

Management Options for  
Mercury-Containing Lamps



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

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OFFICE OF  
SOLID WASTE AND EMERGENCY  
RESPONSE

**MEMORANDUM**

**SUBJECT:** Management Options for Mercury-containing Lamps

**FROM:** *Elizabeth A. Clotsworth*  
Michael Shapiro, Director  
Office of Solid Waste

**TO:** Waste Management Division Directors  
Regions 1 - 10

The Administrator has just signed a proposal on the management of mercury-containing lamps (e.g., fluorescent and high intensity discharge lamps). A prepublication copy of this notice is enclosed for your information and use as well as a copy of the fact sheet.

As you know, fluorescent and high intensity discharge lamps generally are considered hazardous waste because of their mercury content. Therefore, these lamps must be disposed of as hazardous waste (unless they are generated by households or conditionally exempt small quantity generators).

This proposed rule contains two options for the management of spent mercury-containing lamps (light bulbs). The first option is an exclusion for mercury-containing lamps from regulation as hazardous waste if disposed in municipal landfills that are permitted, licensed, or registered by states with EPA approved municipal solid waste landfill permit programs, or managed in State permitted, licensed, or registered reclamation facilities. The second option would add lamps to the Universal Waste Proposal (58 FR 8102, February 11, 1993), which would establish a streamlined, reduced regulatory management structure for certain widely-generated hazardous wastes. States would not be required to adopt either the exclusion or universal waste system if made final as both options would relax regulation over generators of hazardous waste.

We are considering these two options based on data that indicate these lamps may be safely managed outside of the hazardous waste system or within a reduced, regulatory structure within the hazardous waste system. In addition, fluorescent lamps, as well as other mercury-containing lamps, are used in energy conservation programs which encourage the installation of energy-efficient lighting. Energy-efficient lighting consumes less electricity, reducing the generation of pollution from power plants. The options in today's proposal may encourage participation in these energy conservation programs.



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If you need more specific, technical information or assistance, please contact Valerie Wilson at (202) 260-4678 or Greg Helms at (202) 260-6721. If you or your staff want additional copies of the notice, please call the RCRA Docket at (202) 260-9327. The general public can obtain copies by calling the RCRA Hotline at (800) 424-9346.

#### **Attachments**

cc: RCRA Branch Chiefs  
State Authorization Section Chiefs  
Permitting Section Chiefs  
ESD Laboratories  
RCRA Community Relations Coordinators

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Parts 261.4**

**[FRL-XXXXX]**

**[RIN 2050-AD93]**

**Hazardous Waste Management System; Modification of the Hazardous Waste Program; Mercury-Containing Lamps**

**AGENCY:** Environmental Protection Agency.

**ACTION:** Proposed Rule; Modification of the Hazardous Waste Program, Mercury-Containing Lamps .

**SUMMARY:** Mercury-containing lamps (light bulbs) may be hazardous waste under the Toxicity Characteristic Rule (codified at 40 CFR 261.24) issued under the Resource Conservation and Recovery Act (RCRA) and if so, must be managed as a hazardous waste, unless they are a household waste or are generated by an exempted small quantity generator. Mercury-containing lamps include fluorescent, high pressure sodium, mercury vapor and metal halide lamps. The Environmental Protection Agency (EPA) is today seeking comment on two alternative approaches for the management of mercury-containing lamps. First, EPA is seeking comment on whether an exclusion from regulation as hazardous waste is appropriate for mercury lamps, provided they are disposed in municipal landfills that are permitted by States/Tribes with EPA approved municipal solid waste (MSW) landfill permitting programs or managed in mercury reclamation facilities that are permitted, licensed or registered by States/Tribes. The second approach would add mercury lamps to EPA's Universal Waste Proposal (February 11, 1993, 58 FR 8102). The Universal Waste approach is

a streamlined, reduced regulatory structure, which is designed to address the management of certain widely generated wastes currently subject to full Subtitle C RCRA regulations.

Today's proposal presents management options that would be considered less stringent than the existing Federal regulations because they would exempt certain activities now within the purview of RCRA Subtitle C (hazardous waste management).

Therefore, States authorized under RCRA section 3006 to administer and enforce a hazardous waste system in lieu of the Federal program would be allowed flexibility in modifying their programs to adopt less stringent regulations regarding the management of mercury-containing lamps, should one of the proposed options be promulgated as a final rule.

**DATES:** Comments on this proposed rule must be submitted on or before (insert date 60 days after date of publication in the Federal Register).

**ADDRESSES:** Persons who wish to comment on this notice must provide an original and two copies of their comments, include the docket number (F-94-FLEP-FFFFF), and send them to EPA RCRA Docket (OS-305), U.S. EPA, 401 M Street S.W., Washington, D.C. 20460. The RCRA Docket is located at Room M2427, U.S. Environmental Protection Agency, 401 M Street S.W., Washington, D.C. 20460. The docket is open from 9:00 a.m. to 4:00 p.m., Monday through Friday, excluding Federal holidays. To review docket materials,

the public must make an appointment by calling (202) 260-9327. The public may copy a maximum of 100 pages from any regulatory docket at no cost. Additional copies cost \$0.15 per page.

**FOR FURTHER INFORMATION CONTACT:** For general information, contact the RCRA/Superfund Hotline toll free at (800) 424-9346. In the Washington, D.C. metropolitan area, call (703) 412-9810. For information regarding specific aspects of this notice, contact Valerie Wilson, Office of Solid Waste (mail code 5304), U.S. EPA, 401 M Street S.W., Washington, D.C. 20460, telephone (202) 260-4678.

## **SUPPLEMENTARY INFORMATION**

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## **I. Legal Authority**

These regulations would be promulgated under the authority of sections 1006, 2002(a), 3001-3007, 3010, 3013, 3016-3017, 3018 and 7004 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6905, 6912(a), 6921-6927, 6930, 6937-6938, 6939 and 6974 [commonly referred to as RCRA].

## **II. Background**

### **A. The Toxicity Characteristic**

Under section 3001 of the Resource, Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (EPA) is charged with defining which solid wastes are hazardous by identifying the characteristics of hazardous waste and by listing particular hazardous wastes. Toxicity is one of the four characteristics used by EPA to identify waste as hazardous (along with ignitability, corrosivity, and reactivity). EPA promulgated the Extraction Procedure Toxicity Characteristic (EPTC) on May 19, 1980. The EPTC regulated eight metals, four insecticides, and two herbicides. Section 3001(g) of RCRA, added by the Hazardous and Solid Waste Amendments (HSWA) of 1984, required EPA to revise the EPTC. On March 29, 1990 (55 FR 11798), the EPA promulgated the Toxicity Characteristic (TC) to revise the existing EPTC. Like the EPTC, the TC and its associated testing

methodology, the Toxicity Characteristic Leaching Procedure (TCLP) is used to define the toxicity of a waste by measuring the potential for the toxic constituents in the waste to leach out of an unlined municipal landfill into groundwater and contaminate drinking water wells at levels of health or environmental concern if not subject to Subtitle C controls. The TC implemented an improved leaching procedure that better predicts leaching and added several hazardous waste constituents. Twenty-five organic hazardous waste constituents were added to the TC and a model was developed to predict their fate and transport in the groundwater. If wastes exhibit the Toxicity Characteristic they are subject to the hazardous waste management requirements of RCRA Subtitle C.

As discussed in the preamble to the Toxicity Characteristic Rule (March 29, 1990, 55 FR 11813), the regulatory levels for the TC metals were not changed by the promulgation of the final TC rule. EPA retained the regulatory levels set by the EPTC rule, pending further study of the fate and transport of metals in groundwater.

The Agency is continuing longer-term developmental work on a metal speciation model, called MINTEQ, to be used to evaluate the fate and transport of the TC metals (including mercury) for purposes of reassessing the toxicity characteristic regulatory levels for the TC metals. EPA's preliminary analysis indicates that mercury that would leach out of landfills would not all

necessarily travel far enough through the groundwater to contaminate drinking water wells, depending on the distance to the well. A certain percent (still to be determined) will combine with other substances in the soil (via complexation, adsorption, etc.) to form solid substances and remain in the soil. Therefore, the regulatory limits for mercury if reassessed using the MINTEQA model, when completed, might be higher (less stringent) than the current limits because mercury may be less mobile than the current TC rule indicates. However, these studies are still ongoing (U.S. EPA, 1991b).

Available data (included in the docket for this proposal) indicate that as a result of the use of mercury in the production of fluorescent and high intensity discharge (HID) lamps, a relatively high percentage of these lamps, when spent, exhibit the characteristic of toxicity. (U.S. EPA, 1992a) However, all generators of spent lamps that exhibit the toxicity characteristic may not have to manage those lamps as hazardous waste. EPA has specified different requirements for generators of hazardous waste depending on the amount of hazardous waste generated per month. Conditionally-exempt small quantity generators (CESQG) generate less than 100 kilograms (kg) of hazardous waste each month and can send their waste to a hazardous waste facility, or may elect to send their wastes to a landfill or other facility approved by the State for industrial

or municipal non-hazardous wastes see 40 CFR part 261.5' Generators of more than 100 kg of hazardous waste per month are required to fully comply with Federal hazardous waste regulations (although generators of between 100 and 1000 kg of hazardous waste per month are subject to certain reduced regulatory requirements).

For the purposes of this proposal "electric lamp" also referred to as "lamp" is defined as the bulb or tube portion of a lighting device specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common electric lamps include but are not limited to, incandescent, fluorescent, high intensity discharge, and neon lamps. Also, a "mercury-containing lamp" is defined as an electric lamp in which mercury is purposely introduced by the manufacturer for the operation of the lamp. The Agency requests comment on whether the definitions of "lamp" and "mercury-containing lamp" are technically correct and on whether they accurately define the appropriate universe of items.

#### **B. Energy-Efficient Lighting Programs**

Today's proposal, which would reduce management requirements for lamps, is expected to support the efforts of many existing and planned energy conservation programs, which encourage the

installation of energy efficient lighting. Energy efficient lighting consumes less electricity, reducing the generation of pollution from power plants. However, replacing energy inefficient lighting systems with energy efficient lighting systems requires the use and eventual disposal of fluorescent and high intensity discharge (HID) lamps, which contain mercury. Requiring the disposal of lamp wastes as hazardous waste, under full Subtitle C regulations, may discourage participation in energy efficient lighting programs. The Agency anticipates that either of the proposed actions will encourage participation in energy-efficient lighting programs, and will therefore promote the energy-efficiency and the environmental benefits derived from that program.

If energy-efficient lighting were used wherever it is profitable, the nation's demand for electricity could be cut by more than 10 percent. This would result in reductions of estimated annual carbon dioxide emissions of 202 million metric tons (4 percent of the national total), reductions of annual sulfur dioxide emissions of 1.3 million metric tons (7 percent of the national total), and reductions of annual nitrogen oxide emissions of 600,000 metric tons (4 percent of the national total). (U.S. EPA, 1992b)

In 1991, EPA initiated a voluntary energy conservation program called "Green Lights" to encourage pollution prevention

through energy efficient lighting. Lighting accounts for 20-25 percent of electricity used annually in the U.S. Lighting for industry, businesses, offices, and warehouses represents 80-90 percent of total lighting electricity use. Available technologies in energy efficient lighting can reduce lighting electricity demand by over 50 percent, enabling power plants to generate less electricity and burn less fuel. It also reduces other types of pollution resulting from mining and transporting power plant fuels and disposing of power plant wastes (U.S. EPA, 1992b). In addition, electric utilities, when burning fossil fuels, emit mercury at a rate of 0.0428 mg/kWh sold, on a national average. Full implementation of Green Lights is estimated to reduce the emission by 9.7 Mg of mercury by the year 2000 (U.S. EPA, 1992b). Further, the energy-efficient fluorescent lamps, used by Green Lights and other energy conservation programs, contain less mercury than energy-inefficient fluorescent lamps.

A goal of Green Lights is to encourage the widespread use of efficient lighting technologies to reduce air pollution from coal combustion. Energy-efficient lighting technologies provide excellent investment opportunities. A typical lighting upgrade yields an internal rate of return of 20-30 percent and a payback of 3-4 years.

