



Review and Assessment of Thermostat Recycling Activities in the Northeast June 2008

Prepared by the Northeast Waste Management Officials' Association (NEWMOA)

Executive Summary

The Massachusetts Department of Environmental Protection (MassDEP) contracted with the Northeast Waste Management Officials' Association (NEWMOA) to complete this assessment of mercury-added thermostat collection and recycling programs in order to identify mechanisms that could be used to enhance the recycling of these products in Massachusetts and elsewhere. The following report focuses on the results of the nationwide Thermostat Recycling Corporation (TRC), a voluntary industry-funded program to collect and recycle end-of-life mercury thermostats, which does not include incentive payments, as well as a number of other state mercury thermostat collection efforts, many of which do include incentives.

In 2006, the TRC collected over 113,000 thermostats containing 1,082 pounds of mercury nationwide and 3,354 thermostats containing 27.16 pounds of mercury in Massachusetts.¹ Compared with previous years, this was an increase in mercury thermostat collection – both in Massachusetts and nationwide. These and other mercury thermostat collection results are included in Section 1 of the Report.

However, in order to assess overall program effectiveness these collection numbers were compared to the number of eligible mercury thermostats likely to be entering the waste stream using a formula developed by the Maine Land and Water Resources Council.² Based on this formula, NEWMOA estimates that approximately three percent of the eligible mercury thermostats entering the waste stream in Massachusetts are collected through the TRC program each year with an additional three percent captured through another state program.³ The state of Maine, which is implementing legislation mandating thermostat collection with incentives to recyclers, has achieved a recycling rate twice that of Massachusetts.

To help identify possible mechanisms to improve thermostat collection rates, NEWMOA reviewed programs in a number of states, including those based on voluntary collection efforts as

¹ Thermostat Recycling Corporation Summary of Results by State:

<http://www.nema.org/gov/ehs/trc/upload/TRC%2006%20YEAR%20END%20SUMMARY-1.xls>

² Labeling and Collection of Mercury-Added Products, to the Joint Standing Committee on Natural Resources, 119th Maine Legislature, January 1999.

<http://www.state.me.us/dep/mercury/hgreport.htm> - can request a copy of the full report from Maine DEP.

³ This second program, which includes incentive payments to recyclers, is being implemented in only a portion of the state and is funded by Massachusetts municipalities whose trash is incinerated.

well as those with mandated incentive payments, and has included this assessment in Section 2 of the Report.

A review of the experience in other states reveals that the most successful mercury thermostat collection and recycling efforts:

- Include mandated financial incentives (payments), sometimes paid by the manufacturers, for heating ventilation and air conditioning (HVAC), electrical contractors, and homeowners that collect and recycle thermostats;
- Effectively inform HVAC, electrical contractors, and homeowners about applicable mercury product disposal ban requirements;
- Engage retailers, household hazardous waste programs, municipal officials, and others in expanding the accessibility and convenience of mercury thermostat collection and recycling locations; and
- Implement effective outreach and education efforts to increase awareness of the importance and environmental and public health benefits of mercury thermostat collection and recycling.

Section 1: TRC Thermostat Recycling Results

Background

The Thermostat Recycling Corporation's (TRC) thermostat collection program is an industry-sponsored private corporation, originally established by thermostat manufacturers Honeywell, White-Rodgers, and General Electric. TRC facilitates the collection of all brands of used, wall-mounted mercury-switch thermostats so that the mercury can be separated and recycled. Collection takes place through Heating Ventilation and Air Conditioning (HVAC) wholesale outlets, HVAC contractors, and more recently through local household hazardous waste facilities throughout the U.S. Participation is voluntary, and the companies and agencies collecting the thermostats pay a one-time fee of \$25.00 to obtain a collection bin to store and ultimately transport the thermostats for recycling. The elemental mercury from the thermostats collected through this program is reclaimed.

TRC has been recycling mercury-switch thermostats since January 1998 when they initiated the program in nine states – Florida, Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, Ohio, and Wisconsin. The group expanded its operations in January 2000 to include Washington D.C. and 13 of the eastern states. In 2001, TRC further expanded the program so that it was available in all 48 continental states. As of 2006, TRC operates programs in 45 states. The TRC nationwide results are presented in Table 1.

In 2001, NEWMOA conducted a telephone survey of the electrical wholesale firms in the Northeast who were participating in the TRC program to collect used mercury-containing thermostats. NEWMOA presented the results of that survey in *Review of the Thermostat Recycling Corporation Activities in the Northeast*.⁴

At the request of MassDEP, NEWMOA conducted a second survey in 2003 of the HVAC and electrical wholesalers in Massachusetts that were listed as participating in the TRC program. These survey results, as well as a brief assessment of the program's progress, are presented in *Survey of Thermostat Recycling Corporation (TRC) Wholesalers*.⁵

In 2007-2008, MassDEP asked NEWMOA to examine the current status of the TRC program in the Commonwealth and the experience of other states with TRC and other thermostat collection initiatives to help identify possible options to enhance thermostat recycling in Massachusetts and elsewhere. Massachusetts' mercury products legislation now bans the sale and distribution of mercury-containing thermostats, and their disposal in household trash, in Massachusetts as of May 1, 2008.

The following Sections of this Report provide up-to-date information on mercury thermostat collection results, covering the TRC collection program for Massachusetts, the Northeast states, and nationwide. This Report also reviews the variety of collection approaches used by other

⁴ Review of the Thermostat Recycling Corporation Activities in the Northeast, November 2001.
<http://www.newmoa.org/prevention/mercury/TRCreport.pdf>

⁵ Survey of Thermostat Recycling Corporation (TRC) Wholesalers, June 2003.
<http://www.newmoa.org/prevention/mercury/trc.pdf>

states and/or regions and identifies options that may be applicable for enhancing the program in Massachusetts and elsewhere. An “options assessment,” with recommendations for improving thermostat collection programs is presented in the final Section of this Report.

Results of TRC’s Collection Program

The number of thermostats and pounds of mercury collected nationwide are summarized in Table 1. According to the TRC, mercury thermostats contain an average of 1.4 mercury switches with a minimum of 2.8 grams of elemental mercury per switch.⁶ In 2006, TRC reported collecting over 113,000 thermostats containing 1,082 pounds of mercury nationwide. Since 1998, TRC has collected almost 560,000 thermostats containing over 5,000 pounds of mercury (Table 1).

Although the collection numbers have been increasing since the inception of the program and the totals collected are significant, as discussed later in this report, the available data indicate that only a small fraction of the total number of mercury thermostats disposed of each year are being captured for recycling. Most thermostats are still being disposed of in the trash and ultimately contribute to mercury releases associated with waste incinerators and landfills.

There are currently over 1,400 electrical wholesalers and almost 200 contractors participating in the TRC program nationwide. In 2007, TRC listed 63 wholesalers as participating in the TRC program in Massachusetts on their website.⁷ This shows an increase in participation, as compared to NEWMOA’s previous survey results, which confirmed 23 wholesalers participating in 2001, and 43 wholesalers participating in 2003. In addition to these wholesalers, TRC identified one contractor and five wholesaler chains in Massachusetts as participants.

In November 2006, TRC announced plans to expand to include local household hazardous waste (HHW) collection facilities in order to increase homeowner participation. Massachusetts currently has 14 permanent HHW collection facilities, serving 32 towns and cities, operating in the state.⁸ There are also many towns and cities that operate HHW collection events periodically throughout the year that would be eligible for participation in the TRC program.

Recently, MassDEP has been promoting TRC’s thermostat collection program to increase participation in the local municipalities. MassDEP is facilitating the delivery of thermostat collection containers for each municipality and paying the one-time \$25.00 TRC initiation fee. As of March 2008, 26 municipalities in Massachusetts have signed up for the program.⁹

⁶ Thermostat Recycling Corporation Power Point Presentation (August 2007):

<http://www.nema.org/gov/ehs/trc/upload/CRRRA%20Presentation%2007%2007.PPT>

⁷ Thermostat Recycling Corporation: <http://www.nema.org/gov/ehs/trc/> - click on the individual lists for Wholesalers (August 2007) and Contractors (March 2007).

