CFLs, Mercury and Mayhem!
The Energy Efficiency Community Responds

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ABSTRACT

For years the energy efficiency community has grappled with the issue of mercury in compact fluorescent lamps (CFLs), but several recent events catapulted it from a minor frustration to a major topic of concern. First, Wal-Mart announced its intention to sell 100 million CFLs, which by its dramatic scale provided product stewardship advocates and Wal-Mart critics the opportunity to highlight the issue. Second, policy actions to phase-out incandescent lamps were announced. But the nightmare really began when the *Bangor Daily News* published an account of a $2,000 clean-up fee for a broken CFL in a woman's Maine home. Although the paper quickly recanted the story, investigations by numerous other local, national and international media outlets were already in motion. Questions shifted from proper clean up to lack of recycling options. Misinformation was rampant and energy efficiency advocates were on trial in the public eye to provide answers. Subject complexity makes it difficult to quickly and easily discuss this issue with consumers; consequently, offering a convenient recycling option is the easiest communications strategy. However, funding is a primary challenge since – unlike other products and materials that consumers recycle – CFLs have little market value. The purpose of this paper is to provide context around the mercury issue and identify the best and most appropriate methods for utility participation. Further, we discuss why the energy efficiency community should consider human health and environmental impacts from the manufacture, use and/or end-of-life disposal of other emerging technologies when developing market transformation/resource acquisition programs.

Introduction

Mercury, a naturally occurring element and potent neurotoxin, is essential to the operation of all fluorescent lamps, and no substitute is expected in the near term. Mercury has become the "Achilles heel" of the CFL because of the growing awareness of the hazards and health impacts associated with exposure to the element. We review key events that shaped the issue, provide context around CFLs' total mercury contribution, and discuss current recycling activities underway. Together, this information will help energy efficiency program managers develop effective solutions and knowledgeably address consumer questions to ensure healthy CFL sales continue.

Key Events

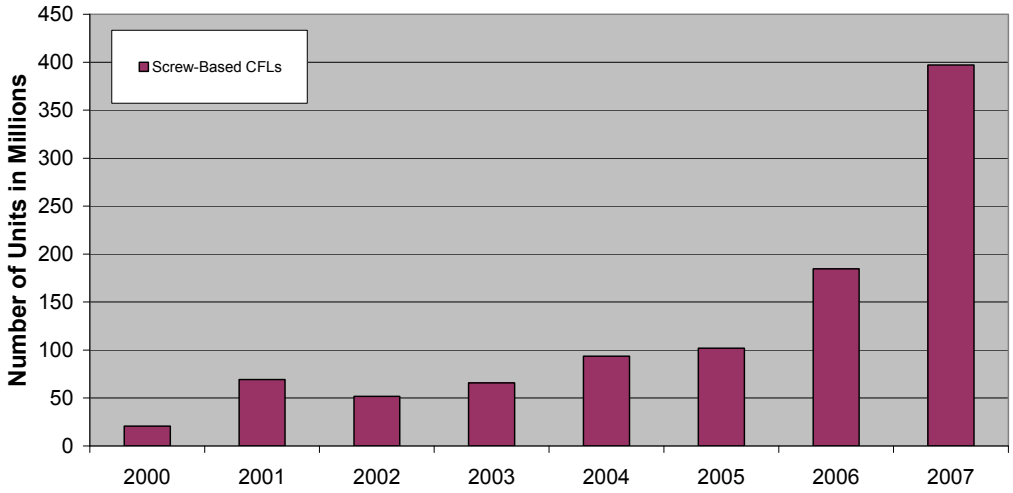
For several decades, members of the energy efficiency community have recognized the challenge of promoting fluorescent lighting when the product contains the same toxin it helps to prevent through energy savings at coal-fired power plants (Dunmire et al. 2003). Repeated analysis of the total environmental benefits compared to mercury impacts shows that the pros far

outweigh the cons (Calwell et al. 2007; Ramroth 2008); however, mercury is an emotional topic easily sensationalized and difficult to explain with all the complexities and variables involved.

Several key events are responsible for the increased interest in the CFL mercury issue: dramatic increases in sales, negative media attention, legislated landfill bans, and a lack of recognition related to the impressive advances in source reduction.