Green Lights participants include: corporations; State, city, and county governments; lighting manufacturing and management companies; electric utilities; non-profit organizations; and hospitals, universities, and other businesses throughout the U.S. Green Lights encourages the establishment of comprehensive energy-efficient lighting programs within an organization that include: converting from less-efficient fluorescent to more-efficient fluorescent lamps; converting from incandescent to compact fluorescent lamps; converting from magnetic to electronic lighting ballasts; installing occupancy sensors, daylight dimmers, and other lighting control technologies; installing more efficient luminaries or lighting fixtures; and efficient maintenance practices, such as group relamping and regular fixture cleaning.

By signing a partnership agreement with the EPA, Green Lights participants agree to survey and upgrade, within 5 years, 90 percent of all domestic facilities wherever profitable and wherever lighting quality is improved or maintained. In return, these participants should receive reductions (savings) in their monthly energy expenses. A good energy-efficient lighting upgrade typically includes some type of control strategy (such as occupancy sensors) that will reduce lamp burning hours. The result is that the lamp will last longer and need to be replaced less frequently. As of June 30, 1993, over 1,000 organizations

have joined the Green Lights program. These organizations have committed over 3.5 billion square feet of facility space to the program.

The Green Lights Program encourages the use of energy-efficient lamps using an initial and scheduled periodic relampings to achieve higher energy efficiency and reduce energy costs. These relampings involve removal and replacement of all lamps in a building or in an area at one time, as opposed to replacement of lamps as they burn out. An initial lighting upgrade and group relamping may result in a large number of fluorescent lamps that require disposal. In some instances, a participant that would usually be a conditionally exempt small quantity generator, could become a large quantity generator of hazardous waste due to the large number of lamps generated in one month. In general, if a generator disposes of more than approximately 350 four foot fluorescent lamps, that generator is a large quantity generator due to lamps alone.

Despite the environmental and financial benefits of energy efficient lighting systems, there are disincentives to participating in an energy conservation program like Green Lights. Establishing a comprehensive energy-efficient lighting program and installing energy-efficient lighting technologies require an initial investment that may be significant, depending on the size and comprehensiveness of the project. Although Green

Lights provides information to participants on financing options, many profitable lighting upgrade projects are delayed due to restricted availability of capital. It is especially difficult for smaller businesses and government organizations to raise the necessary capital, although energy-efficient lighting investments are low risk and in the long run will reduce costs. The additional costs associated with managing, transporting, and disposing of lighting wastes as hazardous wastes can create an additional disincentive to join Green Lights and make the initial investment in energy-efficient light technologies. For example, under the hazardous waste regulations, large quantity generators are required to label boxes and drums, notify EPA of status as a hazardous waste generator, transport waste via a hazardous waste transporter, manage waste consistent with the land disposal restrictions, and manage waste at a hazardous waste management facility. In addition, on May 8, 1994, generators of mercury-containing lamps will be required (under the Land Disposal Restrictions) to meet a treatment standard for lamps as hazardous debris. As is discussed in detail in Section VII, Economic Impact Analysis, of this preamble, the Agency estimates that the annual national cost of Subtitle C compliance for large quantity generators could range from 110 to 134 million dollars. EPA's preliminary estimates suggest that an exclusion would save generators of mercury containing lamps approximately 85 to 102

million dollars annually, while the inclusion of lamps in the universal waste management system would save generators approximately 16 to 20 million dollars annually

Although the Green Lights program may increase the number of large quantity generators on months when mass relamping occurs, the program is not expected to increase the total quantity of used fluorescent lamps in the long run. The lamps recommended by the Green Lights program are more energy efficient and with implementation of energy saving practices, these lamps could have an extended life of four to five years rather than the average three to four years. Therefore, if by reducing the initial costs of participation in the Green Lights program, generators participate in the Green Lights Program, an energy savings will occur. These additional energy savings will decrease the amount of mercury and other pollutants emitted to in the atmosphere from coal-burning.

#### *C. Industry Source Reduction Initiatives*

A report, "The Management of Spent Electric Lamps Containing Mercury," by the National Electrical Manufacturers Association (NEMA, 1992) discussed industry efforts to reduce mercury in fluorescent lamps. According to the report, due to the use of more efficient dosing techniques (i.e., placing mercury in the lamp), the average mercury content of a standard 4-foot, 1-1/2 inch diameter, cool white fluorescent lamp was reduced by 14%

(48.2 mg/lamp to 41.6 mg/lamp) from 1985 to 1990. Future industry projections of mercury reductions by 1995 show an estimated 35% further reduction (41.6 mg/lamp to 27.0 mg/lamp) for the standard fluorescent lamp.

Source reduction, which is the reduction or elimination of the toxicity and/or volume of a waste product, is at the top of EPA's hierarchy of municipal solid waste (MSW) management methods. With regard to mercury, the most significant source reduction achievement has been the trend toward elimination of mercury from alkaline batteries. Although these batteries are still a significant contributor of mercury to municipal solid waste, discards of mercury from alkaline batteries are dropping dramatically because of source reduction achievement. Mercury-containing lamps are one of the next highest single sources of mercury in the municipal solid waste, accounting for 3.8% of mercury now going to MSW landfills. EPA encourages cost-effective source reduction of mercury in fluorescent lamps. Opportunities exist to reduce mercury content levels in both standard 4-foot fluorescent lamps and the increasingly popular compact fluorescent lamps (U.S. EPA, 1993b). 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 remain constant or decrease over time even as fluorescent lamp usage increases.

EPA requests comment on industry and other source reduction initiatives involving the reduction of mercury in fluorescent lamps. Source reduction may be occurring through more efficient dosing techniques, lightweighting of lamps, and changes in phosphor powder technology. The Agency requests comments reflecting these and any other source reduction activities and may use this information to develop a strategy to support and encourage voluntary source reduction.

### **III. Environmental Release and Fate**

This section presents the technical information used by the Agency in developing options for the management of used mercury-containing lamps. Information is provided on the environmental fate and transport in the ground water and air pathway for mercury. Specifically, EPA has reviewed leachate data from municipal landfills and data on air emissions from municipal waste combustors and municipal landfills. In addition, the Agency has estimated possible releases of mercury to the air from lamps broken during storage and transportation. Most of the information considered pertains to management in municipal landfills. Information on other types of non-hazardous landfills is not presented due to a lack of data and the wide variability in design and waste composition of other non-hazardous landfills.

The Agency requests comment on the data presented in this section of the preamble. These data, along with any data submitted in the public comment to this proposal, will be used to determine the risk to human health and the environment from the management of used mercury-containing lamps. Also, some information on the risks of managing mercury-containing lamps in landfills, combustors and recovery facilities was submitted to the Agency in response to a request for such information in the Universal Waste Proposal (58 FR 8102). This information is included in the rulemaking docket for today's proposal and the Agency requests comment on it.

*A. Groundwater Impacts*

This section discusses leachate samples collected by EPA from municipal landfills. As previously discussed, the Agency is further developing its groundwater model under the TC to accurately predict the movement of mercury through the groundwater system. The groundwater pathway for mercury is being considered because the TC uses the groundwater pathway to estimate the movement of contaminants from municipal landfills. The leachate data indicate that further analysis may be needed on the behavior and movement of mercury in municipal landfills and in groundwater, although initial analyses indicate that mercury is less mobile than previously believed.

EPA has collected data indicating that mercury may not leach from MSW landfills at levels above the drinking water MCL, despite some mercury disposal in MSW landfills. EPA estimates that approximately 73% of municipal solid waste (MSW) is placed in municipal landfills, while 14% of municipal solid waste is incinerated and 13% is recycled. Based on a study of mercury production and use, the Agency estimates that about 643 metric tons (Mg) of mercury is discarded in MSW landfills per year. A major source of mercury in municipal solid waste is household batteries which accounts for about 88% of the 565 metric tons (Mg) of mercury in municipal solid waste. Most of these batteries fall under the Household Waste Exclusion (see 45 FR 33119, May 19, 1980). Thermostats/thermometers and mercury-containing lamps are second in their contribution of mercury in municipal solid waste, 3.9% and 3.8% respectively. The Agency estimates that, assuming all lamps are disposed of in MSW landfills, approximately 20 Mg of mercury would be placed in MSW landfills per year from used mercury-containing lamps. (U.S. EPA, 1991c).

Data on the amounts of mercury in MSW landfill leachate are included in a study summarizing the available data on MSW landfill leachate characteristics conducted by the Office of Solid Waste (U.S. EPA, 1988). Out of 109 leachate mercury analyses collected, only six (7 percent) were above the drinking

water level or maximum contaminant level (MCL) for mercury (0.002 mg/L) and none were above the Toxicity Characteristic (TC) limit for mercury (0.2 mg/L). The average of these MSW leachate analyses was 0.0008 mg/L mercury. The maximum concentration reported is 0.0098 mg/L.

Further analysis indicates that less than 0.01 percent of the mercury in MSW landfills leaches from the landfill. This estimate is supported by a study measuring mercury disposition (in landfill gas and leachate) in four Swiss landfills which found around .007 percent of the mercury from the landfill in the leachate (Baccini et al., 1987).

The behavior of mercury in a MSW landfill is not known in great detail. The complexity of aqueous mercury chemistry makes it difficult to predict and model at this time. However, the available information suggests that chemical conditions tend to favor the metallic form of mercury in MSW landfills. This form has a lower solubility in water (0.02 - 0.04 mg/L) than other chemical forms. In addition, EPA has identified studies that indicate that municipal solid waste has a significant capacity for retaining mercury in the landfill unless there are unusually large quantities of mercury in municipal solid waste (Gould et al., 1988/Mennerich, 1985). The Agency has not seen field data for industrial non-hazardous landfills.

In addition, the Agency reviewed 1990 and 1991 Superfund Records of Decision (RODs) for information on municipal landfill sites where mercury was listed as a contaminant of concern (COC). A total of twelve out of sixty-six 1990 and 1991 RODs for landfills accepting municipal waste listed mercury as a COC. Of these 12 sites, 5 had mercury detections in ground-water over the MCL. All but one of these sites had confirmed industrial waste codisposal. At this site only onsite ground-water exceeded the MCL for mercury (maximum of 0.013 mg/L); all offsite ground-water samples were below detection limits.

In conclusion, preliminary data and analysis suggest at this time that mercury in municipal solid wastes is not being readily released by leaching processes that typically occur in the MSW landfill environment. This indication is also supported by controlled leaching studies of high-concentration mercury-containing wastes codisposed with municipal solid waste (Borden et al., 1990/Gould et al., 1988). However, the Agency requests that commenters provide any MSW landfill leachate or groundwater data, or data from industrial Subtitle D landfills, that EPA has not considered in its analysis.

#### **B. Air Exposure**

The Agency is also reviewing data on the air pathway for mercury because low levels of mercury in surface water have

caused elevated fish concentrations at many sites in Minnesota, Michigan, Wisconsin, Florida, and other States, and these elevated levels of mercury have been attributed to atmospheric deposition from non-specific sources (U.S. EPA, 1993a). Therefore, EPA reviewed data on mercury emissions to air from a number of sources, including those potentially related to lamp disposal. EPA also considered available data on the fate and transport of mercury of mercury emitted to the air.

Because of elemental mercury's high vapor pressure, it is easily volatilized into the atmosphere. Two factors are believed to contribute to the recent increases in atmospheric deposition of mercury compounds. The first factor is increased atmospheric levels from mercury emissions from coal-fired power plants, chloralkali plants, MWC facilities, and other sources. The second factor is increased oxidation of atmospheric elemental mercury vapor to more soluble oxidized forms which is enhanced by anthropogenic (i.e., pollution from man-made sources) increases in atmospheric oxidizing agents, such as ozone and inorganic acids. Based on current mercury emissions inventories EPA believes that major mercury emission source categories include coal fired power plants, municipal waste combustors and medical waste combustors. (U.S. EPA, 1993)

Mercury that is methylated is strongly biomagnified through the food chain through bioconcentration in animals, and in plant

tissue. Methylation is a chemical process in which a methyl unit is added to either elemental or oxidized mercury. The primary environmental human exposure pathway for mercury is through the consumption of contaminated fish. Fish bioconcentration factors (fish tissue concentration/water concentration) are as high as 85,000. Recently, elevated levels of mercury in fish in isolated, pristine lakes have been identified in widespread areas around the country. There are currently over 1,550 fish consumption bans or advisories due to mercury in effect in the United States (Sorensen et al, 1990).