⁸ Massachusetts Collection Centers for Household Hazardous Products – MassDEP Website:

<http://www.mass.gov/dep/recycle/hazardous/permctrs.htm>

⁹ MassRecycler Spring 2008 Newsletter

<http://www.massrecycle.org/publications.html>

Table 1
Thermostats and Elemental Mercury Collected by TRC Nationwide* (1998-2006)

| Year | Number of States Participating | Number of Thermostats Collected | Pounds of Mercury Collected |
|------------------------|---------------------------------------|--|------------------------------------|
| 1998 | 9 | 15,270 | 163 |
| 1999 | 9 | 27,780 | 237 |
| 2000 | 14 | 31,611 | 256 |
| 2001 | 23 | 48,215 | 402 |
| 2002 | 35 | 90,501 | 762 |
| 2003 | 40 | 64,957 | 626 |
| 2004 | 43 | 80,094 | 729.43 |
| 2005 | 43 | 87,899 | 819.81 |
| 2006 | 45 | 113,658** | 1,082.54 |
| Total 1998-2006 | 45 | 559,985 | 5,077.78 |

Source: <http://www.nema.org/gov/ehs/trc/upload/TRC%2006%20YEAR%20END%20SUMMARY-1.xls>

*The following states were not participants in the TRC collection program as of 2006: Alaska, Hawaii, Mississippi, Rhode Island, and Wyoming.

**This value is estimated to be approximately 2.5 percent of the total number of mercury thermostats that were eligible to be recycled during the Thermostat Recycling Corporation (TRC) program's most recently calculated year (2006). This percentage was calculated using Maine's method described on the following pages (see Table 3) and the current U.S. Census population estimates for the number of households (105,480,101) and private non-farm business establishments (7,499,702) in the U.S. The actual capture rate may be higher because this method is calculated based on the entire U.S. population, even though not all of the states participated in the TRC program in 2006 (see notation above).

The Northeast states have shown an increase in the number of thermostats and pounds of mercury being collected and recycled through the TRC program as shown in Table 2. Massachusetts, New Jersey, and New York were among the earliest Northeast states to join the program, and all of them have increased the number of thermostats collected.

Table 2 shows that thermostat collection and recycling in Massachusetts has been increasing. Massachusetts has among the largest number of thermostats collected (11,652 total) with the greatest increase (1,482 percent) in the Northeast since beginning the TRC program.

Table 2
Thermostat Collection Results for the Northeast States Participating in the TRC Program*

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Total | % Increase in Number of <u>Thermostats</u> from 1 st Year |
|-------------|-------|-------|-------|-------|-------|-------|-------|---------------|---|
| CT | | | | | | | | | |
| Thermostats | - | 305 | 224 | 901 | 909 | 1,333 | 972 | 4,644 | 219 |
| Pounds Hg | - | 2.3 | 1.4 | 7.8 | 6.85 | 13.54 | 7.99 | 39.88 | |
| ME | | | | | | | | | |
| Thermostats | - | 233 | 280 | 482 | 1,079 | 1,290 | 2,924 | 6,288 | 1,155 |
| Pounds Hg | - | 1.5 | 1.8 | 4.49 | 9.82 | 15.11 | 21.77 | 54.49 | |
| MA | | | | | | | | | |
| Thermostats | 219 | 262 | 429 | 1,168 | 3,242 | 2,978 | 3,354 | 11,652 | 1,432 |
| Pounds Hg | 1.9 | 2.5 | 3.6 | 11.56 | 28.47 | 29.05 | 27.16 | 104.24 | |
| NH | | | | | | | | | |
| Thermostats | - | 173 | 226 | 398 | 545 | 1,053 | 484 | 2,879 | 180 |
| Pounds Hg | - | 1.0 | 2.0 | 3.47 | 4.0 | 7.87 | 3.89 | 22.23 | |
| NJ | | | | | | | | | |
| Thermostats | 354 | 1,139 | 1,255 | 1,075 | 1,681 | 2,890 | 2,418 | 10,812 | 583 |
| Pounds Hg | 2.7 | 10.3 | 9.6 | 10.82 | 14.79 | 25.62 | 21.58 | 95.41 | |
| NY | | | | | | | | | |
| Thermostats | 2,083 | 1,334 | 1,041 | 1,829 | 2,473 | 2,211 | 3,915 | 14,886 | 88 |
| Pounds Hg | 19.73 | 14.5 | 9.0 | 16.23 | 20.97 | 20.64 | 34.12 | 135.19 | |
| VT | | | | | | | | | |
| Thermostats | - | - | 54 | 194 | 151 | 372 | 223 | 994 | 313 |
| Pounds Hg | - | - | 0.4 | 1.59 | 1.2 | 3.01 | 2.0 | 8.2 | |

Source: <http://www.nema.org/gov/ehs/trc/upload/TRC%2006%20YEAR%20END%20SUMMARY-1.xls>

* Connecticut, Maine, and New Hampshire did not join the TRC program until 2001. Vermont did not join the program until 2002. Rhode Island did not participate in the TRC program as of 2006.

However, although the trend is encouraging, many end-of-life thermostats continue to be disposed of in regular trash, which is incinerated or disposed of in landfills. In order to quantitatively assess thermostat recycling program effectiveness, NEWMOA calculated mercury thermostat capture rates in the Northeast based on a method developed by the Maine Land and Water Resources Council. This formula considers both the number of households¹⁰ and businesses, rather than an overall population estimate for calculating the number of thermostats in service in a state at any one time.

In January 1999, the Maine Land and Water Resources Council submitted a report, *Labeling and Collection of Mercury-Added Products, to the Joint Standing Committee on Natural Resources*,

¹⁰ Please note that the household data provided by the U.S. Census Bureau also includes mobile homes, trailers, and recreational vehicles, which would not contain thermostats, therefore, the actual number of eligible households in each state may be slightly less.

119th Maine Legislature.¹¹ In this report, the Council estimated the number of mercury thermostats entering the waste stream annually in Maine. Their calculation was based on the following assumptions:

- A thermostat has a 30-year life span;
- On average, there are 1.5 thermostats per household;
- On average, there are 1.25 thermostats per business establishment;
- 83 percent of all thermostats contain mercury; and
- On average, mercury thermostats contain 3 grams of mercury.

As shown in Table 2, TRC recovered 3,354 thermostats in Massachusetts in 2006, representing 27.16 pounds of mercury, which is an average of 3.67 grams of mercury in each thermostat. Maine's assumption of an average of 3 grams of mercury per thermostat appears to be, therefore, somewhat conservative. Using Maine's assumption for the amount of mercury in thermostats, and the most recent data from the U.S. Census Bureau, NEWMOA estimates that approximately 3,224,121 mercury thermostats are being used in Massachusetts at any one time, representing the "standing stock" of mercury thermostats (based on current U.S. Census estimates of 2,443,580 households and 175,291 private non-farm business establishments in Massachusetts).¹²

If each thermostat contains 3 grams of mercury, the mercury thermostats being used in Massachusetts at any one time may contain approximately 9,672,364.53 grams or 21,323.91 pounds of mercury (over 10 tons of mercury) in total. Assuming a thermostat life span of 30 years, approximately 107,471 mercury thermostats are estimated to be entering the Massachusetts waste stream, for a total of 710.80 pounds of mercury, per year.

Based on the 2006 results from TRC, the Massachusetts TRC program captured approximately 3 percent of the eligible thermostats in Massachusetts as shown in Table 3. An additional 3,280 mercury thermostats were recovered in Massachusetts through other community programs in 2006,¹³ raising the total estimated capture rate for Massachusetts in 2006 to approximately 6 percent. Table 3 presents the TRC collection results for the other states in the Northeast using the same approach to estimate the capture rate. The calculations show that Massachusetts has the second highest capture rate in the Region with Maine having the highest rate at approximately 13 percent.

¹¹ Labeling and Collection of Mercury-Added Products, to the Joint Standing Committee on Natural Resources, 119th Maine Legislature, January 1999.

<http://www.state.me.us/dep/mercury/hgreport.htm> - request a copy of the full report from Maine DEP.

¹² US Census Bureau State Quick Facts – Massachusetts: Household data (2000) and Private Non-farm Business Establishment data (2005)

<http://quickfacts.census.gov/qfd/states/25000.html>

¹³ Pat Scanlon (Scanlon Associates – Andover, MA) during a telephone interview on March 25, 2008.

Table 3
Thermostat Collection Recycling Rates in the Northeast for a Given Year*

| State | Number of Hg Thermostats (2006 TRC Data) | Households (2000 US Census) | Businesses (2005 US Census) | Number of <u>Eligible</u> Hg Thermostats | Capture Rate (%) |
|--------------|---|------------------------------------|------------------------------------|---|-------------------------|
| CT | 972 | 1,301,670 | 93,561 | 57,255 | 1.7 |
| ME | 2,924 | 518,200 | 41,933 | 22,955 | 12.7 |
| MA | 6,634** | 2,443,580 | 175,291 | 107,471 | 6.2 |
| NH | 484 | 474,606 | 39,224 | 21,053 | 2.3 |
| NJ | 2,418 | 3,064,645 | 242,128 | 135,556 | 1.8 |
| NY | 3,915 | 7,056,860 | 514,265 | 310,645 | 1.3 |
| VT | 223 | 240,634 | 22,273 | 10,911 | 2.0 |

Source: <http://quickfacts.census.gov/qfd/states/>

* Rhode Island did not participate in the TRC program as of 2006.