CFL sales. EPA estimated screw-based CFL sales at 400 million in 2007 (290 million were ENERGY STAR qualified), nearly double the sales in 2006 and equal to the totals sold in 2000 – 2005 combined (see Figure 1) (EPA 2008a). This extraordinary growth raised concerns by solid waste stakeholders and the public; mainly, "What do we do with these when they burn out?"

Figure 1. Annual U.S. Screw-Based CFL Sales 2000 - 2007



Media attention. The irony of the environmental community promoting a product that contains mercury easily captured the media's attention. The first "big" story occurred shortly after the 2001 West Coast energy crisis, when CFL sales and giveaways in the Northwest jumped to roughly 8 million (LCLRC 2006). The article, "Bulbs save energy, but pose waste hazard" on the front page of *The Oregonian* (Cole 2002) was picked up by the Associated Press and ran in papers throughout the country. Because previous CFL sales were so much lower, the focus was generally on how to develop a system for when the bulbs began to burn out.

Other news stories followed for the next several years, but three events in late 2006 and early 2007 shifted the visibility and intensity of the public discussion. First, Wal-Mart announced its intention to sell 100 million CFLs in 2007 (Wal-Mart, Inc. 2006). Wal-Mart critics, in particular, pounced on the opportunity to berate the retail giant for not offering a recycling program when promoting a mercury-containing product (NPR 2007; Wake Up Wal-Mart 2007). Second, a *Bangor Daily News* article ran about a woman who broke a CFL in her child's room and was informed the clean-up cost would be about $2,000 (Bangor Daily News 2007). Although the paper quickly recanted the story, it was picked up by *Fox News* and many other publications across the nation and globe (Milloy 2007; Farah 2007). ENERGY STAR estimates that a minimum of a dozen stories ran in major media outlets in the first half of 2007 alone.

Legislation. The Energy Independence Security Act (EISA) included federal lighting efficiency standards which will effectively outlaw the standard incandescent light bulb as we know it in

favor of more efficient alternatives, starting in 2012. The initial targets can be met by advanced incandescent lamps, but the longer-term targets will likely be met by CFLs and other advanced technologies. This legislative action prompted the question about a national system to ensure residential consumers have easy access to fluorescent lamp recycling.

In addition to legislation that will increase the use of CFLs, there is also legislation at the state level that prohibits their disposal in regular trash. States with these landfill bans include California, Maine, Massachusetts, Minnesota, New Hampshire and Vermont (Fletcher and Cassell 2008). Additionally, California's Huffman bill (AB1109) – which directs the Energy Commission to adopt minimum energy efficiency standards for all general purpose lights – also requires the Department of Toxic Substances Control to convene a Task Force to discuss the end-of-life management of general purpose lighting and identify the most effective and cost-efficient methods of recycling by September 1, 2008.

Source reduction efforts. Dunmire et al. (2003) estimated that CFLs sold in 2001 likely contained between 5 and 8 milligrams (mg) of mercury per lamp, with best practice at about 1.5 mg in some pin-based models. At that time, the accepted industry average for commonly used CFLs in the residential setting was 5 mg. The authors recommended that source reduction be the first priority in the CFL-mercury discussion, and considerable strides have been made over the last five years with the advent of better dosing technologies.

Two significant modifications in the manufacturing process were required in order to reduce mercury content in CFLs. First, manufacturers needed to make engineering changes to lamp design and phosphor chemistry to prevent mercury from becoming adsorbed into the phosphor (which causes early lamp failure) (Banwell 2007). Second, manufacturers needed a precise dosing mechanism that also maintained appropriate vapor levels over time. This transition took place quickly in China, the international center of CFL manufacturing. In 2005, mercury dosing was performed by hand using precision syringes (Figure 2). By 2007, this technique was abandoned by all large manufacturers involved in U.S. imports and was replaced with amalgam pellets, which enable precise dosing and are applied to each CFL by machine during production (see Figure 2 below). Industry representatives estimate that fully 70% of all Chinese CFLs adopted amalgam dosing techniques by 2007 (Chen 2007).

