

US EPA ARCHIVE DOCUMENT

DCN FLEP-00010

COMMENTER Wisconsin Public Service Corporation

SUBJECT DATA4

COMMENT In response to the Wisconsin policy, a number of light recycling facilities have started operating and many businesses are recycling their lighting wastes. This is because of recently issued guidance by the WDNR which allows recycling. Recycling the lighting waste is less expensive than sending it to a Subtitle C mercury treatment facility. However, no recycling facility reclaims all the mercury, and as little as 50 percent of the mercury may be reclaimed by the facilities. This makes the whole management scenario unproductive. The process of recycling fluorescent bulbs in a typical Wisconsin lighting waste recycling facility involves crushing the lights under negative pressure and collecting gases and small particles for mercury reclamation. Broken glass, which contains a significant portion of the mercury, is simply recycled as scrap glass. This is possible because the recycling process removes enough of the mercury so that it will pass a TCLP. A recent audit of a recycling facility in Wisconsin revealed TCLP results on the waste glass at times exceeding 100 parts per billion. Fluorescent lights which fail the TCLP before recycling are frequently just over the 200 parts per billion limit. This indicates that recycling facilities may be recovering as little as 50 percent of the mercury. Mercury emissions can still result when the glass is then recycled as scrap glass. It is possible that air emissions of mercury are greater than if the lights were landfilled in a Subtitle D landfill. For a period of eight months, WPSC shipped 23,247 lights to a light recycling facility in Wisconsin. If each light contained 50 mg of mercury, the lights would have contained about 2.5 pounds of mercury. During this period, as little as 1.25 pounds of mercury was likely recovered based on the facility's TCLP results. The cost of recovering the mercury exceeded \$30,000, and the result was that about \$50 worth of mercury was actually recovered. The point is that recycling does not capture all the mercury and is only reducing the level in the waste from a point which was slightly over the TCLP limit before recycling to one which is slightly under after recycling with the expenditure of a lot of time, effort, energy, and money.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues

pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream⁷ facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN SCSP-00022

COMMENTS MRT System

SUBJECT DATA4

COMMENT Comments to the proposed modifications to the hazardous waste

recycling program. Federal register / Vol 58 No. 27 February 11, 1993. Docket No. F-93-SCSP-FFFFF General comments Annex No. 1 - General information about MRT System AS - Reference lists - MRT System AS present in the US - Leaflet of R*cyclights Annex No.2 - Collection of tubes In Sweden - Leaflet of containers used - Flow shoot - Mass balance calculation - Four different methods of collecting tubes - HID flow shoot - Cost estimation for recycling Annex No. 3 . The MRT technology (leaflets) Annex No. 4 -Consultant report according to a test program requested by EPA in Sweden. -Test analyses an the residue after the processes acc. to the US TCLP -Mass balance calculation including diagrams of emission values -The final resolution of the operation In Sweden issued by the EPA County Government Board. Annex No. 5 Estimated fluorescent tube market worldwide Estimation of percentage recycled In Europe Future directives by the European Community Swiss landfill regulations A Swedish EPA report (Naturvirdsverket No. 3705) confirming emissions from landfills. Annex No. 6 Correspondence with NEMA Annex No. 7 -Information about the MRT battery process.

RESPONSE

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COMMENT In Annex No. 5, I give a brief information about actions that are taken in the European Community and Europe in general. There is also some statistics about total volumes of lamps sold and how much that are collected and recycled today. In that Annex No. 2, I also enclose information on how collection is done in Sweden (4 different methods) and charged for. In the last page of Annex No. 2 is also stated that the recycling fee only contributes to 2 % of the total costs of lighting a space for 5 years (source GE).

RESPONSE

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DCN SCSP-00022

COMMENTS MRT System

SUBJECT DATA4

COMMENT (I must just mention one example. Osram, Peter Bleasby, was interviewed in the magazine *Lighting Dimension*, issued in the autumn 1992.) One quotation among others. "To distill takes a hell of a lot energy. If you are using electricity to do your distillation, then you are popping out more mercury back into the environment through the power stack emission". In a fax to me the 21st of January 1993, he then asked how much energy kWh were used. See the correspondence and my answers in Annex No. 6. To produce electricity in a coal fired power plant for distilling fluorescent powder from 10 million tubes, means a mercury pollution of 3.2 grams. 200 000 kWh x 0.016 mg Hg emission per kWh. This means that it is 18,000 times better to recycle compared to incineration. EPA has requested information

on the risks of current or developing mercury recovery technologies. For your information, I enclose in Annex No. 3 and No. 4 important information about the MRT technology including: Leaflets. (Annex No. 3) Technical reports made by independent consultants requested by EPA in Sweden. (Annex No.4) A few test analyses concerning the Hg content in different materials after the process. (Annex No.4) Mass balance calculations about our technology and how much that actually is recovered. Here are also all emissions mentioned from the process. Note that the process itself only contribute to a minor emission. Most of the emission occurs from collection and storage which also will be the case if just collecting tubes and thereafter landfilling. (Annex No. 4) The final resolution for the operation by the EPA County Government Board. (Annex No. 4) I can guarantee EPA that our systems are well proven which also is confirmed in the above documentation. We have been selling systems for commercial use for more than ten years. So honestly, I can not understand how NEMA can say that it is still evolving world wide. Finally and maybe the most important information for EPA is whether landfilling of tubes would pose a risk or not. I enclose one report made by the Swedish EPA No. 3705, which certainly confirm that significant levels of mercury vapor occur in the air above the landfills. Be also aware of that batteries and fluorescent tubes already were collected in Sweden at the time for measurements. If those spent products would have been present at the top layers of the landfills, we believe the values would have been tenfold. See also the comments on this subject in the final resolution documentation for the MRT plant in Sweden. I think I do not need to go into a deeper discussion about leachate from landfills or the incineration problems. Those problems has been recognized in several reports world wide to be mentioned is actually the big report on Fluorescent and HID Lamp Management by Minnesota Office of Waste Management. That report gives a good description of the entire problem with spent lamps.

