



# **REPORT REGARDING THE RECYCLING OF FLUORESCENT LAMPS AND CONSUMER EDUCATION EFFORTS**

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## **I. BACKGROUND**

The Maine Department of Environmental Protection (DEP) has administered a recycling program for fluorescent and other mercury-added lamps since the mid-1990s. Initially, the focus of the program was on waste lamps from businesses because only businesses were banned from disposing of mercury lamps in the municipal waste stream. That changed on January 1, 2005, the effective date of a law banning the disposal of mercury-added products from households.<sup>1</sup>

In anticipation of the expanded disposal prohibition, the DEP and the State Planning Office began working with municipalities in 2001 to provide collection services for household-generated lamps at all municipal solid waste transfer stations and other solid waste disposal facilities.

Last year, the 123<sup>rd</sup> Legislature passed Resolve 2007, chapter 25 (Chapter 25), charging the DEP and the Public Utilities Commission (PUC) with the development and implementation of a program to support and expand recycling of fluorescent lamps from households. The program was to include funding options and provide for education of consumers about the mercury content in the lamps as well as the need to recycle them. A copy of Chapter 25, which became effective September 20, 2007, is included as Attachment 1 to this report.

Work on the legislative directive had already started in early 2007, and in June the DEP and the PUC launched the nation's first comprehensive recycling program for Compact Fluorescent Lamps (CFLs). The cost-free program has been embraced by retailers and consumers throughout the state, and has become a model for other jurisdictions seeking to follow Maine's lead.

Chapter 25 also directed the two agencies to report back to the Joint Standing Committee on Natural Resources about the program's development and implementation. This report is the response to that directive.

## **II. HISTORY**

Fluorescent lighting is not new. It has been available commercially since the 1940s when a patent for an improved and practical version of the technology was issued to George Inman, a scientist working for General Electric. Fluorescent lamps work on a very different principle than the incandescent light bulb invented by Thomas Edison in 1879. In the incandescent bulb, electricity heats a filament typically made of tungsten, an element that is resistant to the passage of electricity. The resistance results in high temperature, causing the filament to glow and emit light.

In fluorescent lamps, light is not created by heat. It results from the electrical stimulation of mercury and phosphor atoms in a sealed glass tube. The tube contains a small amount of mercury and an inert gas, typically argon. The tube also is coated on the inside with phosphor powder. As electricity flows through the tube, some of the mercury is changed from a liquid to a gas, releasing ultraviolet light in the process. The phosphor coating serves to convert the ultraviolet light, which our eyes don't register, to visible light.

Incandescent bulbs also emit ultraviolet light, but do not convert any of it to visible light. Incandescent lamps also lose more energy through heat emission than do fluorescent lamps. Consequently, a lot of the energy used to power an incandescent lamp is wasted. Overall, a typical

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<sup>1</sup> See 38 MRS §1666.

CFL is up to 6 times more efficient than an incandescent bulb casting similar levels of light.

Today, fluorescent lamps are universal. They come in many shapes and sizes and are used for both general illumination as well as specialty applications ranging from photocopying to bug zappers. Perhaps most familiar are the 4-foot linear tubes that have long been used for illumination in schools, office buildings, warehouses and stores. The National Electrical Manufacturers Association (NEMA) estimates that over two million 4-foot fluorescent tubes are sold in Maine each year.

Fluorescent lighting also has long been used to illuminate some residential spaces such as home workshops, kitchens and basements, but widespread use in the living area of homes has been constrained until recently by two factors. First, people generally prefer the "warmer" light of incandescent bulbs, which produce a light with more red and less blue than that given off by the phosphor in fluorescent lamps. Second, fluorescent lamps have not been available in sizes that fit in traditional home lighting fixtures. These limitations largely have been overcome in the last decade by rapid advances in CFL technology. Screw-based CFLs that can be used in any fixture that accepts an incandescent bulb are now available in many sizes and wattages. The light quality of CFLs also has been improved by varying the mix of phosphors.

### **III. MERCURY USE IN LAMPS**

All fluorescent lamps contain mercury. NEMA reported that its members<sup>2</sup> used about 8 tons of mercury in the manufacture of lamps sold in the U.S. in 2004. About 6½ tons of this total were used to make fluorescent lamps, including CFLs which consumed about 650 pounds of mercury that year.<sup>3</sup> The rest was used in other types of lamps, e.g. mercury vapor lamps and high intensity discharge lamps (HIDs).

Lamp manufacturers have been working to reduce the amount of mercury they use and have, for example, reduced the average mercury content of 4-foot fluorescent lamps by 75% since 1985. However, it has not yet proven feasible under current technology to eliminate the mercury altogether.

The mercury in fluorescent lamps did not rise to regulatory attention in Maine until the 1990s when it was realized that the spent lamps qualified as hazardous waste and, as such, were banned from disposal in municipal waste under state and federal law. That realization spurred the development of a now robust commercial lamp recycling industry.