Figure 2. Mercury Dosing Technique Changes, 2005 - 2007

Liquid Mercury Dosing Technique
Source: Banwell 2005

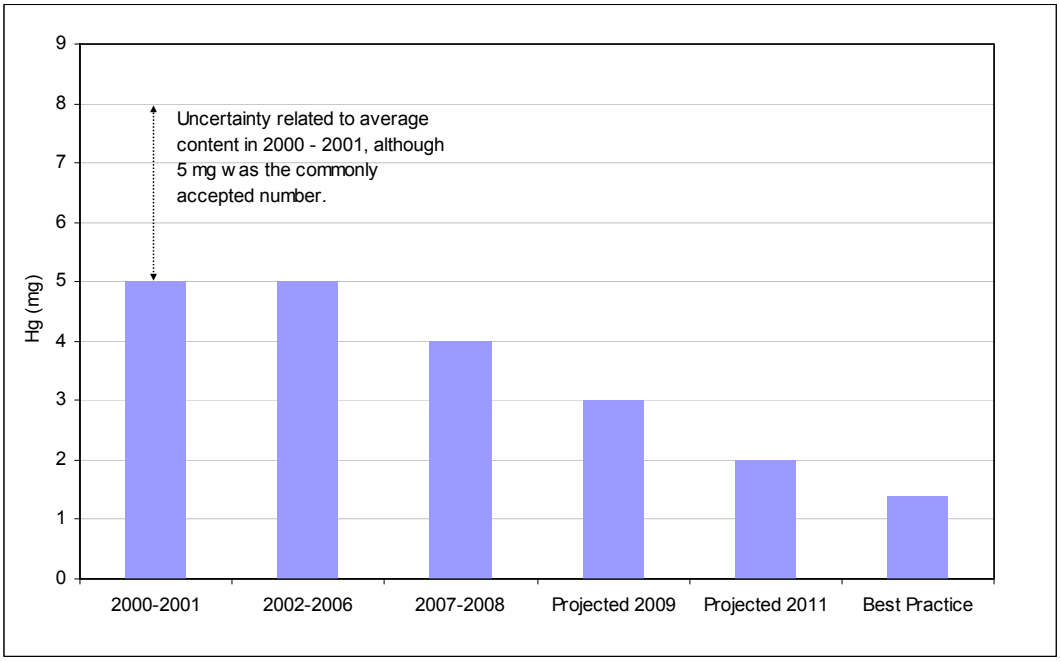
Mercury Pellets (Solid Dosing Technique)
Source: Banwell 2007

We speculate that the European Union's RoHS (Restrictions on Hazardous Substances) propelled development of these improved dosing technologies given the imprecision of liquid

dosing. Additionally, Wal-Mart demanded its vendors reduce mercury content (Wal-Mart 2007a). Together, these events led to NEMA (National Electrical Manufacturers Association) adopting a voluntary mercury content standard in 2007 of 5 mg per unit for CFLs that use less than 25 watts of electricity and 6 mg for CFLs that use 25 to 40 watts (NEMA 2007). Best practice is at 1 - 1.4 mg, and a number of manufacturers have popular lamp models with 2 - 3.5 mg (Calwell et al. 2007). Because of these advances, we believe that average content has dropped at least 20% to 4 mg. NEMA is currently surveying its members on mercury content of both CFLs and linear tubes, and estimates the average is likely between 3 and 4 mg (see Figure 3). For CFLs, we expect another reduction in average content within the next year or two for these reasons:

- TCP, Inc., maker of about 70% of CFLs sold in the U.S. under numerous brand names, is testing a 1.6 mg dosage on several models, and hopes to move its entire line to this dosage over time (Yan 2008).
- Europe's EUP (energy using products) standards process is proposing that by 2009, any mercury-containing lamp with more than 3 mg will require a lifetime of 20,000 hours, and by 2011 the maximum content will be 2 mg.

Figure 3. CFL Mercury Dosing 2000 – Present (Averages and Best Practice)