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DCN SCSP-00118

COMMENTS Robert M. Quintal

SUBJECT DATA4

COMMENT EXAMPLE PROCESS - MRT SYSTEM Examination of the MRT System process shows that a time proven, safe, and effective process exists to handle this waste. A summary of the lamp sub-components, post process, and the corresponding TCLP test results are shown: [See hard copy of SCSP-00118 for table.] MRT

System Sweden, Christer Sundberg, MRT System AB The MRT System can process up to 4,000 lamps/hour. At single shift operation, a single facility is capable of processing over eight million units per year. It can be calculated that if MRT System or equivalent equipment were employed to address this problem nationally, 64 such facilities would be required to the annual disposed quantity, at a cost to private industry of approximately \$95 million. The necessary process equipment takes six months to be assembled, shipped, installed, and fully operating. RECYCLING/RECLAMATION Reclaimed glass cullet may be re-manufactured for non-food containers or used as filler in cement and asphalt, aluminum endcaps handled by traditional recycling aftermarket, and the distilled mercury is separated and can be sold to mercury refiners.

RESPONSE

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DCN FLEP-00130

COMMENTER U.S. Department of Energy

SUBJECT DATA4

COMMENT EPA requests information on which recycling technologies are currently being used (59 FR 38294). At DOE ORNL, there are treatability studies under way for development of a method to wash crushed fluorescent lamp bulbs to remove the mercury-containing phosphorus powder. This method will allow 'clean' crushed bulbs to be either recycled or disposed with the rinsate managed as a hazardous waste. Methods such as these for treatment of crushed bulbs should also be considered by EPA under the proposed exclusion.

RESPONSE

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In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management

standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

The current universal waste rule prohibits universal waste handlers from crushing universal wastes (40 CFR ' 273.11 and 273.31). The final rule for hazardous waste lamps retains the treatment prohibition for universal waste handlers and applies the prohibition to handlers of hazardous waste lamps. The definition of treatment under RCRA includes Any method, technique, or process...designed to change the physical, chemical, or biological character or composition of any hazardous waste, so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.@ The crushing of hazardous waste lamps clearly falls within the definition of treatment under RCRA (40 CFR 260.10).

Some commenters to the proposed spent hazardous waste lamps rule requested that the Agency allow generators of such lamps to crush them on-site before sending them off-site for treatment or disposal. However, as explained in the preamble to the final universal waste rule (60 **FR** 25519), the Agency believes that it is not appropriate to allow universal waste handlers to treat universal wastes because the handlers are not required to comply with the Subtitle C hazardous waste management standards for generators (40 CFR Part 262). These hazardous waste generators must obtain EPA identification numbers, are subject to the 90-day (or 180-day) accumulation limit, and must comply with the technical standards of 40 CFR Part 265 for storage and accumulation units. Because these standards are relatively stringent, EPA's policy is that generators may treat hazardous wastes on-site, provided that they comply with all applicable requirements of 40 CFR Part 262 for storage and accumulation of hazardous wastes.

Universal waste handlers, on the other hand, are allowed a much longer accumulation time limit of one year and need not comply with specific technical standards for accumulation and storage units. Instead, they are subject only to the general performance standard of managing universal wastes in a manner that prevents releases@to the environment. In addition, information available to the Agency on drum top crushing systems for lamps indicates that these units may allow significant air emissions of mercury, particularly when the units are not in operation, and emissions often may exceed the OSHA limit of 0.05 mg/m³.

For these reasons, the Agency is not allowing crushing of hazardous waste lamps under federal regulations. However, generators located in a state with an authorized universal waste program may be allowed to crush universal waste lamps, if within the state authorization process the Agency determines that a state's program allowing generators to treat lamps under controlled or

restricted conditions is equivalent (per RCRA ' 3006) to the federal prohibition. EPA believes that this approach both ensures protection of human health and the environment while allowing for the development of state regulatory programs that include specific standards for the safe crushing of hazardous waste lamps.

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DCN FLEP-00143

COMMENTS A-TEC Energy Corporation

SUBJECT DATA4

COMMENT A-TEC Recycling, Inc. currently operates a lamp recycling facility in Polk County, Iowa (EPA I.D. number: IA0000109827).

All lamps received at this facility are processed within twenty-four (24) hours of their arrival at the facility. The machine used to process the lamps operates under negative pressure to capture mercury laden gas and dust particles during processing. The processing yields three (3) main materials:

- Metals: End caps, wires, etc. which are collected and sold to a scrap metal broker for reuse.
- Glass: Which is shipped to a St. Paul, Minnesota facility where it is ground to a consistency similar to sand for reuse in asphalt and concrete.

- Mercury/Phosphor: Which is collected and sealed in DOT approved 55 gallon steel drums and shipped to Bethlehem Apparatus Company in Hellertown, Pennsylvania where the mercury is distilled and sold for reuse.

RESPONSE

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DCN SCSP-00146

COMMENTS Advanced Environmental Recycling Corp.

SUBJECT DATA4

COMMENT AERC currently operates one facility in Allentown, Pennsylvania

and MTI operates the second facility in Hayward, California. AERC/MTI is in the process of opening a third facility in West Melbourne, Florida. These facilities will have a combined capacity of approximately 90 million lamps per year. In addition, through a license agreement, another facility is being operated in Minnesota with a capacity of an additional of 20 million lamps per year. AERC is fully committed to establishing additional facilities throughout the country and is in the process of negotiating locations in southern California and in the midwest section of the country. AERC is fully prepared to expand our activities to accommodate national capacity. It should be noted that there are many other companies in the development process for siting facilities. These decisions are dependent on sound direction from the USEPA.

RESPONSE

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DCN FLEP-00149

COMMENTS Weyerhaeuser Company

SUBJECT DATA4

COMMENT Recycling options for businesses are ever increasing with new recyclers entering the market place. Weyerhaeuser has had success in developing business relationships with recycling brokers and the actual recyclers. Costs were initially an impediment to recycling, however, increased competition and successful negotiations have reduced our costs by 70% over the last year. Future reductions in costs are expected.

