply of UV spare parts to our machinery clients, who have to give a warranty of 12-24 months to their end users
- Etc.

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

From our point of view, a final ban of mercury-based discharge lamps would have dramatic consequences for the whole European industry.

Thousands of production lines would have to be stopped. Hundreds of thousands employees would lose their jobs.

EU member countries would have to import the finished products from countries like China, USA, Russia, etc.

We believe, that the enormous costs of an additional unemployment caused by a mercury ban are in extreme disproportion to the relatively small amount of mercury used for mercury discharge lamps every year.

To prevent humans and the environment from an exposure to mercury, we strongly recommend establishing a EU wide recycling system for UV lamps. The mercury from the collected lamps can be used to produce new UV lamps – a perfect closed-loop system.

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.

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