

Light Sources, Inc.  
37 Robinson Boulevard, Orange, CT 06477  
FAX (203) 795-LAMP    PHONE (203) 799-7877

August 30, 2011

US Nuclear Regulatory Commission  
Att: Bruce Carrico  
Washington DC 20555-001

Mail control No. 575400  
Subject: Light Sources Inc., Additional information concerning application for new  
exempt distribution license

Dear Mr. Carrico:

In reference to our application dated June 7, 2011 in which we applied for an exempt  
distribution license, we wish to provide additional information:

Light Sources Inc. does not wish to have Krypton-85 [Kr-85] lamps returned to us if  
consumers or others find them to be defective, no longer need them, etc. We are  
requesting permission for the lamps to be exempt from all radiation waste regulations  
based on the very small quantities of radioactive gas that they contain and the very low  
level risk associated with them. Light Source Inc. supports recycling, will follow all  
solid waste regulations regarding bulb recycling, and will strongly encourage those who  
purchase these Kr-85 bulbs to do the same. We wish to have the option for our Kr-85  
lamps disposal by various methods without regard to their radioactive content.

Based on the small activities per lamp, Light Sources Inc. feels that these items should be  
approved to be handled without regard to their radioactive content. The lamps contain no  
more than 0.12 uCi Kr-85 each. The lamp glass/quartz attenuates some of the beta  
radiation emitted from Kr-85. In addition to the very low activity, the Kr-85 is a gas.  
Were the lamp to be broken, the gas will disperse. The NRC has no intake limit for  
Kr-85 gas; it is not considered an inhalation hazard. Kr-85 is inert, and does not react  
with biological systems, i.e. is not taken up by the body when inhaled and does not enter  
the food chain.

Further, when reviewing 10 CFR 30, numerous similar consumer items are exempt.  
Under 10 CFR 30.15, electron tubes are one of the already exempt items. Light bulbs  
and lamps are not specifically mentioned in this section. However, lamps are an  
invention derived from Thomas Edison's electron tube. As such, does the NRC consider  
a lamp to also be an electron tube?

Under 10 CFR 30.19 many self luminescent devices containing Kr-85 are exempt. Kr-85  
lamps provide illumination, but require an electric source to provide light. Could this  
regulation be applied to all devices designed to provide illumination?

*“Assessment of the Radiological Impact of the Recycling and Disposal of Light Bulbs Containing Tritium, Krypton-85 and Radioisotopes of Thorium”* by KA Jones et al, provides significant information regarding their thorough evaluation of the potential risks to recyclers, waste handlers and others from lamps including Kr-85 lamps. The IAEA considers the dose from any product that is  $< 10$  uSv/yr not to be significant. 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 we will distribute are manufactured.] The study considered transport, landfill disposal, incineration, 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  $4 \text{ E-}6$  uSv/yr, and  $1.024$  uSv/yr to a worker at a large recycling plant. Incineration activities were [over] estimated at  $9 \text{ E-}3$  uSv/yr to workers sorting bulbs, and  $1 \text{ E-}7$  uSv/yr to a member of the public living nearby. Other [over] dose estimates included  $4 \text{ E-}2$  uSv/yr to a landfill worker; a fire resulting in  $9 \text{ E-}4$  uSv to a member of the public and  $4 \text{ E-}3$  uSv to a landfill worker from a fire.

If based on the average bulb activity rather than their assumed activity, doses would be an order of magnitude less than those listed above. Despite the cautious assumptions, all doses were found by KA Jones et al to be below the radiological dose criteria for exemption.

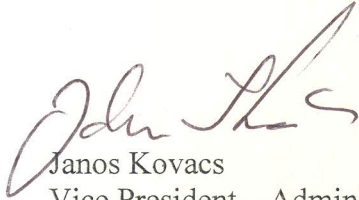
We note that in 10 CFR 20.2005, liquid scintillation counting fluid and animal carcasses containing  $\leq 0.005$  uCi/gram tritium or C-14 can be disposed without regard to their radioactive content. As stated in the KA Jones Kr-85 assessment, the risk from these levels of radioactive material is sufficiently low that full regulation is not warranted. We are respectfully requesting authorization for exempt distribution of intact lamps, and to allow us and our customers to manage intact and/or broken lamps without regard to their radioactive content – i.e., as solid waste, generally sent for recycling. Light Source Inc.’s handling would be consistent with all applicable shipping regulations, local solid waste regulations, and other relevant non radiation regulations.

Further, the lamps are small in size, under 6 inches. They are glass/quartz, with very small connections on the end. Labeling the lamps themselves would be very difficult. Putting a paper label on the lamp glass would be of limited value as the lamps get quite hot and the paper would immediately burn off once the lamp was in use. This would pose an unnecessary fire hazard. If we were able to find a label that could withstand the 1500 degrees, it could block the light being emitted from the lamp, and render it less useful. Printing directly on the glass is also problematic. The non glass ends of the lamp

are too small to allow labeling. Light Sources feels that to ensure that users have safety information, the labeling should be provided on the lamp packaging and as a package insert.