**The 6,634 mercury thermostats identified in this table is actually derived from two different data sets. The Thermostat Recycling Corporation (TRC) collected 3,354 mercury thermostats in 2006. The Massachusetts Municipal Solid Waste Collection (MSWC) program in the Wheelabrator communities collected an additional 3,280 mercury thermostats in 2006. Therefore, when combining this data, the total amount of thermostats collected from all the available programs in Massachusetts in 2006 was 6,634. The MSWC program is discussed in more detail in Section 2 of this Report.

As evidenced in Table 3 the state of Maine has, by far, the highest thermostat collection rate. At 12.7 percent, the Maine rate is over two times higher than that of the second best state, Massachusetts. The state of Maine is implementing legislation that requires thermostat manufacturers to implement recycling programs in the state that include financial incentives for those returning end-of-life thermostats. The state of Vermont recently enacted legislation with similar requirements, which has not yet been implemented. In Massachusetts, approximately three percent of the thermostats recycled in 2006 were captured through an incentive based program being implemented by the state municipal solid waste combustors in a limited number of communities, under mercury source separation plans mandated for these facilities by Massachusetts regulations. Additional mercury thermostats may be collected in Massachusetts and the other Northeast states through venues other than TRC, including the community initiatives described in Section 2 of this report.

Section 2: Other Programs and Possible Options for Increasing Thermostat Recycling

Many state agencies and environmental organizations are actively working to improve mercury thermostat collection and recycling. These stakeholders have evaluated a variety of factors, such as motivation and opportunity, when trying to determine how to increase overall program effectiveness. The Product Stewardship Institute (PSI), which has developed some of the pilot projects described below, has helped to facilitate many of these efforts.

By looking at specific programs, this Section helps to identify possible options for improving mercury thermostat recycling.

Thermostat Collection Initiatives

There are a variety of thermostat collection initiatives that have been implemented by the TRC, other organizations, and/or state agencies in the U.S. as a way to increase thermostat recycling. Many of these initiatives started with a pilot project, such as a temporary thermostat collection project offering an incentive for mercury thermostat recycling. The pilot projects have been designed to increase mercury thermostat collection and gather information on motivating factors for getting people to recycle. In some cases, these pilots have proven so successful that they have become permanent programs. They can serve as valuable models and help to identify common elements that contribute to success.

Massachusetts' Mercury Recovery Program – Community Initiatives

Massachusetts is implementing an initiative targeted specifically for the collection and recycling of mercury thermostats in communities served by waste-to-energy facilities. The program is funded by waste disposal fees – \$0.50 for every ton of waste. Wheelabrator currently operates three of the waste-to-energy facilities in the eastern part of the state, representing approximately 78 communities. For the past seven years, Scanlon Associates has worked for Wheelabrator to implement mercury thermostat recovery initiatives in these communities.

Activities include extensive education and outreach, such as annual mailings to all HVAC contractors licensed in the communities, radio ads, and newspaper advertising to target consumers as well as contractors, and site visits to plumbing supply stores located in the area. The program encourages local Boards of Health to develop and implement regulations banning the improper disposal of mercury thermostats. Each community has at least one centrally located and easily accessible collection site for mercury thermostats. Drop-off locations include Boards of Health, Departments of Public Works (DPW), and/or local solid waste transfer stations.

In 2006, the Wheelabrator program collected 3,280 mercury thermostats and small switches (some thermostats contain multiple switches) from the participating community drop-off locations. That same year, Wheelabrator launched an incentive-based pilot program, called the “Thermostat Reimbursement Program,” to encourage plumbing supply businesses to also collect mercury thermostats from their customers. A total rebate of \$5.00 per thermostat was offered to the plumbing supply businesses – a \$3.00 rebate to be paid to customers that brought in mercury thermostats and \$2.00 for the plumbing supply business who recovered them. In 2007,

Wheelabrator collected 3,715 mercury thermostats and small switches from these communities.¹⁴ This was a 14 percent increase from the previous year, suggesting that the financial incentive was a motivating factor in increasing thermostat collection.

The number of thermostats collected at these community drop-off programs is also comparable to the number of thermostats collected through the TRC program in the state. In 2006, approximately 3,280 thermostats were collected through the Massachusetts Mercury Recovery Program, representing all of the waste-to-energy facility communities in the state.¹⁵ As shown in Table 2, the TRC program in Massachusetts recovered 3,354 thermostats that same year. This suggests that many residents will take advantage of additional drop-off locations in their communities for recycling mercury thermostats.

Vermont's Pilot Project to Test Financial Incentives

From October 1 through November 30, 2007, the Vermont Agency of Natural Resources (VT ANR) and several hardware stores launched a thermostat collection pilot project by offering homeowners a financial incentive to return their used mercury thermostats for recycling. By bringing a mercury-containing thermostat into participating hardware stores, customers received a \$5.00 in-store credit per thermostat (limited to three per customer per visit) that could be used towards the purchase of any item in the store.

The 86 participating retail hardware stores collected over 1,000 mercury thermostats in this 8-week period – more thermostats than the TRC had ever collected in any year since beginning the program in Vermont in 2002.¹⁶ The results of this project suggest that the incentive was a key factor in motivating consumers to recycle thermostats. Other reasons could include the improved accessibility and convenience and retailers actively promoting the program to their customers.

This successful program contributed to the recent adoption of legislation in Vermont mandating manufacturers to provide incentives for thermostat recycling.

National PSI Educational Pilot Projects

In 2005, PSI initiated two separate educational pilot projects in an attempt to increase the number of HVAC wholesalers and the number of contractors participating in the TRC thermostat collection program respectively. These PSI pilot projects relied on the cooperation of many stakeholder groups, including TRC and the state government agencies to conduct outreach to the HVAC wholesalers and contractors via telephone and then follow-up with a letter requesting participation. However, the involvement of the stakeholders was not consistent, and the results from these projects were not promising – the number of participants in the TRC program in the individual states expanded only slightly (10 percent or less).¹⁷ PSI concluded that more direct outreach (i.e., personal contact as opposed to just mailing a letter) is important to the success of this type of project. State officials in Washington believe that this “personal touch,” including site visits, was critical to achieving the relatively small increase in participation. Wisconsin

¹⁴ Pat Scanlon (Scanlon Associates – Andover, MA) during a telephone interview on March 25, 2008.

¹⁵ Pat Scanlon (Scanlon Associates – Andover, MA) during a telephone interview on March 25, 2008.

¹⁶ Bob Nelson (Ace Hardware – Barre, VT) during a PSI networking conference call on January 16, 2008.

¹⁷ Mid-term Progress Report on Thermostat Projects 1 & 2 (December 2005):

http://www.productstewardship.us/associations/6596/files/Hg_MidProgressRep12.15.05.doc

provided bins to wholesalers free of charge, and was also able to achieve a slightly higher participation rate, suggesting that mailing information alone may not be sufficient to motivate participants.

Colorado's TRC Outreach Initiatives

The Colorado Department of Public Health and the Environment (CDPHE) has developed an initiative to promote the TRC program. When the TRC program was first introduced in the state in 2002-2003, CDPHE sent outreach and educational materials to HVAC wholesalers and encouraged participation from Lowe's and Home Depot hardware stores. As part of its "Mercury-Free Colorado Campaign," CDPHE continues to promote the TRC program to HVAC contractors, wholesalers, distributors, and service technicians. Since the overall goal of the program is to prevent disposal of mercury-containing thermostats in municipal landfills, CDPHE also promotes other mercury thermostat collection and recycling opportunities to consumers, such as highlighting household hazardous waste (HHW) facilities that accept mercury thermostats.

CDPHE maintains a list of HVAC wholesalers and contractors participating in the TRC program on its website as a way of acknowledging the efforts of Colorado's TRC participants and providing public recognition. As of 2006, the 18 participating HVAC wholesalers and contractors have helped to collect over 1,800 thermostats, diverting approximately 16 pounds of mercury from Colorado's landfills.¹⁸

Florida, Illinois, Minnesota, Washington, and Wisconsin HHW Collection Pilot Program

From May through December of 2006, the PSI and TRC conducted an eight-month thermostat recycling pilot program for HHW facilities in Florida, Illinois, Minnesota, Washington, and Wisconsin. Participation in the program included permanent HHW and universal waste (UW) facilities, mobile facilities, and one-time collection events in the five participating states. The program was designed to boost mercury thermostat collection from homeowners. TRC collection at HHW facilities provided an opportunity for homeowners, who otherwise may not have had a convenient option, to properly dispose of and recycle their out-of-use mercury thermostats for free.

