

Light Sources, Inc.
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November 17, 2011

US Nuclear Regulatory Commission
Att: Mr. Lawyer
Control Number 575971
King of Prussia, PA
610 337-5269 [fax]

03038456

Subject: Light Sources Inc., License 06-31445-01, Additional information concerning application for special exemption

Dear Mr. Lawyer:

In our letters dated August 18 and September 9 to NRC King of Prussia, and a letter dated August 30th to NRC Headquarters, we have requested clarification and authorization regarding management of limited numbers of certain intact, but not sellable Kr-85 lamps. Light Sources Inc. appreciates your time for continuing phone discussions, including the most recent discussion on 11/10/2011 with our consultant health physicist.

In reference to your letter dated Sept. 26, 2011 and based on our subsequent phone conversations, we wish to continue to provide additional information in support of an exemption to 10 CFR 20.2001 regulations:

Several companies currently have NRC distribution licenses for Kr-85 lamps. Their customers are allowed to manage lamps without regard to their radioactive content. This allows them to dispose of the lamps, and to recycle the lamps. Under an NRC exemption distribution license, Light Sources Inc.'s Kr-85 lamp customers would also be able to manage lamps without regard to their trace radioactive content. Businesses are required to have Universal Waste management programs, which often mandates lamp recycling. Light Source Inc. has long supported recycling, and will continue to strongly encourage those who purchase our lamps, including Kr-85 lamps, to do so. Light Sources Inc. also wishes to be able to comply fully with those Universal Waste regulations. For Light Sources to be able to recycle limited numbers of unusable Kr-85 lamps, we need to have the option [as do our customers] for limited numbers of our intact Kr-85 lamps to be transferred to a lamp recycler. As an upper estimate, Light Sources anticipates less than 200 lamps annually would need to be sent from our facility to a recycler.

Light Sources Inc. has looked into reasonable alternatives for disposal of the small numbers of intact unusable lamps we might have each year –

1) Decay in storage is not an option for managing even small numbers of intact lamps with trace amounts of Kr-85 as the half life of Kr-85 is 10.7 years.

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2) We are not able to take advantage of effluent limits under 10 CFR 20.1301 as Universal Waste regulations at this time do not permit Light Sources to intentionally break mercury containing lamps as a method of disposal.

3) Kr-85 is a gas and therefore 10 CFR 20.2003 release to sanitary sewer is not possible.

4) We have looked into disposal of intact lamps as radioactive waste. On 9/9/2011, a licensed radioactive waste broker was able to obtain a disposal quote for us. It stated "\$36.50/lamp with a \$3,500 minimum shipment charge based on K-85 at $\leq 0.1\mu\text{Ci/lamp}$." Under Universal Waste regulations, we could hold returned/unsellable intact lamps for limited periods of time [often only up to one year.] At that time, if we had 1 lamp or 100 lamps, we would have to pay \$3,500 to dispose of them by this option. We do not consider this reasonable knowing that we anticipate small numbers of intact unsellable lamps to be returned to us by our customers, etc.

Further, and very importantly, Light Sources wants to ensure there is recycling of the mercury and other components from the unsellable lamps. We consider recycling an environmentally conscientious alternative. We feel that recycling is in the public interest when compared to possible lamp burial at a radioactive waste site, etc.

As the NRC requested, we got more information about two different lamp recycler that Light Sources could use. The first is located in CT and has a CT Dept of Energy and Environmental Protection "permit to operate a solid waste volume reduction plant". The lamps are processed with special mechanized equipment. ¹ The equipment in effect disposes of the lamps, but allows for the recycling of the glass, phosphor, metal caps and the mercury from lamps. The recycler routinely accepts distributed Kr-85 lamps from customers for recycling. The facility has a state-of-the-art air filtration system. They have 15 years experience handling lamps and other universal waste for recycling. They, and other lamp recyclers, must comply with local regulations regarding safety and the environment. In effect, a recycler would [on behalf of Light Sources Inc.] be disposing of the lamps during recycling, while releasing the Kr85 gas as an effluent.