Although there may be insufficient data to determine whether mercury from lamps will endanger human health and environment by the release of mercury to the air, there are concerns over emissions of mercury from lamps from municipal waste combustors, possibly landfill gas, as well as concerns with the handling and disposal of mercury lamps. In this section, available information will be discussed pertaining to the hazards of mercury via air exposure.

#### 1) Incineration

The Agency estimates that approximately 14% of U.S. municipal solid waste is burned in municipal waste combustors (MWCs), comprising 23 million metric tons (Mg) of waste. Approximately 100 Mg of mercury-containing waste is burned in

municipal waste combustors, of which about 3 Mg/yr is mercury-containing lamps (U.S. EPA, 1990). Because of its low boiling point, elemental mercury in the waste is largely vaporized during municipal waste combustion and, without controls specific to mercury, passes out of the municipal waste combustor into the atmosphere with the flue gas. Measurements have shown that for several municipal waste combustors with emissions controls for sulfur and nitrogen oxide particulates, average MWC mercury emission factors range from 70 to 90 percent of the mercury input (Vogg et al, 1986/Reiman, 1989). If we assume that 98% of the mercury in incinerated municipal solid waste is volatilized during combustion this would potentially generate 98 Mg/year mercury emissions of this, about 2.9 Mg/year would be from mercury-containing lamps. Post-combustion mercury control at the municipal waste combustor's would reduce mercury levels by 80% to 90%.

EPA plans to propose mercury emission limits for new and existing municipal waste combustors in 1994 (U.S. EPA, 1991a). The mercury emission limits will be based on the use of activated carbon injection for mercury control as demonstrated by EPA at tests at the Stanislaus municipal waste combustor (California) and Camden municipal waste combustor (New Jersey). These tests demonstrated activated carbon injection technology as available for post-combustion mercury control at municipal waste combustors

and achieved mercury reduction levels of 80 to 90 percent. During the tests, activated carbon was injected into the flue gases upstream of the acid gas control system and collected (with the mercury) in the particulate matter control system. The ash from the particulate matter control system was then landfilled.

It is unclear to what degree the mercury being released from municipal waste combustors would contribute to increased mercury levels in surface waters because the transport and cycling of atmospheric mercury emissions are complex and poorly understood. It is uncertain how long mercury will stay in the atmosphere after being released. The oxidation state of mercury dictates how long it remains in the air. Elemental mercury could stay in the atmosphere for months to years, whereas an oxidized species of mercury would stay for only days to weeks. Although controversy remains over the form of mercury as it leaves the MWC stack, it is likely that mercury from a municipal waste combustor would be more oxidized and therefore would not remain in the atmosphere for a long period of time.

However, since MWC facilities comprise one anthropogenic source of atmospheric mercury, there are probably regional-scale or global-scale impacts from such sources (Glass et al., 1986/Johnson, 1987). The elimination of mercury-containing lamps from municipal waste combustors would reduce annual atmospheric mercury emissions from these significant sources by around 3

metric tons, or about 3 percent of the total mercury-bearing waste that is incinerated. The Agency is considering proposing air emission controls for mercury later this year which would, when implemented, reduce these emissions.

## 2) Mercury in Landfill Gas

EPA evaluated emissions of mercury in landfill gas emission in its "Preliminary Risk Assessment" which is available in the public docket (EPA, 1993). EPA reviewed studies on the amount of mercury that may be released to the air from municipal solid waste landfills. Specifically, this section presents in detail the results of two studies that attempt to measure mercury air releases.

A Swiss study (Baccini et al., 1987) measured the amount of landfill gas from four municipal landfills. This study is comparable to municipal solid waste landfills in the U.S. because the study indicated that these Swiss MSW landfills contained approximately 2 parts per million (ppm) of mercury, which, given the standard error range, is comparable to the approximately 3.6 ppm of mercury in U.S. municipal solid waste (U.S. EPA, 1990). The Swiss study indicated that mercury concentrations in landfill gases had a mean value of about 0.4  $\mu\text{g}/\text{cubic meter}$ . The annual total mercury release also was low (0.0065 mg/Mg waste, average). Using this gas release value, and the amount of municipal solid waste annually disposed in U.S. landfills (118 million Mg), the

amount of mercury annually released in landfill gas can be estimated as 0.8 kg, about 0.0001 percent of the total mercury load entering MSW landfills (643 Mg). Adjusting the proportion of total mercury contributed by mercury-containing lamps to the MSW stream (3.8 percent), provides an estimate of annual landfill gas emissions from lamps of about 0.03 kg, less than 0.00001 percent of the total municipal solid waste mercury input (EPA, 1993). The amount of mercury from lamps emitted into the atmosphere by landfill gas is very small (.00003 Mg) when compared to the 3 Mg of mercury from lamps that is estimated to be emitted into the atmosphere through municipal waste combustors.

EPA also received a study (National Environmental Protection Board et al., 1989) in a comment to the Universal Waste Proposal that provided data on mercury gas from four municipal landfills in Sweden. The Swedish study measured the ambient air quality above four municipal landfills. The study did not indicate the level of mercury in the municipal landfills. Mercury was measured using differential optical adsorption spectroscopy (DOAS), located two meters above the landfill, compared with background mercury concentrations measured at each of the four landfills. The mean ranged from 10.2 ng/m<sup>3</sup> to 23.6 ng/m<sup>3</sup> with background mercury levels at 4 ng/m<sup>3</sup> to 3ng/m<sup>3</sup>. The report stated that because all measurements were close to the detection

limit for the DOAS technique, the reliability of the results was questioned. After a review, it was determined that although the quantification was uncertain because of a low signal-to-noise ratio, the concentration above the landfills was significantly above background mercury levels, indicating that mercury was being released to the atmosphere. However, since it is unknown how much mercury is found in Swedish municipal solid waste landfills, the results of this study cannot be readily compared to the situation in the U.S.

### 3) Crushing and Breakage of Lamps

Mercury remains in lamps until they are broken. When lamps break, the elemental mercury inside becomes available for evaporation, adsorption, or reaction. EPA modeled mercury emissions from broken lamps based on two different methods of transportation (EPA, 1993). Discarded lamps may be transported in one of two ways: in refuse trucks as household or commercial trash, and in closed vans or trailers as part of a bulk relamping program. Based on available information, it was assumed for the purposes of this model that as much as 6.6% of mercury could be released in the air from a lamp broken during the collection, storage and transport of mercury-containing lamps in garbage trucks. The Agency recognizes that it is uncertain how much mercury is released from broken lamps. The amount of mercury released would vary depending on the ambient air temperature, the

time the broken lamps are directly exposed to the air and the number of lamps broken. The Agency requests any available data concerning releases of mercury during storage, transportation and waste management (e.g., landfill and recyclers, activities).

### *C. Technical Considerations and Request for Comments*

The available data on landfill leachate suggests that mercury-containing lamps may not pose a threat to groundwater when placed in a state-controlled municipal landfill due to the low levels of mercury found in landfill leachate.

However, available information also indicates that an important route of exposure for mercury is bioaccumulation up the food chain, causing mercury poisoning to both wildlife and humans (i.e., through fish consumption). Although it is unclear how mercury moves through the atmosphere and what conditions enhance or retard it, information suggests that given the high vapor pressure of mercury, it can readily volatilize to the air and be transported, perhaps long distances, and be deposited on surface water or soil (which can run off into surface water). Some mercury that is subsequently methylated will bioaccumulate in the food chain.

The actual amount of mercury released from fluorescent or HID lamps is unknown. It is estimated that lamps that are incinerated will release 98% of their mercury due to the high

temperatures needed for the incineration process. However, because mercury is such a volatile metal, amounts of mercury could be released into the air from lamps broken during transportation or lamps broken at the landfill. For purposes of this proposal, EPA has made assumptions on the amount of mercury that may be released from a broken lamp but few studies have directly measured the amount of mercury released from a lamp over time.

More information on the air release, transport and exposure pathway for mercury is needed in order to better evaluate the proper management methods for spent mercury-containing lamps. The Agency requests information on air transport of mercury from mercury-containing lamps, the mercury methylation process (both in general and in landfills) and any studies that directly measure the amount and form of mercury released from broken mercury-containing lamps.

#### **IV. Management Options**

The information presented in this notice has led the Agency to re-evaluate the management of waste mercury-containing lamps because of their importance in promoting energy-efficiency. As mentioned earlier in this notice, the use of energy-efficient lighting can reduce mercury emissions from coal-burning power plants as well as emissions of carbon dioxide and sulfur oxide.

In light of the benefits derived from the use of these lamps, EPA is seeking comment on two proposed options based the data which indicate that these lamps may be better managed either outside of the hazardous waste system or in a reduced regulatory structure within the hazardous waste system.

However, since there remain uncertainties in the data, more information on the air exposure pathway for mercury from lamps would facilitate a decision by EPA on the management of lamps. Additional information could clarify which kind of reduced management structure would be most appropriate for mercury-containing lamps. The Agency has requested that information, if available, be submitted with the public comment to this proposal.

Given these technical uncertainties, EPA has developed two proposed alternative approaches for the management of mercury-containing lamps. The first approach is a conditional exclusion for mercury-containing lamps from regulation as hazardous waste. Under this approach, mercury-containing lamps would no longer be considered hazardous waste provided that they are managed under the conditions of the exclusion. The second approach is to add mercury-containing lamps to the universal waste management system, which was proposed for batteries and pesticides on February 11, 1993 (58 FR 8102). Under the universal waste management system, lamps that fail the TC would be considered hazardous waste, but they would be subject to streamlined

hazardous waste management requirements, which are described in detail later in this notice. The major difference between these two options is whether lamps are disposed of under Subtitle D requirements or under Subtitle C requirements. Recycling of lamps would be allowed under either option.

If EPA concludes, after considering data from the public comment on this proposal, that the risk from mercury release from mercury-containing lamps is not significant enough to warrant Subtitle C regulation, the Agency may choose to finalize a conditional exclusion. However, if EPA concludes, after considering data received in public comment that the risk from mercury release from lamps is significant, the Agency may choose to keep mercury-containing lamps in Subtitle C, under the universal waste management system.

The following sections describe the two approaches in detail.

#### A. Conditional Exclusion

Section 3001 of RCRA charges EPA with identifying the characteristics of hazardous waste and listing particular hazardous wastes. Section 1004(5) of RCRA defines waste as "hazardous" if the waste poses a "substantial present or potential hazard" to human health or the environment when improperly managed. The groundwater data discussed earlier in this notice suggest that mercury-bearing lamps, if they are

disposed of according to the conditions of the proposed exclusion, may not pose a substantial present or future threat to human health or the environment. Based on the Agency's authority to identify characteristics of hazardous waste and the statutory definition of hazardous waste, EPA is considering whether an exclusion of used mercury-containing lamps from regulation as hazardous waste would be appropriate. EPA requests comment on the data presented in the proposal, as well as on whether to exclude these lamps from regulation as hazardous waste.

The exclusion under consideration today has two conditions. In order to qualify for the exclusion:

- (1) (a) generators would be required to either dispose of these lamps in a municipal solid waste landfill that is permitted by a State/Tribe with an EPA-approved MSW permitting program, or
- (b) if generators do not send these lamps to a MSW landfill, they would send them to a State permitted, licensed, or registered mercury reclamation facility; and
- (2) generators would be required to keep a record of the lamps shipped to management facilities.