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Management costs under the universal waste approach will be lower than full Subtitle C management because hazardous waste transporters and manifests will not be required for lamp shipments between hazardous waste lamp generators and disposal or recycling facilities.

DCN FLEP-00156

COMMENTS National Electrical Manufacturers Assn.

SUBJECT DATA4

COMMENT NEMA has summarized available risk information on mercury in spent lamps in the enclosed document entitled "Environmental Risk Analysis: Spent Mercury-Containing Lamps" (Enclosure 5). This document shows that if all of the 27 tons of mercury contained in the spent lamps generated per year in the U.S. were to be landfilled in either a hazardous waste landfill or a municipal landfill, only .04 to .31 tons, or 15 percent to 1.15 percent of the mercury would likely be released into the environment. If all 27 tons were to be recycled, only .05 tons to .81 tons would be released, or .2 percent to 3 percent of the mercury, not including any emissions resulting from processing of recovered materials. Clearly, recycling and landfilling results in very little release of mercury.

NEMA's recent study in the third area of concern, namely

residual mercury contamination in the materials recovered in lamp recycling/ reclamation operations, has been mentioned previously in these comments (See footnote 12 on page 7 and Enclosure 4). NEMA evaluated lamp materials from commercial recycling operations and found significant levels of mercury in the recovered glass. Typical levels ranged from 0.2 to 14.4 milligrams per kilogram of glass. Wet processes tend to utilize an acid wash step which can be effective at removing some of the mercury that becomes imbedded in the glass over lamp life. These levels, if projected to high volume operation, would result in residual mercury in processed glass ranging from approximately 0.1 to 13.1 grams per ton. When such glass is subjected to re-use processes involving the application of heat, NEMA found that the mercury can be released at rates as high as 7 milligrams per hour per kilogram of glass, or approximately 0.6 grams of mercury per ton of heat-treated glass. If completely remelted, emission levels could be as high as the worst case 13.1 grams per ton, since essentially all entrained mercury would be released as air emissions.

IX. RE-USE OF RECYCLED MATERIALS IN FLUORESCENT LAMPS One question that has often been asked of the lamp manufacturers is whether the materials recovered from spent lamps in the recycling process can be re-used in the manufacture of new lamps given current recycling technology and current economic conditions, re-use of these materials by manufacturers is unlikely. The difficulties presented by re-use of the recovered materials, other than elemental mercury which the lamp manufacturing industry already acquires from the secondary market, are described in detail in the NEMA paper entitled "Re-use of Recovered Materials in the Manufacture of High Volume Linear Fluorescent Lamps" (Enclosure 11).

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions

Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that State oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR, Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN FLEP-00167

COMMENTS Florida Power and Light Company

SUBJECT DATA4

COMMENT Crushing fluorescent lamps, using several of the commercially available and well-designed 'drum top' crushers is also a viable option for the management of lighting wastes which EPA should not rule out. This mature technology uses a vacuum collection system cyclone separator, and EPA and charcoal filters to control mercury emissions into the work area. Generally, this equipment is noted to operate below the OSHA limit of 0.05 mg/m³ of mercury. One manufacturer advertises that the average release from their equipment was in the 0.025 mg/m³ range. A

crusher can facilitate the storage of lighting waste. Because of the resultant volume reduction, one can fit 1200 4-foot lamps into a standard 55-gallon drum rather than storing the same number of spent lamps in 13-14 of the original containers and then pelletizing them for handling. Spent lamps can be crushed as generated and the material stored rather easily in drums. Storing spent lamps intact could require storage of a sufficient quantity to make pickup by a lamp reclaimer economically feasible. This entail quantities as large as 15,000 to 35,000 spent lamps in order to provide 2 to a full truck load.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The current universal waste rule prohibits universal waste handlers from crushing universal wastes (40 CFR ' 273.11 and 273.31). The final rule for hazardous waste lamps retains the treatment prohibition for universal waste handlers and applies the prohibition to handlers of hazardous waste lamps. The definition of treatment under RCRA includes Any method, technique, or process...designed to change the physical, chemical, or biological character or composition of any hazardous waste, so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.[@] The crushing of hazardous waste lamps clearly falls within the definition of treatment under RCRA (40 CFR 260.10).

Some commenters to the proposed spent hazardous waste lamps rule requested that the Agency allow generators of such lamps to crush them on-site before sending them off-site for treatment or disposal. However, as explained in the preamble to the final universal waste rule (60 *FR* 25519), the Agency believes that it is not appropriate to allow universal waste handlers to treat universal wastes because the handlers are not required to comply with the Subtitle C hazardous waste management standards for generators (40 CFR Part 262). These hazardous waste generators must obtain EPA identification numbers, are subject to the 90-day (or 180-day) accumulation

limit, and must comply with the technical standards of 40 CFR Part 265 for storage and accumulation units. Because these standards are relatively stringent, EPA's policy is that generators may treat hazardous wastes on-site, provided that they comply with all applicable requirements of 40 CFR Part 262 for storage and accumulation of hazardous wastes.

Universal waste handlers, on the other hand, are allowed a much longer accumulation time limit of one year and need not comply with specific technical standards for accumulation and storage units. Instead, they are subject only to the general performance standard of managing universal wastes in a manner that prevents releases to the environment. In addition, information available to the Agency on drum top crushing systems for lamps indicates that these units may allow significant air emissions of mercury, particularly when the units are not in operation, and emissions often may exceed the OSHA limit of 0.05 mg/m³.

For these reasons, the Agency is not allowing crushing of hazardous waste lamps under federal regulations. However, generators located in a state with an authorized universal waste program may be allowed to crush universal waste lamps, if within the state authorization process the Agency determines that a state's program allowing generators to treat lamps under controlled or restricted conditions is equivalent (per RCRA ' 3006) to the federal prohibition. EPA believes that this approach both ensures protection of human health and the environment while allowing for the development of state regulatory programs that include specific standards for the safe crushing of hazardous waste lamps.

