# IMERC Fact Sheet
# Mercury Use in Thermostats

This Fact Sheet summarizes the use of mercury in thermostats found in residences, businesses, and industrial settings, including thermostats sold as stand-alone units and as components within heating and cooling equipment. It includes information on the total amount of mercury in all thermostat products that were sold in the U.S. in 2001, 2004, 2007, 2010, 2013, and 2016. To date, all manufacturers have phased-out the sale of mercury-added thermostats. Therefore, this Fact Sheet will likely be the last one prepared for this product category unless IMERC learns about new information on thermostats that contain mercury.

The information in the Fact Sheet is based on data submitted to the state members of the Interstate Mercury Education and Reduction Clearinghouse (IMERC), including Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The data is available online through the IMERC Mercury-Added Products Database.

## Mercury Components in Thermostats

Mercury thermostats use mercury switches to sense and control room temperature through communication with heating, ventilating, and air conditioning (HVAC) equipment.

Mercury thermostats contain bimetal coils that contract and expand with room temperature. When the coil contracts or expands, it activates the mercury switch, which opens or closes a circuit to make the furnace, heat pump, or air conditioner turn on or off. A mercury thermostat may contain one or more switches, depending on how many heating and cooling systems it activates.


Mercury Thermostat
Source: NEWMOA


Mercury Switch inside Thermostat
Source: Wikipedia


Mercury Thermostat
Source: NEWMOA

According to the Thermostat Recycling Corporation (TRC), mercury thermostats contain an average of 1.4 mercury switches (i.e., components), with a minimum of 2.8 grams of elemental mercury per switch. Therefore, the total amount of mercury used in a single thermostat is more than four grams. Industrial-sized thermostats may have multiple switches and thus have reported higher amounts of mercury. Some examples of industrial thermostats reported by manufacturers include a low-voltage multi-stage wall thermostat and a heat pump thermostat.