The Agency is proposing to limit the exclusion to spent lamps disposed in MSW landfills (requirements of MSW landfills are discussed later in this section), rather than allowing

disposal in any nonhazardous waste landfill, because EPA has field data on leachate (including mercury levels) only for MSW landfills (among Subtitle D facility categories). The available information (discussed above) suggests that the amount of mercury from mercury-containing lamps that is released from MSW landfill gas is very small and its effect on ambient air quality may not pose a significant hazard to human health or the environment. EPA requests any information on the levels and impacts of mercury in MSW landfill gas. Further, data on leachate quality and air emissions from other nonhazardous waste landfills, including industrial solid waste landfills, is very limited. However, some soil column data also suggest that mercury dissolution into soil pore water occurs at very low levels (Eichholz et al., 1986). EPA requests comment on this approach and any information on mercury releases from other nonhazardous waste landfills. Based on EPA's existing data and any additional data received, EPA may expand the exclusion to include disposal in non-municipal, solid waste, Subtitle D disposal facilities.

While this proposed exclusion from Subtitle C of RCRA is supported by data from municipal solid waste landfills with a range of design and operating conditions, EPA believes that limiting the exclusion to spent lamps disposed only in MSW landfills that are permitted by States or Tribes with EPA-approved MSW landfill permitting programs will provide further

assurance that human health and the environment will be protected. In particular, these MSW landfill permitting controls will provide added protection to the management of these lands

In October 1991, EPA promulgated new requirements for municipal solid waste landfills (40 CFR Part 258, October 9, 1991, 56 FR 51016). These requirements cover location restrictions, landfill design and operations, groundwater monitoring, corrective action measures, financial assurance, and conditions for closing the landfill and post closure care. The majority of landfill owners/operators accepting greater than 100 tons per day must comply with the majority of the requirements by October 9, 1993. On October 1, 1993 (58 FR 51536), EPA delayed the October 9, 1993 effective date for six months for landfills accepting less than 100 tons per day (in addition to other criteria) and delayed the effective date for two years for landfills in arid or remote regions that accept less than 20 tons per day.

States, tribes are in the process of incorporating these new municipal solid waste landfill standards into their permitting programs and applying for EPA approval of their permitting programs. EPA is currently evaluating these State permitting programs to determine their adequacy in incorporating the new municipal solid waste landfill criteria (40 CFR part 258). As of June 30, 1993, EPA approved thirty-six State municipal solid

waste landfill programs. In addition, EPA is actively reviewing numerous State permitting program applications and expects to approve the remaining State landfill permitting programs by April 1994, well before this proposed rule would become effective as a final rule. EPA expects to issue "partial" program approvals to some States because their landfill permitting programs may not fully address all elements of the EPA municipal solid waste landfill criteria. For purposes of today's rule, EPA would consider "partial" program approvals, as well as "full" program approvals, to be "EPA-approved" State municipal solid waste landfill permitting programs. Further, States with "partial" approval have agreed to an EPA approved schedule for full approval. The Agency believes that limiting today's proposed exclusion to landfills that are permitted by States that have incorporated EPA's new municipal landfill standards will provide further assurance that spent lamps will be safely managed in municipal solid waste landfills. EPA requests comment on this approach and any alternative approaches.

The second condition, which limits the proposed exclusion to lamps managed in State permitted, licensed, or registered mercury reclamation facilities, is also consistent with the Agency's support for environmentally sound reclamation of waste. EPA believes that with adequate State oversight, mercury containing lamps can be safely recycled and the mercury reclaimed from them.

However, EPA is concerned that, in States without oversight over recyclers, recycling activities could pose a threat to human health and the environment because of inadequate or non-existent waste management controls. Therefore, the Agency is requesting information on recycling operations and practices. EPA is aware that several technologies are available to recycle lamps and recover mercury from them. However, the Agency does not have complete information on which technologies are currently being used by recycling companies and if these technologies can address all different kinds of lamps (e.g., tube, U-shaped, compact, etc.). The Agency also seeks information that tracks mercury as it moves through the recycling process. Further, EPA would like to know the operating capacity of existing or planned recyclers of mercury-containing lamps. The Agency is also requesting information on what markets exist for the mercury and other materials recovered from lamps. This information will be useful to the Agency in understanding and assessing possible risks to human health and the environment as well as to determine the potential or actual use of the materials recovered from lamps in the market.

Under the conditional exclusion, regulated lamp generators (i.e., those that generate more than the conditional-exempt small quantity generator (CESQG) limit of 100 kilograms of hazardous waste per month which would be about 350 mercury-containing

lamps) would not be able to send lamps to a municipal waste combustor for disposal. EPA does not propose to extend the exclusion to lamps disposed in municipal waste combustors because of concern over mercury air emissions from these sources. However, this proposed option would not affect municipal waste combustors' ability to continue the combustion of traditional municipal solid waste which contains limited quantities of unregulated household or CESQG mercury-containing lamps. Because mercury-containing lamps do not burn, it is unlikely that truck loads of mercury-containing lamps (i.e., containing more than 350 lamps) would have been acceptable to most operators. The exclusion would assure that this disposal alternative is not considered in any situation. The Agency requests comment on the proposal to limit the exclusion to permitted municipal solid waste landfills (i.e., regulated lamp generators would not be allowed to send lamps to a municipal waste combustor for disposal).

EPA also requests comment on adding to the exclusion handling requirements to minimize mercury emissions during storage and transportation (e.g., packaging to reduce breakage). These management controls could be the same as those proposed in the universal waste management system. The Agency is interested in data on the cost of and human health protection provided by these handling requirements for lamps.

The third condition is that generators taking advantage of the exclusion would be required to maintain a written certification indicating the disposal or recycling location for the lamps. The proposed certification, to be signed by the generator or its authorized representative, would state that on a specified date a specified amount of lamps was consigned to a specified transporter for disposal or recycling at a specified facility. This certification would be required for each shipment of lamps and would be maintained by the generator for three years from the date of shipment. The Agency is proposing this documentation as a mechanism for verifying that the conditions of the exclusion have been met. Failure to maintain the required documentation would disqualify the generator from eligibility for the exclusion. The existence of the certification, however, would not protect a generator from an enforcement action if the lamps were not actually disposed of or recycled in accordance with the conditions.

The Agency is proposing that separate documentation be required for each shipment based on its belief that most lamp generation is sporadic (every three to four years), as opposed to on-going generation which would lead to a continuous relationship with the same disposal or recycling facility. Given that the life span of mercury-containing lamps is approximately three to four years, businesses that participate in mass relampings would

only dispose of their lamps every few years. Under the current hazardous waste regulations, many of these businesses would be subject to hazardous waste regulation because mass relamping could cause them to exceed the conditionally-exempt small quantity generator level (approximately 350 four foot lamps, if lamps are the only hazardous waste generated). However, small businesses and other facilities that generate just under the CESQG limit of hazardous waste (100 kg per month) may exceed this limit with attrition relamping. For these generators, this recordkeeping requirement could be more burdensome. The Agency requests comments on whether there are alternative mechanisms that can be used by generators to demonstrate compliance with the conditions of the exclusion. The Agency also requests comment on whether, if the Agency determines that documentation is necessary to demonstrate compliance with the conditions, the form and frequency of documentation proposed are appropriate.

In addition to requesting comment on the conditions of the exclusion, the Agency requests comment on having a 3 to 5 year sunset provision on the exclusion. A sunset provision would require the Agency to re-evaluate the exclusion after a period of three to five years, to determine whether an exclusion is indeed appropriate for lamps given any unanticipated management or risk issues that develop as a result of the exclusion. The Agency would then determine whether to extend the exclusion.

Finally, the Agency requests comments on other alternatives that still achieve the overall RCRA goal of protection of human health and the environment. EPA is interested in data on the benefits, costs, and legal authority for any alternatives and the Agency will consider such options.

## *B. Universal Waste Management System*

### *1. Background*

On February 11, 1993, EPA proposed a streamlined, reduced regulatory management structure for certain widely-generated hazardous wastes currently subject to full RCRA Subtitle C regulation, in an effort to facilitate their collection and proper management (the "universal wastes" proposal, 58 FR 8102). The proposed reduced regulatory structure, known as a special collection system, is designed to ensure that management of these hazardous wastes is conducted in a manner that is protective of human health and the environment, given the diffuse and diverse population of generators of these wastes. See the February 11, 1993 preamble discussion, for a detailed discussion of the proposal.

The general waste types that EPA believes may be appropriately managed under this streamlined regulatory structure

are known as "universal wastes" and share several characteristics. These wastes:

- are frequently generated in a wide variety of settings other than the industrial settings usually associated with hazardous wastes;
- are generated by a vast community, the size of which poses implementation difficulties for both those who are regulated and the regulatory agencies charged with implementing the hazardous waste program; and
- may be present in significant volumes in the municipal waste stream.

The February 11, 1993, proposal included specific regulatory text addressing the management of two waste types; hazardous waste batteries, and suspended and/or canceled hazardous waste pesticides that are recalled. The proposal also included a petition process and a set of criteria to be used to determine whether it would be appropriate to add additional waste types to the special collection system in the future. Several waste types such as automotive antifreeze, paint application wastes, and mercury-containing items such as thermostats and thermometers were discussed as possible additions to the Universal Waste proposal, also referred to as the special collection system.

## 2. Universal Waste System Alternative for Lamps

In the February 11, 1993, proposal EPA mentioned fluorescent lamps (58 FR 8110), explaining that the Agency was examining the risks of managing these wastes in landfills and requesting data

on the risks of various management methods for these wastes. Comments received in response to that request are included in the docket for this proposal. The Agency will respond to these comments in the final rule together with those submitted in response to Today's proposal. The Agency is requesting comment on using the proposed special collection system for the management of spent lamps as another approach to the management of mercury-containing lamps. The Agency has not yet promulgated a final universal waste rule but anticipates doing so in the near future. Should EPA select the universal waste option for lamps as a final rule, the Agency will ensure consistency with the more comprehensive universal waste final rule.

The Agency believes that spent lamps may appropriately be considered "universal wastes" in that they are generated in a wide variety of settings, are generated by a very large number of generators, and are present in significant volumes in the municipal waste stream. The special collection system approach may be an appropriate option for addressing the collection phase of managing lamps that are hazardous waste. The special collection system approach (which is consistent with the February 11, 1993 proposal), would not change any of the requirements applicable to the ultimate treatment and disposal or recycling of any wastes collected, but would minimize the regulatory requirements applicable to collection of these wastes (i.e.,

generation, transportation, and intermediate storage/consolidation) for proper management.

Special collection system regulations also could remove some existing barriers to management of hazardous waste lamps under the Subtitle C system by reducing the technical and paperwork requirements applicable to collection, thus making collection more efficient and economical. At the same time, management requirements included in special collection system regulations could be designed to minimize the hazards posed in collection of these wastes (e.g., special packaging could be required to minimize the risk of breakage).

By removing some of the barriers to Subtitle C management for lamps, a special collection system approach could minimize concerns about decreased participation in the Green Lights program by simplifying and clarifying the requirements for mercury-containing lamp collection while maintaining Subtitle C control over final treatment and disposal (or recycling) for these lamps. Such an approach could help in assuring that the substantial environmental benefits offered by the Green Lights program are realized through increased participation. Management costs under the special collection system approach proposed on February 11, 1993, would be lower than full Subtitle C management because hazardous waste transporters and manifests would not be required for lamp shipments between the generator and the

consolidation facility, and permits would not be required for storage at interim consolidation points. However, under the Special Collection System the management of mercury-containing lamps (after reaching the consolidation point) would be more expensive than the management of these lamps under the conditional exclusion (although the larger volumes managed at these consolidation points may result in certain economies of scale for transport and disposal or recycling).

The Agency requests comment on whether spent hazardous waste lamps should be regulated under the special collection system approach proposed February 11, 1993. Documents included in the docket for this proposal include estimates indicating that approximately 3.9 billion spent lamps of all types may be disposed of annually in the country (including 550 million spent fluorescent lamps) and that lighting is one of the second largest contributors of mercury to the municipal waste stream (from all types of mercury-containing lamps). In addition, the Agency believes that spent mercury-containing lamps of some type must be generated by almost every commercial and industrial establishment in the country.