Source: Authors' estimates

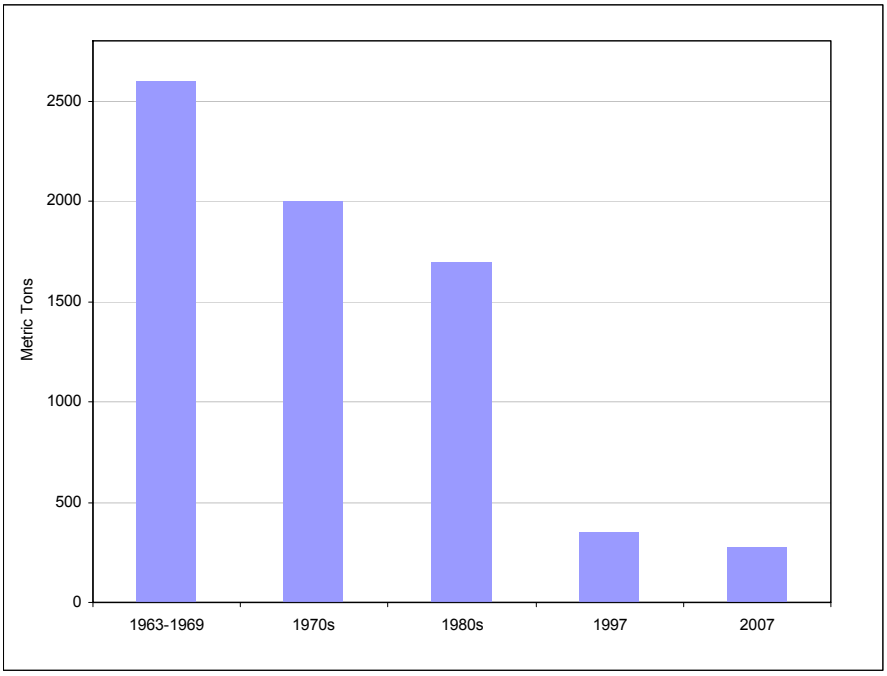
Unfortunately, the source reduction success story has not received the attention it deserves. For perspective, should the average CFL content drop to 3 mg, it would be the equivalent of achieving a 40% recycling rate at virtually no cost.

Mercury Contribution from CFLs to U.S. Anthropogenic Releases

Part of this issue is the misperception that the increases in CFL sales will result in significant increases in mercury emissions, but a closer look indicates otherwise. We analyze this question from both intentional use (total content) and emissions contribution (what is released into the atmosphere). Additionally, we assess the net emissions benefit from energy savings.

Figure 3 shows that mercury use in products and industrial processes has actually declined dramatically over the last 40+ years. EPA (2007) estimates that 274 metric tons of mercury are used annually in chlor-alkali production, electrical and electronics equipment, measuring and control equipment, lighting products, dental use, etc. Even with the increased CFL sales, the mercury content from these products is still a fraction of total use. The 290 million ENERGY STAR qualified CFLs sold in 2007 contain about 1.2 metric tons (i.e., 290 million x 4 mg), roughly 0.4% of the total mercury used in products and industrial processes in the U.S.[1]

Figure 3. U.S. Mercury Use in Products and Industrial Processes 1963 - 2007



Source: Cain et al. 2007, EPA 2007

The data in Figure 3 show total mercury *used* in products and processes. Albeit important information, mercury emission *releases* to the air should be the principal focus, given air emissions are the primary culprit for mercury deposition in lakes, rivers and the ocean.[2] EPA (2008b) estimates that the U.S. is responsible for the *release* of 104 metric tons of mercury emissions annually (primarily through coal-fired power generation).

[1] Because all lamps promoted by utilities and efficiency organizations are ENERGY STAR qualified, we focus on the 290 million CFL sales number rather than the 400 million total.

[2] In the right conditions, mercury in water converts to methylmercury and bioaccumulates in fish. Eating contaminated fish is the most common mercury exposure pathway for humans (EPA 2008b).

Consequently, an important consideration in determining the net impact from the mercury in CFLs is the amount in a bulb that is released as an air emission. A common public/media assumption is that if 5 mg of mercury is used in a CFL, then 5 mg will be released when it is broken in the trash or at a landfill, which is incorrect.[3] A recent collaborative study by researchers at EPA and other environmental consulting firms estimated 10% of the mercury contained in a fluorescent lamp is released as air emissions, 1% is released to water, and 89% is held in soil (contained in landfills) (Cain et al. 2007). This means that each CFL sent to a landfill results in releases of 0.4 mg of mercury. **Assuming all 290 million ENERGY STAR qualified CFLs sold in 2007 are landfilled, they will contribute 0.1 metric tons into the air, just 0.1% of U.S. anthropogenic mercury emissions.**[4]

In addition to CFLs' contribution to the mercury emissions load in the U.S., we must also factor how much mercury CFLs *prevent* through reductions in power plant emissions. Using EPA's eGrid data, we determined that an average of 0.012 mg of mercury per kWh is emitted from U.S. electricity generation (regional emissions vary due to generation sources) (Calwell et al. 2007). As illustrated in Table 1, a 13-watt, 8,000-rated-hour-life CFL (60-watt equivalent; a commonly used lamp type) will save 376 kWh over its lifetime, thus avoiding 4.6 mg of mercury from power plant emissions. If landfilled, the net emissions benefit will be 4.2 mg for a single bulb. For the 290 million CFLs sold in 2007, approximately 1 metric ton is prevented (about 10 times the amount CFLs contribute).