To facilitate recycling, the DEP issued a Mercury-Containing Lamp Policy in 1996. The policy, which was a precursor to the Universal Waste Rules that now govern fluorescent lamp recycling, sought to tailor regulatory requirements specifically to the safe handling of spent lamps. The policy subsequently was incorporated into the Maine Hazardous Waste Management Rules<sup>4</sup> in January 2001 when the rules were amended to establish tailored standards for universal waste. "Universal waste" is a term coined in reference to products like fluorescent lamps and mercury thermostats that are widely used by the general population but have components that cause them to meet the regulatory definition of hazardous waste.

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<sup>2</sup> NEMA-member lamp manufacturers include Eye Lighting, General Electric, Halco, Light Sources, Osram Sylvania, Panasonic, Phillips, Ruud Lighting, SLI, Ushio, Venture Lighting and Westinghouse.

<sup>3</sup> These figures do not account for imported lamps. The U.S. Geological Survey estimated that lamps imported into the U.S. in 2001 contained about 3.1 tons of mercury (Goonan, 2006).

<sup>4</sup> 06-096 CMR chapters 850-857.

Some fluorescent lamps do not qualify as hazardous waste under federal law when analyzed for mercury using a methodology called the Toxicity Characteristic Leaching Procedure (TCLP). In some states, these so-called TCLP-compliant lamps can be placed in the trash for disposal, with the result that mercury is released to the environment when the lamp is broken during collection or when it is landfilled or incinerated. That is not the case in Maine. Maine law bans the disposal of all mercury-added lamps, including those generated by households, regardless of how much mercury they contain.<sup>5</sup>

The Maine Legislature chose not to exempt TCLP-compliant lamps from the disposal ban for several reasons, including the potential confusion resulting from a recycling requirement that applies to some but not all fluorescent lamps even though they all contain mercury. Further, the Maine Legislature was not persuaded that the TCLP test was a good way to differentiate among mercury lamps. Laboratory analyses conducted for the DEP suggest that the differences in mercury content between TCLP-compliant and non-compliant lamps are not significant. The TCLP-compliant lamps that were analyzed contained only slightly less mercury on average than non-compliant lamps. And some TCLP-compliant lamps actually contained more mercury than lamps that are hazardous under the TCLP (DEP, 2001).

#### **IV. LAMP RECYCLING**

##### **A. Lamps Generated by Businesses**

There are about 58,000 non-household generators of waste fluorescent lamps in Maine, assuming most businesses use fluorescent lighting. Businesses use 85% of all fluorescent lighting in the U.S., according to the Association of Lighting and Mercury Lamp Manufacturers (ALMR, 2007). The vast majority of this is straight tube fluorescent lamps. The extent to which businesses use CFLs is unknown but presumably small compared to residential usage.

Under Maine's Universal Waste Rules, businesses are responsible for keeping spent fluorescent lamps intact, safely storing them and arranging for them to be picked up or shipped for recycling. Commercial lamp recycling services are available throughout the State. The DEP web page lists over 20 companies that will transport spent lamps for recycling.

These companies charge a recycling fee ranging from 7¢ to 12¢ per foot (or 28¢ to 48¢ per 4-foot lamp) depending on the number of lamps to be picked up. Recycling companies also usually charge a pickup fee ranging from \$30 to \$200 per location depending on the distance of the pickup point from the company's home base.

One lamp recycling company has obtained approval from the DEP to sell pre-paid containers for shipping spent lamps by common carrier. This option is targeted at small businesses that generate relatively few waste lamps. The recycling cost per lamp is higher, ranging from 60¢ to \$1.50 per lamp, but there is no pick-up fee.

According to EPA, even the highest of these recycling costs is less than one percent of the life cycle cost of fluorescent lighting (EPA, 1997). Because incandescent lighting as a rule of thumb uses three-to-four times more energy over its life cycle, fluorescent lighting is, by far, the more cost-effective choice even when recycling costs are included in the analysis.

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<sup>5</sup> See 38 MRSa §§1661 and 1665; see also 06-096 CMR chapter 850(3)(A)(13)(a)(vi) and (c)(i).

ALMR estimates that the national recycling rate for mercury lamps is below 24% (ALMR, 2007). Universal waste manifests documenting the transport of waste lamps by Maine generators suggest an equally low recycling rate in this state.<sup>6</sup> The majority of fluorescent lamps still are discarded with municipal solid waste that ultimately is incinerated or landfilled. Much of the mercury in these discarded lamps likely is released into the environment when they are broken, compacted and crushed in the waste handling process. The U.S. Geological Survey estimates that over 3 tons of mercury are released into the environment each as a result of lamp breakage in the U.S. (Goonan, 2007).

