

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

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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)

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## 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 appointed<sup>1</sup> 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 requests<sup>2</sup> 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 consultation.<sup>3</sup>

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.<sup>4</sup>

To contribute to this stakeholder consultation, please answer the below questions until XYZ.

### 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),*

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

<sup>2</sup> Exemption request available at <http://rohs.biois.eu/requests.html>

<sup>3</sup> Clarification questionnaire available at

<sup>4</sup> 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”

## 2. QUESTIONS

1. VDMA and LightingEurope5 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-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 exemption should be prolonged to the maximum validity with the same scope and wording (at least until 2026).

Reasons for that are:

No alternative technology is mature enough to replace the medium pressure mercury lamps. LED technology is not yet advanced enough that it can replace the mercury lamps without having strong impact on curing properties, efficiency of production lines, technical properties of UV curable coatings (e.g. chemical and scratch resistances), availability of raw materials (e.g. photo initiators), eco friendly versions of coatings, labelling of coatings, cost in use of UV LED coatings.

A too early ban of the medium pressure mercury technology would cause supply shortfall in the value chain. This would mid-term result in an import of mercury lamp cured products from other non-EU regions to cover the European demand while significantly weakening the European manufacturing industry.

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

A reduction of the duration of the exemption agreement is not reasonable because the development in alternative curing technologies (e.g. LED/EB) is very slow and fast change is not expected because of physical hurdles in raw materials for LED production. Especially the development of efficient UV-C LEDs for surface curing and the use of standard photo initiators due to cost reasons but also availability is a long-term project without expected quantum jump in the cost/efficiency perspective. The UV-C light, emitted by medium pressure mercury lamps, offers new perspectives in eco/health friendly UV coating applications (e.g. curing without photo initiator, without negative impact of those chemicals and related cleavage products in the curing process on end user articles like packages). In addition, in the disinfection area and the current pandemic situation UV-C lamps can help to minimize the impact of new viruses and help to keep pandemics under control. The current wording of the exemption “Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex” should be kept, because it is most likely that not all applications of UV-C lamps are known and future positive effects are also not evaluated right now.

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 current mercury lamps are LED or EB curing processes. Both have advantages and disadvantages. Currently the disadvantages predominate.

A immediate switch from standard mercury lamps toward other curing technologies would not cover the future costs resulting from additional invests and running costs.

Health and safety aspects are a hurdle because LED coatings have negative impact on labelling due to the use of raw materials with negative impact on those aspects.

Coatings, formulated for LED lamps are higher in costs and lower in performance properties due to the raw material selection. High performance coatings for LED (without use of nitrogen as inert gas) are not possible to develop currently because of the relation of the emitted wave lengths and the corresponding photo initiators.

EB is only profitable for high productivity and flat (2D) substrates. For smaller lot sizes the invest is too high and cannot be afforded for many producers of UV coated goods. More complex substrates cannot be cured with this technique.

- 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.

Current alternatives (e.g. LED) are not efficient enough in the emitted UV spectra. Wavelengths above 350 nm lead to non-economic raw material costs. The shortage of long wavelength initiators limits the amount of producible coatings and has a negative impact on raw material costs. Compared to mercury lamps emitting lower wavelengths, matching with standard initiators with good availability in the market, such LED coatings are not economic and are therefore not gaining significant market importance.

Current LED lamp solutions, processed without nitrogen inertization in the production line, lead to insufficient coating properties of the cured film. The lack of chemical resistance as well as of scratch resistance is a hurdle for broader introduction of LED lamps.

Nitrogen inertization in a production line is an additional cost factor, technically not always possible (depending on the geometric structure of the coated substrate) and a safety issue at the line.

The same applies for the EB curing process. Here a high nitrogen consumption leads to higher production costs which is only economic at high throughput. Safety issues as well as a geometric structure of the cured part are critical for the inertization process.

- 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.

Coating raw materials producers are working on possible chemical solutions which are, however, hampered by the negative impacts mentioned above. A solution from a pure raw material point of view is most likely not possible. Only a concerted development process between device and raw material producer as well as line owners will help to drive the process.

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?

Most familiar alternatives are LED and EB technology provided by Phoseon, IST, Easytech, Electron Crosslinking AB, PCT. Alternative curing technologies, however, are not easy to adapt on existing lines and need to be evaluated in each case. This is leading to a high invest in coating development, higher raw material costs depending on application and high invest in the alternative curing technology. In any case it has to be checked if a switch in a existing line is useful and feasible at all.

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?

Exact statistical data is not available and can be only estimated. Due to large growing UV-coating market, boosted by the conversion from solvent-borne coatings to waterborne and UV, investments in production lines should increase in the next years.

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

An immediate ban of mercury lamps, part of this exemption, would lead to massive problems in highly efficient curing lines in printing and furniture production. Also some other industrial processes with high efficiency and environmentally friendly coating and curing process could not be used anymore. Alternatives in comparable cost in use and environmentally friendly technology are currently not available.

- 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-quested 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.

A ban of mercury lamps would most likely financially ruin a lot of line owners and coating/furniture manufacturers because of high costs and the missing technical feasibility of alternative curing technologies that are as eco-friendly as UV curable systems. The ban of such lamps would also have a big impact on the employment in the chemical industry. If an immediate ban of mercury lamps was realized, the producers of UV curable raw materials

would need to switch to other technologies which might not enough developed to secure current business and workplaces. Coating producers would be influenced in the same way.

- 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).

An immediate ban of mercury lamps will not only have a huge negative impact on the raw material suppliers but rather on the whole value chain.

There is a high risk is that the quality of alternatively produced printing goods and furniture cannot be maintained and a shortage in the availability of such goods for the consumer would be very likely.

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

As stated above, there is a conversion in the coating market from solvent-based coatings to more sustainable alternatives like water-based and UV technologies with UV being superior to water-based in terms of performance.

From a sustainability point of view a ban of mercury lamps is of course reasonable and the chemical industry is working on raw materials for alternative curing technologies (like LED and EB) in close cooperation with the curing device producers.

However, a too fast switch - like with an immediate ban of mercury lamps - to other technologies will cause more damage than benefit. This is due to the fact that other sustainability concerns, like regulatory compliance of the raw materials, curing efficiency and the potential migration of un-cured substances need to be considered as well.

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**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.**