During the 8-month pilot project, HHW facility operators in the states returned over 3,000 thermostats containing almost 22 pounds of mercury to TRC.¹⁹ This estimate does not represent all of the thermostats collected, since all the facilities had not yet returned their bins as of February 2007 (i.e., the date the report was prepared) – therefore, TRC believes that more thermostats were recovered during the pilot.

This pilot confirmed that mercury thermostats can be effectively collected and managed by HHW facilities. Because of its success, TRC has turned this pilot project into a full program for permanent HHW facilities and collection events nationwide. This expansion was initiated in

¹⁸ Colorado Mercury Thermostat Recycling Program Website:

<http://www.cdphe.state.co.us/HM/mercury/therm.htm>

¹⁹ Final Report: Thermostat Collection at HHW Facilities (May 2007):

http://www.productstewardship.us/associations/6596/files/PSI_Final_Report_to_EPA-Thermostat_HHW_Collection_5-16-07.doc

2007. Participating HHW facilities now accept mercury thermostats from homeowners and HVAC contractors free of charge, thereby providing them with a safe and convenient way to recycle out-of-use mercury thermostats. As a result of this expansion, TRC expects the number of mercury-added thermostats collected to increase in the future.

Indiana and Oregon Pilot Program to Test Financial Incentives

A pilot program evaluating the role that financial incentives can play in thermostat recycling was conducted in Indiana and Oregon from January 1 through December 31, 2006. The program was implemented by the TRC and PSI, with funding from the U.S. Environmental Protection Agency (EPA). Under this program, contractors in Indiana and in Oregon received rebate coupons for bringing mercury-containing thermostats to participating wholesalers. Contractors recycled their thermostats free of charge and could use the rebate coupons towards the purchase of a new non-mercury EnergyStar qualified thermostat (rebate coupons were accepted until June 2007). To determine whether different financial incentives affected the recycling rate, a \$3.00 rebate was tested in Indiana and a \$4.00 rebate was tested in Oregon.

In Oregon, the number of thermostats collected increased from 2,052 in 2005 to 4,587 in 2006 – an increase of 124 percent. The number of wholesalers that participated in the program increased from 20 in 2005 to 44 in 2006. In contrast, Indiana experienced a 6 percent increase in the number of thermostats collected during their pilot project – from 5,763 collected in 2005 to 6,080 in 2006. The number of Indiana wholesalers participating in the program during this time period only increased from 52 in 2005 to 58 in 2006.²⁰

Among the reasons for the difference in the success of the pilot programs in the two states could be the lower rebate amount offered in Indiana (\$3.00). Other reasons could include the relative age of the program in Indiana compared to Oregon and the fact that Oregon conducted more outreach to advertise their pilot project. Indiana was one of the first states to implement the TRC program in 1998. Many contractors and wholesalers had been participating in the program before the incentive pilot began, and there were not many new contributors. In contrast, the TRC program has been offered in Oregon since 2002, so the program might have been new to many people. The financial incentive was one way to get wholesalers and contractors, who were reluctant to participate in a new program, to “jump on board.” This, combined with targeted outreach and education, could have helped boost Oregon’s participation level.

Although there were differences in the effectiveness of the two programs, once the incentive pilot programs ended both states experienced a drop in thermostat collection, suggesting that the financial incentive was a significant motivating factor for people to recycle mercury thermostats.

Washington’s King County Pilot Project to Test Incentives

The King County Household Hazardous Waste Management Program in Washington State conducted a pilot project, similar to the one in Indiana and Oregon described above, from October 2004 through April 2005. As part of this pilot, HVAC contractors and service technicians were offered a \$4.00 cash incentive for each mercury thermostat they recycled at participating suppliers.

²⁰ Final Report: Effect of Financial Incentive for HVAC Contractors in Two-State Pilot (November 2007): http://www.productstewardship.us/associations/6596/files/Final_Report-Thermostat_Incentive_Pilot_OR_IN_11-12-07.doc

During the pilot project, a total of 2,089 mercury thermostats were recycled at the 27 King County suppliers equipped with TRC bins – however only eight of these suppliers offered the \$4.00 cash incentive. The total number of mercury thermostats recycled from these 8 suppliers was 1,676, which is an average of 210 thermostats collected per supplier. The 19 suppliers that did not participate in the incentive program collected 413 thermostats, which is an average of 22 thermostats per supplier.²¹ Therefore, 80 percent of the mercury thermostats that were recycled during this pilot were collected at just 30 percent of the suppliers. The suppliers participating in the cash incentive project collected approximately 10 times more thermostats than the non-participating suppliers, suggesting that the financial incentive was important in increasing thermostat collection.

Wisconsin's Public Recognition Program

The Wisconsin Department of Natural Resources (WDNR) created a public recognition incentive for HVAC wholesalers and contractors that choose to participate in the voluntary TRC program. Wholesalers and contractors that pledge to collect and recycle mercury thermostats receive public recognition in the form of certificates and pledge patches, both of which can be used as customer relations tools. As of 2004, there were approximately 50 HVAC wholesalers and contractors participating in Wisconsin's pledge program.²²

The City of Madison, in Dane County, Wisconsin strictly bans mercury thermostats from being disposed of in its landfills. To make it easier for homeowners to properly dispose of their thermostats, the City requires all retailers that sell mercury thermostats to offer a free mercury thermostat take-back program for their customers. This provides consumers with convenient locations to recycle. Residents are also allowed to dispose of mercury thermostats through the County's "Clean Sweep" program free of charge. In 2007, 372 mercury thermostats were recovered from Dane County and shipped via the TRC program for proper recycling.²³

State Thermostat Legislation

In this Section NEWMOA reviews the state laws covering the collection and recycling of mercury-added thermostats that have been enacted. Appendix A presents a brief summary of proposed state legislation and their status as of June 2008. Legislative proposals frequently change, so the Appendix does not provide full details on the proposed bills.

Maine's Law Requiring a Collection Program and Financial Incentives

Maine's Legislative Decision (LD) 1901, which was signed into law on April 14, 2004, established requirements for manufacturers of mercury-added thermostats and wholesalers, who sell mercury-added thermostats, to participate in a collection and recycling program. The bill required the manufacturers to establish at least 100 centers throughout Maine for collecting

²¹ Final Report: Mercury Thermostat Recycling in King County (March 2007):
http://www.productstewardship.us/associations/6596/files/Mercury_Therm_Recycling_King_County_Summary_Report_3-07.pdf

²² Wisconsin DNR Mercury Thermostat Recycling Website:
<http://dnr.wi.gov/org/caer/cea/mercury/thermostat/index.htm>

²³ 2007 Dane County and City of Madison Clean Sweep Annual Report:
http://www.danecountycleansweep.com/pdf/2007_Annual_Report.pdf

mercury thermostats, but did not include incentive payments. This bill also directed the Maine Department of Environmental Protection (Maine DEP) to submit a report assessing the effectiveness of the collection and recycling program in 2006. If the goals of the program were not met, the report was to include a plan for implementing a collection program in which the manufacturers of mercury-added thermostats are required to pay compensation for each mercury thermostat returned to a collection center.²⁴

Following the report required under LD 1901 – in which Maine DEP determined that the program was not effective in meeting its goals – a new legislative decision, LD 1792, requiring an incentive-based collection program for mercury thermostats, was established. LD 1792 was signed into law on April 10, 2006. The legislation required the Maine DEP, TRC, and other stakeholders to work together to develop a thermostat manufacturer collection program that would provide a minimum \$5.00 financial incentive, paid by the manufacturers, to the persons recycling mercury thermostats.²⁵ This is the first law of its kind in the nation.

Thermostat manufacturers belonging to TRC (i.e., Honeywell, White-Rodgers, General Electric, and more recently, Nordyne) account for 97 percent of the mercury thermostats recovered nationally through the TRC program – however, Maine DEP was interested in capturing the other 3 percent. The membership fee to join TRC is currently \$10,000 (one-time fee), which can be expensive for the smaller thermostat manufacturers, who are responsible for making relatively few thermostats. Therefore, most of them (with the exception of Nordyne, which is a large company) have chosen not to join TRC.²⁶ Because the State cannot require these thermostat manufacturers to join TRC, Maine DEP had to develop a parallel collection system, similar to TRC's, for these small manufacturers. This “dual collection system” enables all thermostat manufacturers to fulfill their regulatory obligations, but has also added a layer of complexity.²⁷ Maine DEP provides the wholesalers with a collection bin free-of-charge, and they must comply with the law by collecting mercury thermostats and returning the full bins to TRC. The costs of recycling the mercury thermostats and providing the financial incentive (including the administrative costs of processing the incentive coupon) are borne by the manufacturers.