## **B. Lamps Generated by Households**

Almost all Maine municipalities either collect mercury lamps generated by households and store them for recycling, or have made arrangements for their residents to take the lamps to a regional collection facility. To help them in this effort, the DEP included provisions in the Universal Waste Rules that allow fluorescent lamps and other universal wastes to be collected and stored at municipal solid waste transfer stations and that ease the regulatory burden associated with handling those wastes. The DEP also held and continues to hold training sessions for transfer station personnel on the safe handling of lamps and other universal waste.

Since 2001, the State Planning Office has disbursed about \$750,000 to municipalities from the State's Solid Waste Management Fund and voter approved bonds to pay for universal waste collection and storage infrastructure at transfer stations. In all, 135 municipal facilities now are equipped to collect mercury-containing lamps and other universal wastes for recycling. These facilities collectively serve over 500 municipalities and unorganized townships. A town-by-town list of universal waste collection locations is included as Attachment 2 to this report.

Most municipalities charge a drop-off fee for CFLs, typically \$1 per lamp, to offset the cost of recycling. Lamp recyclers charge municipalities about 50¢ to 75¢ per lamp plus a pickup fee of up to \$200. The latter fee covers both lamps and any other universal wastes picked up at the same time.

## **C. Training and Education**

The DEP has taken numerous steps since the year 2000 and before to educate businesses and the general public about both the need to recycle fluorescent lamps and about recycling options. The DEP also has conducted numerous training sessions for large and small quantity generators of waste lamps, municipal solid waste personnel and lamp recyclers. The following bullets summarize some of these efforts.

- In 2001, the DEP held 16 half-day training sessions for municipal solid waste personnel to educate them on how to manage lamps and other universal wastes. DEP staff continues to offer this training on request and holds about 8 sessions each year.
- The DEP has developed and distributed educational brochures on fluorescent lamps and other universal waste. Over 40,000 copies of a general brochure on mercury and mercury products were mailed to Maine towns for distribution to the public. A separate brochure on municipal responsibilities under the universal waste rules was mailed to every municipal office. Another brochure informing businesses about the disposal ban and the obligation to recycle fluorescent

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<sup>6</sup> 555,918 spent mercury lamps were collected from Maine generators in Maine in 2003, 732,645 in 2004, 819,689 in 2005 and 671,349 in 2006. This yields recycling rates of 19%, 24%, 27% and 22% respectively based on ALMR's estimate of the number available for collection in each of those years.

lamps was sent on two occasions to every business on the mailing list of the Maine Revenue Service.

- The DEP has undertaken numerous training and education activities for the business community, including creation of a Universal Waste Handbook and a website with extensive information.<sup>7</sup> Since the adoption of the universal waste rules in 2001, the DEP has conducted 49 training sessions attended by 1,757 business representatives. Many of those attendees in turn, have educated and trained others at their workplaces.
- The DEP has developed spill clean-up guidance for universal waste including broken lamps, initially for the business community but later modified for homeowners. Further information about spill clean-up is available on Efficiency Maine's and DEP's respective web sites.
- The DEP worked with electrical distributors to set up a reverse distribution collection system for waste lamps. These systems serve the business community by allowing the distributors to pick up waste lamps when delivering new lamps to their customers. Two Maine distributors operate in this manner. They have a total of seven facilities and operate throughout the state.

## V. COMPACT FLUORESCENT LAMPS (CFLs)

"As the issue of global warming begins to resonate throughout mainstream America, compact fluorescent lamps have emerged as a simple and effective way for household consumers to reduce their carbon footprint owing to the lamps' modest energy use and long lifetime."

- *Product Stewardship Institute*

CFLs are a type of fluorescent lighting geared toward residential use. These lamps are often recognizable by their distinctive corkscrew shape, although in recent years many on the market are designed to look more like traditional incandescent bulbs.

CFLs give off high-quality light using a fraction of the electricity used by incandescent bulbs. They are up to six times more efficient than incandescent bulbs and last up to 10 times longer.

CFLs' penetration in the Maine market began to surge in the 1990s, when electric utilities ramped up efforts to promote their use. That effort gained momentum in 2002 when the PUC's response to a legislative directive to reduce growth in energy consumption included an aggressive marketing program for CFLs that relied on consumer incentives.

By the end of 2007, the PUC's Efficiency Maine program was promoting the purchase of as many as 30,000 CFLs in Maine each month. An estimated 67 percent of Maine households have at least one CFL installed, and the average Maine home has seven CFLs in use. By contrast, only 10% to 15% of Maine homes use fluorescent tube lamps.

The PUC calculates that the use of CFLs purchased in 2006 through the Efficiency Maine program will avoid the annual release of 4,100 pounds of nitrogen oxides, 11,000 pounds of sulfur dioxide, and 3,400 tons of carbon dioxide. Others, including NEMA, further suggest that the use of CFLs could result in a net reduction in mercury emissions—that the reduction of mercury emissions from electricity generation more than offsets the amount of mercury used in the manufacture of CFLs (NEMA, 2007d).