In addition, a special collection system approach could address all types of spent lamps that fail the toxicity characteristic and are therefore hazardous waste, not only mercury-containing lamps. Such an approach seems appropriate

since any type of waste lamp is likely to be "universal" in nature. The Agency requests comment on whether various types of spent lamps (e.g., incandescent, neon), other than mercury-containing lamps, typically fail the TC test (or exhibit other characteristics) and would be hazardous waste under the current RCRA Subtitle C toxicity characteristic (40 CFR 261.24). Indeed, should the Agency choose, in a final rule, to conditionally exempt mercury-containing lamps from regulation under Subtitle C, the Agency may still elect to add other types of lamps to the universal waste management system. The Agency requests comment on this approach and on whether, how frequently, and for what TC constituents various lamp types may fail the toxicity characteristic. The Agency also requests that commenters submit any additional data that may be available on this question.

The Agency requests comment on a special collection system for management of spent lamps including the same basic structure and requirements for generators, transporters, consolidation points, and destination facilities as proposed on February 11, 1993 for management of hazardous waste batteries and pesticides. The Agency is also specifically requesting comment on the items discussed below.

First, in the February 11, 1993, proposal the Agency proposed a quantity limit for storage of batteries above which generators and consolidation points would be required to notify

the Agency of their storage activities. The Agency requests comment on a notification requirement for generators and consolidation points storing more than 35,000 spent mercury-containing lamps. This requirement is similar in substance to the notification requirement proposed in the Universal Wastes rule (proposed §273.11(c) and §273.13(d) (58 FR 8129-8130)). EPA is suggesting a numerical limit rather than a weight limit because lamp packaging (e.g., the cardboard boxes in which new replacement lamps were shipped) may constitute a large proportion of the total weight of a shipment or stored quantity of lamps. In addition, industry practice appears to be to quantify inventories by number of lamps rather than by weight, calculated by multiplying the number of boxes of lamps in storage or in a shipment by the number of lamps per box. Since about 35,000 lamps roughly correspond to a full truckload of packaged fluorescent lamps, the Agency is suggesting a 35,000 limit for fluorescent lamps. The Agency also requests comment on appropriate quantity limits for notification for other hazardous waste lamps types.

Second, the Agency is requesting comment on the options proposed in the Universal Waste proposal §273.11(b)(2) and §273.13(a)(2) (58 FR 8129-30) for demonstrating that lamps are not stored for greater than one year. In addition, with respect to tracking of lamp shipments, the Agency is requesting comment

on several alternatives. The approach included in today's proposed regulatory text is the same as that included in the universal wastes proposal for batteries (§273.12(b) of the universal waste proposal). This approach requires that the manifest system be used (which triggers the use of hazardous waste transporters) for shipments from the last consolidation point to a destination facility, but that no manifests or other records (or hazardous waste transporters) be required for shipments from generators to consolidation points, between consolidation points, or from generators to destination facilities. On the other hand, because a number of comments received on the proposed universal wastes rule disagreed with this approach, the Agency is also requesting comment on two additional approaches. The first alternative, which was suggested in several comments on the universal wastes rule, would be to require that persons initiating and receiving shipments of lamps retain shipping papers documenting the shipments. The minimum data elements required for such records could be specified (e.g., quantity of lamps, date of shipment or receipt, name and address of shipper and receiver). The second alternative would be not to specifically require any specific record keeping for shipments of lamps, but, as with all exemptions, the person claiming the exemption would have to keep documentation to show they qualify (see section 261.2 (f)). The

Agency is requesting comment on this second alternative because it is believed that due to the large volumes of lamps, shipments are more likely to be made directly from the generator to a destination facility. Records would be available for such shipments because destination facilities are already required under 40 CFR part 264.73(b)(1) or part 265.73(b)(1) to maintain records including the description and quantity of each hazardous waste received. It is likely that lamps would be shipped directly from generators to disposal facilities because volumes are likely to be large enough that consolidation will not be necessary to make full truckloads. In addition, the storage space and careful handling required for management of these wastes make consolidation less attractive and shipment directly to the destination facility more likely.

A third question on which the Agency requests comment is what management controls would be appropriate to impose on collection of lamps under a special collection system approach. Some of the data included in the docket for this proposal discuss the risks of the types of management likely in lamp collection such as management at the generator's site, transportation, and storage (U.S. EPA, 1993a). Requirements could include packaging that would be required to meet a performance standard of minimizing breakage for unbroken spent lamps. A wide variety of containers would probably satisfy such packaging requirements.

EPA expects that packaging in which new replacement lamps are shipped from the manufacturer would frequently be reused to store and transport removed, used lamps. Another option could be to impose a prohibition on intentional breakage of spent lamps by generators

In addition, requirements could be imposed on the storage and transportation of spent lamps that are inadvertently broken, to prevent further mercury emissions. Steel 55-gallon drums or any enclosed container could be used to hold broken lamps for transportation to the disposal site. In summary, the Agency requests comment on whether the exclusion should include requirements to minimize mercury emissions during storage and transportation of spent lamps. Management standards would apply to transporter and consolidation points as well as for generators. The Agency requests comment on management practices for lamps, the risks posed by these practices, and appropriate technical controls to minimize these risks while at the same time not inhibiting collection and proper management. The Agency also requests comment on whether generators or consolidation points should be allowed to intentionally crush lamps to minimize volume for storage or shipment and what, if any, standards should be imposed to protect against mercury releases during crushing or the subsequent management of crushed lamps. The proposed universal waste management system includes a prohibition on

treatment (crushing is considered treatment) of lamps at the generator, transporter and consolidation points.

A fourth question on which the Agency requests comment is whether to include a 3 to 5 year sunset provision on the universal waste system for lamps. A sunset provision will require EPA to re-evaluate the effectiveness of the universal waste system in addressing the disposal of lamps after 3 to 5 years. The Agency can then decide whether less controls or more controls are needed to maintain the safe management of lamps and whether to extend the inclusion of lamps in the universal waste system.

## **VI. State Authority**

### **A. Applicability of Rules in Authorized States**

Under Section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program with the State. (See 40 CFR part 271 for the standards and requirements for authorization.) Following authorization, EPA retains enforcement authority under sections 3008, 3013, and 7003 of RCRA, although authorized States have primary enforcement responsibility. The standards and requirements for authorization are found at 40 CFR part 271.

Prior to the Hazardous and Solid Waste Amendments (HSWA) of 1984, a State with final authorization administered its hazardous

waste program entirely in lieu of EPA administering the Federal program in that State. The Federal requirements no longer applied in the authorized State and EPA could not issue permits for any facility in the State that the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obliged to enact equivalent authority within specified time frames. New Federal requirements did not take effect in an authorized State until the authorized State adopted the requirements as State law.

In contrast, under section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by the HSWA take effect in authorized States at the same time that they take effect in non-authorized States. EPA is directed to implement HSWA requirements and prohibitions in an authorized State, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, HSWA applies in authorized States in the interim.

#### **B. Effect on State Authorizations**

The conditional exclusion and the universal waste management system would not be HSWA regulations, and thus would not be immediately effective in authorized States. Thus, the exemption would be applicable only in those States that do not have final

authorization for the base (non-HSWA) portion of the RCRA program.

Section 3009 of RCRA allows States to impose more stringent regulations than the Federal program. Accordingly, authorized States are only required to modify their programs when EPA promulgates Federal regulations that are more stringent than the authorized State regulations. For those changes that are less stringent or reduce the scope of the Federal program, States are not required to modify their programs. Today's proposed options are considered less stringent or smaller in scope than the existing Federal regulations because that portion of today's proposal would exempt certain activities now within the purview of RCRA Subtitle C. Therefore, authorized States are not required to modify their programs to adopt regulations consistent with and equivalent to the proposed exclusion or the proposed universal waste management system for lamps.

Even though States will not be required to adopt today's proposed options (if either is finalized), EPA would encourage States to do so. As already explained in the preamble, a conditional exclusion of mercury-containing lamps or the addition of lamps to the universal waste management system could reduce barriers to participation in EPA's Green Lights program, which encourages pollution prevention through energy savings. Further,

it could help to clarify for the regulated community the proper management of mercury-containing lamps.

In addition, the proposed options, by making regulations less stringent for management of lamps, would give States more freedom to develop programs for lamp disposal that would be appropriate for their situation.

## **VII. Economic Impact Analysis**

Under Executive Order No. 12866, [58 Federal Register 51735 (October 4, 1993)] the Agency must determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may: (1) have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the

President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, this section of the preamble summarizes the costs (savings) and the economic impact analysis of (option 1) the proposed mercury-containing lamp exclusion and of (option 2) the proposed special collection of mercury-containing lamps. Based upon the economic impact analysis for today's rule, the Agency's best estimate is that the exclusion of mercury-containing lamps from Subtitle C hazardous waste regulatory requirements (option 1) may result in nationwide annualized savings of approximately \$93 million, and the special collection of mercury containing lamps (option 2) may result in a nationwide annualized savings of approximately \$17 million. A complete discussion of the economic impact analysis is available in the regulatory docket for today's proposed rule (EPA, 1994).

The Agency requests information to better evaluate the human health and environmental effects of the two options described in this notice and current disposal practices. Human and environmental exposure to mercury could occur during the collection, transportation, processing, recycling, treatment, and disposal of spent lamps. EPA estimated the potential mercury air emissions resulting from some of these activities, but is uncertain about the extent and likelihood of human and environmental exposure. The Agency is also aware that the two

regulatory options may pose different worker and transportation injury risks as well as different environmental risks. The Agency requests information on the overall risks to human health and the environment associated with current practices and the two proposed options.

#### A. Compliance Costs (Savings) for Regulatory Options Considered

This section briefly describes 1) the universe of spent mercury-containing lamps and lamp generators, 2) the current regulatory baseline and 3) the major options for the regulation of spent mercury-containing lamps included in today's proposal for consideration. Descriptions of the baseline and the major options also include a summary of the methodology used in estimating compliance costs (savings). Results of the analysis are summarized in section 5.

##### 1. Universe of Spent Lamps and Spent Lamp Generators

The Agency estimates that approximately 310 to 380 million mercury-containing lamps, and 47,000 to 64,000 facilities could be affected annually by today's proposal.

The spent lamp generation number is based on sales data<sup>1</sup>, adjusted to account for (1) lamps generated by Conditionally Exempt Small Quantity Generators (CESQG), which would not be affected by either one of the proposed options, and (2) lamps

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<sup>1</sup>Source: National Electrical Manufacturing Association.

generated in States where spent bulb management regulations exist (California, Minnesota, and Wisconsin) (It was assumed that these State controls would be more stringent than the options considered in today's proposal and would therefore supersede any Federal exemption of spent mercury-containing lamps from Subtitle C requirements).

## 2. Baseline Costs

EPA assumed that baseline requirements are the continuation of current Subtitle C regulatory standards for the treatment and disposal of mercury-containing lamps which currently fail the TC. Under this scenario, generators of spent mercury containing lamps which fail the TC continue to be subject to the full spectrum of hazardous waste management standards including record keeping and manifesting of all mercury-containing lamp shipments, Agency notification and Subtitle C transport, treatment, storage and disposal standards.

In the cost analysis, all spent mercury-containing lamps were assumed to be TC (Toxicity Characteristic) hazardous wastes. All spent lamps were also assumed to be in the low risk category for mercury, requiring stabilization as treatment under the Land Disposal Restrictions.

Cost drivers for the baseline management of spent lamps include hazardous waste transportation, and Subtitle C disposal. The bulk of mercury-containing lamps currently disposed (97%) are

assumed to be stabilized and disposed of in hazardous waste landfills. The remainder, based upon volume data from the spent mercury-containing lamp recovery industry, are recycled. Based upon conversations with the recycling industry, which indicate planned increases in recycling capacity, the analysis assumed a small annual increase in the baseline recycling rate of mercury-containing lamps over the first three years of the analysis. Unit costs for stabilization, landfilling, recycling and hazardous waste transport were applied on a per ton basis.