Table 1. Net Mercury Emissions Benefit from Using a CFL

Lamp Type	Watts	Hours of Use	kWh Use	National Average Hg Emissions	Hg from Electricity Use	Hg Emissions from Landfilling	Total Hg
CFL	13	8,000	104	0.012	1.2	0.4	1.6
Incandescent (8 @ 1000 rated hours)	60	8,000	480	0.012	5.8	0	5.8

These numbers will remain dynamic given the changes underway at both the CFL and power plant levels, and that U.S. anthropogenic mercury emissions are expected to continue to decline as other mercury reduction programs and policies are implemented. Most notably, there are mercury emission limits pending for power plants which will likely lower the net emissions benefit in the future.[5] However, nothing short of a dramatic overhaul of existing coal-fired power plants with maximum achievable control technologies (MACT) will substantially reduce the net emissions benefit. Further, over time we expect the number of CFLs recycled to increase and that CFL manufacturers will continue to reduce mercury content per bulb. Certainly, ongoing analysis will be needed.

[3] Not all mercury contained in fluorescent lamps is released as an emission when it burns out because mercury vapor attaches to the lamp walls, phosphor powder and other components (Calwell et al. 2007).

[4] Interestingly, this same study concluded that, due to mercury amalgams in dental fillings, human corpses contribute 2.0 metric tons of mercury to the air during cremation, about 2% of U.S. anthropogenic mercury emissions.

[5] A three-judge federal appeals panel in Washington struck down on February 8, 2008, the EPA limits on mercury emissions from coal-fired power plants, which would have required 70% reductions from 2000 levels by 2018, indicating stricter Maximum Achievable Control Technologies (MACT) may be implemented on a faster timetable (Berringer 2008). Other analysts believe that this ruling has caused confusion and will delay any final regulations by up to 8 years (Holmstead 2008). At present, EPA is reviewing the decision to determine its response.

The Recycling Infrastructure

Challenges to Developing Recycling Programs for Consumers

Recycling CFLs to recover the mercury for safe reuse is the preferable approach for proper disposal according to the EPA's Office of Solid Waste. However, a set of factors together make CFL recycling a challenging prospect:

- **Costs.** Allocating the costs of recycling CFLs among market players is the primary barrier to recycling. Unlike other products, refrigerators, cell phones, etc., CFLs have no value in the market as scrap material. Also, CFLs are rarely concentrated in large numbers in a single facility. That, plus their attached ballasts and varying sizes, mean they are labor intensive to manage and thus fairly expensive to recycle ($0.50 to $1.00 per lamp, on average) (Calwell et al. 2007).
- **Fragility.** Avoiding breakage is the primary strategy to avoid mercury emissions from fluorescent lamps; therefore, curbside recycling and other traditional methods for collecting recyclable materials are not appropriate.
- **Retailer reluctance.** Retailers are reluctant to engage in recycling for a number of reasons, including costs, liability, in-store logistics and ongoing staff training. Their lack of participation means that consumers frequently lack convenient access to recycling facilities.

Current Snapshot

According to the Association for Lighting and Mercury Recyclers (ALMR), the recycling industry is currently operating at 30% of capacity (Goonan 2006), meaning that substantial recycling capacity is sitting unused today. Clearly, recycling capacity is not a barrier.[6] If recycling is available for a consumer, options generally include government household hazardous waste (HHW) facilities, community "clean-up" days, and retail drop-off locations. The primary pros and cons of each are outlined in Table 2 below.