Please let us know if you require any additional information.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Janos Kovacs', written in a cursive style.

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

Attachment - *“Assessment of the Radiological Impact of the Recycling and Disposal of Light Bulbs Containing Tritium, Krypton-85 and Radioisotopes of Thorium”* by KA Jones et al



Rad code	Description
32316426	EVOLUTION LIGHT 400-241 FDA II RS-9
32314551	EVOLUTION LIGHT 650-241K14S II RS-16
32314069	SUPER LIGHT 620-241 230V FDA II RS-16
32314331	EVOLUTION LIGHT 620-241 K14S II RS-16
32317493	Ergoline Ultra 250W-241 GY 9,5 JK
32316423	ERGOLINE 400-241 R7s JK RA-9
32313558	ERGOLINE 400-241 R7S IVP JK RA-9
32316546	BP 400W-241 R7S L NO-16 LL
32313378	630-241 MEST NT RA-16
32312688	610-241 MESO NT RA-16
32316541	HTC 600W-241 ungesockelt NT
32314248	HTC 610-241 MeSo RP RA-16
32313965	HTC 630-241 MEST RP RA-16
32314304	ULTRASOL 600-700-241 GYH9,5 SC NO-16
32317467	Supra 250W-241 GY 9,5 TC
32314446	RADIANCE 400-241 R7s TC RA-9
32314412	SUPRA 400-241 R7S TC RA-9
32314435	SUPRA 400-241 GY9,5 TC RA-9
32314543	RADIANCE 400-241 GY9,5 TC RA-9
32316534	AUVL 400-241 R7S RA-9 TC
32314414	SUPRA 400-241 LI TC RA-9
32317434	Supra-400-240 GY9,5 RA-9 TC
32317439	AUVL 400W-241 GY9,5 TC RA-9
32316533	AUVL 400W-241 LI RA-9 TC
32317433	Radiance 400-240 GY9,5 RA-9 TC
32314447	RADIANCE 400-241 LI TC RA-9
32314437	SUPRA 500-241 GYH9,5 TC RA-16
32314440	SUPRA 500-241 GY9,5 TC RA-16
32317437	AUVL 500W-241 GYH9,5 TC RA-16
32314425	SUPRA 600-241 MeSt TC RA-16
32314434	SUPRA 600-241 K10S T C RA-16
32317425	SunItalia 650-241 GYX 9,5 TC
32314449	RADIANCE 600-241 MeSt TC RA-16
32316531	AUVL 600W-241 MeSt RA-16 TC
32316530	AUVL 600W-241 K10S RA-16 TC
32316532	AUVL 600W-241 MeSo RA-16 TC

32314448	RADIANCE 600-241 MeSo TC RA-16
32314423	SUPRA 600-241 KU10S TC RA-16
32314424	SUPRA 600-241 MeSo TC RA-16
32316588	Supra 600W-241 Fa6,5 GL Ra-16
32317465	Independence 250W-241 UP
32316428	SOLAR ELEMENTS 400-500W-241 R7S UP RA-9
32317572	Independence 400-500W-241 UP R7s
32317281	Solar Elements 300-520W-241 GY9,5 UP
32316427	SOLAR ELEMENTS 400-500W-241 LI UP RA-9
32313384	NEW TECH 400-500-241 LI UP RA-9
32313390	NEW TECH 400-500-241 R7S UP RA-9
32313397	NEW TECH 410-241 MESO UP RA-9
32313391	NEWTECH 300-500-241 GY9,5 UP RA-9
32316434	SOLAR ELEMENTS 630W-241 MEST UP RA-16
32317280	Solar Elements 650W-241-GYH 9,5 UP
32316503	SOLAR ELEMENTS 600W 241 K10SF RA-16 GL
32313398	NEW TECH 610-241 MESO UP RA-16
32316459	SOLAR ELEMENTS 650W-241 KY10s UP RA-16
32316433	SOLAR ELEMENTS 610W-241 MESO UP RA-16
32316432	SOLAR ELEMENTS 600W-241 KU10S UP RA-16
32313399	NEWTECH 600-241 KU10S UP RA-16
32316548	SOLAR ELEMENTS 620W-241 R7S NO-16 UP
32316431	SOLAR ELEMENTS 620W-241 K10S UP RA-16
32317497	HTC 580-700W-241 KY10S GL RA-16
32314552	EVOLUTION LIGHT 500-241 K14S II RS-16
32316480	EVOLUTION LIGHT 800W-241 K14S II RS-4
32314329	EVOLUTION LIGHT 1400-241 K14S II RS-12
32314070	SUPER LIGHT 1000-241 230V FDA II RS-12
32314071	SUPER LIGHT 1400-241 230V FDA II RS-12
32314330	EVOLUTION LIGHT 1000-241 K14S II RS-12
32314077	SUPER LIGHT 2400-349 400V FDA II RS-12
32314554	Soleil 500-241 GYH9,5 JK RA-16
32314361	OPEN SUN 800-241 GYH9,5 JK RA-4
32317440	LIGHTTECH 500-1000W-241 GYH9,5 LL NO-4
32311144	HSC 400-241 GY9,5 NT RA-9
32314305	HSC 500-1000-241 GY9,5 NT RA-4
32314191	HTC 1000-341 KY10S UB RA-4
32313379	1530-241 MEST NT RA-12
32312600	1510-241 MESO NT RA-12
32314310	HTC 1000-341 KY10S NT RA-4
32314144	HTC 1000-341 KY10S NT RA-4
32314315	HTC 1000 - 1400 -241 K10s NT RA-12
32314224	HTC 2510-349 MESO NT RA-12