Phase 1 of this program, the “Contractor Incentive Plan,” was initiated in May 2007. For this phase, manufacturers paid the \$5.00 incentive to contractors and service technicians recycling their used mercury thermostats. Early results show that 3,516 mercury thermostats were recycled from May through December in 2007 as compared to 1,609 during the same period in 2006 – more than doubling the number of thermostats collected. In addition, 47 TRC bins were returned during this period as opposed to only 17 bins returned during this same time period in the previous year.²⁸ The results suggest that incentive payments increase recycling rates.

²⁴ Maine Legislative Decision, LD 1901:

<http://janus.state.me.us/legis/LawMakerWeb/summary.asp?LD=1901&SessionID=5>

²⁵ Maine Legislative Decision, LD 1792:

<http://janus.state.me.us/legis/LawMakerWeb/summary.asp?ID=280019944>

²⁶ Ann Pistell (Maine DEP) during a telephone interview on May 1, 2008.

²⁷ Report on the Collection and Recycling of Mercury-Added Thermostats (March 2008)

<http://www.maine.gov/dep/rwm/legislative/mercuryaddthermo.doc>

²⁸ Report on the Collection and Recycling of Mercury-Added Thermostats (March 2008)

<http://www.maine.gov/dep/rwm/legislative/mercuryaddthermo.doc>

Maine's law requires all thermostat manufacturers to be responsible for the collection and recycling of their mercury thermostats. To avoid having to administer the financial incentive themselves, the thermostat manufacturers not belonging to TRC hired Environmental Products Incorporated (EPI) to handle all of the administrative tasks involved with the incentive program, such as writing checks.²⁹

In March 2008, Maine initiated Phase 2 of its collection program, the "Homeowner Incentive Plan," and established a mercury thermostat mail-back program for homeowners. This program was developed in response to LD 1792 and to *Maine Public Law Chapter 558*, which prohibits homeowners from disposing of mercury-containing thermostats in their household trash. The thermostat manufacturers are required to provide free pre-paid UPS mailing labels for shipping back the used thermostats to any homeowner that requests them. Once the manufacturer receives the thermostats, they mail a check of \$5.00 per thermostat to the homeowner. Payments continue to be provided to contractors and service technicians that recycle their thermostats through local HVAC wholesalers. Since this phase of the program is still new, the results have not yet been compiled – however, Maine DEP officials are optimistic that this phase of the initiative will also be successful.³⁰

Maine DEP plans to have the manufacturers initiate a homeowner thermostat collection system at retail locations. Agency officials believe that retail collection is an important component in the homeowner program, as it is both cost-efficient and convenient. They are proposing a manufacturer financed incentive in the form of a \$5.00 in-store coupon. The agency believes this is a more cost-effective approach than having the TRC, on behalf of the manufacturers, write and send individual checks to the homeowners. Maine DEP officials are currently working with the Maine Public Utilities Commission (PUC) and TRC to implement this initiative.³¹

Massachusetts' Local Mercury Thermostat Disposal Restrictions

Massachusetts legislation now prohibits the sale and disposal of mercury thermostats, but does not mandate specific recycling programs or incentives for mercury-added thermostats. In addition to state legislation, many local government agencies in Massachusetts are implementing ordinances requiring a collection and recycling program for mercury containing thermostats.

For example, the town of North Reading, Massachusetts implemented a mercury thermostat disposal ban and requires a collection program. Under *Massachusetts General Laws Chapter III, Section 31*, the North Reading Board of Health requires mercury thermostats to be disposed of through an approved recycling program. The program must document how they accept, store, recycle, and transfer each mercury device and provide documentation to the Board of Health that they have been successfully recycled. These regulations became effective on August 7, 2002.³²

²⁹ Ann Pistell (Maine DEP) during a telephone interview on May 1, 2008.

³⁰ Ann Pistell (Maine DEP) during a telephone interview on May 1, 2008.

³¹ Report on the Collection and Recycling of Mercury-Added Thermostats (March 2008)

<http://www.maine.gov/dep/rwm/legislative/mercuryaddthermo.doc>

³² North Reading Board of Health Mercury Disposal Thermostat Regulations:

http://www.northreadingma.gov/Pages/NReadingMA_Health/S006B55A5-00E4D59D

North Reading was the first community in Massachusetts to implement mercury thermostat collection requirements and is often used as the “model” for other towns. Shrewsbury has a comprehensive one-page regulatory document that many towns have also emulated. Currently, there are 60 communities in Massachusetts with mercury thermostat recovery ordinances and regulations. Penalties for non-compliance range from \$50.00 per thermostat up to \$300.00 per thermostat.³³

New Hampshire’s Thermostat Collection Law

Senate Bill (SB) 528 was first introduced to the New Hampshire Senate’s Energy, Environment, and Economic Committee on January 23, 2008. The original bill passed the Senate on February 14, 2008 and was referred to the House Committee of Ways and Means, which recommended an amendment to the bill that removed the proposed requirements for providing financial incentives. The amended bill was passed by the House on May 14, 2008 and the Senate concurred on May 21, 2008. As of June 17, 2008, SB 528 is awaiting action by the Governor.³⁴

The law requires thermostat manufacturers to fund a collection and recycling program for collecting out-of-service mercury-added thermostats from wholesalers, contractors, service technicians, and homeowners. Thermostat collection will take place at all wholesaler locations, HHW facilities, solid waste facilities, and UW locations approved by the New Hampshire Department of Environmental Services (NH DES). Retail locations will help facilitate the residential recycling program by distributing pre-paid mailing labels and educational materials to consumers for recycling their mercury thermostats (provided by the manufacturers). In addition, contractors that remove a mercury thermostat from a home are required to recycle the unit through the program. Performance goals are not specified in the bill but will be set within four months of the first annual report submitted by the manufacturers for NH DES review.

Vermont’s Law Requiring a Collection Program and Financial Incentives

In response to the success of their thermostat collection pilot program launched at retail hardware stores (described above), the Vermont legislature enacted legislation, H.0515, requiring thermostat manufacturers to establish a collection program for out-of-service mercury thermostats. This law is modeled after Maine’s law and requires manufacturers to set up convenient collection and recycling programs for mercury thermostats from all sources, including residential, commercial, and institutional. Bill H.0515 was passed by the House on March 20, 2007 and passed by the Senate on April 22, 2008. It was signed into law by the Governor on May 19, 2008.³⁵

The law requires thermostat manufacturers to provide a minimum \$5.00 financial incentive for each mercury thermostat that is turned in for recycling. For service technicians and contractors returning thermostats to wholesale locations, the \$5.00 incentive will be provided in the form of cash or a coupon that is redeemable for cash. In the case of homeowners, who are returning a

³³ Pat Scanlon (Scanlon Associates – Andover, MA) during a telephone interview on March 25, 2008.

³⁴ Status of New Hampshire Senate Bill, SB 528:

http://gencourt.state.nh.us/bill_status/bill_status.aspx?lsr=2887&sy=2008&sortoption=&txtsessionyear=2008&txtbillnumber=SB528&q=1

³⁵ Vermont Bill, H.0515:

<http://www.leg.state.vt.us/database/status/summary.cfm?Bill=H%2E0515&Session=2008>

mercury thermostat to a retail collection point, the incentive may be provided in the form of a coupon that is redeemable for credit towards the purchase of any other merchandise in that store. Other components of the law include provisions for developing education and outreach materials for wholesalers, retailers, contractors, and homeowners; and requirements for reporting mercury thermostat collection rates for evaluation of the program.

Iowa's Thermostat Collection Law

Iowa recently enacted legislation House File (HF) 2669, requiring thermostat manufacturers that have sold or distributed mercury thermostats in Iowa to implement an approved collection plan for collecting mercury thermostats and report the collection results to the Iowa Department of Natural Resources (DNR) annually. Although specific performance measures are not identified in the law, it states that the Iowa DNR, in consultation with interested stakeholders, will determine collection goals for the program by January 2009. If these collection goals are not met, the groups will consider modifications to the collection plan. In addition, this law requires that thermostat retailers provide outreach and educational materials to their customers.