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<sup>7</sup> Educational reference materials have been mailed to over 150 people per year in response to requests submitted via the web site.

NEMA's calculations are national in scope, however, and thus based on likely emissions from coal-fired power plants. New England specific calculations by the PUC and DEP, taking into account the region's much lower reliance on coal for electricity generation, suggest that CFLs will reduce mercury emissions only if a high percentage of the mercury in CFLs currently in use is recovered through recycling.

#### **A. Mercury in CFLs**

The Product Stewardship Institute aptly refers to CFLs as an "environmental paradox". On the one hand, they use a fraction of the energy used by the incandescent lamps they replace. On the other hand, like all fluorescent lamps, CFLs depend on the use of a small amount of mercury, a persistent and bio-accumulative neurotoxin. In Maine, as in many states, mercury levels in fish have risen to the point where public health officials advise people to limit their consumption of this otherwise healthy and recommended food source.<sup>8</sup>

Because CFLs can be a source of mercury releases to the environment, it is important that they be managed responsibly. This means minimizing breakage by keeping spent CFLs intact until they can be recycled.

Lamp manufacturers are working to reduce the levels of mercury in CFLs, but mercury-free CFLs are not likely to be available in the near future (NEMA, 2007d). Home furnishings retailer IKEA estimates that mercury-free CFLs are 5 to 10 years away from commercial production (IKEA, 2007).

IKEA, which has promoted and sold CFLs for over 10 years and offered free bulb recycling at all of its stores since 2001, has imposed a 3 milligram (mg) limit on the level of mercury in the CFLs it sells (IKEA, 2007). This is 2 mg lower than the 5 mg regulatory limit that applies to the sale of CFLs in Europe under the Restriction on Hazardous Substances or RoHS directive.<sup>9</sup>

In the U.S., there is no regulatory limit on the amount of mercury in CFLs. However, U.S. lamp manufacturers that belong to NEMA announced in March 2007 that, for CFLs of less than 25 watts, they would abide by the same 5 mg limit that applies in Europe (NEMA, 2007a). In the case of CFLs that use 25 to 40 watts of electricity, NEMA members agreed on a cap of 6 mg. The latter lamps cast light levels equivalent to those cast by incandescent lamps of 100 watts or greater.

Many U.S. manufacturers already make CFLs with mercury amounts well below the NEMA cap, a circumstance that has led the eco-label organization Green Seal to propose a revised CFL standard that lowers the maximum mercury content to 3 mg. In making this proposal, Green Seal relied on the fact that Philips Lighting, Ecobulb, Sylvania and Lights of America all make CFLs that contain less than 3 mg of mercury and some with as little as 1.23 mg (Green Seal, 2007). Eco-label organizations in Canada and Europe already have promulgated CFL standards that set the maximum mercury content at 3 mg.

#### **B. Non-Mercury Alternatives**

Alternative lighting technologies now under development could compete with CFLs in the future, especially if CFL manufacturers are unsuccessful in eliminating the need for mercury. One promising alternative is light emitting diodes or LEDs. LEDs are made from semiconductor

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<sup>8</sup> See the Maine Family Fish Guide, <http://www.maine.gov/dhhs/eohp/fish/index.htm>.

<sup>9</sup> See Directive 2002/95/EC of the European Parliament and of the Council, Official Journal the European Union, 37L:19-23 (February 13, 2003).

materials that emit light when an electrical current flows through them. They are energy-efficient, do not contain mercury and already are used in some lighting applications including decorative lighting, traffic lights, exit signs, instrument panel backlighting and flashlights.

LED technology has not yet advanced to a point where it is a practical alternative for general lighting in homes and buildings. The characteristics and performance of LEDs are such that a successful switch likely will not be as simple as replacing fluorescent or incandescent lamps in the same socket (LRC, 2005). However, Charlie Jerabek, chief executive of Osram Sylvania, observes that the "light output of an LED, with the research that is going on, doubles every two years, and the price comes down 10 percent. You will see it replacing standard lighting in more and more consumer products."<sup>10</sup>

In February 2007, GE announced that it is working on advancements in incandescent lamps that could raise their energy efficiency to levels comparable to CFLs. The company expects to introduce its high efficiency incandescent (HEI) lamp over the next several years. According to GE's press release:

The target for these bulbs at initial production is to be nearly twice as efficient, at 30 lumens-per-watt, as current incandescent bulbs. Ultimately the high efficiency lamp (HEI) technology is expected to be about four times as efficient as current incandescent bulbs and comparable to CFL bulbs.

