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EPA's Roadmap for Mercury

I. Addressing Mercury Releases

July 2006

I. ADDRESSING MERCURY RELEASES

OVERVIEW

Significant progress has been made to date to reduce industrial emissions of mercury in the U.S., as well as to reduce or eliminate the amount of mercury used in various processes and products. Most of the large industrial sources of mercury emissions are sites where mercury is emitted as a byproduct of combustion processes. Other major sources of mercury include industrial processes and products that use mercury deliberately, such as certain chlor-alkali chlorine manufacturing processes, batteries, lamps, and measuring devices such as thermometers. Mercury is also released through mining practices, sewage discharge, and metal refining operations. When mercury is used in a product, most releases occur during manufacturing or disposal. In the U.S., there are over 100 manufacturing processes that use some form of mercury.[1]

In the last 15 years, EPA focused most of its mercury reduction efforts on large point sources of air emissions such as municipal waste combustors, medical waste incinerators, hazardous waste combustors, and more recently, industrial boilers and chlor-alkali facilities. With the March 2005 completion of EPA final regulations for coal-fired power plants, the Agency now has standards in place limiting mercury air releases from most major known industrial sources in the U.S.

In the next 10 years, in addition to implementing the regulatory standards in place, the Agency's efforts to reduce mercury pollution will focus on three areas in particular: smaller sources and industrial uses that collectively contributed over 20 percent of the nation's mercury air releases in 1999;[2] understanding and addressing mining releases that in some areas of the western U.S. are the major sources of mercury pollution to water and land; and international emissions which continue to

contribute to the mercury deposited in the U.S. EPA's strategy for addressing these three areas will include, where applicable, a combination of regulatory and voluntary approaches to reduce mercury releases to air, land, and water, coupled with efforts to address the use of mercury in products and processes. As the U.S. continues to address domestic mercury use and releases, it will also promote international efforts to address mercury use and emissions abroad as discussed further in Section V on international mercury efforts. (Note: The *Roadmap* generally uses metric tons when discussing global mercury use and emissions. However, U.S. air emissions are reported in English tons. One English ton is equivalent to 0.9070 metric tons.)

TABLE 1. National Air Emissions Estimates for Mercury[3]

Source Category	1990 (tons)	1999 (tons)[f]	% reduction
Utility Coal Boilers[b]	51.1	47.9[a]	6%
Industrial Boilers[b]	12.0	12.0	0%
Medical Waste Incinerators	49.7	1.6	97%
Municipal Waste Combustion	56.7	4.9	91%
Hazardous Waste Incinerators[b]	6.6	6.6	0%
Chlorine Production	10.0	6.5	30%
Electric Arc Furnaces[c]	6.9	NA	NA
Gold Mining	3.4[d]	11.5	NA
Other[e]	23.5	21.6	6%
Total	219.9	112.6	45%

[a] *1990 estimate derived using a different methodology.*
[b] *Regulations for these categories finalized after 1999.*
[c] *Electric Arc Furnaces data not available for 1999. The 2002 estimate is 10 tons per year.*
[d] *The 1990 emissions estimate is a preliminary estimate and is based on back calculations and assumptions using data from 1999 along with information about types of processes, production rates, and ores used in 1990 compared to 1999.*
[e] *Other includes, but is not limited to such items as, Portland cement production –2.36 tons per year (tpy), pulp and paper production–1.69 tpy, and over 219 miscellaneous industrial processes.*
[f] *1 ton equals 0.9070 metric ton.*

Releases to Air

Sources. When the 1990 Clean Air Act Amendments passed, more than half of U.S. mercury air emissions came from just three source categories: coal-fired power plants, municipal solid waste combustors, and medical waste incinerators. The major air emissions source categories are shown in Table 1.

Progress to date. EPA's Clean Air Rules. Medical waste incinerators and municipal solid waste combustors are now subject to stringent control standards that require facilities to reduce mercury emissions by over 90 percent from 1990 levels. These efforts have contributed to reducing overall mercury emissions to the air by about 45 percent (from 220 tons in 1990 to 113 tons in 1999—see Figure 2).

