Consultation Questionnaire
Exemptions Annex III for

"Mercury in High Pressure Sodium lamps (vapour) lamps for general lighting purposes not exceeding (per burner):

4(c)-I P≤ 155W: 20 mg per burner
4(c)-II 155W < P< 405W: 25 mg per burner
4(c)-III P> 405W: 25 mg per burner"

Abbreviations and Definitions

RoHS	Directive 2011/65/EU on the Restriction of Hazardous Substances in Electrical and Electronic Equipment
EEE	Electrical and Electronic Equipment
LED	Light-Emitting Diode
HPS	High Pressure Sodium lamps

Background

The Oeko-Institut and Fraunhofer IZM have been appointed by the European Commission, within a framework contract[1], for the evaluation of applications for exemption from Directive 2011/65/EU (RoHS), to be listed in Annexes III and IV of the Directive.

LightingEurope with the support of Japan Lighting Manufacturers Association (JLMA) submitted a request for the renewal of the above-mentioned exemptions, which has been subject to an initial evaluation. A summary of the main argumentation for justifying the request is 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 applicant on the request 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] The contract is implemented through Framework Contract No. ENV.B.3/FRA/2023/0012, led by Ramboll Deutschland GmbH.

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

1.1 Background

The request for the renewal of three existing exemptions under Annex III of the RoHS Directive 2011/65/EU concerns the use of mercury in High Pressure Sodium (HPS) lamps for general lighting purposes. The three sub-exemptions set maximum mercury content thresholds per burner according to wattage: 20 mg for lamps up to 155W (4(c)-I), 25 mg for lamps between 155W and 405W (4(c)-II), and 25 mg for lamps exceeding 405W (4(c)-III).

The lamps covered by this request are High Intensity Discharge lamps designed primarily for professional outdoor lighting applications, most notably street lighting, parking lots, city squares, and building floodlighting. The wattage range spans from 35W to 1000W, with the highest sales volumes concentrated in the 70W and 150W categories. These lamps are characterised by long lifespans of 30,000 to 50,000 hours, high luminous efficacy of 80 to 150 lm/W, and a lumen maintenance exceeding 80% at end of life. They are usually sold through specialised distribution channels, with typical customers being governments and municipalities.

The applicant proposes a renewal period of three years for all three exemptions. The applicant frames the requested three-year renewal as a balanced approach that recognises both the inevitability of the LED transition and the practical constraints preventing immediate phase-out

History of the exemption

When Directive 2011/65/EU was published, an exemption for mercury in High Pressure Sodium (HPS) lamps was specified in Annex III Ex. as follows:

“4(c)-Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):

4(c)-I	P ≤ 155 W	No limitation of use until 31 December 2011; 25 mg may be used per burner after 31 December 2011
4(c)-II	155 W< P ≤ 405 W	No limitation of use until 31 December 2011; 30 mg may be used per burner after 31 December 2011
4(c)-III	P > 405 W	No limitation of use until 31 December 2011; 40 mg may be used per burner after 31 December 2011”

The exemption was last reviewed in 2015-16. Following the evaluation in 2016, the amount of mercury in the 4(c) sub-categories was reduced as follows:

“4(c)-I	P≤ 155W:	20 mg per burner
4(c)-II	155W < P< 405W:	25 mg per burner
4(c)-III	P> 405W:	25 mg per burner”

Volume of Mercury to be placed on the EU market through the exemption

According to the applicant's estimates, the total amount of mercury placed on the European market through HPS lamps covered by exemption 4(c) was approximately 105 kg in 2024, encompassing both already installed lamps requiring replacement and newly sold units. This figure follows a continuously declining trend in line with the shrinking installed base. The EPPA socio-economic study[2] provides a cumulative estimate of 584 kg of mercury anticipated to be placed on the EEA market over the five-year period from 2021 to 2025, also with a negative trend over time. The applicant argues that the net environmental impact of this mercury is limited, given that the professional collection and recycling rate for HPS lamps is estimated above 80%, meaning that approximately 64 kg of the annual 105 kg is recovered through recycling. Individual mercury doses per lamp range from 1 to 25 mg depending on lamp power, with the maximum amounts defined by the exemption thresholds of 20 mg (≤155W) and 25 mg (>155W).

1.2 Technical description

HPS lamps are gas discharge lamps used predominantly in professional outdoor lighting (street lighting, parking lots, flood lighting). They consist of a polycrystalline alumina discharge tube, referred to as “burner”, containing xenon fill gas and a sodium–mercury amalgam pill, housed in a vacuum glass outer bulb. HPS lamps offer high luminous efficacy (80–150 lm/W), long lifespans (30,000–50,000 hours), and operate across a 35–1,000 W power range. They require dedicated driver systems (electromagnetic ballast with ignitor or electronic driver) for starting and operation.

Mercury serves four essential functions in the lamp: (1) it tunes the plasma's electrical resistance to optimise lamp-driver efficiency; (2) it broadens the sodium emission spectrum, improving light output and colour quality; (3) it reduces thermal conduction losses in the plasma, significantly boosting efficacy; and (4) it limits tungsten electrode evaporation, preserving lumen maintenance over the lamp's lifetime. Mercury is dosed as amalgam (Hg/Na fraction 75–97%) in amounts of 1–25 mg per burner, depending on the lamp power. Removing or reducing mercury leads to approximately 5% lower luminous efficacy, 5% reduced lumen maintenance, and shorter lifetime (4 vs. 6 years). The applicant states, that mercury-free and mercury-poor HPS variants do not comply with the ErP Regulation 245/2009 efficiency requirements and are no longer placed on the EU market.