This bill was first introduced as HF 751 on March 12, 2007 and later reintroduced as HF 2329 on February 20, 2008. The bill was reintroduced again as HF 2669 on April 3, 2008 after a group of local middle school students and their teacher pushed for legislation requiring used mercury-containing thermostats to be recycled rather than discarded in municipal garbage. After passing the Senate and the House, HF 2669 was signed into law by the Governor on May 12, 2008.³⁶

Oregon's Thermostat Collection Law

Oregon's House Bill (HB) 3007, was enacted to reduce the amount of mercury entering the environment through solid waste disposal. Under this law, manufacturers of mercury thermostats are mandated to provide programs for the collection of thermostats, as well as to provide incentives and sufficient outreach information for their customers on proper mercury thermostat disposal. Manufacturers must also create a notification process for the disposal of mercury thermostats by HVAC wholesalers and contractors. This bill was signed into law on August 8, 2001.³⁷

Other Mercury Product Collection Campaigns

Examining the results from other product stewardship initiatives, in addition to those specifically related to thermostat recycling may also provide valuable lessons that could be applied to mercury thermostat collection programs. There are a variety of successful initiatives underway nationwide and in many states that focus on the collection and recycling of other mercury-added products. The summary below is not a comprehensive review of all of the mercury-added product programs around the U.S. but rather examples that illustrate some available options and approaches.

³⁶ Iowa House File, HF 2669:

<http://coolice.legis.state.ia.us/Cool-ICE/default.asp?Category=BillInfo&Service=Billbook&ga=82&hbill=HF2669>

³⁷ Oregon House Bill, HB 3007:

<http://ssl.csg.org/dockets/23cycle/2003A/23Abills/0223a01or.pdf>

Automobile Switches

Minnesota's auto switch recovery program is an example of a successful incentive-based collection mercury-added product program. The two-year pilot program, started in 2004 and funded by the Alliance for Automobile Manufacturers, established a \$1.00 bounty for dismantlers that remove the mercury switches (e.g., light switches, anti-lock brake system switches, and HID headlamps) from the automobiles and collect them for recycling before the cars are flattened, shredded, and melted to make new steel. The result was that over 8,700 mercury switches were recovered from approximately 14,000 vehicles – a significant increase compared to past recovery and recycling rates.³⁸

Other states have also implemented auto switch recovery programs with success. In August 2006, the mercury switch removal project was expanded into a national program, the National Vehicle Mercury Switch Recovery Program (NVMSRP). The program is now managed by End of Life Vehicle Solutions (ELVS), which ensures that the mercury switches are properly recycled. An incentive of \$1.00 per mercury switch pellet and \$3.00 per anti-lock brake system mercury switch is paid to the dismantlers that remove, collect, and ship them to ELVS.

In Maine, the removal of mercury switches from automobiles is mandatory. Under *Title 38 Section 1665-A*, mercury switches are required to be removed from automobiles prior to dismantling. Automobile dismantlers and end-of-life vehicle (ELV) handlers are required to remove mercury switches and send them to a collection facility; automobile manufacturers must then pay a \$4.00 bounty for each switch that is delivered for recycling – as long as the switch is accompanied by a vehicle identification number (VIN). Since the start of the program in 2002, approximately 18,000 mercury switches, containing nearly 40 pounds of mercury have been collected and recycled.³⁹ As part of this program, Maine DEP continues to develop educational and outreach materials, including the *Best Management Practices for Motor Vehicle Recycling* guidance manual.

Fluorescent Lamps

Vermont requires all mercury-containing lamps to be managed as hazardous waste. Commercial businesses must dispose of their lamps through an electrical wholesaler, licensed recycler, or local HHW facility (for small businesses only). Consumers must also properly dispose of and recycle their mercury-containing lamps. To make this process easier for consumers, the Vermont Department of Environmental Conservation (VT DEC) and Vermont Small Business Development Center (VT SBDC) partnered with local Ace, Do it Best, and True Value hardware stores to set up collection points where customers can drop-off their spent fluorescent lamps (including CFLs and HID bulbs). This program is funded by VT DEC and VT SBDC, who pay the recycling costs of the fluorescent lamps through a supplemental environmental project fund established specifically for this program.

This program received additional funding in February 2008 and is expected to continue for another 2-3 years (depending on how many lamps are collected). When the funding is finally exhausted, the plan is that the hardware stores will take on the financial responsibility to sustain

³⁸ John Gilkeson (Minnesota PCA) during a PSI networking conference call on November 28, 2007.

³⁹ Mercury Switch Removal from Motor Vehicles in Maine: Fourth Annual Report (March 2007).

<http://mainegov-images.informe.org/dep/rwm/motorvehiclerecycling/pdf/fourthautoswitchreport2007.pdf>

the program. VT DEC and the participating stores will need to figure out the logistics of this program over the new couple of years, but VT DEC officials are hopeful that the program will continue successfully.

Collection points at the hardware stores provide the consumer with a convenient, safe, and legal way to dispose of their lamps. As of 2007, participating hardware stores in Vermont have collected over 104,598 linear feet of fluorescent tubes and 2,768 circle-lines, u-tubes, and compact fluorescent bulbs.⁴⁰

This program continues to be such a success, that other states have adopted similar ones. For example, the New Hampshire Department of Environmental Services (NH DES) has developed a program modeled on the one in Vermont by offering consumers the opportunity to recycle their fluorescent lamps at select hardware stores. This program is funded under a settlement agreement to conduct mercury projects and recovered 814 compact fluorescent lamps and 26,920 linear feet of linear lamps in its first year.⁴¹

TAGS Home and Hardware and other independent hardware stores in Cambridge, Massachusetts also accept spent fluorescent lamps from homeowners for free recycling.⁴² This program is currently funded by the City of Cambridge – there is no financial incentive offered, but the City pays the costs for recycling the bulbs.

Similarly, Efficiency Vermont (EVT) is funding a separate program for all other lighting partners (~150-200) not already involved in the VT DEC/VT SBDC program to collect and recycle compact fluorescent lamps (CFLs). They have just recently started placing 5-gallon mail-back containers for CFLs in grocery stores and other lighting stores as part of this project.⁴³

Options for Improving Thermostat Collection Rates

The programs described in the previous sections demonstrate that the most successful mercury-product collection and recycling can be achieved when a program addresses motivation, opportunity, and awareness. To increase thermostat recycling, the review of experiences to date indicates that programs should combine financial incentives, greater accessibility, and effective education/outreach. In particular, the most successful programs have been those that include financial incentives in the form of cash or merchandise rebates to those recycling thermostats.

As described in Appendix A, some states are proposing legislation to address these challenges. As more states consider adopting laws pertaining to mercury thermostats, PSI developed a model thermostat collection and recycling program to assist states.⁴⁴ The model legislation focuses on

⁴⁰ Vermont Hardware Store Lamp Recycling Update – NEWMOA Newsletter (Spring 2007):

http://www.newmoa.org/prevention/newsletters/17_1/Vol17_1.htm#vt-dec-update3

⁴¹ New Hampshire Lamp Recycling Project Update – NEWMOA Newsletter (Spring 2008):

http://www.newmoa.org/prevention/newsletters/18_1/Vol18_1.htm#nh-des-update3

⁴² Kerrie Harthan (TAGS Home and Hardware – Cambridge, MA) during a PSI networking conference call on January 16, 2008.

⁴³ Karen Knaebel (Vermont DEC) in an email correspondence on June 11, 2008.

⁴⁴ Product Stewardship Institute's Model Program:

<http://www.productstewardship.us/displaycommon.cfm?an=1&subarticlenbr=107>

multi-stakeholder responsibility by manufacturers, wholesalers, and retailers. It includes options for prohibiting the sale, use, and disposal of mercury thermostats, and for establishing project performance goals.

Incentives

In all of the programs described above, thermostat recycling increased when financial incentives were provided. The pilot projects also demonstrated that keeping incentives consistent and on-going is important. As the Hazardous Waste Management Program in King County, Washington found, after the incentive stopped the number of thermostats recycled declined – despite the increase in the number of available TRC locations. Similarly, thermostat recycling rates in Indiana and Oregon significantly decreased once the financial incentive offered in their programs was removed. These examples suggest that the incentives were a significant motivation for recycling.

PSI concluded that the behavior change associated with offering financial incentives wears off quickly once the incentives are eliminated. Therefore, these incentives need to be offered on a long-term basis in order to maintain the desired behavior.⁴⁵ For example, the NVMSRP's goal is to change people's outlook on collecting and recycling mercury switches by continuing to offer financial incentives for the vehicle mercury switch recovery program for up to three years.