These or other technological advances may provide significant lighting alternatives in the future. PUC staff members, however, cannot predict if or when high-efficiency, non-mercury lamps will become a viable replacement for CFLs in the lighting marketplace.

## **VI. RETAILER COLLECTION OF CFLs**

### **A. Program Development**

As consumer usage of compact fluorescents has grown, so has concern about their safe handling and the adequacy of recycling options and consumer education. These concerns were heightened in early 2007 when extensive press coverage focused attention on the issue.

Lawmakers, led by the Joint Standing Committee on Natural Resources, recognized the need to expand the existing recycling program to include options that would boost recycling rates for fluorescent products. The Committee's actions jump-started the creation of a ground-breaking, in-store recycling program for CFLs. The program provides an easy, no-cost CFL recycling option to consumers in every corner of the state, from Kittery to Calais, and from Wells to Fort Kent.

The 'Replace Reduce Recycle' program was designed to make it as easy as possible for Maine consumers to bring burned-out CFLs to a local participating retail store for recycling. More than 214 stores are already participating in the recycling program and new stores are signing up almost every day.

In March 2007, DEP and PUC staff began planning the program. Contacts were made with industrial partners, leading project developers to Veolia Environmental Services, an international recycling company which operates a fluorescent recycling facility in Stoneham, Mass. Veolia was already working with wholesale electrical supply houses to provide – with DEP oversight – a pickup and recycling program for commercial fluorescent lamps.

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<sup>10</sup> "Urging consumers to warm up to energy efficient light", Boston Globe, March 18, 2007.

Initial discussions raised the idea of placing large recycling containers at facilities that already participated in the PUC's CFL marketing program. There was concern, however, that the potential concentration of comparatively large quantities of mercury at retail outlets in Maine would pose a health hazard.

Project developers turned then to the idea of placing specialized, 5-gallon plastic containers at participating stores. This reduces the hazard as well as the amount of floor space that stores need to dedicate to the program. The decision was made in April to adopt that approach.

Some 302 stores in Maine participate in the PUC's CFL promotion and rebate programs, and PUC field staff members provide regular contact with the store owners. The DEP developed training protocols for CFL recycling, trained the PUC field staff, and participated in early trainings for store owners who wished to be certified for participation in the CFL recycling program.

The program was designed to meet the DEP's universal waste rules mentioned in section III of this report. Those rules require, among other things, that each universal waste collection point obtain an identification number from the U.S. Environmental Protection Agency (EPA), a process that was eased in this case by pre-populating the EPA registration form used to obtain this number with information from DEP and PUC databases. The store owner merely had to review the information for accuracy, make corrections if necessary, and sign. This simplified procedure for obtaining the required EPA identification number, together with the streamlined compliance procedures of the universal waste rules, was one key to store owner acceptance of the program.

A checklist for retailers is included as Attachment 3 to this report. The PUC's store inspection form is included as Attachment 4.