1.3 Applicant’s justification for the requested exemption

1.3.1 Availability of alternatives

The applicant's central technical argument for the continued necessity of mercury rests on its irreplaceable function within the discharge technology. Mercury serves as the primary means of tuning the electrical resistance of the plasma to ensure that the lamp and driver combination operates at optimal efficiency. Beyond this principal role, mercury fulfils several additional essential functions: it broadens the sodium resonance line through atomic interactions, enabling the lamp's colour point to be aligned with the black-body curve; it significantly reduces thermal conduction losses from the plasma to the discharge tube wall, thereby improving overall lamp efficiency; and its high vapour pressure limits the evaporation of the tungsten electrodes, which preserves lumen maintenance over the lamp's lifetime by preventing arc tube blackening. The applicant emphasises that mercury is not consumed during operation but rather forms part of a sodium-mercury amalgam system whose

[2] EPPA (2020) Socio-economic study, found in document: SEA Ex 4 working copy 16JAN2020

composition determines lamp voltage behaviour over time and thus controls lamp lifetime. Any reduction in mercury content would alter this equilibrium, leading to premature lamp failure or reduced efficiency.

While the applicant acknowledges that full LED luminaire replacement is technically feasible and already widely implemented for new road lighting projects, it is argued that direct substitution of HPS lamps with LED retrofit lamps in the large existing installed base faces fundamental barriers. The thermal architecture of HPS luminaires presents the most significant challenge: HPS lamps dissipate waste energy primarily as radiation through the enclosure, whereas LEDs generate waste heat conductively at the chip and require junction temperatures below 100°C — far below the 160°C to 400°C envelope temperatures measured in HPS luminaires. This makes it physically impossible to achieve equivalent lumen output and lifetime with an LED retrofit lamp of the same compact dimensions.

Additional retrofit barriers include dimensional incompatibility, with LED retrofits up to 36% longer and significantly heavier than HPS equivalents; 10%–40% lower lumen output; different beam patterns creating glare and uniformity problems that may compromise road safety; and incompatibility with existing electromagnetic ballasts and high-voltage ignitors (1800–3300V), which necessitates rewiring and raises CE marking compliance concerns. Most LED retrofits also lack dimming capability, which is mandatory in some markets such as Spain. For higher wattage categories (150W, 250W, 400W, 1000W), LED retrofit products remain essentially unavailable or unproven

1.3.2 Environmental and health arguments (also LCA aspects)

The applicant argues that the dominant environmental impact of HPS lamps occurs during the use phase, driven by electricity consumption. Any attempt to eliminate or reduce mercury in HPS discharge technology would lower luminous efficacy, meaning more electricity is needed to deliver the same light output. This increased energy consumption would, in turn, raise greenhouse gas emissions and overall environmental burden, thus violating the RoHS principle that substitution or elimination must not cause greater negative environmental impacts than the presence of the restricted substance itself.

Regarding the mercury release risk, the applicants contend that HPS lamps are predominantly used in professional applications (street and industrial lighting) served by organised take-back and recycling schemes. They cite high collection rates (above 80%) and mercury recovery through compliant recycling processes such as distillation and capture as mercury sulphide. Because of these professional handling chains, only a limited net quantity of mercury escapes recovery, and the actual environmental risk from mercury dispersal is therefore characterised as low.

The applicant addresses human health impacts using an ECHA-referenced monetisation framework. They acknowledge that mercury exposure can cause adverse health effects — notably cognitive impairment and cardiovascular outcomes — and they assign a monetary value per kilogram of mercury placed on the market, drawing on scientific literature.

However, the applicants conclude that the health benefits of non-renewal (i.e., reduced mercury on the market) are outweighed by the broader costs that non-renewal would trigger. These costs include expenses for premature lamp replacement, additional waste generation, and disruption to existing lighting infrastructure. On balance, the applicants argue that the cost-effectiveness ratio is unfavourable for non-renewal: the monetised health gains from avoiding a relatively small quantity

of professionally managed mercury do not justify the substantial economic and environmental burdens that would result from denying the exemption.

1.3.3 Socioeconomic impacts

The applicant also provides socio-economic arguments and suggests that the phasing out of existing installations using HPS lamps would impose significant additional costs on municipalities. It is estimated that approximately 19 million installed HPS luminaires needed replacing, which would cost approximately € 496 million in luminaire and labour costs. It is argued that municipalities require adequate time to develop financial and technical roadmaps, that an additional budget exceeding € 5 billion would need to be allocated across the EU, and that the continued availability of HPS lamps as spare parts is essential to prevent unnecessary disposal of functional luminaires and maintain public lighting safety during the transition period.

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? Are there any additional reasons that support the requested extension of the exemption? Please detail in your answer if you agree with the exemption wording proposed by LEU and to the duration for which the exemption has been applied for. In each case, please explain your views.

2. In your opinion, what reasons oppose the requested extension of the exemption?

3. The applicant states that 'LED replacement lamps of the same size as current HPS lamps will not be available in the coming decades'. In light of the wide range of LED lamps that have become available since the last exemption review in 2025, is this argument still valid? Please provide details of possible LED lamp and/or LED-based equipment substitutes if available on the market.

4. The applicant claims that LED retrofits with active cooling are "not widely accepted due to reliability concerns in professional applications." Are you aware of specific reliability concerns in support of this assertion?

5. The applicant claims that LED retrofits cannot be dimmed, which is a required feature in some regions. Is dimmability a mandatory feature for HPS lamps in their intended application areas? Are there any LED retrofit lamps available that can be dimmed? Or does operating them on legacy HPS ballasts cause problems?

6. How do you assess the overall benefits of substitutes for the environment, health and consumer safety?

7. 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.