If Light Sources were to send 100 Kr-85 lamps to this one recycler annually, that would total < 12 microcuries of Kr-85. To be below 10 CFR 20 Appendix B air effluent concentration limits of 7 E-7 $\mu\text{Ci/ml}$, the recycler's air exhaust system would only have to discharge 17 cubic meters of air per year, or less than 0.07 cubic meters of air each day of operation [assuming 5 days per week and 50 weeks per year.] This is a huge system, moving many orders of magnitude more air per year than this.

A detailed written description from a second lamp recycler is attached. We trust that the NRC will find these details contain the information about lamp recycling that you wanted.

As discussed in Light Source's prior letters to both NRC Headquarters and NRC King of Prussia, a complete evaluation of worker, environmental and public safety has been conducted by KA Jones et al. Copies of this study have been previously provided and are available via the Internet. "*Assessment of the Radiological Impact of the Recycling and Disposal of Light Bulbs Containing Tritium, Krypton-85 and Radioisotopes of Thorium*" provides significant information regarding their thorough evaluation of the potential risks to recyclers, waste handlers and others from lamps including Kr-85 lamps.

Air effluent has not been noted to be of concern with these facilities. In this report, highly conservative assumptions were used, assumptions which they acknowledge overestimate doses to recycling and disposal workers, and members of the public by at least an order of magnitude. [They wished to consider exposure to more than one exempted practice per year.] The study included visits to large recycling plants including one in Germany [Germany - where the bulbs Light Sources will distribute are manufactured.] The study considered transport, sorting and other direct handling, and breakage of lamps. KA Jones et al further assumed long Kr-85 immersion times, and included equipment failure, fires, accidents and misuse. They assumed 5 million Kr-85 lamps to landfill each year, 1 million glow starters and 1.5 million metal halide bulbs for recycling, i.e. numbers that far exceed what Light Sources Inc. plans. In the US, these specialty lamps which Light Sources Inc. will distribute, account for well less than 80,000 annually.

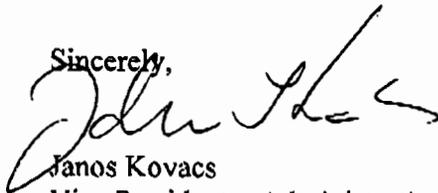
The KA Jones study concluded that "radiological consequences from the transport of lamps to the end-user and transport in bulk of disused lamps to landfill are not significant." [Over] estimated doses to members of public living near a recycling plant were given as $4 \text{ E-}6 \text{ uSv/yr}$, and 1.024 uSv/yr to a worker at a large recycling plant. Incineration activities were [over] estimated at $9 \text{ E-}3 \text{ uSv/yr}$ to workers sorting bulbs, and $1 \text{ E-}7 \text{ uSv/yr}$ to a member of the public living nearby. Other [over] dose estimates included $4 \text{ E-}2 \text{ uSv/yr}$ to a landfill worker; a fire resulting in $9 \text{ E-}4 \text{ uSv}$ to a member of the public and $4 \text{ E-}3 \text{ uSv}$ to a landfill worker from a fire.

Despite the cautious assumptions, all doses were found by KA Jones et al to be below the radiological dose criteria for exemption. These estimates are below 10 CFR 32.24 Table of Organ Doses.

As stated in the KA Jones Kr-85 assessment, the risk from recycling of these levels of radioactive material is sufficiently low that full regulation is not warranted. We are respectfully requesting authorization for an exemption to 20.2001 that will allow Light Sources to transfer limited numbers of intact but unusable Kr-85 lamps to recyclers which have appropriate State or local permits but which do not possess [nor require] NRC or Agreement State radioactive material licenses. Light Source Inc.'s handling would be consistent with any applicable shipping regulations, local solid waste regulations, and other relevant, non radiation regulations.

Please let us know if you require any additional information.

Sincerely,



Janos Kovacs
Vice President – Administration
and Manufacturing Operations
Light Sources Inc.

1. <http://www.nlr-green.com/lampmachine.html>
Accessed via the Internet on Nov. 11, 2011