Table 2. Advantages and Disadvantages of Consumer Recycling Options

Recycling Option	Advantages	Disadvantages
HHW Facilities	Highly trained staff Lower cost per bulb	Frequently not a convenient option (limited hours, distant location), thus lamps end up in the household garbage
Community "Clean-up" Days	Typically include a wide range of recyclable products Generally lower cost per bulb Trained staff usually on hand	Very limited timeframe for consumers to participate, thus lack of convenience
Retail Drop-off	Consumer convenience Instigates purchase of another CFL	Generally higher cost per bulb Staff turnover = ongoing training

[6] Fluorescent lamp recycling options generally fall into two categories: large national/international recycling organizations, and smaller, regional companies. Veolia Environmental Services, Waste Management, and AERC Recycling Solutions represent the largest companies; all offer mail-in box/pail programs.

Product stewardship advocates, other stakeholders, and consumers typically support retail-based recycling programs. A Northwest Energy Efficiency Alliance focus group study found a preference for this recycling option (Ecos Consulting and PRR 2003), and survey results for the Lane County Lamp Recycling Coalition reported a high satisfaction level with the retail-based program (LCLRC 2006).

Overview of Current Utility Programs

Electric utilities – especially those with CFL programs – represent some of the most committed stakeholders in getting retail-based recycling programs underway. There are several reasons for this, but primarily they are seen by the public as advocates of using CFLs and therefore partly responsible for offering consumers solutions for disposal. Program design elements are outline below for four of some of the most active programs in the U.S.[7]

Efficiency maine. Efficiency Maine's program is the first statewide offering paid for entirely with utility public benefits funds. The CFL recycling program was developed in conjunction with the Maine Department of Environmental Protection (DEP) shortly after the $2,000 broken CFL situation occurred (Middleton 2008). Efficiency Maine uses its field implementation contractors to recruit retailers into the recycling program, and DEP provides training to both Efficiency Maine field representatives and to participating retailer staff. Additionally, field representatives complete an inspection checklist and Resource Conservation and Recovery Act (RCRA) form to simplify the process for retailers.

This program utilizes a five-gallon pail system from Veolia Environmental Services, Technical Solutions, which holds up to 90 CFLs ($0.89 per bulb if filled to capacity). The lid seals much like a spackle container lid, providing a high level of containment should a CFL break in it (see Figure 4).

Figure 4. Efficiency Maine CFL Recycling Program Materials

Source: Veolia Environmental Services and Efficiency Maine

At present, 214 retailers in the state participate (about 75% of all participating lighting program retailers). Field representatives place buckets in the stores, train sales associates on the process and proper handling of lamps (including clean-up instructions), and provide program marketing materials (see Figure 2). FedEx provides pick-up and shipping of full buckets to Veolia for recycling.

[7] See the Product Stewardship Institute's Fluorescent Lamp Action Plan for other recycling programs (Fletcher and Cassel 2008).

Efficiency Maine program manager Richard Bacon estimates the program cost at about $1.00 per bulb (Behringer 2008). "Because CFLs are so cost-effective, I just look at this program as part of our marketing costs – because it completes the cycle. It takes away that barrier: Any question in the in the back of a consumer's mind of 'How am I going to get rid of this thing?' is answered. And if you remove a barrier, your sales numbers will go up."

One of the keys to easy implementation of the Maine program was DEP's involvement. Since every state has responsibility for implementation of national regulations regarding waste management, the final rules are implemented at the local level. The DEP took a proactive approach to simplifying the recycling process by visiting each retailer and encouraging their participation. This shift – treating retailers as sources of waste to facilitators of proper disposal – is a promising approach to building a recycling infrastructure. Given the recent launch of the program, little evaluation data are available.

Focus on energy. Focus on Energy also recently launched a CFL recycling program, utilizing a pre-paid CFL recycling box from Veolia, which holds up to 250 CFLs (see Figure 5 below). Like Efficiency Maine, Focus on Energy pays for the cost of recycling. If the container is filled to maximum capacity, the cost per bulb is $0.56. The program started in September 2007, and now has more than 290 retailers participating. Given the recent launch date, little data are available on return rates; however, some retailers are starting to report that they will soon need to order new boxes.

