

Consultation Questionnaire Exemption Annex III Ex. 4(a)-I

**Exemption for
“4(a)-I Mercury in low pressure non-phosphor coated discharge lamps,
where the application requires the main range of the lamp-spectral
output to be in the ultraviolet spectrum: up to 15 mg pure mercury may
be used per lamp”**

Abbreviations and Definitions

RoHS	Directive 2011/65/EU on the Restriction of Hazardous Substances in Electrical and Electronic Equipment
EEE	Electrical and Electronic Equipment
Hg	Mercury
LE	LightingEurope
LED	Light emitting diode
LP	Low pressure
LP-NPC-DL	low pressure non-phosphor coated discharge lamps
MP	Medium pressure
UV	Ultra-violet light emitted in the spectral bandwidth of NASA Science (2010): UV-C: 100-280 nm UV-B: 280-315 nm UV-A: 315-400 nm
TOC	Total Organic Carbon

Background

The Oeko-Institut and Fraunhofer IZM have been appointed by the European Commission, within a framework contract¹, for the evaluation of applications for exemption from Directive 2011/65/EU (RoHS), to be listed in Annexes III and IV of the Directive.

¹ The contract is implemented through Framework Contract No. ENV.B.3/FRA/2023/0012, led by Ramboll Deutschland GmbH.

Crystal IS Inc., and UV SAFE submitted requests for an amendment of the above-mentioned exemption, which has been subject to an initial evaluation. LightingEurope (LE) requested a renewal without changes. A summary of the main argumentation for justifying the requests are provided below. Additional information supporting this request can be found on the request webpage of the stakeholder consultation (<https://rohs.exemptions.oeko.info/exemption-consultations/2026-consultation-1>).

For further details, please check the exemption request and additional information submitted by the applicants on the exemption webpage of the stakeholder consultation.

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 (RoHS 2), which can be found under:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02011L0065-20250101>

If you would like to contribute to the stakeholder consultation, please review the summary of the argumentation provided and answer the questions that follow.

1 Summary of argumentation of applicant on the justification of the exemption

Suggested formulations for an amended/ renewed exemption 4(a)-I

Running No.	Exemption	Scope and dates of applicability
0 (original)	Mercury in low pressure non-phosphor coated discharge lamps, where the application requires the main range of the lamp-spectral output to be in the ultraviolet spectrum: up to 15 mg pure mercury may be used per lamp.	Expires on 24 February 2027
1	Mercury in low pressure non-phosphor coated discharge lamps, where the application requires the main range of the lamp-spectral output to be in the ultraviolet spectrum: up to 15 mg pure mercury may be used per lamp.	<i>Expires on dd mm ivy (5 years) for category 1-7, 10 and 11. Expires on dd mm yyyy (7 years) for categories 8,9.</i>
2	Mercury in low pressure non-phosphor coated discharge lamps, where the application requires the main range of the lamp-spectral output to be in the ultraviolet spectrum: up to 15 mg pure mercury may be used per lamp.	<i>Expires on 24 February 2027 for category 1 and 2: Large and small household appliances. Expires on dd mm yyyy for categories 3-11.</i>
3	Mercury in low pressure non-phosphor coated discharge lamps, where the application requires the main range of the lamp-spectral output to be in the ultraviolet spectrum <i>and with critical function imparted by emissions at 185 nm</i> : up to 15 mg mercury may be used per lamp	<i>Expires on dd mm yyyy (5 years)</i>
4	Mercury in low pressure non-phosphor coated discharge lamps, where the application requires the main range of the lamp-spectral output to be in the ultraviolet spectrum, <i>with critical function imparted by emissions at 185 nm, where:</i> <ul style="list-style-type: none"> - <i>the lamp envelope is manufactured from a material that transmits radiation at 185 nm, and no optical filter or envelope treatment is employed to suppress emission at that wavelength; and</i> - <i>the 185 nm emission serves a documented and specified functional requirement of the application; and</i> 	<i>Expires on dd mm yyyy (5 years)</i>

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| | - up to 15 mg mercury may be used per lamp. | |
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Scope

The applications that benefit from this exemption are limited to small scale applications due to the restriction of 15 mg Hg. Whereas larger use cases exist, these employ higher power low pressure (LP) and medium-pressure (MP) lamps which are covered by exemption 4(f)-IV.

Wavelength differentiation

Low-pressure mercury vapour lamps are generally used in residential, commercial, medical, and light industrial applications, and almost exclusively for disinfection. There, the wavelengths below 240nm are blocked and referred to as Ozone-free.

Considering lamps where emission at 185 nm is blocked and with low output power (resulting from the <15 mg Hg limit of 4(a)-I), UV-C LED systems currently exist as a viable replacement in all applications.

A single exception exists, since alternative technologies have not yet reached sufficient scale and performance to replace speciality applications of the mercury lamp with a 185 nm emission, and so this may be viewed separately to the emission above 240nm.