DCN FLEP-00176

COMMENTS Coalition of Lamp Recyclers

SUBJECT DATA4

COMMENT The potential of multi-media environmental contamination in uncontrolled collection and disposal of mercury bearing wastes exists, but certainly the most critical environmental exposure is to the air. The greatest mercury exposure and release potential the Coalition of Lamp Recycler's have experienced at their facilities is the incoming vehicle transporting intact lamps. Consistent with the recyclers' operating procedures to monitor potential environmental emissions and worker safety, the mercury levels are monitored from incoming vehicles using a Jerome Mercury Vapor Monitor. The level of mercury vapor present immediately overloads the machine's capacity and exceeds its upper monitoring limits of 10.0 mg/M3. This mercury vapor is being released from lamps that have been shipped intact, in containers or cartons with the ends taped closed, in a closed environment without air turbulence. These readings are from vehicles containing an estimated 1% - 5% breakage, occurring during transport. This indicates substantial release of mercury

without crushing, without air currents, without material agitation, and without the phosphor being released from the cartons. Breakage data is also submitted with these comments as Attachment 4 and Attachment 5. Attachment 4 documents the mercury vapor release at the first instant of lamp breakage. It only measures the first vapor release in a controlled environment. There was no material movement and the temperature was held constant. The rate and the emissions of mercury vapor release will increase with material/air movement and increased temperature. Additional testing is currently being finalized on mercury release from the phosphor and will be submitted to EPA in the very near future.

Mercury-containing lamp recyclers monitor vent emissions and workplace levels for mercury vapor on a frequent and routine basis. The vent emissions from the recycling process are monitored and measured by the recyclers. The releases of mercury vapor to the atmosphere from recyclers with the appropriate air pollution control equipment are approximately 50 grams per year while processing up to 10 million lamps. Workplace mercury vapor levels consistently stay below the OSHA threshold limit value (TLV) of 0.05 mg/m³. This demonstrates the recycler's ability to remove the mercury effectively and capture the vapor and phosphor, eliminating the release to the environment. Workplace levels are monitored daily to ensure the levels of mercury are not creating a harmful environment and are staying below the OSHA threshold limit value.

EPA requested information on the tracking of mercury as it moves through the recycling process. Lamp processing equipment will vary to some degree between types of equipment and individual recyclers. However, there are many similarities and equivalent methods. The following is a general summary of the process and flow of the mercury: Intact lamps are received at the recycling facility packaged in the original cardboard boxes with the ends taped closed or in fiber containers with closed lids. The boxes are on pallets and banded or shrink-wrapped together for shipment. Intact lamps are fed into the processing machine (a crush and sieve type or material separating system), the aluminum end caps are removed by gravity or sieve, the glass is crushed and removed by auger or sieve screen, and the mercury-containing phosphor is collected through a vacuum

system. The mercury-containing phosphor is collected by bag house filters or particulate filters, collecting the phosphor in receiving drums. The air continues on through high efficiency filters (HEPA) and then to an activated carbon filter before being discharged to the atmosphere. The bag house filters and HEPA filters are designed to capture the phosphor powder and any fine particulate matter, the HEPA filters are very fine micron filters to capture the smallest particle size, and the activated carbon bed is to capture any remaining mercury vapor. The phosphor can be retorted to remove the mercury and sold as a product. Mercury vapor is monitored through out the process - in the workplace and the vent emissions. EPA requested information on the markets for the separated components, glass, aluminum, and mercury, are as follows: 1 .The glass is sold to glass recyclers for use as fiberglass additive (diluted 20:1 before being used), concrete, and asphalt filler or can be sold directly to companies that make gravel base aggregate. 2.The aluminum end caps are sold to scrap metal dealers or directly to a smelter. 3.The phosphor can be retorted on-site and the mercury sold to a mercury reclaimer or the phosphor can be shipped off-site to the mercury reclaimer for retort. Prices received for each item varies with the market and the location of the recycling facility.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows

mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN SCSP-00186

COMMENTS Nine West Technologies, Inc.

SUBJECT DATA4

COMMENT Our experience, and the experience of the recycling industry in Europe indicates that there are techniques available which will leave minimal amounts of mercury on the glass tubing, thus permitting the glass to be safely recycled. The European techniques are divided into two basic groups, Wet Methods and Dry Methods. One company using the Wet Method, for example, is AquaControl, a German company. AquaControl crushes lamps in a sodium sulfide solution before final processing. Residual mercury is reported at .5 ppm or less. Recytec of Switzerland crushes lamps dry but processes them in a fluoroboric solution; residual mercury left on the glass by this method is also approximately .5 ppm. Runstat and Thur (Germany), Sovag (Switzerland), and LumenEx (The Netherlands) process the lamps with a Dry Method. They report residual mercury at 3-5 ppm on the glass. Representatives from National Electrical Manufacturers Association (NEMA) visited these company in November 1991 and were provided the above results. NWT has developed a wet reclamation method in which mild acid solutions

are used. General Electric Co. analyzed glass from bench test experiments conducted by Mr. Jacob Van Broekhoven of NWT. The results showed mercury at 1 ppm on the glass. Dry Method samples submitted by another recycler were at 3 ppm. NWT believes that on a production basis the Wet Method results will be very close to the European values. Pricing for NWT is expected to be about 30 [cents] for a 4 [foot] lamp. This is lower than any of the current recyclers operations now operating in the U.S.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as *downstream* facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN FLEP-00191

COMMENTER Utility Solid Waste Activities Group

SUBJECT DATA4

COMMENT Not only is disposal in MSWLFs fully protective of human health and the environment, but USWAG is concerned that there is not adequate, environmentally protective recycling capacity to accommodate the large volumes of lighting wastes that would be generated by full participation in Green Lights and similar programs. For example, as of 1993, there were only three fully operational mercury retorters in the country, only two of which could retort mercury from fluorescent powder. RTI Report at 130. USWAG estimates that approximately 90 million fluorescent tubes are removed from service per year in California alone, with many more hundreds of millions of bulbs removed from service per year in the remaining states. In California, reclaimers can each process about 400,000 tubes a month which equates to 5 drums a month of fluorescent powder. Retorters can process about 20 drums per week. Based on this statistic, California alone could generate enough material to take care of one of the retorter's quotas. Thus, adequate and environmentally sound recycling capacity is clearly an issue of concern for any participant in an energy-efficient relamping program. Indeed, the RTI Report acknowledges that there are currently only a few viable recyclers available and not likely an adequate number to accommodate the total number of bulbs removed from service annually.