EPA's recently promulgated Clean Air Mercury Rule (CAMR) is part of a suite of regulatory actions that will dramatically improve America's air quality. CAMR directly regulates mercury emissions from coal-fired

power plants. Among other things, CAMR requires compliance with a two-phase nationwide cap on mercury emissions. The first phase cap (effective in 2010) is 38 tons per year ("tpy"), and the second phase cap (effective in 2018) is 15 tpy. Once fully implemented, CAMR will result in about a 70 percent reduction in mercury emissions from domestic coal-fired power plants, which is a reduction from a 1999 baseline of 48 tons.[4]

In addition to CAMR, the Agency recently issued another rule called the Clean Air Interstate Rule (CAIR) that addresses the transport of pollution across state borders in the eastern U.S. CAIR will result in the deepest cuts in sulfur dioxide and nitrogen oxide emissions in more than a decade. Although affected States retain flexibility to decide how to achieve the sulfur dioxide and nitrogen oxide emissions reductions required by CAIR, EPA has concluded that obtaining the reductions from power plants is highly cost-effective. EPA therefore anticipates that affected States will meet their emission reduction obligations by controlling power plant emissions through the two-phase cap-and-trade approach provided in the final CAIR, the first phase of which occurs in 2010 and the second in 2015. EPA also concluded that the technologies that most cost-effectively achieve sulfur dioxide and nitrogen oxide emission reductions for power plants are scrubbers for sulfur dioxide and selective catalytic reduction for nitrogen oxide. These technologies, once implemented, not only reduce sulfur dioxide and nitrogen oxide, they provide important reductions of mercury emissions from coal-fired power plants. Thus, CAIR and CAMR work together and provide a flexible multi-pollutant approach for reducing sulfur dioxide, nitrogen oxide, and mercury emissions from power plants. From a legislative perspective, the President's proposed Clear Skies legislation, if enacted, would require a mandatory 70 percent annual cut in power plant pollution (NOx, SOx and mercury) when fully implemented.[5]

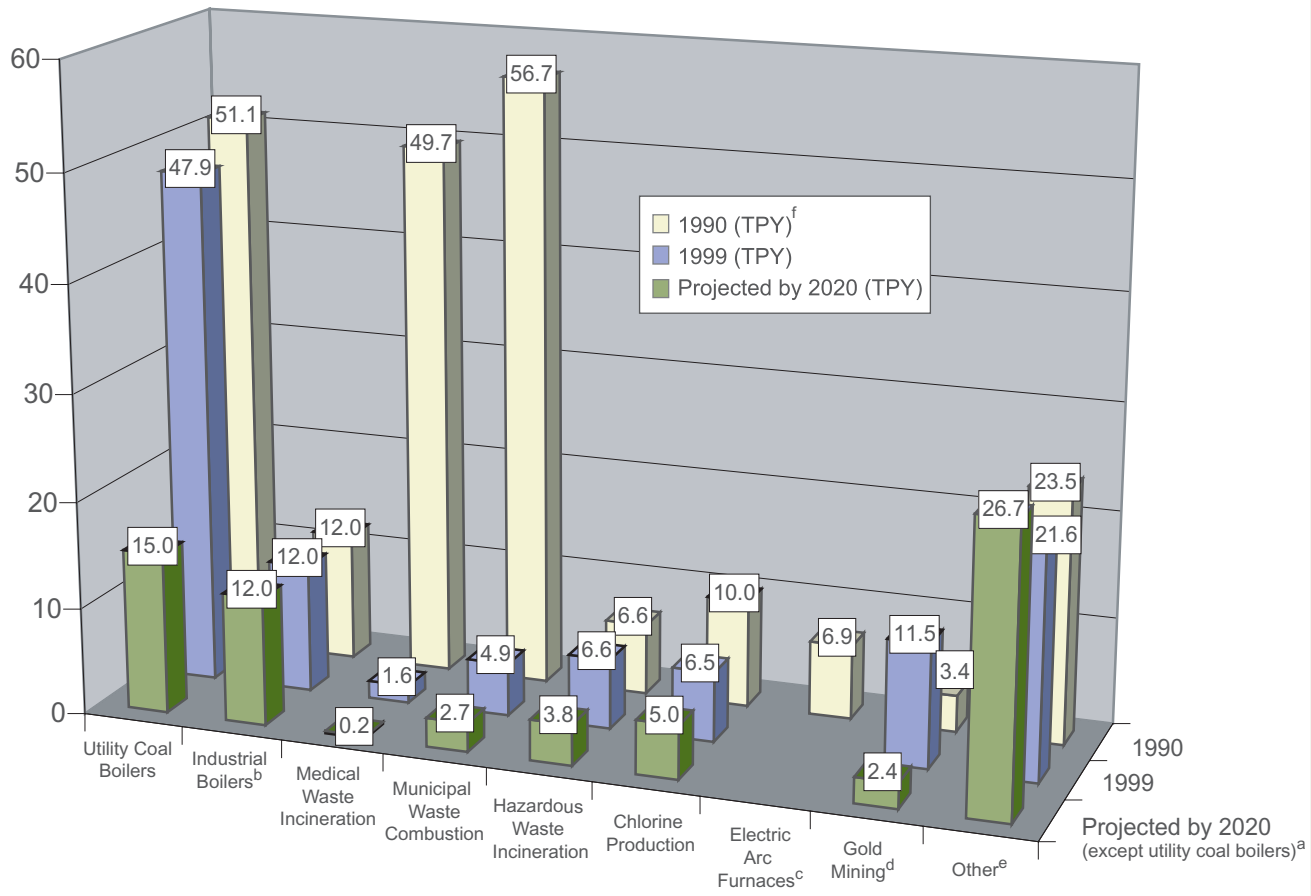
What is EPA's National Emissions Inventory (NEI)?