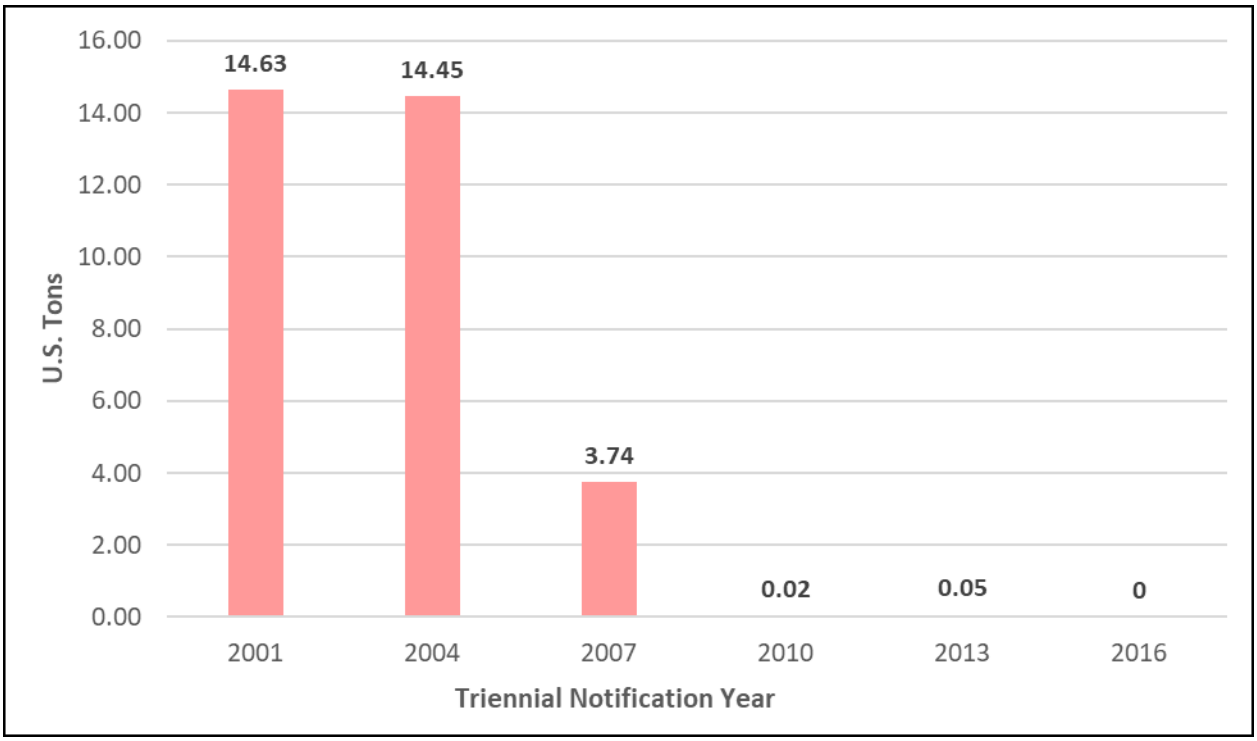
## Mercury Use in Thermostats

Table 1 presents information on the total amount of mercury sold in thermostats in 2001, 2004, 2007, 2010, 2013, and 2016.[1] Eight thermostat manufacturers have consistently submitted Mercury-added Product Notification Forms to IMERC-member states, though some started phasing out mercury in these devices as early as 2009.[2] As of the 2016 triennial report, all known thermostat manufacturers have reported to IMERC that they have phased-out making and selling mercury-added thermostats in the U.S.

**Table 1: Total Mercury Sold in Thermostats (pounds)**

| 2001 | 2004 | 2007 | 2010 | 2013 | 2016 |
|---|---|---|---|---|---|
| 29,253 (14.63 tons) | 28,901 (14.45 tons) | 7,485 (3.74 tons) | 32 (0.02 tons) | 102 (0.05 tons) | 0 (0 tons) |

[Note: 453.6 grams = 1 pound; 2,000 pounds = 1 ton. All numbers are rounded to the nearest whole number.]




[1] More detailed information on the 2001 and 2004 data can be found in the report, *Trends in Mercury Use in Products: Summary of the IMERC Mercury-added Products Database*, June 2008. (www.newmoa.org/prevention/mercury/imerc/pubs/reports.cfm)

[2] The National Electric Manufacturers Association (NEMA) reports on behalf of the three major thermostat manufacturers in the U.S. – General Electric, Honeywell, and White-Rodgers. These companies reported that they phased-out the manufacture and sale of mercury-added thermostats in October 2009.

The amount of mercury in thermostats sold in the U.S. during calendar year 2001 was 14.6 tons compared to zero as of 2016, which is a decreased of 100 percent. For the reporting year 2013, only one manufacturer continued to sell mercury thermostats and, although the amount sold shows a slight increase from the 2010 report, the number was small. All eight of the manufacturers that made and sold mercury thermostats in 2001 (see list below) have reported that they have completely phased out the manufacture of mercury-added thermostats and depleted their inventories as of January 2015, which is evident in the 2016 triennial reports.

Over the past decade, non-mercury programmable thermostats have grown in popularity due to their many advantages. These electronic thermostats are set to heat and cool based on a pre-programmed schedule, which helps conserve energy.

## Phase-Outs & Product Bans on the Sale of Mercury Thermostats

Since 2001, many states have passed legislation restricting the sale of mercury-added thermostats. The following IMERC-member states currently have restrictions on the sale and/or distribution of mercury-containing thermostats: Connecticut, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Rhode Island, Vermont, and Washington. Additional states that restrict the sale or use/installation of mercury thermostats include: California, Florida, Illinois, Iowa, Maryland, Montana, Ohio, Oregon, Pennsylvania, and Wisconsin.

In response to these mercury product bans and phase-outs, all eight thermostat manufacturers that have reported through IMERC have completely phased out the manufacture of mercury-added thermostats and stopped selling these products in these states. These manufacturers are:

- General Electric
- Honeywell
- Invensys Climate Controls
- Lux products Corp.
- Princo Instruments, Inc.
- PSG Controls, Inc.
- TPI Corp
- White-Rodgers

The Thermostat Recycling Corporation (TRC) estimates that mercury-containing thermostats have a life expectancy of 30-50 years, though many are replaced before that time. Conservatively, this means that mercury thermostats in the U.S. should be out of service by the end of 2065. Collection and recycling of these end-of-life products will continue to be a priority for states in years to come.

## Collection & Recycling Programs for Mercury Thermostats

The TRC thermostat collection program is an industry-sponsored private corporation, originally established by General Electric, Honeywell, and White-Rodgers. TRC facilitates the collection of all brands of used, wall-mounted mercury-switch thermostats so that the mercury can be

separated and recycled. For more information on the TRC program, visit: www.thermostat-recycle.org/.

Collection through the TRC program takes place through Heating, Ventilation, and Air Conditioning (HVAC) wholesale outlets; HVAC contractors; and local household hazardous waste facilities throughout the U.S. The participating companies and agencies pay a one-time fee of $25 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.