On top of the concerns regarding the environmental performance of certain recyclers, is the performance of the mercury-recovery operations themselves. USWAG members that have evaluated the environmental performance of recycling facilities have raised legitimate questions regarding the "recovery" performance of certain facilities. In fact, one utility reported that as little as 50 percent of the mercury was reclaimed by the recycling facility it employed in Wisconsin. See Comments submitted by Wisconsin Public Service Corp. to RCRA Docket (Sept. 2, 1994)

(Attachment C). [See hard copy of Comment FLEP-00191 for Attachments]. In this particular operation, the recycling operations involved the crushing of bulbs and the collection of gases and small particles for mercury reclamation. The glass was recycled as scrap glass (apparently as roadbed material). The utility in this case recycled approximately 23,247 lights over a period of 8 months. If each light contained 50 mg of mercury, the total recyclable amount of mercury would have been approximately 2.5 pounds of mercury. In reality, however, as little as 1.25 pounds of mercury was likely recovered based on the facility's TCLP results. Thus, despite a \$30,000 expenditure for mercury recovery, only about \$50 worth of mercury was actually recovered. *Id.* at 2. Thus, despite the expenditure of a significant amount of time, effort, energy and money, the actual environmental and fiscal benefits of recycling in this case were negligible. [13] [Footnote 13: 'USWAG also notes that recyclers have an understandable economic incentive to conditioning any management option on recycling. EPA's cost analysis reveals that the recycling of mercury-containing lamps is significantly more expensive than disposal in MSWLFs. For example, EPA estimates that the average cost for Subtitle D disposal is \$35 per ton as compared to \$400 per ton for Subtitle C disposal and \$1,375 per ton for recycling. 59 Fed. Reg. at 38300, n.4. Similarly, EPA estimates, that Subtitle D landfilling costs range between \$10 and \$150 per ton depending upon the region of the country. As EPA notes, "[c]ompared with an average recycling cost of \$1375 per ton, Subtitle D landfilling is significantly less expensive." *Id.* at 38300 n.5. (emphasis added). Thus, under the conditional exclusion option, reclamation facilities could be impacted by approximately \$7 million in lost revenues (\$469,000 per facility). *Id.* at 38300.]

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions

during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not believe that its proposed conditional exclusion approach would sufficiently protect human health and the environment. EPA gave considerable weight to actions that would minimize mercury emissions to the environment while encouraging the collection and environmentally-sound management of spent lamps. Based upon commenter input and additional information collected and reviewed by the Agency since the publication of the proposed rule, EPA decided to adopt the proposed universal waste approach for controlling potential risks from the management of spent hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards).

Although the Agency believes that today's rule is likely to encourage the recycling of hazardous waste lamps, the rule does not mandate such recycling. Therefore, the Agency was not required to ensure that adequate recycling capacity exists. However, EPA believes that as demand for recycling continues or increases, investment in reclamation facilities will also increase, thus leading to an expansion in capacity. Lamp generators who have concerns about the capacity or effectiveness of particular lamp reclamation facilities may continue to dispose of lamps in Subtitle C landfills.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

Before today's rulemaking, spent lamps that exhibited a hazardous waste characteristic had to be managed under full Subtitle C management standards. Under the universal waste regulations, storage, transportation, and recordkeeping requirements are less stringent than the Subtitle C

regulations for generators and transporters of universal waste. In addition, small quantity handlers of universal waste (those facilities that accumulate 5,000 kilograms or less of total universal waste at one time) are not subject to the universal waste notification and recordkeeping requirements. A significant number of commenters indicated that savings from reduced energy usage more than cover the cost of managing lamps as part of the universal waste regulations. Other commenters indicated the costs for managing lamps may now increase.

The Agency performed calculations on the impact of disposal costs on a lighting upgrade's internal rate of return (IRR). At a \$0.50/lamp transportation and recycling cost, the IRR for a typical project over ten years is 50 percent. At a \$1.00/lamp transportation and recycling cost the IRR was 50 percent, which is only a slight decrease in IRR, despite a 100 percent increase in waste management costs. This result suggests that the cost associated with the participation in energy-efficient lighting programs is largely independent of the regulatory options chosen by EPA.

DCN FLEP-00193

COMMENTS Sunset Lighting Services

SUBJECT DATA4

COMMENT RECYCLING Sunset Lighting Services supports environmentally sound and cost-effective recycling of mercury-containing lamps.

Presently, Lighting Resources recycles our spent lamps, they are picked-up by them and charge \$.08 per foot.

RESPONSE

The Agency appreciates the commenter's support for recycling of hazardous waste lamps. Based upon commenter input and additional information collected and reviewed by the Agency since the publication of the proposed rule, EPA decided to adopt the proposed universal waste approach for controlling potential risks from the management of spent hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards).

Source reduction, which is the reduction or elimination of the toxicity and/or volume of a waste product, is at the top of the EPA's hierarchy of solid waste management methods. The Agency encourages cost-effective source reduction of mercury contained in fluorescent lamps. Second on the hierarchy is recycling. Today's final rule is expected to facilitate the environmentally-sound collection and the proper recycling or treatment of hazardous waste lamps. Generators have several options with regard to waste management, but the ability to access large quantities of universal waste from central collection centers may encourage the development of safe and effective methods to recycle universal waste. Today's rule retains requirements for hazardous waste lamps to ultimately be managed in accordance with RCRA Subtitle C hazardous waste management requirements. This may provide incentives for lamp manufacturers to pursue additional source reduction efforts to reduce or eliminate the amount of mercury used in the manufacture of fluorescent tubes. If source reduction is pursued aggressively by the fluorescent lamp manufacturing industry, the overall contribution of mercury from fluorescent lamps to

municipal solid waste could decrease over time.