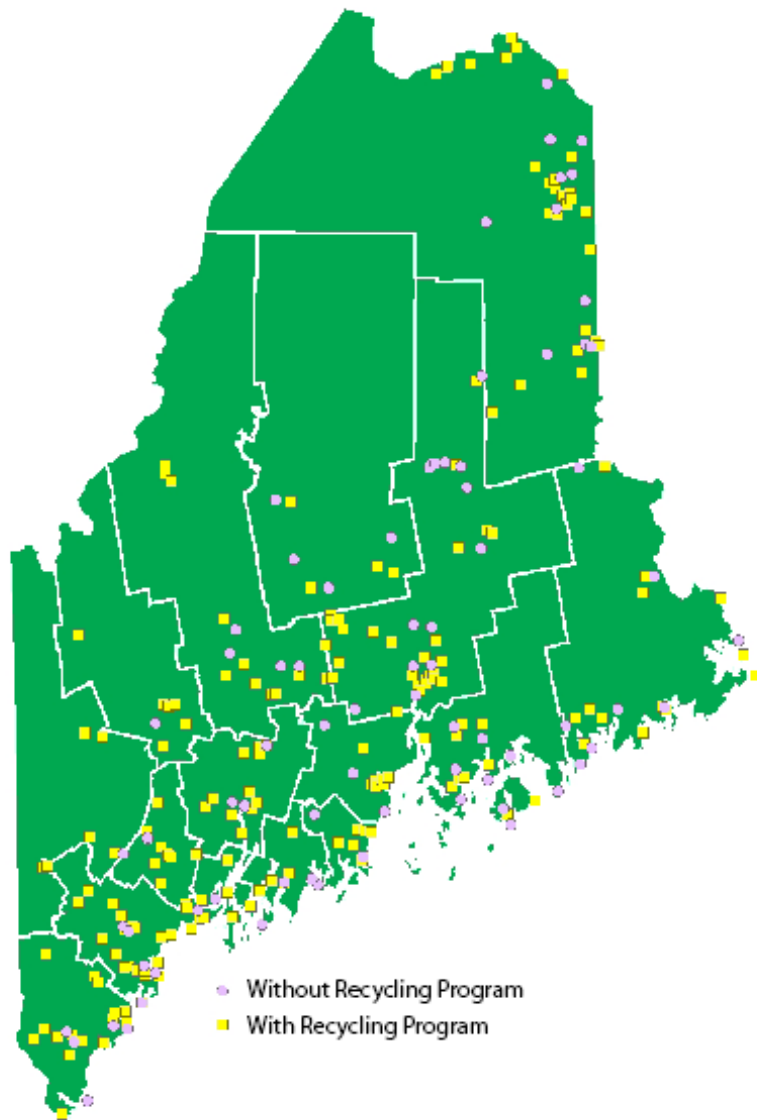
## **B. Program Implementation**

Project workers reviewed the availability of mercury recycling services in the region and ultimately decided to award a sole-source contract for the CFL recycling program to Veolia. The company's prices were in line with prices offered by other companies, and Veolia was the only one currently approved by the DEP to provide this particular service in Maine.

On May 18<sup>th</sup>, the DEP offered a four-hour training course on regulatory compliance and safety for the PUC's field staff, field manager, and others. PUC staff members began in-store training for participating retailers the next day. The collection program was officially launched in June 2007.

Under the program, PUC field staff members place a recycling bucket at participating stores and train sales associates in the proper procedures – including education for consumers when they buy a CFL. FedEx picks up and ships filled buckets to Veolia. Veolia provides quarterly reports to the DEP listing the number of lamps collected by store location.

The response by retailers has been robust. By December 2007, 214 stores had joined the program – more than 70 percent of all stores participating in Efficiency Maine CFL promotions. Every participating store must have at least one worker certified in CFL recycling protocols, and many have trained more than that. Stores participating in the program range from Scovil Building Supply in Blaine, to every Aubuchon Hardware store in the state, to Renys and Wal-Mart, which have shown a laudable corporate interest in the success of energy efficiency.



A map of stores that participate in the Efficiency Maine CFL promotion and recycling programs appears on the left.

The recycling program was fully integrated into the CFL marketing program. Almost every CFL marketing element, whether newspaper and television advertising, web site content, staff contacts with program allies, response to public inquiries or in-store promotion now includes the message: “Replace Reduce Recycle.”

All participating stores display a yellow window sticker promoting the complete program. They also use large yellow mouse pads at the cash registers that promote the “Three Rs” of the CFL program. Examples of those marketing materials are included as Attachment 5 to this report.

Public response to the program has been highly supportive. Retailers tell PUC field staff that in the wake of the early 2007 publicity about

mercury in CFLs, they received numerous customer inquiries about proper disposal of the lamps. In the first quarter of its operation (July through September 2007), 803 CFLs were recycled from towns across the state, including Portland, Belfast, Camden, Eddington, Caribou and Presque Isle.

Retailers did report, anecdotally, that sales of CFLs dropped significantly in response to publicity in early 2007 about CFLs and mercury. At the same time, the DEP has fielded numerous inquiries about the mercury content in CFLs, proper recycling and clean up of broken lamps. The retailer recycling program, by offering a free and convenient option for safely dealing with spent lamps, has helped overcome these consumer concerns and given field staff and retailers a new tool in promoting CFL use as a simple and effective method for reducing energy bills and energy-related pollution. By the end of 2007, CFL sales tracked by the PUC’s Efficiency Maine Program were greater than they had been one year before.

Maine’s CFL recycling program has become a model for the nation. PUC and DEP staffs have received numerous inquiries from other jurisdictions wishing to establish their own CFL recycling program. PUC staff report contacts from utilities in Washington, Illinois, Pennsylvania, and from Duke Energy, a national energy concern based in North Carolina. DEP staff have fielded inquiries about the program from most Northeast states, including Connecticut, Massachusetts, New Hampshire, New Jersey, Rhode Island and Vermont.

PUC staff members presented information on the program at an annual meeting of the Northeast Energy Efficiency Partnerships. E-Source news is also preparing a report and Lockheed Martin is preparing a white paper on the Maine program.

### **C. Program Funding**

The CFLs being recycled today are years old – some being brought in through the Maine program date back to the 1980s, when there were virtually no public policy initiatives encouraging their use. Today both public and private entities are actively boosting their market share, and consumers are responding.

Overall CFL sales numbers in Maine are hard to estimate, but every year more and more Mainers take advantage of CFL rebates offered by Efficiency Maine. Because the lamps last so long, in six or seven years a “wave” of lamps being bought now could enter Maine’s waste stream. PUC staff members estimate that the smaller size of the latest lamps will allow more to be recycled at a lower cost – perhaps 50 or 60 cents per bulb, as compared to today’s dollar-a-bulb recycling cost.