Section 112 of the 1990 amendments to the Clean Air Act (CAA) presents a list of Hazardous Air Pollutants (HAPs), also called air toxics, which includes mercury and mercury compounds. In 1993, EPA began developing the National Toxics Inventory (NTI). This database has been expanded and is now called the National Emissions Inventory (NEI). The NEI is a national repository of emissions inventory data for HAPs. The emissions data and estimates cover major, area, and mobile sources, and include estimates of emissions at the national, regional, county, and facility-specific levels.

The 1999 NEI generally serves as the national baseline inventory for this Roadmap because it includes HAP emission data supplied by 36 states in addition to data gathered while developing Maximum Achievable Control Technology (MACT) standards and Toxics Release Inventory (TRI) data. More information on the NEI, including summary data and documentation, can be obtained at http://www.epa.gov/ttn/chief/index.html.

In addition, §112 (f) of the Clean Air Act (CAA) required EPA to complete a Report to Congress that includes a discussion of methods EPA would use to evaluate the risk remaining after the application of Maximum Achievable Control Technology (MACT) standards. These are known as residual risks. EPA published the Residual Risk Report to Congress in March 1999.[6] The Agency continues to evaluate the remaining residual risks, if any, for a

FIGURE 2. Air Emissions Data for Mercury



[a]*Fifteen tons per year will be acheived when full implementation of the Clean Air Mercury Rule is achieved, which may exceed 2020.*
[b]*Growth in this sector is being offset by regulation.*
[c]*Electric Arc Furnaces data not available for 1999. The 2002 estimate is 10 tons per year.*
[d]*The 1990 emissions estimate is a preliminary estimate and is based on back calculations and assumptions using data from 1999 along with information about types of processes, production rates, and ores used in 1990 compared to 1999.*
[e]*These projected emissions do not account for reductions from non-regulatory actions described elsewhere in the Roadmap.*
[f]*1 ton equals 0.9070 metric ton*

number of source categories for which EPA has issued MACT standards. In the context of that review, EPA will evaluate the hazardous air pollutants (HAPs) emitted by each source category, including mercury.

Regional initiatives have also resulted in substantial reductions in air emissions of mercury. For example, EPA's Region 9 office and the State of Nevada entered into an innovative collaboration with four of the largest gold mining companies in Nevada to reduce mercury emissions associated with gold mining.[7] The Voluntary Mercury Emission Reduction Program set a goal to reduce mercury emissions by 50 percent by 2005, and has already surpassed this goal. In 2004, the program participants reported a 75

percent reduction from the baseline year. This is a reduction of 15,702 pounds of mercury from the baseline emissions of 21,098 pounds.[8]

Future focus. The Integrated Urban Air Toxics Strategy, which was published in the Federal Register in 1999[9], is an important element in EPA's national air toxics program. The strategy outlines actions to reduce emissions of air toxics, as well as assessment activities to improve EPA's understanding of the health and environmental risks posed by air toxics in urban areas. One major component of the Urban Air Toxics Strategy is the Area Source Program.[10] Area sources are smaller sources that can cumulatively emit significant amounts of hazardous air pollutants.

The 1999 Strategy identifies 33 hazardous air pollutants, including mercury, that EPA determined posed the greatest threat to public health in the largest number of urban areas. The Strategy further identifies 30 of those 33 HAP as being emitted by area sources. Finally, the Strategy identifies the 70 categories of industry sectors (i.e., source categories) that represent 90 percent of the aggregate emissions of the 30 identified HAP emitted by area sources. To date, EPA has issued standards for 16 of the 70 source categories and is currently collecting data and information for many other source categories.