DCN FLEP-00195

COMMENTS South Carolina Electric and Gas Company

SUBJECT DATA4

COMMENT It is also our contention that recycling spent lamps is the preferred alternative in some instances, but it is not always the best solution. Through our experiences in the recycling process we have learned that recyclers cannot always accommodate a huge volume of lamps which means that full participation in relamping programs might create yet another problem. Moreover, many, recycling facilities do not use environmentally safe procedures in their recycling process; therefore, qualified MSWLFs are more desirable particularly in view of the fact that MSWLFs are equipped with liners and leachate collection systems. We've also found that it is difficult to ascertain (from recycling entities) how mercury is recovered, the means of recovery, and how treatment residuals are used. These factors make us question the reliability of recycling facilities.

RESPONSE

The Agency does not believe that its proposed conditional exclusion approach would sufficiently protect human health and the environment. EPA gave considerable weight to actions that would minimize mercury emissions to the environment while encouraging the collection and environmentally-sound management of spent lamps. Based upon commenter input and additional information collected and reviewed by the Agency since the publication of the proposed rule, EPA decided to adopt the proposed universal waste approach for controlling potential risks from the management of spent hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards).

Although the Agency believes that today's rule is likely to encourage the recycling of hazardous waste lamps, the rule does not mandate such recycling. Therefore, the Agency was not required to ensure that adequate recycling capacity exists. However, EPA believes that as demand for recycling continues or increases, investment in reclamation facilities will also increase, thus leading to an expansion in capacity. Lamp generators who have concerns about the capacity or effectiveness of particular lamp reclamation facilities may continue to dispose of lamps in Subtitle C landfills.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury

reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR, Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

The Agency believes that management controls under RCRA for hazardous waste lamps are necessary to minimize releases of mercury and other hazardous constituents to the environment during lamp accumulation and transport, to ensure safe handling of such lamps, and to keep hazardous waste lamps out of municipal waste facilities (both landfills and solid waste incinerators). Mercury is high on the Agency's priority list of toxic pollutants, along with other heavy metals such as cadmium and lead. These metals have been identified as constituents of some waste lamps. The primary health effects from mercury are on the neurological development of children exposed through fish consumption and on fetuses exposed through their mother's consumption of fish.

As required by the Clean Air Act Amendments of 1990, the Agency issued the *Mercury Study Report to Congress*. The study estimates the quantity of mercury emissions to the air from a number of human activities, estimates the health and environmental impacts associated with these mercury emissions, and describes the technologies available to control mercury emissions from these sources. The report concludes that there is cause to seek further reductions in mercury releases and exposures to mercury.

Spent hazardous waste lamps are a significant source of mercury in the municipal solid waste stream, possibly accounting for as much as 3.8 percent of all mercury now going to municipal landfills. The Agency does not have data characterizing the behavior of mercury in different types of landfills over long time periods. Data available to the Agency show that mercury can be found in municipal landfill leachate, and EPA remains concerned that landfill releases may pose threats over the long term. The Agency has concluded therefore, that some management controls are essential for these wastes. Further data and analysis are necessary to evaluate the potential for mercury to be released in landfill leachate as a landfill ages.

DCN FLEP-00229
COMMENTS Global Recycling Technologies, Inc.

SUBJECT DATA4

COMMENT 10. Recycling significantly reduces the mercury available to the environment. Using MRT System, 98.8% of mercury input is recovered. From MRT mass balance calculations - 0.8% residual - 0.2% breakage - 0.2% emissions into carbon filters 11. Current recycling capacity is about 20% of annual discards. This will expand unless forced to compete long-term with MSW landfill as proposed in Option 1. Full capacity could be in place within 1 year after adoption of Option 2.

CASE STUDY: RECYCLING Global Recycling Technologies of Stoughton Massachusetts has received and processed over 2 million fluorescent lamps. GRT utilizes Swedish manufactured equipment from MRT SYSTEM. MRT has been developing and installing mercury reclamation equipment for over 20 years. The process involves removal of metal end caps, removal of mercury containing phosphor powder, and volume reduction (crushing) of clean soda lime glass. The process contains the mercury vapor release, and stages the vapors through a series of active carbon (HEPA) filter systems. MASS BALANCE ANALYSIS Using the MRT System, 98.8% of input mercury is recovered. A mass balance analysis shows that residual mercury is low (0.8%), vapor lost is due to breakage (1 %, 20% Hg escape) and emissions extremely low (0.21% which is captured by charcoal filters installed)[12]. ["Management of Used Fluorescent Lamps: Preliminary risk Assessment", Truesdale, Beaulieu, Pierson, Research Triangle institute - Revised May 14, 1993. (Pg. 146; MRT SYSTEM mass balance calculations).] Of the residual mercury not fully recovered, 0.7% remains in the glass, 0.02% in the metal and 0.03% in the powder (for a total of 0.75%). A recent study of residual mercury in sub-components conducted by The Coalition of Lamp Recyclers [13] [Footnote 13: Attachment 1; Total mercury study by The Coalition of Lamp Recyclers consisting of 31 samples with an average of 1.6 ppm mercury in glass.] [See hard copy of Comment FLEP-00229 for Attachments] shows an average of 1.6 ppm total mercury in the glass; or an average of 0.9%. This is well below the amount of mercury released from vapor and evaporation from lamps broken under current and proposed exclusion management methods (6.6% to as high as 95%, according to a recent case study by RECYCLIGHTS and EG&G Idaho [14] [Footnote 14: Attachment 2: "Emissions from broken lamps", and "Mercury on Glass ", Thorndyke, November 1994.][See hard copy of

Comment FLEP-00229 for Attachments]). Depending on the re-use scenario for the glass, a fraction of the 0.7% could be released if glass is heated. It is likely that only a percentage of the residual mercury would be released to the environment in certain processes. RECYCLING CAPACITY Currently, there are 23 recycling facilities in operation in the U.S., with capacity for 20% of the annual discards. Because the technology is now considered virtually "off the shelf" and commercially available from 2 U.S. companies, expansion of capacity and new facilities are being planned. The outcome of the Departments findings are causing delay in expansion plans of many existing recycling companies. Global Recycling is a company that plans expansion and markets lamp recycling equipment. We estimate that if Option 2 is enacted, it would take no longer that 1 year for additional facilities to be opened to handle full capacity of annual discards.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