Generator specific requirements which applied to all large quantity generators of spent mercury-containing lamps included record-keeping, manifesting, exception reporting, and BRS (Biennial Reporting System) reporting. Other generator requirements, including rule familiarization, notification, personnel safety training and emergency<sup>2</sup> planning were only assessed for new facilities which spot relamp and store (up to 90 days for large quantity generators, up to 180 days for small quantity generators) spent lamps on site. It is assumed that costs resulting from generator requirements which are incurred on

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<sup>2</sup>According to 40 CFR, 265 Subpart D of the Resource Conservation and Recovery Act, all large quantity generators of hazardous waste must draft a contingency plan describing the actions facility personnel will take should a fire, explosion, or any unplanned sudden or non-sudden releases of hazardous waste constituents to air, soil, or surface water occur. Local emergency response teams use the information required in the contingency plan to minimize unanticipated damage from the storage of hazardous waste.

a per shipment basis (i.e. manifesting, exception reporting) will be incurred by group relampers once every three years (once per relamp). Spot relampers will incur these costs twice a year (for small quantity generators) or four times per year (for large quantity generators).

3. Option 1: Conditional Exclusion from Subtitle C Standards  
Costs

The first option under consideration in today's proposal is to exclude mercury-containing lamps from Subtitle C management standards with the condition that these lamps are managed in permitted municipal landfills or recycling facilities. The proposed exclusion also includes a minor generator record keeping requirement. As the exclusion would be deregulatory, primary economic impacts to small and large quantity generators of mercury-containing lamps resulting from this action would be in the form of cost savings from avoided Subtitle C regulatory management, particularly for transport and disposal of spent lamps.

In the cost analysis, it was assumed that, given the proposed conditional exclusion, all small and large quantity generators of spent mercury-containing lamps would opt for management in municipal landfills in order to reduce disposal costs.

Some generators may have slightly higher disposal costs than others as a result of the proposed exclusion of mercury-containing lamps from municipal combustors. If these generators currently manage their non-hazardous waste in municipal combustors, the combustor exclusion may require these generators to: 1) keep their spent lamps separate from the rest of their municipal solid waste, 2) store spent lamps on site until enough volume has been generated to make disposal cost effective, and 3) haul spent lamps greater distances to municipal solid waste landfills.

In short, overall savings to be accrued from the proposed exclusion may vary slightly from generator to generator.

#### 4. Option 2: Special Collection Costs

The second option, special collection, included in today's proposal would allow small and large quantity generators of spent mercury-containing lamps to reduce certain administrative activities required under Subtitle C standards, including biennial reporting, notification, manifesting and personnel training. Additionally the option also allows generators to store spent mercury-containing lamps on-site for up to one year without a hazardous waste permit, and to transport their spent lamps direct to final disposal or recycling using non-hazardous waste haulers.

The option also includes similar reduced requirements for interim spent lamp storage facilities and "special collection centers." Transportation to these facilities or centers from the generator would not be regulated under Subtitle C standards, however, transport to final disposal or recycling from these facilities would be regulated under Subtitle C standards

The costs estimated for Special Collection Option assumes for urban generators direct shipment using non-hazardous waste haulers, as allowed under this option, from generators to final disposal; thus the costs of creating and operating an interim storage facility or special collection center are not included for urban generators. The rationale for this omission is twofold: 1) it is assumed that spent lamp generation is large enough to create economies of scale for direct non-hazardous waste transport; the need for special collection centers is precluded by non-hazardous waste transport "milk runs" for spent lamps, and 2) although there may be economies of scale generated for long-haul transport of spent lamps from collection centers, the special collection option requires Subtitle C transport from the centers to final disposal or recycling, thus making the use of a collection center with Subtitle C final transport more expensive than Subtitle D direct transport to the disposal facility.

## 5. Results

### a. National Annualized Costs Savings<sup>1</sup>

A summary of estimated national annual compliance costs associated with the exclusion option and the special collection option, along with estimated baseline compliance costs are presented below in exhibit VII 1. Also presented are estimated incremental savings above baseline compliance costs for each option. Costs were annualized over a twenty-year period, using a 7% discount rate. The analysis used projected growth in the U.S. population over the twenty-year time frame of the analysis to estimate the increase in growth of spent lamp generation. Total estimated annualized savings range between approximately \$85 million and \$102 million for the exclusion and savings estimates for the special collection option range between \$16 million and \$20 million in savings.

The above savings estimate is based on the assumption in the baseline that all facilities are properly managing their mercury-containing spent lamps as Subtitle C waste. Currently, however, some lamp generators may not be aware that fluorescent lamps are hazardous waste and therefore may not be following Subtitle C requirements. Hence, estimated savings may represent savings from a future scenario of full compliance with current law, rather than savings from current lamp management. EPA expects that if no regulatory action is taken, Subtitle C management of

mercury-containing lamps will become more prevalent over the next few years.

**Exhibit VII.1. - ANNUALIZED COSTS (SAVINGS) OF REGULATORY OPTIONS**

Costs (savings) are presented in millions of 1992 dollars/year<sup>1</sup>

REGULATORY OPTION		TOTAL ANNUALIZED COSTS	INCREMENTAL ANNUALIZED COSTS/ (SAVINGS) ABOVE BASELINE
Baseline:	Subtitle C Standards	\$110 - \$134 BE: \$113	NA
Option 1:	Conditional Exclusion from Subtitle C	\$25 - \$32 BE: \$25	(\$85) - (\$102) BE: (\$93)
Option 2:	Special Collection	\$94 - \$115 BE: \$101	(\$16) - (\$20) BE: (\$17)

BE = Best Estimate

**b. Individual Generator Savings**

Average total savings per generator for both options were simply assessed by dividing total savings by the estimated number of generators above (refer to the methodology section). The average annual baseline Subtitle C cost per generator is estimated to be between \$2,000 to \$2,250 per generator. Average per generator savings for the two deregulatory options are

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<sup>1</sup>Numbers may not add up due to rounding.

indicated below in exhibit VII.2. Individual generator savings, however, will vary due to facility size, proximity to disposal or recycling facility, and regional disposal/recycling costs

**EXHIBIT VII.2. - AVERAGE ANNUAL COST (SAVINGS)  
PER REGULATED GENERATOR**

In 1992 dollars

Regulatory Option	AVERAGE ANNUAL COST (SAVINGS)/GENERATOR
Exclusion from Subtitle C Standards	(\$1,500) - High Savings Scen.
	(\$2,000) - Low Savings Scen.
	(\$1,600) - Best Estimate
Special Collection	(\$300) - High Savings Scen.
	(\$300) - Low Savings Scen.
	(\$300) - Best Estimate.

c. Savings Per Waste Lamp Generated

As with average savings per generator estimates, average savings per waste lamp generated were derived by simply dividing total upper and lower bound costs (savings) by the estimated number of waste lamps accounted for by small and large quantity generators in states without specific spent lamp management standards. The average baseline Subtitle C cost per bulb is estimated to be \$.34 to \$.36. The resulting savings per lamp is estimated at \$.27 per bulb for the conditional exclusion option (both high and low savings scenario) and at \$.05 per bulb for the

special collection option. Again, cost per bulb may vary significantly due site specific factors

#### 6. Sensitivity Analysis

This section presents the results of EPA's analysis of the effects of varying selected major parameters in the cost analysis (where the Agency used considerable judgment in arriving at the parameter's value) on the estimated savings incurred under the proposed conditional exclusion and the proposed Universal Waste Rule. The following assumptions were analyzed in the sensitivity analysis for EPA's analysis of spent lamp management costs:

(1) Percentage of Lamps Generated at Small and Large Quantity Generators - In the sensitivity analysis, EPA set its lower bound estimates of the percentage of lamps generated at SQGs and LQGs at fifty percent of total spent lamp generation and its upper bound estimates at ninety percent. (Seventy-five percent was used in the initial cost analysis).

(2) Cost to Transport Subtitle C Waste - In the sensitivity analysis, EPA increased the upper bound estimates of the costs of transporting spent lamps as Subtitle C by a factor of three, based on price quotes from commercial transporters, over original estimates.

(3) Cost to Dispose of Subtitle C Waste - Based on price quotes from commercial hazardous waste disposal facilities, EPA

increased the upper bound estimates of the Subtitle C disposal costs by a factor of four over original estimates

(4) Cost of Employee Training - To reflect uncertainty over whether a professional trainer would be required and over how many employees would need to be trained, EPA increased and decreased the cost of employee training required by 50 percent

The costs associated with the high-end scenario were estimated using the upper bound estimates for each cost element included in the sensitivity analysis. The costs associated with the low-end scenario combined the lower bound estimates for each cost element. The results from these two analyses suggest that the range of total annual savings from the proposed condition exclusion for spent lamps could be \$65 million to \$289 million, and the range of total annual savings from the proposed Universal Waste RCRA requirements for generators of spent lamps could be \$15 million to \$39 million. The range in cost savings is mainly the result of uncertainty over Subtitle C transportation and disposal costs for lamps. Although EPA has received price quotes for management of lamps as Subtitle C waste that are considerably higher than the average cost of managing hazardous waste in Subtitle C landfills, it is not appropriate to directly compare price quotes to engineering costs because the prices quotes reflect a constrained market place which tends to inflate prices well above costs. However, a three-fold difference between the

price quotes for spent lamps and standard Subtitle C management cost may also be due to other factors beyond the inflated prices of the constrained market, including the low density of lamps (i.e. a ton of lamps has a greater volume than a ton of hazardous waste sludge), or difficulty in handling lamps. EPA requests comment on the true costs, as well as the reasoning behind these costs, of managing spent lamps as Subtitle C waste.

### *B. Proposed Rule Impacts*

#### 1. Impacts on Generators of Mercury-Containing Waste Lamps

As indicated above, option 1, the exclusion, is estimated to result in average annual savings per small and large quantity spent lamp generator ranging from \$2,000 to \$2,250. Option 2, special collection, is estimated to result in an average annual per generator savings of approximately \$300.

#### 2. Secondary Effects

While total incremental savings from the proposed exclusion (option 1) and from the proposed special collection system (option 2) over a Subtitle C management approach appear to be high, the Agency does not expect significant immediate shifts in demand or price for the lamps or for products manufactured or sold by firms which consume these lamps due to the proposed options. Because the impacts to lamp generators are positive (i.e. net savings), the Agency does not expect the rule to result

in adverse impacts to businesses, or to affect employment or international trade to any appreciable degree

EPA believes that, with the exception of lamps generated in States with existing lamp disposal requirements, most small and large quantity generators of mercury containing lamps will choose to dispose of their waste lamps in municipal solid waste landfills under option 1, the proposed exclusion from Subtitle C. This is because Subtitle D disposal is significantly less expensive per bulb than recycling or Subtitle C disposal<sup>4</sup>. Subsequently, most waste lamps currently being handled according to Subtitle C standards by permitted hazardous waste haulers, disposal sites and spent lamp processing facilities, would be handled by Subtitle D haulers and disposal facilities. Thus Subtitle C waste haulers, disposal and spent lamp processing facilities would be affected negatively while Subtitle D haulers and disposal facilities would be affected positively under option 1

The exclusion, option 1, may also have an impact upon mercury-containing lamp processors. The Agency estimates that there are currently 15 facilities which process spent mercury-containing lamps. Two of these facilities recover spent mercury through retorting; the remaining 13 facilities separate the glass

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<sup>4</sup>EPA estimates that the average cost per ton for Subtitle D disposal is \$35 as compared to \$400 per ton for Subtitle C disposal and \$1375 per ton for recycling.

and aluminum ends, and send the mercury-containing phosphor powder to the two facilities that report. Ten of the 15 lamp processing facilities are located in the three States where spent lamp management regulations exist. Although most recovery facilities are located in States with stringent State lamp disposal requirements, and would most likely will not be affected by today's proposed exclusion, a certain percentage of the spent lamps currently recovered at these facilities are generated in States with no specific lamp disposal requirements. EPA believes that a portion of mercury-containing lamps would no longer be sent for recovery under the proposed exclusion (option 1) since disposal in municipal landfills would be significantly less expensive<sup>5</sup>. Assuming that lamps generated outside of these States will not be sent for recovery, it is possible that 17 percent, or 16 million lamps, may be diverted. Using a lamp/revenue ratio for recovery facilities of \$.44, total impact to the industry could be approximately \$7 million dollars<sup>6</sup> in lost revenues (\$469,000 per facility). Future recycling efforts may also be impacted since many of these facilities may retract

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<sup>5</sup>EPA estimates that Subtitle D landfilling costs range between \$10 and \$150 per ton depending upon the region of the country. Compared with an average recycling cost of \$1375 per ton, Subtitle D landfilling is significantly less expensive.