Some states, including California, Connecticut, Illinois, Iowa, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Montana, New Hampshire, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, and Wisconsin have enacted extended producer responsibility (EPR) legislation requiring thermostat manufacturers to establish collection programs for recycling out-of-service mercury thermostats. Some of these states have established annual performance goals as a way to measure the success of the program, though the methodology used to calculate the collection goals varies. For example, California bases its goals on the number of thermostats anticipated to become waste (i.e., at their end of life); Maine sets theirs based on mercury collection by weight.

Many states, including California, Illinois, Maine, Massachusetts, Minnesota, New Hampshire, New York, Rhode Island, and Vermont have laws restricting or fully prohibiting the disposal of mercury-added thermostats in household trash. As a result, these states are actively working to improve mercury thermostat collection and recycling – either by promoting the TRC's voluntary mercury thermostat collection and recycling program; or through other local, state, or regional mercury thermostat collections.

Table 2 illustrates the requirements of IMERC-member states for managing mercury-added thermostats at their end-of-life. For more information on the state programs and legislation pertaining to the collection of mercury thermostats, go to: www.thermostat-recycle.org/statelaws.

In order to boost collection rates, some states, including Maine and Vermont, require manufacturers to pay a financial incentive to persons delivering mercury thermostats for recycling. In 2013, Rhode Island conducted a pilot program that set performance goals and utilized a $5 financial incentive. For 2011 and 2012, 1,416 and 1,543 thermostats were collected, respectively. For 2013 and 2014, the State program recovered 2,618 and 2,720 units, respectively, which is an increase of over 76 percent. As a result of this success, Rhode Island set even more ambitious goals for future collections. While they did not choose to continue with a financial incentive, the law allows the State to impose a financial bounty if the program is underperforming.[3] New York also has the authority to require manufacturers to pay a financial incentive if collection goals are not met.

[3] Rhode Island Dept. of Environmental Protection Proposed Collection Targets for 2015-2020 for Collection of Out-Of-Service Mercury Containing Thermostats: http://www.dem.ri.gov/programs/benviron/assist/pdf/therfinl.pdf

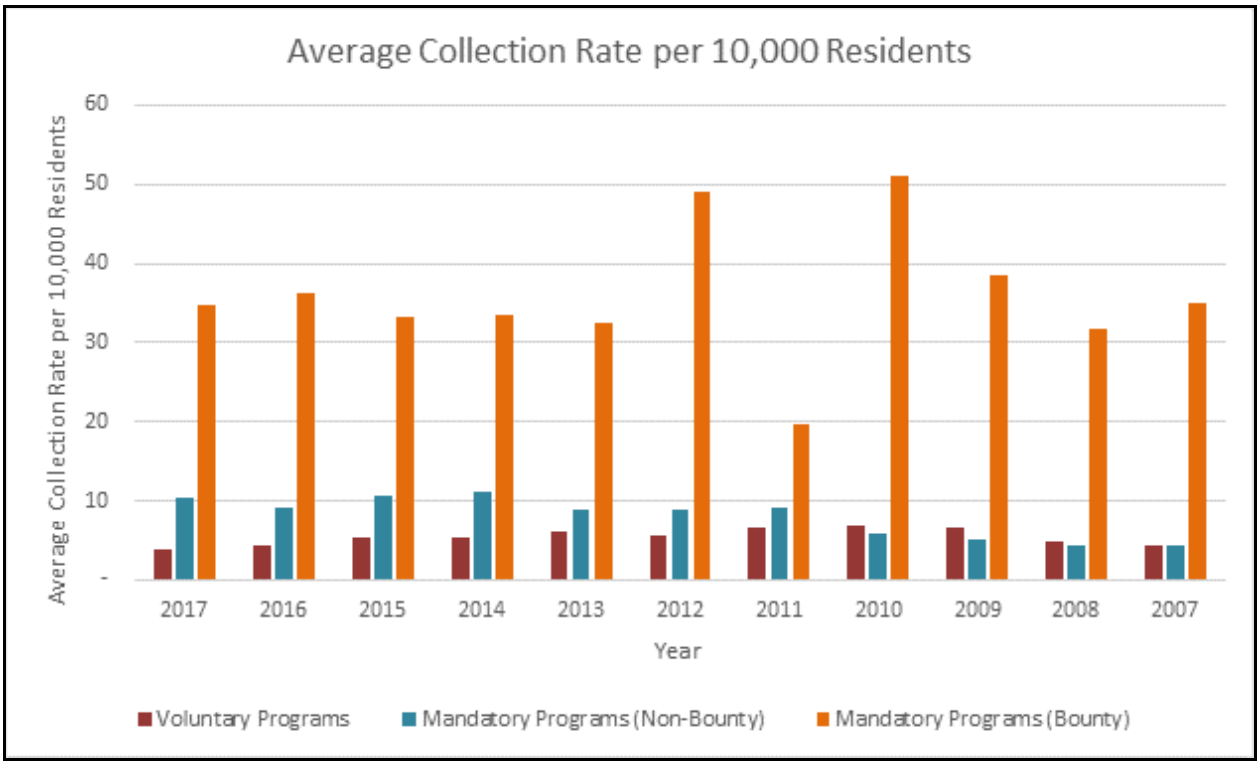
| Table 2: Regulations for Managing Mercury-Added Thermostats | | | | |
|---|---|---|---|---|
| **State** | **Prohibits SW Disposal** | **Manufacturer-Financed Collection** | **Annual Performance Goals** | **Financial Incentive** |
| Connecticut | | ✓ | | |
| Louisiana | | ✓ | | |
| Maine | ✓ | ✓ | ✓ | $5 |
| Massachusetts | ✓ | ✓ | | |
| Minnesota | ✓ | ✓ | | |
| New Hampshire | ✓ | ✓ | | |
| New York | ✓ | ✓ | ✓ | TBD |
| Rhode Island | ✓ | ✓ | ✓ | TBD |
| Vermont | ✓ | ✓ | ✓ | $5 |
| Washington | ✓ | | | |

