

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”

BÄRO is a manufacturer of surface and air cleaning products, based in Leichlingen, Germany, with 150 employees. Since the mid-1990s, our products are used in the food industry, in kitchens, or for general air disinfection purposes – as mobile systems or installed in ventilation ducts of central ventilation systems.

We use low-pressure UVGI lamps as a source of UV radiation for multiple purposes, e.g. kitchen exhaust air treatment, or disinfection of air and surfaces. Particularly in the food industry, when it comes to producing, processing, packaging and storing fresh products such as meat and cold cuts, bread and bakery products, or dairy products, using UVGI helps keeping standards of hygiene high, extending the products’ expiration date, and avoiding both the use of chemical substances for such purposes and unnecessary food waste.

In the restaurant and catering industry, UV radiation plays an important role when it comes to eliminating grease and thus cleaning the kitchen exhaust air, which in turn helps to reduce odours and minimise the risk of fire.

We use about 5.000 low pressure UV lamps in different styles and wattages per year for our disinfection and purification systems.

For some applications such as kitchen exhaust air treatment, we do not see any alternative source at all in terms of energy efficiency, system effectiveness and maintenance-friendliness. For wavelengths in the range of 185nm, LEDs are not suited so far.

For air disinfection solutions in the range of 265 nm, LEDs are available, but the energy efficiency is still way below an adequate level to use them in air treatment systems. The energy consumption would be at least 10 times higher than in current systems. Therefore, a mercury ban wouldn't match the decarbonising strategy of the EU.

Today, there is no adequate alternative technology to low pressure UV lamps. In case these lamps were prohibited, we would no longer be able to provide viable solutions to our customers, and as a consequence, we would have to stop serving European markets and close our fab.

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).

We support the activity of VDMA and Lighting Europe including the wording and the extension at least until 2026, most likely beyond that date.

For UV discharge lamps, we do not see a proper substitution in terms of energy efficiency, reliability, safety, and lifetime.

UV radiation is accepted worldwide as a part of the multiple barrier approach against airborne pathogenic germs and viruses. Currently, low pressure UV discharge lamps are the most reliable and effective UV source in the market. A ban of UV discharge lamps is counterproductive in the fight against the current pandemic situation and will be a big disadvantage for European citizens in terms of health protection.

LED might be a solution for the future. But at the moment, we have

- Low efficiency
- Short life time
- High power-consumption manufacturing process
- Many various spectra of LEDs and no severe studies against pathogens referring the difference in spectral distribution for radiation
- No standards for exchange products.

There is no alternative effective UV source for 185 nm technology. This technology is used in food production and is important to prevent fire and rescue the live of humans. The only alternative would be a more intense use of noxious chemicals.

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

The point of missing standards and regulations for UV LEDs requires particular consideration. Single LED Chips do not have enough power, especially for air treatment applications, so there must be an arrangement of multiple chips as a UV source. There are no standards yet nor any activities to standardize geometrical, electrical, performance- and safety-related issues for this kind for LED sources today. This easily leads to many proprietary solutions. The life time of LEDs is currently much shorter than the whole air cleaner system. So what about exchange of LED UV radiation sources? Would we have to trash the complete mobile air cleaner? Mobile UV cleaning systems would increase the electronic scrap massively in the future.

The development for LEDs rapidly continues. But for sustainable use of UV LEDs, we need proper standards and regulations. That will take at least 5 years and more. Otherwise we will achieve the opposite of a well-intentioned environmental decision.

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.

The only alternative to UV radiation for disinfection of surfaces and air treatment in the food producing/processing industries to establish the required level of cleanliness and hygiene and for the benefit of a safe work environment and food safety, but also in order to extend the products' expiration date for the benefit of minimising food waste, is the use of chemical antidegradants. It appears to be widely undisputed that such solutions will be to the detriment of both the consumers and public health in Europe.

Vacuum UV radiation is used to extract grease from kitchen exhaust air in order to prevent fire in cooker hoods and chimneys. Alternative electro filter systems require high levels of maintenance and the use of chemicals, whilst consuming a lot of energy. Besides that, the use of electro filters requires higher air pressure, i.e. increased fan power, which means additional energy levels, which is not in line with the EU decarbonising strategy.

- a.