<sup>6</sup>Similar estimates were not derived for Subtitle C waste haulers or disposal sites.

plans for expansion in States which currently have no specific lamp disposal requirements

Under option 2, the proposed special collection system, small and large quantity generators would not be allowed to choose to dispose of hazardous waste lamps in a municipal solid waste landfill. Thus the above impacts on Subtitle C waste haulers, disposal and spent lamp processing facilities would not be observed under the second option.

#### VIII. REFERENCES

- Baccini, P., G. Hensler, R. Figli, and H. Belevi. 1987. Water and Element Balances of Municipal Solid Waste Landfills. Waste Management and Research. 5:483-499
- Borden, R. C., and T.M. Yanoshak. 1990. Ground and Surface Water Quality Impacts of North Carolina Sanitary Landfills. Water Resources Bulletin. 26(2): 269-277
- Eichholz, C.G., Petelka, M.F., Kury, R.L. 1986. Migration of Elemental Mercury through Soil from Simulated Burial Sites. Water Resources. 22(1): 269-277
- Gould, J.P., F.G. Pohland, and W.H. Cross. 1988. Mobilization and Retention of Mercury and Lead from Particulates Co-disposed with Municipal Solid Waste. Particulate Science and Technology. 6:381-392.

Kirschner, D.S., R.L. Billau, and T.J. MacDonald. 1988.

Fluorescent Light Tube Compaction: Evaluation of Employee Exposure to Airborne Mercury. Applied Industrial Hygiene 3:129-131.

Mennerich, A. 1985. Laboratory Scale Test Simulating Co-disposal in Landfills. In: Proceedings -- International Conference on New Frontiers for Hazardous Waste Management. U.S. EPA. 60/9-851025.

Metzger, M., and H. Brown. 1987. In-situ Mercury Speciation in Flue Gas by Liquid and Solid Sorption Systems. Chemosphere. 16(4):821-832.

NEMA. 1992. The Management of Spent Electric Lamps containing Mercury. National Electrical Manufacturers Association. Washington, D.C.

National Environmental Protection Board and Swedish Association of Public Sanitation and Solid Waste Management. 1989. Off-gassing of Mercury Vapor from Landfills. Depa-90 Report No. 5. Sweden.

Reimann, D.O. 1989. Heavy Metals in Domestic Refuse and their Distribution in Incinerator Residues. Water Waste Management and Research. 7:57-62.

Sorenson, J.A., G.E. Glass, K.W. Schmidt, J K. Huber, and G.R.

Rapp, Jr. 1990. Airborne Mercury Deposition and Watershed Characteristics in relation to Mercury Concentrations in Water, Sediments, Plankton, and Fish of eighty northern Minnesota Lakes. Environmental Science Technical. 24(11):1716-1727.

U.S. EPA. 1988. Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics. EPA/530-SW-88-038. U.S. EPA. Office of Solid Waste. Washington, D.C.

U.S. EPA. 1990. Characterization of Municipal Solid Waste in the United States: 1990 Update. EPA/530-SW-90-042. Office of Solid Waste and Emergency Response. Washington, D.C.

U.S. EPA. 1991a. Environmental News: EPA Sets Air Emission Standards for Municipal Waste Incinerators. January 11, 1991.

U.S. EPA 1991b. A Geochemical Assessment Model for Environmental Systems. EPA/600-3-91-021. U.S. Environmental Protection Agency. Washington, D.C.

U.S. EPA. 1991c. Characterization of Products containing Mercury in Municipal Solid Waste in the United States, 1970-2000. U.S. EPA. Office of Solid Waste. Washington, D.C.

U.S. EPA. 1992a. Analytical Results of Mercury in Fluorescent Lamps. U.S. EPA. Office of Solid Waste. Washington, D.C.

- U.S. EPA. 1992b. Green Lights Program: The First Year. U S. EPA. Office of Air and Radiation. Washington, D C.
- U S. EPA. 1993a. Management of Used Fluorescent Lamps Preliminary Risk Assessment U S EPA Office of Solid Waste. Washington, D.C.
- U.S. EPA. 1993b. Report of the National Technical Forum on Source Reduction of Heavy Metals in Municipal Solid Waste. U.S. EPA. Office of Solid Waste. Washington, D.C.
- U.S. EPA. 1994. Technical Background Document: Economic Impact Analysis for Proposed Options on Mercury-Containing Lamps. U.S. EPA. Office of Solid Waste. Washington, D.C.
- Vogg, H., H. Brown, M. Metzger, and J. Schneider. 1986. The Specific Role of Cadmium and Mercury in Municipal Solid Waste Incineration. Waste Management and Research. 4:65-74.

#### **IX. Paperwork Reduction Act**

The information collection requirements in today's proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. An Information Collection Request (ICR) document has been prepared by EPA (ICR# 1699.01) and a copy may be obtained from Sandy Farmer, Information Policy Branch, U.S. Environmental Protection Agency, 401 M Street, S.W. (2136); Washington, D.C. 20460 or by calling (202) 260-2740.

Environmental Protection Agency, 401 M Street, S.W. (2136); Washington, D.C. 20460 or by calling (202) 260-2740.

The public record keeping burden for this collection of information is estimated to average 4 7 hours per response annually, including time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM-223Y, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503, marked "Attention: Desk Officer for EPA." The final rule will respond to any CMB or public comments on the information collection requirements contained in this proposal.

#### **X. Regulatory Flexibility Act**

The Regulatory Flexibility Act (RFA) of 1980 requires Federal agencies to consider "small entities" throughout the regulatory process. Section 603 of the RFA requires an initial screening analysis to be performed to determine whether small entities will be affected by the regulation. If affected small entities are identified, regulatory alternatives must be

considered to mitigate the potential impacts. Small entities as described in the Act are only those "businesses, organizations and governmental jurisdictions subject to regulation "

The only entities directly subject to today's proposed rule are small and large quantity generators of spent mercury containing lamps (conditionally exempt small quantity generators are not directly subject to today's proposed rule). In order to meet the definition of a regulated entity under today's rule, a generator must produce over 100 kg of spent lamps (350 four foot fluorescent lamps) in a given month. It is conceivable that some of these generators would meet the definition of "small business" as defined by the Regulatory Flexibility Act (i.e. mid-sized firms that group relamp and generate in excess of 346 spent fluorescent lamps in a given month); however the Agency does not have an estimate of the number of such "small entities." However, both of the proposed options are expected to result in net savings to the regulated entities. Option 1, excluding mercury containing lamps from Subtitle C management standards, is estimated to result in per generator savings of between \$2,000 and \$2,250 annually. Option 2, managing spent lamps under a special collection system is estimated to result in an average annual per generator savings of approximately \$300. Thus, since generator impacts are positive for both options, EPA has determined that small regulated entities will not be adversely

**Hazardous Waste Management System; Modification of the Hazardous Waste Program;  
Mercury-containing Lamps; Proposed Rule**

impacted, and thus, no "mitigating" options are being analyzed in this section. Hence, pursuant to section 605 of the Regulatory Flexibility Act, 5 U.S.C. 605(b), "the Administrator certifies that this rule will not have a significant economic impact on a substantial number of entities "

\_\_\_\_\_  
Date

\_\_\_\_\_  
Carol M. Browner  
Administrator

**Hazardous Waste Management System; Modification of the Hazardous Waste Program;  
Mercury-containing Lamps; Proposed Rule**

impacted, and thus, no "mitigating" options are being analyzed in this section. Hence, pursuant to section 605(b) of the Regulatory Flexibility Act, 5 U.S.C. 605(b), "the Administrator certifies that this rule will not have a significant economic impact on a substantial number of entities."

July 13/1994  
date

Carol M. Browner  
Carol M. Browner  
Administrator

**PART 260 -- HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL**

1. The authority citation for part 260 continues to read as follows:

**Authority:** 42 U.S.C. 6905, 6912(a), 6921-6927, 6930, 6934, 6935, 6937, 6938, 6939, and 6974.

**SUBPART B -- DEFINITIONS**

2. A definition for "electric lamp", also referred to as "lamp", is added to Section 260.10, in alphabetical order, to read as indicated below:

3. A definition for "mercury-containing lamp" is added to Section 260.10, in alphabetical order to read as indicated below:

§ 260.10 Definitions.

\* \* \* \* \*

Electric lamp means the bulb or tube portion of a lighting device specifically designed to produce radiant energy, most often in the ultraviolet (UV), visible, and infra-red (IR) regions of the electromagnetic spectrum. Examples of common electric lamps include, but is not limited to, incandescent, fluorescent, high intensity discharge, and neon lamps.

Mercury-containing lamp is an electric lamp in which mercury is purposely introduced by the manufacturer for the operation of the lamp.

\* \* \* \* \*

## OPTION 1

### **PART 261-IDENTIFICATION AND LISTING OF HAZARDOUS WASTE**

In 261.4, paragraph (b)(16) is added to read as follows:

#### **261.4 Exclusions**

(b) \* \* \*

(16) Spent mercury-containing lamps which are disposed in municipal solid waste landfills in States or Indian Tribes with an EPA approved State or Tribal municipal solid waste landfill program or managed in mercury reclamation facilities that are permitted, licensed or registered by a State or Tribe. To qualify for this exclusion, a generator must maintain in its operating records for three years from the date of shipment a certification for each shipment of mercury-containing lamps that is signed by the generator or its authorized representative and that states the following:

I certify, under penalty of law, that on [date], I consigned [amount] of mercury-containing lamps to [name and address of transporter] for [disposal] [recycling] at [name and address of disposal or recycling facility]. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

OPTION 2

**PART 273 -- STANDARDS FOR SPECIAL COLLECTION SYSTEM WASTES**

3. A table of contents for Subpart D is added to the table of contents for Part 273 to read as follows

**Subpart D -- Lamps that are Hazardous Wastes**

§ 273.30 Applicability.

§ 273.31 Generator requirements.

§ 273.32 Transporter requirements.

§ 273.33 Consolidation point requirements.

§ 273.34 Destination facility requirements.

§ 273.35 Export requirements.

§§ 273.36 - 273.39 Reserved.

4. The authority citation for Part 273 continues to read as follows:

Authority: 42 U.S.C. 6922, 6923, 6924, 6925, 6930, and 6937.

5. Definitions for "electric lamp" also referred to as "lamp" and "mercury-containing lamp" are added to Section 273.3, in alphabetical order, to read as follows:

§ 273.3 Definitions.

\* \* \* \* \*

Electric lamp means the bulb or tube portion of a lighting device specifically designed to produce radiant energy, most often in the ultraviolet (UV), visible, and infra-red (IR) regions of the electromagnetic spectrum. Examples of common electric lamps include, but is not limited to, incandescent, fluorescent, high intensity discharge, and neon lamps.

Mercury-containing lamp is an electric lamp in which mercury is purposely introduced by the manufacturer for the operation of the lamp.

\* \* \* \* \*

6. Subpart D is added to Part 273 to read as follows:

**Subpart D - Lamps that are Hazardous Wastes**

§ 273.30 Applicability.

(a) Covered wastes.

(1) This subpart sets forth standards for managing lamps that are hazardous wastes.

(2) Lamps that are hazardous wastes and that are not managed in compliance with the requirements of this Part must be managed

under the hazardous waste regulations in 40 CFR Parts 260 through 272 of this chapter.

(b) Household and Conditionally Exempt Small Quantity Generator Waste Lamps.

(1) Persons managing the wastes listed below may, at their option, manage them under the requirements of this subpart without changing the wastes' exempt status:

(i) Household hazardous waste lamps that are exempt under 40 CFR 261.4(b)(1); and/or

(ii) Conditionally exempt small quantity generator hazardous waste lamps that are exempt under 40 CFR 261.5.

(2) Persons who commingle household hazardous waste lamps and/or conditionally exempt small quantity generator hazardous waste lamps together with hazardous waste lamps regulated under this subpart must manage the commingled lamps under the requirements of this subpart.