Figure 5. Focus on Energy CFL Recycling Box at a Retail Location

Source: Focus on Energy

Lane county lamp recycling coalition (LCLRC). In September 2003, Eugene Water & Electric Board (EWEB) began an effort to develop a pilot residential fluorescent lamp recycling program, which launched in late 2004 and ran for one year (LCRLC 2006). It built a coalition of the area utilities, county officials, state officials and other interested organizations to organize and implement a retail-based recycling program for CFLs and fluorescent linear tubes. All participating retailers are small, independently owned businesses. During the pilot, CFL recycling increased from about 1% to 6.7%, and linear tube recycling increased from 4.3% to 16.3%. Overall, both consumer and retailer satisfaction with the pilot were high, so the program continues under the management of Lane County Public Works, Waste Management Division, with marketing and promotion support from the five regional utilities.

Lane County pays for the cost of recycling and makes quarterly pick-ups from the smaller retailers, but the single-largest retailer delivers lamps to the transfer station on an as-needed basis (Jerry's Home Improvement Center receives about 60% of all lamps collected). Consistently,

linear tubes represent roughly 80% of lamps returned for recycling. CFLs represented 13.4% of lamps collected in 2005, 14% in 2006, and 11% in 2007 (Behringer 2008). Earth Protection Services provides recycling services to Lane County. The cost per CFL is $0.30 and $0.05 per linear foot for linear lamps (e.g., $0.20 per four-foot tube).

Minnesota. Minnesota passed a law in 1992 prohibiting the disposal of fluorescent lamps in landfills (residential exemption expired in 1994). Lamp recycler Mercury Technologies developed a retail-based lamp recycling program with small independent retailers to collect lamps from consumers and small businesses. Mercury Technologies provides drums for storing linear tubes and plastic totes are used for all other odd-sized lamps. Pick ups are scheduled on an as-needed basis. Mercury Technologies charges $0.55 per CFL; however, retailers are at liberty to charge the consumer additional fees to cover the cost of retail space, labor, etc. Some provide a direct pass through while others charge up to $1.25 per lamp.

Electric utilities serving more than 200,000 customers are required to support fluorescent lamp recycling efforts through allocation of conservation improvement funds. Xcel offers $0.50 coupons to help residential and small business customers cover some of the cost of recycling (limit 10 per customer per year). In 2006, Xcel estimated a 3.5% coupon redemption rate; i.e., about 1,000 coupons redeemed out of nearly 29,000 lamps (linears, HIDs and CFLs) recycled in its service territory (Sherman 2006).

Continuing Challenges

Costs. The costs associated with CFL recycling can vary greatly, mostly due to economies of scale, illustrated in Table 3 below.

Table 3. Cost-effectiveness Analysis of Various CFL Recycling Programs

Product Description	Cost per Container	Maximum CFLs per Container	Cost Per CFL	Cost Per Pound Hg Collected*
WM LampTracker TriGuard® TLC	$79.95	106	$0.75	$68,485
WM LampTracker MercuryVaporLok™	$99.95	106	$0.94	$85,617
RecyclePak Large Box	$139.00	250	$0.56	$50,484
RecyclePak 5-gallon pail with Life Latch® lid	$80.00	90	$0.89	$80,711
RecyclePak Consumer Kit	$20.00	12	$1.67	$151,333
Lane County Solid Waste (Earth Protection Services)	N/A	N/A	$0.30**	$27,240
Minnesota Programs (Mercury Technologies)	N/A	N/A	$0.55	$49,940

**Assumes average of 5 mg per lamp; the likely estimate for lamps being returned in 2008. If recycling prices remain steady, the cost per lb. will actually increase with lower-dosed lamps.*
***Costs do not include pick up and transportation to the recycler, just the recycling fee at the facility.*

From a societal and technical perspective, CFL recycling is a very expensive method of capturing mercury from products. The cost for collecting other mercury containing products, such as thermometers and thermostats, is roughly $270 per pound (LCLRC 2006). Mercury sold on the open market costs only $7.25 per pound (Brooks 2008), thus why CFL recycling cannot be internally financed. Therefore, utility programs should seek a balance between user

convenience and the resources needed to implement a program, as well as ways to spur competition between vendors to reduce the cost of recycling.

Retailer concerns. To date, the vast majority of participants in retail-based recycling programs include mostly small independent hardware stores, such as ACE and TrueValue. IKEA is the exception for national chains. The retailer recycles CFLs for customers at no cost at all of its stores; however, with only 32 outlets in the U.S. it's hardly a national solution.