The results of some pilot programs suggest that simple cash incentives may lead to increased thermostat recycling rates. Offering a rebate or coupon usually involves more administrative work as compared with paying cash. Wholesalers and retail chains may be more likely to participate in incentive programs that have little or no cost to them and/or take a short amount of time to implement. In addition, service technicians, contractors, and consumers may be more likely to recycle mercury thermostats when they perceive an immediate reward, such as cash. Maine DEP originally considered promoting energy-efficient thermostats when developing their incentive program by specifying in the law that the incentive for recycling a mercury thermostat was to be a rebate towards the purchase of a new EnergyStar thermostat. However, stakeholders in the state asserted that the rebate process involving an EnergyStar purchase could add unnecessary complexity and administrative costs to the program and the proposal was dropped.⁴⁶

Indirect incentives, such as cost-savings, may motivate programs that are collecting thermostats to participate in TRC. HHW facilities can save money by using the TRC thermostat collection program for recycling the mercury thermostats that they collect. Ordinarily, HHW or UW facilities recycle thermostats together with other mercury products and pay a private vendor between \$3.00 and \$5.00 to pick-up, transport, and recycle each pound of mercury waste.⁴⁷ Over time, these fees can add up. Participation in the TRC collection program consists of a one-time \$25.00 initiation fee – no matter how many thermostats are collected or how many bins are returned.

⁴⁵ Final Report: Effect of Financial Incentive for HVAC Contractors in Two-State Pilot (November 2007): http://www.productstewardship.us/associations/6596/files/Final_Report-Thermostat_Incentive_Pilot_OR_IN_11-12-07.doc

⁴⁶ Ann Pistell (Maine DEP) written testimony to the Vermont Legislature Senate Committee on Natural Resources & Energy, in a letter dated March 25, 2008.

⁴⁷ Final Report: Thermostat Recycling at HHW Facilities (May 2007): http://www.productstewardship.us/associations/6596/files/PSI_Final_Report_to_EPA-Thermostat_HHW_Collection_5-16-07.doc

Enforcement for non-compliance may also be a negative incentive. Many states, including California, Maine, Massachusetts, Minnesota, New Hampshire, Rhode Island, and Vermont, have laws restricting or fully prohibiting the disposal of mercury-added products, including mercury thermostats, in household trash.⁴⁸ Therefore, in order to stay in compliance and avoid possible enforcement, wholesalers, contractors, and consumers must properly recycle their mercury thermostats.

Another example of an incentive for contractors to participate in thermostat recycling would be requiring it as a condition of their professional license. Non-compliance with this requirement could lead to having their license revoked.

Accessibility

As demonstrated by the pilot programs described above, another effective way to increase the number of mercury thermostats being recycled is to offer more accessible collection locations. Until recently, contractors and wholesalers were the main groups being targeted with information about the TRC program. PSI estimates, however, that consumers account for nearly 25 percent of the mercury thermostats sold each year in the U.S.⁴⁹ Yet many consumers do not recycle their old thermostats – either because they are not aware of the dangers mercury in thermostats may pose to the environment or they do not know about recycling opportunities, among other reasons. Depending on the location, one of the most convenient options for consumers to recycle mercury thermostats is through existing HHW and UW facilities in their community. Other convenient locations for mercury thermostat collection include local government agencies, such as the Board of Health, Departments of Public Works (DPWs), and solid waste transfer stations, as demonstrated in some Massachusetts communities.

Results from Vermont's thermostat incentive pilot project at hardware stores suggest that accessibility can play a significant role in getting consumers to recycle their mercury thermostats. Most of the customers that recycled their thermostats in Vermont made a purchase at the hardware store – in fact, just 40 coupons were not redeemed at the end of the project.⁵⁰ The reasons for this may vary, but one reason could be that the customer needed to go to the hardware store, and having a collection point at the store provided an easy way for them to drop off their thermostats rather than having to drive to another facility to recycle them. Since it is illegal for consumers in Vermont to dispose of mercury thermostats in household trash, they may look for the easiest way to recycle them. Therefore, a thermostat collection point at the local hardware store is a convenient way for consumers to participate.

The results are similar for fluorescent lamp collection points in Vermont and New Hampshire hardware stores. Even without the financial incentive, people reported that they were more likely to recycle their spent fluorescent bulbs because the hardware store locations were

⁴⁸ State Mercury Thermostat and Related Product Laws and Legislation Chart (updated June 11-21, 2007): <http://www.productstewardship.us/displaycommon.cfm?an=1&subarticlenbr=108>

⁴⁹ Final Report: Thermostat Recycling at HHW Facilities (May 2007): http://www.productstewardship.us/associations/6596/files/PSI_Final_Report_to_EPA-Thermostat_HHW_Collection_5-16-07.doc

⁵⁰ Bob Nelson (Ace Hardware – Barre, VT) during a PSI networking conference call on January 16, 2008.

convenient. In fact, when customers were surveyed, two out of three indicated that they would be willing to pay \$0.50 per bulb for the convenience of continuing to recycle their fluorescent lamps at the hardware stores in Vermont.⁵¹

As described above, Maine's law makes it mandatory for wholesalers to serve as mercury-added thermostat collection points, making thermostat recycling more accessible to service technicians. This requirement also "levels the playing field" by putting the collection responsibility on both the thermostat manufacturers and the wholesalers that sell them. HVAC service technicians and contractors account for the majority of mercury thermostats recovered through the program. By requiring wholesaler participation, service technicians have more options for recycling out-of-use mercury thermostats at convenient locations. The entire \$5.00 rebate goes directly to the service technician, which also contributes to the success of Maine's program.

Outreach

Outreach and education are important for informing people about state requirements and thermostat recycling opportunities. Part of the success of the pilot project in Oregon may be attributed to their greater level of education and outreach as compared with Indiana. This additional outreach included personal contact with wholesalers and contractors, and the use of a dedicated intern for making program information widely available. Only 726 coupons were redeemed for the 6,080 thermostats returned in Indiana; and in Oregon, only 1,578 coupons were redeemed for the 4,587 thermostats returned.⁵² This suggests that many of the contractors did not take part in the incentive, and the outreach associated with the entire pilot project was important.

Maine requires all HVAC service technicians and contractors to have a professional license. Because of this, Maine DEP was able to obtain a list of service technicians working in the state and use this list to provide direct outreach and education about the new law. Before the thermostat recycling law went into effect, Maine DEP mailed outreach packages with information about the increased recycling opportunities and financial incentive to the 11,500 licensed service technicians in the state.⁵³ The substantial outreach activities, coupled with increased wholesaler participation and the resulting bin availability, helped to increase thermostat collection results – however, the greatest increase occurred after the financial incentive went into effect.

King County, Washington publicized its thermostat pilot project through articles in trade publications, posters and brochures at participating wholesalers, and information mailings to contractors. Staff also visited many HVAC contractors to make "personal contact." However, the best publicity, according to King County staff, was word-of-mouth among HVAC service technicians and contractors.⁵⁴ The amount of mercury thermostats collected from the

⁵¹ Bob Nelson (Ace Hardware – Barre, VT) during a PSI networking conference call on January 16, 2008.

⁵² Final Report: Effect of Financial Incentive for HVAC Contractors in Two-State Pilot (November 2007): http://www.productstewardship.us/associations/6596/files/Final_Report-Thermostat_Incentive_Pilot_OR_IN_11-12-07.doc

⁵³ Report on the Collection and Recycling of Mercury-Added Thermostats (March 2008) <http://www.maine.gov/dep/rwm/legislative/mercuryaddthermo.doc>

⁵⁴ Final Report: Mercury Thermostat Recycling in King County (March 2007): http://www.productstewardship.us/associations/6596/files/Mercury_Therm_Recycling_King_County_Summary_Report_3-07.pdf

Wheelabrator communities in Massachusetts, also suggests that significant outreach and education, in conjunction with the thermostat regulations, has helped to promote mercury thermostat recycling. Direct mailings, regional and local advertisements, and local promotions (e.g., posters, stickers, etc.) have educated residents and contractors of the need to prevent these mercury devices from entering the municipal waste stream – as well as the need to comply with the regulations.

Part of the success of the HHW collection pilot project in Florida, Illinois, Minnesota, Washington, and Wisconsin can be attributed to the level of outreach conducted by PSI and the states to encourage participation and raise awareness. PSI and the five pilot states developed various outreach materials for this project, including fact sheets, flyers, templates for posters and newspaper advertisements, and TRC bin stickers. PSI and TRC issued a joint press release to announce the project kick-off and several trade publications published news articles. Illinois issued a press release in coordination with PSI and TRC, and held a separate press event, which was covered by several TV stations. Many other states and facilities also reported that they conducted additional outreach activities.