Electric Arc Furnaces (EAFs)—one of the area source categories that the Agency is currently evaluating—emitted about 10 tons of mercury in 2002.[11] In EAFs, mercury is emitted through the stack when ferrous scrap containing mercury switches and other materials contaminated with mercury are melted. Many of these mercury-containing switches are found in scrap automobiles—over 200 million of these switches were installed in vehicles from 1974 to 2002. Although mercury switches were eliminated from new vehicles at the end of 2002, mercury switches will remain in the steel scrap supply for the next 10 to 15 years. The steel industry recycles about 12 to 14 million end-of-life vehicles each year, and vehicles retired in 2003 had 8.5 million mercury-containing switches.[12] The EPA air toxics program has identified EAFs as a priority sector and currently intends to propose emissions standards for that source category in 2006.

Releases to Water

Sources. The majority of mercury in surface waters from human activity in the U.S. is the result of air deposition, both from international and domestic sources. Mercury in surface waters can also occur naturally. Mercury can be released directly to surface waters from municipal sewage treatment plants, also called Publicly-Owned Treatment Works (POTWs), and non-municipal facilities (e.g., industrial and federal facilities). Point source discharges of pollutants to surface waters are required to have National Pollutant Discharge Elimination System (NPDES) permits.[13] On a national basis, these mercury discharges to surface waters are significantly smaller than nationwide inputs to water from air deposition. In some areas, particularly in the western states, mercury resulting from past mining practices (specifically mercury, silver, and gold mining) are significant sources of contamination to water bodies.[14]

EPA's Toxics Release Inventory (TRI) provides information on mercury releases to land, air, and water. (See box on page 27). Based on the EPA TRI data, total quantities of mercury discharged to surface waters have declined steadily from 2000 to

2004.[15] From 2000 to 2001 the decline was over 25 percent; from 2001 to 2002 nearly 32 percent; from 2002 to 2003 4 percent; from 2003 to 2004 nearly 59 percent and from 2000 to 2004 nearly 38 percent. TRI data for 2004 indicate that surface water releases of mercury totaled approximately 694 pounds (0.31 metric tons). An additional 219 pounds (0.10 metric tons) per year of mercury effluent is estimated from POTWs.[16]

Clean Water Act requirements. Under the Clean Water Act, states and authorized tribes must have water quality standards in place that define the designated uses and acceptable levels of pollutants for each water body under their jurisdiction. For mercury, EPA has published a national methylmercury ambient water quality criterion for protection of human health. This is a fish tissue concentration of 0.3 parts per million of methylmercury, based on EPA's 2001 Reference Dose (RfD) for methylmercury and consumption rates.[17] EPA's RfD is an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily oral exposure to the human population (including sensitive groups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.[18]

When pollutant levels exceed water quality standards, state water quality program managers must take action to reduce pollutant loadings. An initial step in this process is the development of a TMDL for a water body. The TMDL is the maximum daily amount of a pollutant that can enter a water body and still ensure that the water meets applicable water quality standards. TMDLs also allocate the allowable pollutant loads between the point and non-point sources of a pollutant.[19] Over 8,000 individual water bodies are identified as impaired (not meeting water quality standards) due to mercury contamination and will require mercury TMDLs,[20] and 44 states, 1 territory, and 2 tribes have fish consumption advisories due to mercury contamination.[21] States and EPA have been discussing how to best address mercury in their water bodies, since mercury can travel from sources out-of-state and from international sources and be deposited on local waters. Developing TMDLs that identify reductions from local sources alone is unlikely to result in attainment of water quality standards in many water bodies.

Progress to date. Because past analytical methods could not detect mercury at the level of current water quality standards in many effluents, there are limited data on low-level mercury discharges to water from point sources. To address the critical data gap, EPA recently developed a new more sensitive analytical method for use in water discharge permits.[22] As NPDES permits are reissued, they should require use of this more sensitive method where appropriate. Requiring use of this analytical method will improve EPA's understanding of the significance of point source mercury contributions to surface waters, and will provide necessary data for EPA and states to determine whether surface water discharge permits need to include mercury effluent limits.

As noted earlier, the states, tribes, and EPA's air and water programs are working together on how to address mercury pollution in TMDLs and water permitting programs, particularly mercury from air sources. To date, mercury TMDLs have been developed for over 250 water bodies in 19 states.[23] Many of these TMDLs identify needed reductions in air deposition of mercury. TMDLs such as those in Georgia and California also incorporate

mercury characterization and minimization provisions for water discharge (NPDES) permit holders. To assist states in developing mercury TMDLs, EPA has conducted two pilot projects in cooperation with Florida and Wisconsin to examine approaches that could be used in developing TMDLs for water bodies impaired by atmospheric mercury.