In our discussions with larger, big box retailers, regulatory requirements represent one of the greatest barriers to accepting fluorescent lamps at retail locations (in addition to costs and funding mechanisms). National retailers see a patchwork of regulations covering the proper handling of CFLs that are not just variable by state, but even by county, making the development of a national recycling program difficult to plan and implement. Efficiency Maine found that involvement from DEP allayed retailer fears, so collaboration with the proper entity is critical. This differs from other regions, where retailers feel that they need to design a recycling program and hope that it meets with regulators expectations. Utility program field representatives can play a role in establishing a positive relationship with regulators.

Conclusions and Recommendations

Considerable progress has been made on the mercury issue, but there is more to be done. Specifically, the single best strategy for minimizing the mercury problem is source reduction. Industry has made significant advances, with best practice at 70 - 80% reduction from the traditional 5 mg average. The energy efficiency community can and should highlight this accomplishment as part of their communications approach.

We detailed the CFL contribution to mercury load in the U.S. and find that the alarm from the media and public is somewhat overblown, especially when considering the net emissions benefits. ENERGY STAR qualified CFLs contribute just one tenth of one percent (0.1%) to U.S. anthropogenic mercury emissions. CFLs also offer a net reduction in mercury emissions from coal-fired power plants, reducing mercury emissions by approximately one ton, or 1% of U.S. anthropogenic emissions. Together, the environmental benefits far outweigh the risks, even before considering reductions in greenhouse gas emissions and other power plant pollutants. Nevertheless, the lack of convenient recycling options will continue to vex stakeholders until a national solution is achieved.

Recycling is also making progress, but at a much slower pace than source reduction. We profiled four programs, illustrating how electric utilities and efficiency organizations can participate in recycling at different levels. At one end of the spectrum is Efficiency Maine, who takes a hands-on, full-service approach to the problem, but at a high cost. At the other end is Xcel Energy, who leaves the infrastructure to other market actors, but offers financial incentives to encourage recycling. Clearly, removing barriers to CFL recycling, financial and otherwise, is a good idea in the short term, since many consumers today are asking for recycling options and find it impossible or impractical to do.[8] However, using utility public goods funds for long-term financing of CFL recycling programs may be problematic, since it will divert resources from

[8] Longer term, however, it is not clear that electric utilities will play an ongoing role in this equation, particularly since market forces are now driving substantial sales of CFLs in areas without any utility program involvement meaning that many CFL promotional programs will be scaled back or cancelled.

efficiency programs that arguably result in greater environmental benefits from the energy savings (reductions in mercury, greenhouse gasses and other power plant pollutants).

In the near term, there are a number of simple steps that utilities and efficiency organizations can take to address the mercury issue with the press and the public:

- The CFL mercury issue is complicated, multi-faceted and difficult to explain in simple terms, so start with some practical communications materials (EPA has information available at www.energystar.gov.). Appoint someone within your utility or efficiency organization to become an expert on the issue. Be prepared to answer the tough questions from consumers and the press. It is better to be prepared with answers than allow others to form conclusions that may be inaccurate, alarming to consumers, or both.
- Examine different recycling models and determine an appropriate role for your organization. Arrange a meeting with representatives from the recycling industry and other stakeholders to understand what options exist in your area.
- Discuss the issue with retailers who are participating with your CFL promotion efforts, and work toward common solutions; encourage the most cost-effective options.

Long term, we need two actions at the national level to set this issue to rest: 1) a national funding mechanism, perhaps in the form of a small fee on each bulb[9] and; 2) participation from a national retailer(s) or other national entity (e.g., U.S. Postal Service) in a recycling program. The challenges to achieving these actions are great, but entirely possible (as demonstrated in the European Union through the Waste Electrical and Electronic Equipment (WEEE) Directive). We encourage all stakeholders to engage on the issue, participate where possible, and work toward long-term solutions.

Finally, as new technologies emerge as opportunities to improve energy efficiency in a particular end-use, our industry should assess other potential market challenges and be prepared to respond to public questions. For example, LEDs are often hailed as the better product because they are mercury free. However, it is unclear if any impacts to human health or the environment exist from their manufacture, use and/or disposal. We need to ask these types of questions upfront and begin planning for issues early in the process of promoting any new promising technology. Quite simply, today's market demands it.

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[9] See the PSI Fluorescent Lamp Action Plan for a discussion on various funding mechanisms.

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