In order to figure out how people became aware of the project, hardware stores participating in Vermont's fluorescent lamp recycling project provided all customers returning lamps with a short survey. The survey results showed that the number one way most customers found out about the recycling project was through in-store outreach, such as flyers, signs, and conversations with employees. The second most common way people learned of the initiative was through newspaper advertising.⁵⁵

While, the financial incentive was a motivating factor for recovering vehicle mercury switches during Minnesota's pilot program, much of the program's success is also due to the significant amount of outreach and education conducted by the Minnesota Pollution Control Agency (MPCA), Minnesota Waste Wise, and other partners.⁵⁶ By educating automobile dismantlers at scrap metal yards to properly and safely remove the mercury switches from the vehicles, they were able to achieve a greater level of program participation and therefore, a better mercury switch recovery rate.

Summary of Options for Expanding Thermostat Collection

Mercury thermostat collection programs may be improved through several mechanisms. These include offering some form of an incentive for recycling mercury thermostats (financial or other), increasing the accessibility of thermostat collection points, and implementing a variety of outreach and education efforts to HVAC wholesalers, contractors, and consumers. The following bullets summarize options that could be implemented:

- Develop a consistent and long-term financial incentive program for example, through legislative requirements. A two-month incentive program might not generate lasting results because after the two-month period, customers are not motivated enough to

⁵⁵ Bob Nelson (Ace Hardware – Barre, VT) during a PSI networking conference call on January 16, 2008.

⁵⁶ Report on Implementation Progress of the Minnesota Auto Mercury Switch Recovery Program (May 2005): <http://www.pca.state.mn.us/oea/publications/mn-switchreport-may2005.pdf>

recycle their thermostats.

- Promote flexibility by allowing persons to recycle mercury thermostats through multiple, convenient mechanisms, such as HVAC wholesalers, HHW facilities, local government facilities, and local retailers. This allows people to choose a location that makes the most sense for them. With increased recycling locations comes the need for increased outreach and education – for everyone involved. MassDEP should be mindful to provide significant outreach at the start of the “new and improved” program as well as periodic updates throughout.
- Involve all stakeholders at the beginning of the process. The motivating factors that are discussed in this report – incentives, accessibility, and outreach – should also be addressed in any type of legislative proposal. As experience has shown, the most successful programs consist of a combination of all of these factors.
- Continue to reach out to HHW facilities and encourage them to participate in the TRC program to increase thermostat recycling rates among consumers. For example, there are currently 14 permanent HHW collection centers, serving 32 towns in Massachusetts.⁵⁷ In addition, many cities and towns organize annual or periodic HHW collection events where homeowners can drop off mercury-added products for recycling.
- Work with local government agencies, such as community Boards of Health, to encourage proper disposal and recycling of mercury thermostats. Local collection points are often convenient for residents, so setting up drop-off locations at community facilities would increase consumer accessibility.
- Seek to expand and leverage existing programs. For example, elements of the successful thermostat recycling efforts established by Wheelabrator in Massachusetts may be transferable to other communities.
- Partner with local retailers, such as hardware stores, to provide thermostat collection locations. This type of collection method benefits all participant levels – the retailers can generate additional sales from customers that spend money at the store, the mercury products are recycled, the consumer is given an easy way to comply with the law, and the entire effort generates positive publicity.
- Publicize laws prohibiting mercury thermostats from being disposed of in municipal trash, as applicable.
- Develop an outreach effort about mercury thermostats and the importance of recycling and use this opportunity to promote energy efficiency by encouraging the use of digital programmable thermostats as replacements for the mercury thermostats.

⁵⁷ Massachusetts Collection Centers for Household Hazardous Products – MassDEP Website:
<http://www.mass.gov/dep/recycle/hazardous/permctrs.htm>

- Set performance goals. This was an important aspect of the Maine law. Without these performance goals to measure against, Maine DEP would not be able to evaluate the program's effectiveness.
- Address the challenge that can result from a dual collection system like the one that is underway in Maine. Maine DEP hopes that as more states implement mercury-added thermostat legislation, the smaller thermostat manufacturers will join TRC, thus eliminating the need for two separate collection systems. As more states require thermostat recycling, the number of thermostats that these small manufacturers are responsible for will grow. Therefore, they may find that the TRC membership fee is more cost effective for them.

Appendix A: Status of Proposed Thermostat Legislation

California's Proposed Legislation

Previously proposed legislation, Assembly Bill (AB) 1193, would have enacted the Mercury Thermostat Collection Act of 2007. Part of this proposal required manufacturers to establish and maintain a collection and recycling program for out-of-service mercury-added thermostats. This bill was first introduced on February 23, 2007; was amended and referred to various committees; and was recommended for adoption by the Committee on Environmental Safety and Toxic Materials and sent to the Committee on Appropriations on April 17, 2007. However, this bill did not pass and is currently inactive.⁵⁸

Another newly proposed bill, Assembly Bill (AB) 2347, sponsored by the California Product Stewardship Council and the Sierra Club was recently introduced on February 21, 2008 and referred to the Committee on Environmental Safety and Toxic Materials on March 5, 2008. It has since gone through a series of amendments and was most recently re-referred to the Committee on Environmental Quality on June 10, 2008. This proposed bill is similar to the previous one in that it would require thermostat manufacturers to establish and maintain a collection and recycling program for out-of-service mercury-added thermostats by January 1, 2010. The proposed bill also includes a requirement for developing educational and outreach materials for contractors, service technicians, and homeowners as a way to encourage the return of thermostats to the established recycling collection points. Sellers of mercury-added thermostats (retailers and wholesalers) would be required to act as a collection site and to distribute these outreach and educational materials to customers. The proposed bill also includes financial penalties for non-compliance.⁵⁹

Illinois Proposed Legislation

The recently proposed bill, House Bill (HB) 5348, would create the Mercury Thermostat Collection Act. This proposed legislation would require thermostat manufacturers to establish and maintain a program for the collection and recycling of mercury thermostats. The program must include an incentive and will be reviewed and approved by the Illinois Environmental Protection Agency (IEPA). The mercury thermostat collection program must be designed to achieve the following collection goals based on the estimated number of mercury thermostats that are removed, replaced, or taken out of service during the year: 15 percent in 2011 and 2012; 30 percent in 2013 and 2014; 50 percent in 2015 and 2016; and 80 percent for each year thereafter. This bill was first introduced on February 14, 2008 and referred to the Environmental Health Committee. After a series of amendments (including removal of a requirement for retail locations to provide outreach materials), it passed the House on April 8, 2008. It is currently under review in the Senate.⁶⁰

⁵⁸ Status of California Assembly Bill, AB 1193:

http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=ab_1193&sess=CUR&house=B&author=ruskin

⁵⁹ Status of California Assembly Bill, AB 2347:

http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=ab_2347&sess=CUR&house=B&author=ruskin

⁶⁰ Status of Illinois House Bill, HB 5348:

<http://www.ilga.gov/legislation/billstatus.asp?DocNum=5348&GAID=9&GA=95&DocTypeID=HB&LegID=36610&SessionID=51>

Montana Proposed Legislation

Montana's proposed bill, House Bill (HB) 0779, was an act that would ban the future sale or installation of mercury-added thermostats; require manufacturers of mercury-added thermostats sold in Montana to establish collection and recycling programs; require incentives for recycling mercury-added thermostats; and prohibit the sale of thermostats by manufacturers who are in non-compliance. Introduced on February 20, 2007, this bill was referred to the Committee on Business and Labor, but unfortunately was not passed – citing technical concerns.⁶¹

Pennsylvania Proposed Legislation

Proposed legislation, Senate Bill (SB) 830 and House Bill (HB) 44, would require thermostat manufacturers to establish and maintain a collection and recycling program for out-of-service mercury thermostats received from contractors, service technicians, and homeowners. It would also require that manufacturers provide adequate incentives and outreach/education materials so that persons are encouraged to bring their thermostats to these collection points for proper recycling. SB 830 and HB 44 were referred to the Environmental Resources and Energy Committees on May 3, 2007 and January 30, 2007 respectively.⁶²

⁶¹ Status of Montana House Bill, HB 0779:

<http://data.opi.mt.gov/bills/2007/billhtml/HB0779.htm#About>

⁶² Status of Pennsylvania Senate Bill, SB 830 and House Bill, HB 44:

<http://www.legis.state.pa.us/cfdocs/billinfo/billinfo.cfm?&syearch=2007&searchind=0&body=S&type=B&bn=0830>

<http://www.legis.state.pa.us/cfdocs/billinfo/billinfo.cfm?&syearch=2007&searchind=0&body=H&type=B&bn=0044>