For now, the PUC is fully funding the cost of the collection program from the Efficiency Maine Residential Lighting Program budget. This avoids the need for a CFL drop-off charge and minimizes out-of-pocket costs to participating retailers.

Veolia was awarded a one-time contract to provide, deliver and collect 400 five-gallon CFL recycling drums to participating stores for a one-time cost to the state of \$21,373.50. The price includes the full cost of drum pickup by Veolia and the subsequent recycling and disposal costs. The per-bucket cost equates to roughly a dollar per recycled CFL, depending on the size of the lamps placed in any given container (the smaller the lamp, the more that can fit). PUC and DEP staff consider this to be a cost-effective response to the recycling need, considering the estimated lifetime savings in electricity costs of \$54 or more for each CFL purchased.

Veolia is able to recycle almost every component of a CFL: mercury, plastic, glass, phosphorous, aluminum and copper, leaving about a tablespoon of material for landfill disposal.

The added costs of implementing a complete life-cycle CFL program are difficult to quantify. PUC staff members estimate that the value of marketing costs, staff time and other resources aimed specifically at the recycling component rose above \$20,000.<sup>11</sup>

When the PUC’s Efficiency Maine Program phases out subsidization of CFL recycling, both agencies recommend that the Legislature review recycling options including requiring lamp manufacturers to assume financial responsibility for establishing a system to recapture the mercury. This approach was recommended by the Maine Land and Water Resources Council in their January 1999 report "Labeling and Collection of Mercury-Added Products."

The idea that manufacturers should bear responsibility for the environmental impacts of their products throughout the product life cycle, including at end of life, is known as Extended Producer Responsibility or EPR. The case for an EPR approach to mercury lamp recycling can be summarized as follows:

- It assigns responsibility for the safe management of the mercury in CFLs to those who placed the product in commerce;

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<sup>11</sup> This cost is in addition to the \$21,373.50 spent on the contract with Veolia.

- It internalizes the cost of keeping the mercury out the environment in the initial purchase price of the product, thereby avoiding the need for end-of-life handling fees that can be a disincentive to recycling;
- It avoids the need to use tax dollars to fund municipal collection of lamps; and
- It sends a strong signal to the marketplace, driving innovation in product design, recycling technologies and collection systems as manufacturers strive to minimize their costs to recapture the mercury and to raise the lamp recycling rate.

NEMA has issued a white paper opposing EPR for mercury-added lamps on several grounds (NEMA, 2007b). NEMA points out, for example, that an EPR requirement would widen the gap in purchase price between CFLs and incandescent lamps. We agree, but that gap already is wide and largely has been overcome through consumer education. It now is common knowledge that the lifecycle cost of fluorescent lighting is far lower than incandescent lighting. The cost difference is so substantial that a rise in the purchase price of CFLs to cover the cost of recycling is unlikely to be a significant disincentive to their purchase.

NEMA also observes that a lamp recycling infrastructure already exists and that a manufacturer take-back system would be duplicative. Again, both observations are true. A third party lamp recycling industry has developed to serve hazardous waste generators (and in Maine, all businesses and homeowners) who are prohibited by law from putting spent mercury-added lamps in the waste stream. It does not make sense to duplicate that system and manufacturers should not be required to do so.

EPR does not mean lamp manufacturers must physically repossess the lamps; it means they should have the main responsibility for ensuring that an effective recycling system is in place to recycle. Any such requirement should be structured to allow use of the existing lamp collection recycling infrastructure and could include a refund/deposit system to enhance the recycling rate.

EPR already has been employed successfully in Maine to address the recycling of televisions, computer monitors and mercury switches in automobiles,<sup>12</sup> and has withstood legal challenge. Automakers challenged the law requiring them to pay the costs of recycling the mercury switches from junked automobiles. The lawsuit, which contends that the law is unconstitutional, was dismissed on summary judgment in federal district court.<sup>13</sup>

There is nothing unique about CFLs as a product to suggest funding of recycling by manufacturers is ill-advised; nor are there any apparent legal or practical obstacles. The Product Policy Institute, in fact, has called on lamp manufacturers to take this important step:

A comprehensive and integrated approach to promoting the use of energy efficient lighting requires safe disposal at the end of their useful life. We believe that companies that make money by selling toxic products need to be part of the solution. The private sector has far greater capacity to design a convenient, efficient, and cost-effective fluorescent light collection program than local or state government. We believe that the most successful programs are those driven by product manufacturers, where recycling costs are internalized in the product price, similar to the mandates of the European Union's Waste Electrical and Electronic Equipment (WEEE) directive. However, we also believe that retailers have a

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<sup>12</sup> See 38 MRSA §1610, sub-§6, and 38 MRSA §1665-A, sub-§5.