§ 273.31 Generator requirements.

(a) Generation of hazardous waste lamps.

(1) The date a used lamp becomes a waste is the date the generator permanently removes it from its fixture.

(2) The date an unused lamp becomes a waste is the date the generator decides to throw it away.

(3) A waste lamp is a hazardous waste if it exhibits one or more of the characteristics identified in 40 CFR Part 261, Subpart C.

(b) Condition of hazardous waste lamps.

A generator of hazardous waste lamps must at all times:

(1) Contain unbroken lamps in packaging that will minimize breakage during normal handling conditions; and

(2) Contain broken lamps in packaging that will minimize releases of lamp fragments and residues.

(c) Storage.

(1) A generator may store a hazardous waste lamp for no longer than one year from the date the lamp became a waste.

(2) A generator who stores hazardous waste lamps must be able to demonstrate that lamps are not stored for more than one year from the date they became a waste. A generator may make this demonstration by:

(i) Placing the lamps in a container and marking or labeling the container with the earliest date that any lamp in the container became a waste;

(ii) Marking or labeling an individual lamp with the date that it became a waste;

(iii) Maintaining an inventory system that identifies the date each lamp in storage became a waste;

(iv) Maintaining an inventory system that identifies the earliest date that any lamp in a group of lamps became a waste; or

(v) Placing the lamps in a specific storage area and identifying the earliest date that any lamp in the storage area became a waste.

(d) Notification.

(1) A generator who stores more than 35,000 hazardous waste lamps at any time must have, before exceeding the 35,000 lamp quantity limit, sent written notification of hazardous waste lamp storage to the Regional Administrator and received an EPA Identification Number.

(2) This notification must include:

(i) The generator's name and mailing address;

(ii) The name and business telephone number of the person at the generator's site who should be contacted regarding the lamp storage activity;

(iii) The address or physical location of the lamp storage activity;

(iv) A statement indicating that the generator stores more than 35,000 hazardous waste lamps.

(e) Prohibitions.

A generator of hazardous waste lamps is:

(1) Prohibited from diluting or disposing of them;

(2) Prohibited from treating them, except by responding to releases as provided in paragraph (f) 2) of this section, and

(3) Prohibited from sending or taking the hazardous waste lamps to a place other than a consolidation point, destination facility, or foreign destination

(f) Lamp management.

(1) A generator must at all times manage hazardous waste lamps in a way that minimizes lamp breakage.

(2) (i) A generator must immediately contain all releases of residues from hazardous waste lamps.

(ii) A generator must determine whether any materials resulting from the release are hazardous wastes, and if so, the generator must manage them in accordance with all applicable requirements of 40 CFR Parts 260 through 272.

(3) A generator must ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal facility operations and emergencies.

§ 273.32 Transporter requirements.

(a) Shipments from a generator to a consolidation point, from a generator to a destination facility, or from one consolidation point to another consolidation point.

(1)(i) A transporter must at all times contain unbroken lamps in packaging that will minimize breakage during normal handling and transport conditions; and

(1i) A transporter must at all times contain broken lamps in packaging that will minimize releases of lamp fragments and residues.

(2) A transporter of hazardous waste lamps may only store them at a transfer facility for ten days or less.

(3) A transporter of hazardous waste lamps is prohibited from:

(1) Diluting or disposing of them;

(1i) Treating them, except by responding to releases as provided in paragraph (a)(4) of this section; and

(1ii) Transporting them to a place other than a consolidation point, destination facility, or foreign destination

(4)(1) A transporter must at all times manage hazardous waste lamps in a way that minimizes lamp breakage.

(1i) A transporter must immediately contain all releases of residues from hazardous waste lamps.

(1ii) A transporter must determine whether any materials resulting from the release are hazardous wastes, and if so, the transporter must manage them in accordance with all applicable requirements of 40 CFR Parts 260 through 272.

(b) Shipments from a consolidation point to a destination facility

A transporter who transports shipments from a consolidation point to a destination facility must comply with 40 CFR Part 263

§ 273.33 Consolidation point requirements.

(a) Condition of lamps.

The owner or operator of a consolidation point managing hazardous waste lamps must at all times:

(1) Contain unbroken lamps in packaging that will minimize breakage during normal handling conditions; and

(2) Contain broken lamps in packaging that will minimize releases of lamp fragments and residues.

(b) Storage.

(1) The owner or operator of a consolidation point may store a hazardous waste lamp for no longer than one year from the date that the owner or operator receives it

(2) The owner or operator of a consolidation point who stores hazardous waste lamps must be able to demonstrate that lamps are not stored for more than one year from the date they were received. The owner or operator may make this demonstration by:

(i) Placing the lamps in a container and marking or labeling the container with the earliest date that any lamp in the container was received;

(ii) Marking or labeling an individual lamp with the date that it was received;

(iii) Maintaining an inventory system that identifies the date each lamp in storage was received,

(iv) Maintaining an inventory system that identifies the earliest date that any lamp in a group of lamps was received; or

(v) Placing the lamps in a specific storage area and identifying the earliest date that any lamp in the storage area was received.

(c) Prohibitions.

The owner or operator of a consolidation point managing hazardous waste lamps is:

(1) Prohibited from diluting or disposing of them,

(2) Prohibited from treating them, except by responding to releases as provided in paragraph d) 2' of this section, and

(3) Prohibited from sending or taking them any place other than a consolidation point, destination facility, or foreign destination.

(d) Lamp Management.

(1) The owner or operator of a consolidation point must at all times manage hazardous waste lamps in a way that minimizes lamp breakage.

(2) (i) The owner or operator of the consolidation point must immediately contain all releases of residues from hazardous waste lamps.

(ii) The consolidation point owner/operator must determine whether any materials resulting from the release are hazardous wastes, and if so, the owner/operator must manage them in accordance with all applicable requirements of 40 CFR Parts 260 through 272.

(3) The consolidation point owner or operator must ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal facility operations and emergencies.

e) Notification.

(1) (i) A consolidation point owner or operator who stores more than 35,000 hazardous waste lamps at any time must have, before exceeding the 35,000 lamp quantity limit, sent written notification of hazardous waste lamp storage to the Regional Administrator and received an EPA Identification Number.

(ii) This notification must include.

(A) The owner's or operator's name and mailing address;

(B) The name and business telephone number of the person who should be contacted regarding the lamp storage activity;

(C) The address or physical location of the lamp storage activity;

(D) A statement indicating that the owner or operator stores more than 35,000 hazardous waste lamps

(2)(1) A consolidation point owner or operator who sends a shipment of hazardous waste lamps directly from the consolidation point to a destination facility, who is not required to notify under paragraph (e)(1) of this section, must have, before initiating the shipment, sent written notification of hazardous waste lamp shipments to a destination facility to the Regional Administrator and received an EPA Identification Number.

(11) This notification must include:

(A) The owner's or operator's name and mailing address;

(B) A statement that the owner or operator intends to ship hazardous waste lamps to a destination facility;

(C) The name and business telephone number of the person who should be contacted regarding the lamp storage activity; and

(D) The address or physical location of the lamp storage activity.

(f) Uniform Hazardous Waste Manifests.

The owner or operator of a consolidation point who sends a shipment of hazardous waste lamps directly to a destination

facility must comply with Subpart E of Part 262 and §§ 262.30 through 262.33, 262.40(a), 262.40(d), and 262.42 of this chapter when initiating a shipment.

§ 273.34 Destination facility requirements

(a) Owners or operators of destination facilities that recycle, treat, store, or dispose of hazardous waste lamps must comply with all applicable requirements of Parts 264, 265, 266, 268, 270, and 124 of this chapter, and the notification requirement under section 3010 of RCRA.

(b) Owners and operators of destination facilities that recycle hazardous waste lamps without storing them before they are recycled must comply with 40 CFR 261.6(c)(2).

§ 273.35 Export requirements.

(a) A generator who sends hazardous waste lamps to a foreign destination, without first sending them to a consolidation point or destination facility, must:

(1) Comply with the requirements applicable to a primary exporter in 40 CFR §§ 262.53, 262.56(a)(1) - (4), (6), and (b) and 262.57;

(2) Export such materials only upon consent of the receiving country and in conformance with the EPA Acknowledgement of Consent as defined in Subpart E of Part 262 of this chapter; and

(3) Provide a copy of the EPA Acknowledgement of Consent for the shipment to the transporter transporting the shipment for export.

(b) A transporter transporting a shipment of hazardous waste lamps to a foreign destination may not accept a shipment if the transporter knows the shipment does not conform to the EPA Acknowledgment of Consent. In addition the transporter must ensure that:

(1) A copy of the EPA Acknowledgment of Consent accompanies the shipment; and

(2) The shipment is delivered to the facility designated by the person initiating the shipment.

(c) An owner or operator of a consolidation point who sends hazardous waste lamps to a foreign destination, without first sending them to another consolidation point or destination facility, must:

(1) Comply with the requirements applicable to a primary exporter in 40 CFR §§ 262.53, 262.56(a)(1 - (4), (6), and (b) and 262.57;

(2) Export such materials only upon consent of the receiving country and in conformance with the EPA Acknowledgement of Consent as defined in Subpart E of Part 262 of this chapter, and

(3) Provide a copy of the EPA Acknowledgement of Consent for the shipment to the transporter transporting the shipment for export.

(d) A destination facility sending hazardous waste large to a foreign destination must also comply with the generator requirements of Part 262 of this chapter, and with 40 CFR §§ 264.71(c) or 265 71(c) pertaining to initiating the manifest



# Environmental Fact Sheet

## Options Proposed for Managing Discarded Fluorescent and Other Lights that Contain Mercury

### Background

Mercury-containing lamps include fluorescent, high-pressure sodium, mercury vapor, and metal halide lamps. Fluorescent and high intensity discharge (HID) lamps are energy efficient and consume less electricity, reducing the generation of pollution from utility plants. However, these lamps generally are considered hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA) because of their mercury content. Therefore, fluorescent and other mercury-containing lamps must be disposed of as hazardous waste (unless they are generated by households or conditionally exempt small quantity generators).

Many existing and planned energy conservation programs encourage the installation of energy efficient lighting systems, including the Environmental Protection Agency's (EPA's) voluntary energy conservation program, *Green Lights*. Fluorescent bulbs are the most commonly used energy efficient lights, with approximately one billion in use throughout the U.S. About half—or 500 million—of these lamps are disposed of by large-scale facilities, both public and private.

Upgrading and maintaining energy efficient lighting systems often means that businesses replace all of their lamps at once. As a result, some businesses become hazardous waste generators of mercury-containing lamps when they normally are exempt from Subtitle C regulation.

### Action

This proposal contains two options for managing spent mercury-containing lights (such as, fluorescent bulbs and HID lamps).

- Option one would exclude mercury-containing lamps from regulation as hazardous waste if they are disposed of in municipal solid waste landfills (MSWLFs) that are registered, permitted, or licensed by states with EPA approved MSWLF permitting programs, or in state registered, permitted, or licensed

mercury-reclamation facilities. Under this option, incineration of lamps in municipal waste combustors would be prohibited.

- Option two would add mercury-containing lamps to the proposed universal waste system for certain widely generated hazardous wastes (primarily nickel-cadmium batteries and cancelled pesticides). This option would allow generators to ship their lamps without a hazardous waste manifest and store lamps for a longer period of time.

EPA is considering these two options for the management of spent mercury-containing lamps based on data which indicate that these lamps may be safely managed outside of the RCRA hazardous waste system or within a reduced regulatory structure under it.

## **Contact**

For more information or to order a copy of the *Federal Register* notice, contact the RCRA Hotline, Monday-Friday, 8:30 a.m. to 7:30 p.m. EST. The national, toll-free number is (800) 424-9346; TDD (800) 553-7672 (hearing impaired); in Washington, D.C., the number is (703) 412-9810, TDD (703) 412-3323.

Copies of documents relevant to this action may be obtained by writing: RCRA Information Center (RIC), U.S. Environmental Protection Agency, Office of Solid Waste (5305), 401 M Street SW, Washington, D.C. 20460.