In today's rule, the Agency is not finalizing the conditional exclusion option for the management of hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than full Subtitle C management standards). Studies conducted by the Agency indicate that a significant potential for mercury emissions from spent lamps occurs during storage and transport. Uncontrolled crushing and breaking of lamps allows mercury to be emitted into the air. The universal waste rule allows the Agency to set specific management standards to control potential emissions of mercury and releases of other hazardous constituents during handling, accumulation, storage and transportation activities.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are

subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN FLEP-00261

COMMENTS New Hampshire Dept. of Env. Services

SUBJECT DATA4

COMMENT 2. EPA's October 1992 study of used fluorescent lamp management demonstrated that "mercury recovery facilities can have significant environmental impacts through poor operating practices and inadequate emission controls". one commercial facility that recovers mercury was placed on the National Priorities list in 1983. The study also concluded that "the concentration of mercury-bearing wastes at such facilities makes adequate oversight of their design and operations a necessity for protection of human health and the environment".

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

Based upon commenter input and additional information collected and reviewed by the Agency

since the publication of the proposed rule, EPA decided to adopt the proposed universal waste approach for controlling potential risks from the management of spent hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., universal waste rule is less stringent than full Subtitle C management standards).

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.

DCN FLEP-00296

COMMENTS State of Ohio EPA

SUBJECT DATA4

COMMENT Information on the cost of recycling lamps in Ohio is scanty but we have obtained a cost-breakdown from a lamp recycler for your review (attached) [See hard copy of Comment FLEP-00296 for attachments.].

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 FR 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*, discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and

lamp mercury emissions rates from specific waste management practices).

DCN FLEP-00309

COMMENTER Bethlehem Apparatus Company

SUBJECT DATA4

COMMENT 3. Recycling Operations and Practices, p. 38,294, col. 1-2.

Bethlehem has fully described its operation and facilities in Section 1 above. In addition, Bethlehem can handle all types and shapes of Lamps, but does not handle non-mercury containing incandescent light bulbs. Bethlehem uses a document system which keeps track of each shipment of Lamps as it is sorted (if necessary) crushed, retorted and distilled. The markets for mercury include industry, manufacturers of Lamps, brokers, the United States Government and foreign governments.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,[@] discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

DCN FLEP-L0001

COMMENTER Environmental Technology Council

SUBJECT DATA4

COMMENT A. Advantages of Recycling Fluorescent Lamps Recycling facilities separate the mercury-containing phosphorous powder from the other components of the fluorescent lamp under negative pressure, thereby minimizing the release of any mercury. The mercury-containing powder is then sent to mercury retorters, who purify the mercury and place it back in commerce. Retorting, of course, is Best Demonstrated Available Treatment (BDAT), under EPA's Land Disposal Restriction regulations, for most high-concentration mercury wastes. Regarding resource conservation, recycling of mercury conserves mercury resources. This avoids the mining of the equivalent amount of mercury. By

reducing mercury mining, recycling prevents the pollution that occurs during the mercury mining process, when significant releases of mercury emissions take place. Recycling also conserves the energy that is used during the mercury mining process, thereby reducing power generation -- the same goal as EPA's Green Lights program. Fluorescent lamp recycling also involves the recycling of the metal (aluminum) and glass components of the lamps. Again, this conserves natural and energy resource; and reduces the opportunity for pollution during mining. In short, recycling of fluorescent lamps has numerous pollution prevention, environmental protection and resource conservation advantages, and directly supports high Congressional and EPA priorities on recycling.

With the resultant growth in the market demand for recycling, the private sector will respond by providing additional recycling facilities, in a relatively short time. For example, the State of Minnesota began an aggressive Lamps Program in 1991, requiring recycling or hazardous waste disposal of fluorescent lamps. At that time, there were no fluorescent lamp recycling facilities in the state. Within two years, four lamp recycling facilities came on-line, with a total capacity of 11 million lamps per year. [34] [Footnote 34: MN PCA letter, November 30,1993, p.7.] This is far more than needed for Minnesota's requirement alone, and represents approximately eight to ten percent of total national requirements if all lamps were recycled. California regulations similarly spurred the development of fluorescent lamp recycling facilities in that state.

B. There Would Also Be Sufficient Recycling capacity In addition to the adequate available hazardous waste landfill and treatment capacity, there is also A substantial and growing recycling capacity, which would expand even more rapidly if the universal waste option were chosen. Within six months to a year, recycling capacity alone could be adequate to manage all used fluorescent lamps. EPA identified sixteen existing lamp recycling facilities in its publication, "Lighting Waste Disposal" (p.17) as of January 1994. Additional facilities have come on-line since then. The capacity for the facilities discussed in EPA's Preliminary Risk Assessment (pp. 130-144) ranged from two to four million lamps per year-each for the

older facilities, to seven to ten million lamps per year each for the newer ones. As mentioned above (Section IV.G.2), the Minnesota Pollution Control Agency states that the four facilities in Minnesota have a total capacity of 50 million, lamps per year (operating on multiple shifts), for an average of 12.5 million lamps per year each. With the four Minnesota facilities having a total capacity of 50 million lamps per year, a conservative estimate of the capacity of all the existing facilities would be 100 million lamps per year. Approximately 500 to 600 million lamps are removed from service annually and must be disposed of or recycled. With the conservative estimate of current capacity of 100 million lamps per year, this leaves a shortfall of 400 to 500 million lamps per year, if all lamps were to be recycled. Again, making a conservative estimate that new facilities have an average capacity of 7.5 million lamps per year, the shortfall in capacity of 400 to 500 lamps per year would require 54 to 67 new facilities, to recycle all used fluorescent lamps. Of course, many lamps are disposed of by households and small quantity generators not subject to these regulations, so the actual shortfall would be about 300 to 460 million lamps (40 to 54 new facilities). Experience in the industry is that new lamp recycling capacity can be brought on-line within four to six months.