<sup>13</sup> *Alliance of Automobile Manufacturers v. Martha Kirkpatrick*, Civil No. 02-149-B-W (D.Me. Feb. 17, 2004).

critical role in creating convenience for the consumer, as there is no better option to ensure high recycling rates than take-back programs at the point of sale. (PPI, 2007)

## **VII. CONSUMER EDUCATION**

Education about hazards posed by mercury and the proper disposal or recycling of mercury-containing products is an essential part of the program. Marketing materials refer consumers to the Efficiency Maine website, which includes links to several informational bulletins produced by DEP and the DEP webpage on fluorescent lamps.

In addition, Efficiency Maine's residential lighting program is working to educate consumers on the issue through its advertising campaign:

- Program print ads now include the phrase "CFL lamps contain trace amounts of mercury and must be recycled at the end of their life."
- The same phrase appears on the back of in-store coupons used to buy the lamps – approximately 30,000 to 40,000 of these coupons are filled out by customers each month.
- The program's most recent television ad featuring animated talking bulbs reinforces the message to recycle the CFL at the end of its life. This commercial has been viewed more than a half-million times across the state.

## **VIII. RECOMMENDATIONS**

- Maine should continue to prohibit the disposal of mercury-added lamps of all types.
- Maine should shift financial responsibility for recycling mercury-added lamps to the lamp manufacturers.
- Maine should consider adopting a deposit/refund system for mercury-added lamps to enhance the recycling rate.

## REFERENCES

Association of Lighting and Mercury Recyclers (ALMR, 2004). "National mercury-lamp recycling rate and availability of lamp recycling services in the U.S.", November, 2004.

Association of Lighting and Mercury Recyclers (ALMR, 2007). "Recycling of mercury-containing lighting: alliance formed to promote recycling", downloaded from [alr.org](http://alr.org), December 10, 2007.

Green Seal (2007). "Revision of Green Seal's environmental standards for compact fluorescent lamps, GS-5", November 9, 2007.

GE Consumer & Industrial (2007). "GE announces advancement in incandescent technology: new high-efficiency lamps targeted for market by 2010", press release: February 23, 2007.

Goonan, T. (2006). "Mercury flow through the mercury-containing lamp sector of the economy of the United States", U.S. Geological Survey, 2006 .

Harris, T. (2007). "How fluorescent lamps work", downloaded from [howstuffworks.com](http://howstuffworks.com), December 8, 2007.

IKEA (2007). "It all started with Edison! IKEA endorses energy-saving CFL light bulbs and offers free take back program through recycle bins in all IKEA stores", press release: April 10, 2007.

Land and Water Resources Council (LWRC, 1999). "Labeling and recycling of mercury-added products: report to the Joint Standing Committee on Natural Resources, 119th Maine Legislature", January 1, 1999.

Lighting Research Center (LRC, 2005). "LED technology saves energy, attracts shoppers to retail windows," press release, May 18, 2005 (LRC, 2005).

Lighting Research Center (LRC, 2007a). "Introduction to LED lighting", downloaded from [www.lightingdesignlab.com](http://www.lightingdesignlab.com) December 21, 2007.

Maine Department of Environmental Protection (DEP, 2001), "Maine fluorescent lamp study: final report", December 19, 2001.

Maine Department of Environmental Protection (DEP, 2002), "Mercury in maine: a status report", February 2002.

Michigan Department of Community Health (MDCH, 2007). "Compact fluorescent light bulbs: information for the public", downloaded from [michigan.gov/mdch-toxic](http://michigan.gov/mdch-toxic), November 5, 2007.

National Electrical Manufacturers Association (NEMA 2007a). "Voluntary industry commitment to limit mercury content in self-ballasted CFLs sold in the U.S.", March 12, 2007.

National Electrical Manufacturers Association (NEMA 2007b), "Manufacturer take-back of lamps", September 2007.

National Electrical Manufacturers Association (NEMA 2007c). "Recycling household CFLs", September 2007.

National Electrical Manufacturers Association (NEMA 2007 d). "Fluorescent lamps and the environment", downloaded from [nema.org](http://nema.org), December 9, 2007.

Northeast Waste Management Officials Association (NEWMOA 2007), "Mercury in lighting", downloaded from [newmoa.org](http://newmoa.org), December 6, 2007.

Park, J. and Jang, M. (2001). "Impact of mercury attached in spent fluorescent lamps on the recycling of glass and its effect on public health and environment", University of Wisconsin-Madison, 2001.

Product Policy Institute (PPI 2007). "Manufacturer take back: the next step for energy efficient lighting products", downloaded from [www.productpolicy.org](http://www.productpolicy.org), November 5, 2007.

U.S. Environmental Protection Agency (EPA 1997). "Mercury emissions from the disposal of fluorescent lamps: final report", Office of Solid Waste, June 30, 1997.