32314250	HTC 2000-2400-349 K10s NT NO-12
32314195	HTC 2000-2400-349 K10s NT RA-12
32313971	HTC 2000-2500W-349 KY10S NT RA-12
32311787	ASTRA2000-349KX10S AR RS-12
32314234	ULTSOL 1200-1500-229 GY9,5 SC NO-12
32311593	ULTSOL 2400-349 K10S GE SC NO-12
32314720	ULTSOL 2400-349 KY10S GE SC NO-12
32317369	Radiance 500W 241 GY9,5 TC RA-16
32316540	AUVL 500-241 KY10S RA-16 TC
32316483	RADIANCE 600W-241 K10S T C
32314438	SUPRA 800-241 GYH9,5 TC RA-4
32314436	SUPRA 800-241 GY9,5 TC RA-4
32314548	HSC 800-1000W-241 GY9,5 UB RA-4
32314544	RADIANCE 800-241 GY9,5 TC RA-4
32314426	SUPRA 800-1000-241 KY10S TC RA-4
32316538	AUVL 800-1000-241 KY10S RA-4 TC
32317438	AUVL 800-1000W-241 GYH9,5 TC RA-4
32316539	AUVL 800W-241 R7S RA-4 TC
32316481	SUPRA 800W-241 R7S TC RA-4
32314192	HSC 800-1000-241 GYH9,5 UB RA-4
32314439	SUPRA 800-241 GYX9,5 TC RA-4
32316589	Supra 800W-241 Fa6,5 GL Ra-4
32317427	SUPRA 900-241 GYH9,5 TC RA-4
32314428	SUPRA 1000-241 K10S TC RA-12
32314429	SUPRA 1000-341 KY10S TC RA-4
32314431	SUPRA 1000-241 MeSt TC RA-12
32316537	AUVL 1000-241 K10S RA-12 TC
32317426	SunItalia 1400-249 GYH 9,5 TC
32316536	AUVL 1000-341 KY10S RA-4 TC
32314450	RADIANCE 1000-1400-241 KY10s TC RA-4
32316484	RADIANCE 1000-241 K10S TC RA-12
32314452	RADIANCE 1000-241 MeSo TC RA-12
32314453	RADIANCE 1000-241 MeSt TC RA-12
32314451	RADIANCE 1000-341 KY10s TC RA-4
32314427	SUPRA 1000-1400-241 KY10S TC RA-4
32314430	SUPRA 1000-241 MeSo TC RA-12
32316590	Supra 1000W-241 Fa6,5 GL Ra-12
32314432	SUPRA 2000-347 KX10S TC RA-12
32316535	AUVL 2000-347 KX10S RA-12 TC
32314454	RADIANCE 2000-347 KX10s TC RA-12
32314442	SUPRA 2000-349 KX10S TC RA-12
32313393	NEWTECH 500-1000-241 GY9,5 UP RA-4
32313420	NewTechnology 630-830W-241 MEST UP RA-16

32317446	Solar Elements 800W-249 GYH9.5 UP
32316479	SOLAR ELEMENTS 800W-241 R7S UP RA-4
32316436	SOLAR ELEMENTS800-1000-241 KY10S UP RA-4
32317282	Solar Elements 730W-241 GYH9,5 UP RA-16
32313392	NEWTECH 800-1000-241 GYX9,5 UP RA-4
32317476	Solar Elements 900-1200-241GYH9,5 TC RA4
32317279	Solar Elements 1000W-241-GYH 9,5 UP
32316441	SOLAR ELEMENTS 1200W-341 KY10S UP RA-4
32316440	SOLAR ELEMENTS 1400W-241 K10S UP RA-12
32316438	SOLAR ELEMENTS 1530W-241 MEST UP RA-12
32313404	NEW TECHN 1530-241 MEST UP RA-12
32316439	SOLAR ELEMENTS 1510W-241 MESO UP RA-12
32313385	NEW TECH 1000-241 KY10S UP RA-4
32313388	NEW TECH 1000-341 KY10S UP RA-4
32313401	NEW TECHN 1510-241 MESO UP RA-12
32314407	NEW TECH 2000-349 K10SF UP NO-12
32314410	HETXL 2000-349 KY10S UP NO-12
32313409	NEW TECHN 2510-349 MESO UP RA-12
32316437	SOLAR ELEMENTS 2000W-347 KX10S UP RA-12
32316502	SOLAR ELEMENTS1000-1400241 K10SFRA-12 GL
32316458	MHL 2000-2500W-349 KY10S GL RA-12

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