As demonstrated in Table 3 and in the graph on the following page, the states with financial incentives have much higher mercury-added thermostat collection and recycling rates than the states that do not. Based on the 2017 data reported by TRC, NY had a collection rate of 4 percent, compared to ME and VT, which had collection rates of 30 and 42 percent, respectively. ME DEP notes that prior to the incentive program, Maine's mercury-added thermostat collection and recycling rates were below 10 percent. Once they began implementing the financial incentive program in 2009, the collection rate reached just under 26 percent (from both the TRC program and ME's universal waste program) – and has generally remained around 25-30 percent every year since then.[4]

| Table 3: TRC Mercury-Added Thermostat Collection in 2017* | | |
|---|---|---|
| **State** | **Number of Thermostats** | **Collection Rate (# thermostats per 10,000 people)** |
| Connecticut | 4,246 | 12 / 10,000 people |
| Maine | 3,973 | 30 / 10,000 people |
| Minnesota | 8,949 | 16 / 10,000 people |
| New Hampshire | 2,420 | 18 / 10,000 people |
| New York | 7,270 | 4 / 10,000 people |
| Rhode Island | 3,106 | 30 / 10,000 people |
| Vermont | 2,605 | 42 / 10,000 people |

*The IMERC states of LA, MA, MI, NJ, NC, and WA do not require annual TRC reporting and are not included in Table 3.

[4] Implementation of Product Stewardship in Maine, February 2014: http://digitalmaine.com/cgi/viewcontent.cgi?article=1026&context=dep_docs




## Non-Mercury Alternatives

There are non-mercury alternatives that are suitable for replacing mercury thermostats. These include electromechanical (i.e., air-controlled, reed switch, vapor-filled diaphragm, snap-switch) and electronic programmable thermostats (i.e., digital). Many factors should be considered when switching to a non-mercury thermostat, including the relative costs, availability, and product effectiveness.

Many of the non-mercury alternatives are readily available from wholesale and retail heating and plumbing supply stores at a generally comparable price to mercury thermostats. Programmable thermostats are slightly more expensive than traditional mercury thermostats, but can save energy and money, by enabling users to automatically adjust the temperature or turn off the heat or air conditioning depending on the time of day. Today, these devices are commonly used in both residential and commercial settings.

## Data Caveats

A number of important caveats must be considered when reviewing the data summarized in this Fact Sheet:

- The information may not represent the entire universe of mercury-added thermostats sold in the U.S. The IMERC-member states continuously receive new information from mercury-added product manufacturers, and as a result, the data presented in this Fact Sheet may underestimate the total amount of mercury sold in this product category.

- The Notification requirement only applies to manufacturers and distributors of mercury-added thermostats that are allowed to sell into one or more of the IMERC Notification States: Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

- The information summarizes mercury use in thermostats sold nationwide since 2001. It does not include products sold prior to January 1, 2001 or exported outside of the U.S., or products sold in-between triennial reporting years.

- Reported data includes only mercury that is used in the product, and does not include mercury emitted during mining, manufacturing, or other points in the product's life cycle.