Applications where a spectral emission <240nm is required and usually the 185nm peak of LP-NPC-DL is existential for the application:

- Total organic carbon (TOC) reduction to produce ultra-pure water.
- Advanced oxidation processes (AOP) based on direct 185 nm water photolysis to generate hydroxyl radicals.
- Vacuum-UV surface activation in semiconductor and precision optics manufacturing.

UV Safe estimates that LEDs emitting <240nm will be market ready within 5-10 years.

Power differentiation

LEU states that there are no commercially viable and technically equivalent available LED-based alternatives for medium-to-high power applications in areas such as water, air, and surface disinfection, as well as their subcategories nor in curing, photo-oxidation, analytical applications, and organ replacement therapy.

According to UV Safe, these applications are covered by 4(f)-IV due to the limitation of 15mg Hg.

Efficiency and availability of LED

LE argues, that wall-plug efficiency of LP-NPC-DL is higher than for LEDs and that LEDs are an emerging technology with niche applications only.

UV Safe stresses that the mode of operation is very different between technologies as LEDs do not get damaged by switching on and off, therefore they run much less time. Despite lower wall-plug efficiency, LEDs save more than 100 € in energy costs per year. The germicidal efficiency is highest at 260 – 270 nm and therefore outclass 254 nm LP-NPC-DL in efficiency.

Furthermore, the lifetime of LEDs is manifolds higher than LP-NPC-DL. UV-Safe states that UV-C LED costs decrease exponentially, and mass production is already reached. Most application devices based on LED were in the same price category as their LP-NPC-DL equivalent. Capex are about the same but operational costs are significantly lower for LED as they consume less energy and do not need annual replacement lamps. The difference in opex sums up to capex required to transition to LED after a few years.

LE lists several applications where according to LE, substitution by LED-devices is not possible. They include curing, photo-oxidation of water and air and certain analytical applications. We understand that these applications all require light <240nm and are thus covered by wavelength differentiation above.

Product categories

Between the applicants, there is a different interpretation of product categories. While Crystal IS considers the application devices benefitting from the exemption, UV Safe states that the lamps benefitting from the current exemption are product category 5 – lighting equipment – only.

Crystal IS emphasises that category-based restrictions are managed in the scope column without modifying the lamp description. This mechanism is already used throughout Annex III, where different expiry dates and category exclusions apply to the same description across different EEE categories. This mechanism can be used in addition to spectral restriction.

Legal and Standard obstacles

UV-Safe states that DIN 19294-5/6 development and adoption is expected to be finalized in 2027/28. There are no other regulatory hurdles to the adoption of LED-based alternatives.

Spare LP-NPC-DL for legacy devices

Crystal IS estimates that each year more than 1M UV Lamps falling under 4(a)-I are placed on the EU market. LP-NPC-DL are replaced more or less annually.

UV Safe states that direct replacement by retrofit LED is possible without efficiency losses, though the majority of the progress will be made using new equipment.

On the contrary, LEU claims for one-to-one replacement of UV-C lamps in existing equipment, that no UV-C LED alternatives exist in the UVC lamp form factor, allowing retrofit replacement.

Regulating spare LP-NPC-DL where LED-alternatives exist, concerns the following aspects: stockpiling, investment costs in and availability of LED-based devices at scale, premature waste generation.

According to UV Safe, Article 4,4(f) of the RoHS directive allows for putting spare LP-NPC-DL on the market. This is only true if they are interpreted as spare parts of the EEE that benefitted from the exemption. Not if the lamp itself benefitted from that exemption.

Total negative environmental, health and consumer safety impacts

LEU states that current UVC LED-based solutions contain PFAS, which come into contact with the drinking water.

2 Questions to stakeholders

Before you start, please fill in your contact details:

Name:

Company:

E-Mail and phone number:

1. Do you agree with the arguments put forward by the applicants? Where they are contradictory (efficiency and product categories), what is your perspective?
2. Which approach do you perceive as beneficial for regulating replacement LP-NPC-DL for legacy devices? What are the pro's and con's of each approach? Which concerns should be addressed?
3. Which is your preferred exemption formulation? Why?
4. Do you propose any other amendment? Why?
5. When do you think that <240nm LED-based solutions will be market-ready? What are the various stages that need to take place and the estimated time needed for completion of each stage?
6. Are there any other aspects that you believe should be taken into account when assessing this application? Please provide relevant documents and evidence.

Please send your answers to the project email: rohs.exemptions@oeko.de at the latest by 24 July 2026.

Responses submitted electronically will be posted on the RoHS Exemption Website site as they are received unless respondents specifically request that their contribution should not be published. In the latter case, responses should be clearly and visibly marked with the words "Not for publication" and a version for publication should be provided alongside the confidential one.