For UV radiation-based air disinfection applications, high UV irradiance levels are needed to guarantee pathogen-free breathing air. UVGI technology is the most power-saving technology with the lowest maintenance-induced waste, e.g. of filters loaded with viruses, bacteria and spurs. While filter technologies address aerosols, whether they contain pathogens or not, UVGI strikes effectively against airborne pathogens themselves. Especially for in-duct systems, the use of UV discharge lamps has substantial advantages over filter technologies due to low loss of pressure and thus lower power consumption by fan operation. UV radiation kills or inactivates harmful nuclei instead of collecting them and producing microbiological toxic filter waste. Furthermore, the application of filter-based solutions reaches its limits as soon as the humidity of the air to be treated exceeds relatively low levels.

For the same reasons stated earlier in detail, LEDs are not an alternative yet because of performance and cost-related aspects.

- 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. -C

BÄRO is doing research (partly government-funded) to develop environment-friendly and cost-saving technologies for air and surface cleaning. Our intense R&D covers research on filter, plasma and ionisation technology. As part of our core business, UV LEDs have been subject to our ongoing research activities.

Up to now, there is no alternative technology being capable of replacing low-pressure UV discharge lamps now and in the near future.

- 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.

BÄRO currently applies for a government-funded research project supporting the advantage of LEDs. We are optimistic that LEDs could replace UV discharge lamps within the next 10 years. For us, as a medium-sized enterprise, it is vital to be innovative and develop/use the most promising and capable technology in all aspects of sustainability and operational cost-saving. Up to now though, we do not see a short term alternative to UV discharge lamps.

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?

Clearly, we do not see a replacement technology for UV discharge lamps in the foreseeable future. Filter suppliers do not concentrate on germicidal air cleaning, but simply extract aerosols – which is by far not the same. Limitations for higher humidity environments, power consumption, and toxic waste are strong disadvantages. In many applications, the combination of filter and UV technology is beneficial, but it does not make UV technology and/or UV discharge lamps obsolete.

For air treatment, LEDs are still not efficient enough today and will not be so in the next 5 to 10 years. Missing standards and regulation, combined with limited life time of UV LEDs, will also lead to serious problems for the maintenance of existing systems (i.e. installed solutions), making health protection systems useless.

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?

UV-based air disinfection is an emerging industrial field way beyond traditional applications. Due to the pandemic situation of COVID-19, the awareness of clean breathing air has increased substantially. Europe-based development and manufacturing has the opportunity to exploit and export the long-standing experience of a well-researched and fully understood technology, its application and performance. Last year's experience with COVID-19 shows that buildings designed for, e.g., office, manufacturing, health treatment or care do require germicidal cleaning solutions in their air handling systems. According to this, demand for such solutions soared during the last year. For our Clean Air Technologies Division, the worldwide export of air cleaning devices and solutions has multiplied. The ban of UV discharge lamps will be an unfair industrial disadvantage in the global market for health-protecting air handling systems. And as a consequence, it will be a big disadvantage when it comes to health protection for the people in Europe, quite different from the way this topic is being handled in the Americas and in Asia.

- 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?

The waste of microbiological toxic filters will increase. Filters must be replaced much more frequent than UV discharge lamps. Handling that waste in an eco-friendly manner would be a serious challenge.

Additional waste will be caused by contaminated protective clothing and equipment, given that the replacement of filters has to be done under safe conditions for the people who perform the service.

- 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.

Because of inadequate alternative technology, the segment of air disinfection will be given up or will be transferred to our US facilities.

- 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).

The EU will miss the opportunity to support and advance the world health situation with the existing, well-established and performance-proven UV technology. It's quite impossible to determine the costs of such actions for the international health protection systems.

Compared to the loss of both public welfare and market opportunities for Europe-based companies, unemployment costs will be the minor part of economical effects.

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

We want to emphasize that a decision to ban low pressure UV discharge lamps will affect the health situation in Europe negatively. European citizens may no longer benefit from the same protection as the rest of the human population. Alternative technologies are still not available in terms of performance, reliability, and sustainability.

The ban of UV discharge lamps will lead to the opposite of a well-intentioned environmental protection idea. The alternative toxic waste will be more dangerous and is scientifically not as well understood as single chemical elements.

Independent of the serious economic consequences for the European industry, it cannot be in the EU's political interest to deteriorate the overall health condition and risk lives of European citizens.

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.