

Additional feedback to the RoHS Cadmium exemption requests

Question 1: If the Commission would follow the consultant's recommendation/formulation of the exemption, how much cadmium would be placed on the market?

Our estimation for lighting is that CRI 90 is only a small portion of the LED market. Due to higher costs, CRI 90 is only used in high quality lamps and luminaires where the improved Colour Rendering Index is desired and required. The main market for LED lighting is in the CRI 80 range.

According to our calculations and forecasts, as worst-case scenario, the result would be 1,65 kg cadmium in 840 Mio pieces of packaged QD LEDs put on the EU market. Below is an overview of the calculation and forecast we applied to arrive to this conclusion. We ask the European Commission to not make publicly available the tables below due to protected copyright.

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The total financial market of CRI90+ LED is estimated to be in the range 13-16,5% (2021-2025) of the total amount of packaged LED. 600 million \$ correspond to 24.000 Mio packaged CRI90+ LED. About 10% of the total market will be in EMEA (Europe and Middle/ East Africa) → 2.400 Mio pcs packaged CRI 90 LED, see table below.

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The cadmium content is:

- 2.3 micrograms cadmium per LED (1 Watt) used in residential applications (e.g. LED retrofit bulb, 800 lumen, 12 LED = 27,7 micrograms cadmium)
- 1,3 microgram cadmium per LED (0,5 Watt) used in professional market (troffer luminaire for office lighting, 2000 lumen, 64 LED = 84,5 microgram cadmium)
- Average cadmium amount of above values per 1 Mio pieces: 1,97 grams

About 67% of the LED are of type 1 Watt, 33% of the LED are of type 0,5 Watt. 65% of all CRI90+ solutions are COB (Chip-on-Board), technically they are not relevant/suitable for Quantum Dot (e.g. temperature too high).

Therefore, as a worst-case scenario, this results in 1,65 kg cadmium in 840 Mio pieces packaged QD LEDs put on the EU market according to current forecasts. This corresponds to the amount given earlier, see Oeko report, p21.

Please note that currently no such products are put on the market, as the exemption is still under evaluation. Products are ready for the market for more than 2 years.

Question 2: what is the waste management/end of life collection and treatment?

Only a very small portion of LEDs would contain cadmium, see numbers above in response to question 1. Most LEDs would not contain cadmium.

The concentration of cadmium in the waste would be very low. An 800-lumen lightbulb would have a cadmium content of < 30 microgram. Assuming a weight of 60 grams per lamp the concentration of cadmium would be below 0,3 parts per million (ppm) and therefore far below any critical concentrations in waste management. To put this number into context: this is equivalent to cadmium limits for chocolate.

To give another example, the cadmium content coming from LEDs in a 55-inch TV screen is calculated to be < 1 mg. Assuming a weight of 20 kg per TV set a concentration of clearly below 0,05 ppm cadmium in the waste stream. This amount is not considered as critical.

LED lamps are collected together with all other lamps (including mercury-containing lamps), because consumers cannot distinguish between the various technologies. Mercury lamps are treated as hazardous waste. Because LED retrofit lamps are mixed with mercury lamps, the entire batch is treated as hazardous waste.

Today, for technological and economic reasons, LEDs cannot be recycled separately. This has also been shown earlier in studies about the recycling of LED phosphors, [see study here](#). LED technology represents approximately 10% of today's lamp waste stream at EU level, primarily because of the long technical life of this technology.

Lighting manufacturers continue to work with the producer responsibility organisations that are tasked with managing the collection and recycling of lighting products to identify viable technologies for addressing the particularities of LED lamps, also in preparation for when LED lamps will be the bulk of the technology in the waste stream.

Additional remarks:

Due to the high efficiency increase and the increase in light quality, cadmium Quantum Dot LED based lamps and luminaires can substantially contribute to the transition of lighting from mercury-containing lamps to mercury-free solutions:

- Shorter return of investment costs, especially in the professional area where high quality sensor-based luminaires have to be replaced due to the lack of retrofit solutions
- Lower total costs for EU member states (schools, hospitals, public and private non-residential buildings)
- Better and desired light quality (high CRI).

Granting this exemption would have an overall net positive impact for the EU - more energy efficient products on the EU that would deliver energy savings and therefore reduce the total amount of cadmium emitted by power plants in the EU energy mix (see our renewal application and LCA for details)

Contact

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LightingEurope is the voice of the lighting industry, based in Brussels and representing 30 companies and national associations. Together these members account for over 1,000 European companies, a majority of which are small or medium-sized. They represent a total European workforce of over 100,000 people and an annual turnover exceeding 20 billion euro. LightingEurope is committed to promoting efficient lighting that benefits human comfort, safety and wellbeing, and the environment. LightingEurope advocates a positive business and regulatory environment to foster fair competition and growth for the European lighting industry. More information is available at www.lightingeurope.org.