The number of fluorescent lamp recycling facilities has grown from zero to about twenty in a few years, in the face of a relatively small and uncertain market. With a stable and favorable market, and the short time frame to bring new facilities on-line, many more new facilities could be brought on- line within a year.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 FR 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, Mercury Emissions From the Disposal of Fluorescent Lamps,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and

lamp mercury emissions rates from specific waste management practices).

Source reduction, which is the reduction or elimination of the toxicity and/or volume of a waste product, is at the top of the EPA's hierarchy of solid waste management methods. The Agency encourages cost-effective source reduction of mercury contained in fluorescent lamps. Second on the hierarchy is recycling. EPA believes that today's final rule will greatly facilitate the environmentally-sound collection and the proper recycling or treatment of hazardous waste lamps. Generators have several options with regard to waste management, but the ability to access large quantities of universal waste from central collection centers may encourage the development of safe and effective methods to recycle universal waste. Today's rule retains requirements for hazardous waste lamps to ultimately be managed in accordance with RCRA Subtitle C hazardous waste management requirements. This may provide incentives for lamp manufacturers to pursue additional source reduction efforts to reduce or eliminate the amount of mercury used in the manufacture of fluorescent tubes. If source reduction is pursued aggressively by the fluorescent lamp manufacturing industry, the overall contribution of mercury from fluorescent lamps to municipal solid waste could decrease over time.

DCN FLEP-00134

COMMENTER Aetna Life and Casualty Company

SUBJECT DATA4

COMMENT Markets for Recovered Materials USEPA has requested comment regarding the market for recovered materials (Section IV.A.) According to published statements, there is an implication that recycling may be a secondary consideration. [Footnote: The following remarks from publications seem to illustrate the point: Wall Street Journal, "Regulations on Fluorescent Lamp Kindle New Industry," Aug. 31, 1992, Section B. p. 3, "...since the value of recycled mercury is negligible, recycling firms depend on customer fees for nearly all of their income." Robert Blanchard, VP, Advanced Environmental Recycling Corporation. Environment Today, Fluorescent lamps latest reg (sic)," July 1992, p. 26, "...those materials (mercury, glass, phosphorus, metals) will be marketed to lamp manufactures and others, although the markets are not what Blanchard would call lucrative."] It seems that material re-use may or may not occur. Aetna believes that wastes sent for recycling should actually be re-used; if material re-use will not occur, it should be at the generator's option. For this reason it is prudent to retain the proposed language allowing either disposal in approved municipal solid waste landfills or recycling. This mechanism thus preserves the generator's option as to recycling vs. disposal.

RESPONSE

The Agency appreciates the commenter's submission of additional data addressing issues pertaining to hazardous waste lamp management. The Agency considered the additional data submitted by commenters in the development of its model on mercury emissions. On July 11, 1997 (62 *FR* 37183) the Agency made available to the public additional data on mercury emissions from the management of spent lamps. The information provided as part of the Notice of Data Availability consisted of an electronic model and a report that provide an assessment of mercury emissions from the management of hazardous waste lamps under different regulatory approaches. The final report, *Mercury Emissions From the Disposal of Fluorescent Lamps*,⁶ discusses the methodology, data and assumptions used in developing the Mercury Emissions Model. The report describes inputs used in the model for estimating potential mercury emissions during waste management and disposal activities (e.g., lamp properties, lamp disposal rates, and lamp mercury emissions rates from specific waste management practices).

The Agency does not believe that its proposed conditional exclusion approach would sufficiently protect human health and the environment. EPA gave considerable weight to actions that would minimize mercury emissions to the environment while encouraging the collection and environmentally-sound management of spent lamps. Based upon commenter input and additional information collected and reviewed by the Agency since the publication of the proposed rule, EPA decided to adopt the proposed universal waste approach for controlling potential risks from the management of spent hazardous waste lamps. Today's final rule adds hazardous waste lamps to the universal waste regulations under 40 CFR Part 273. The universal waste rule provides a reduced, or streamlined set of requirements (i.e., the universal waste rule is less stringent than Subtitle C management standards).

Source reduction, which is the reduction or elimination of the toxicity and/or volume of a waste product, is at the top of the EPA's hierarchy of solid waste management methods. The Agency encourages cost-effective source reduction of mercury contained in fluorescent lamps. Second on the hierarchy is recycling. Today's final rule will greatly facilitate the environmentally-sound collection and the proper recycling or treatment of hazardous waste lamps. Generators have several options with regard to waste management, but the ability to access large quantities of universal waste from central collection centers may encourage the development of safe and effective methods to recycle universal waste. Today's rule retains requirements for hazardous waste lamps to ultimately be managed in accordance with RCRA Subtitle C hazardous waste management requirements. This may provide incentives for lamp manufacturers to pursue additional source reduction efforts to reduce or eliminate the amount of mercury used in the manufacture of fluorescent tubes. If source reduction is pursued aggressively by the fluorescent lamp manufacturing industry, the overall contribution of mercury from fluorescent lamps to municipal solid waste could decrease over time.

Under today's rule, destination facilities (i.e., recycling facilities and treatment facilities) are subject to all Subtitle C management requirements applicable to hazardous waste treatment and storage facilities, although the Agency does not regulate the specific process of mercury

reclamation (or other reclamation processes) under federal law. However, EPA believes that state oversight is adequate to ensure that hazardous waste lamps are safely and legitimately recycled and the mercury reclaimed. State controls may include best management practices or other controls on the recycling process. In addition, recycling facilities (as well as downstream facilities that reuse the recycled products) must comply with all applicable Clean Air Act requirements and all applicable worker safety standards under the Occupational Safety and Health Administration (OSHA).

Residuals from recovery operations must also be managed in accordance with all applicable solid and hazardous waste management requirements. If residuals exhibit a characteristic of hazardous waste, they must be managed in accordance with all applicable hazardous waste management controls, including the requirements of 40 CFR Part 266, Subpart C, standards for recyclable materials used in a manner constituting disposal.