Within the Great Lakes basin, the states have adopted water quality standards to implement the Water Quality Guidance for the Great Lakes System, including a mercury criterion of 1.3 nanograms per liter (ng/l), based on protection of fish-eating wildlife.[24] Initial results in POTW effluent using the low level analytical method have averaged around 4 ng/l, and it is expected that most POTWs will not meet this criterion.[25] As a result, EPA expects the states in the Great Lakes region (EPA Regions 2, 3 and 5) will be utilizing statewide or individual variances from applicable water quality standards, which will involve setting mercury limits in NPDES permits based on a lowest technically achievable concentration, and requiring the POTW to implement a Pollutant Minimization Program (PMP) to address mercury-contributing sectors within its system. Region 5 has developed a PMP guidance document to promote a consistent approach to PMPs throughout its states.

EPA has provided sophisticated air modeling results to states to better identify the mercury contributions to water bodies from different air sources and geographic areas. The Agency has developed analytical tools that can be used to estimate the impact of air emission and deposition reductions on freshwater fish tissue concentration. These tools relate changes in mercury air emission and deposition rates to changes in mercury fish tissue concentrations.[26] By using such methods during the development of a TMDL, states may be able to determine how much of a reduction in air deposition is needed in order to meet water quality standards, and whether other actions in addition to anticipated air deposition reductions will lead to achievement of the water quality standard.

The Clean Water Act directs EPA to develop national technology-based regulations placing limits on the pollutants that are discharged by categories of industry to surface waters (termed "effluent guide-

EPA's Toxics Release Inventory (TRI)

In 1986, the U.S. Congress enacted the Emergency Planning and Community Right-to-Know Act (EPCRA) and in 1990 passed the Pollution Prevention Act (PPA). Section 313 of EPCRA and §6607 of PPA require certain industrial facilities to submit reports each year on the amounts of toxic chemicals released or otherwise managed as waste. Amounts released are reported separately for air, land, water, and offsite disposal. The reported information is compiled and presented annually as the Toxics Release Inventory (TRI).

In 1998, several new industry sectors were required to file reports for the first time. The new sectors included metal mining, electric utilties and hazardous waste treatment facilities. These new TRI reports have improved EPA's understanding of releases of mercury and mercury compounds. In 2000, the TRI program reduced the use threshold that triggers mercury reporting from 10,000 pounds to 10 pounds. As a result, small users of mercury and mercury compounds are now required to report. TRI information and mapping capability can be publicly accessed at www.epa.gov/triexplorer.

In this document, "TRI releases" refer to quantities of mercury- or mercury compound-bearing wastes that are released into the environment or otherwise disposed, and include, but are not limited to, releases to air, water and land, and to landfills, surface impoundments and underground injection. Even though disposals may be subject to regulatory and permitting requirements, disposal of mercury in waste to landfills, surface impoundments and underground injection is termed a "release" under TRI.

lines") or to POTWs (termed "pretreatment standards"). Pretreatment standards ensure that pollutants do not pass through or interfere with the safe and effective operation of these POTWs. CWA §307(b) requires that EPA revise or establish pretreatment standards from time to time, as control technologies, processes, operating methods, or other alternatives change.[27] As part of its pretreatment standards review process, EPA is reviewing industrial sources of mercury for potential technology-based options for controlling mercury discharges to POTWs. In addition, POTWs are beginning to implement best management practices for collecting mercury from other industrial sources.

Many states have initiated efforts to reduce mercury in wastewater by focusing on the dental sector. Mercury in dental wastewater can be removed by relatively inexpensive amalgam separators and/or by using other pollution prevention practices. Amalgam separators currently on the market can capture more than 95 percent of the mercury particles in wastewater.[28] In addition to outreach and education to dentists on safe handling and disposal practices for mercury-containing dental amalgam, some local efforts are offering incentives to encourage the use of amalgam separators. For example, the city of San Francisco, California has a goal of installing amalgam separators in all 900 dental offices located in the city and is offering assistance and incentives to dental offices least able to afford the separators—specifically those serving low-income communities.[29]

Future focus. EPA will continue to work with its state and tribal partners to identify approaches to TMDLs for water bodies impaired by atmospheric mercury in order to make progress toward achieving state water quality standards. Potential approaches include regional-scale TMDLs and approaches which take into account comprehensive state mercury reduction programs.

Releases to Land

Sources. TRI provides the best single source of information on releases of mercury to land. Based on TRI,[30] the total amounts of mercury that were released to land decreased by about 18 percent between 2002 and 2003 (from 2,554 to 2,079 metric tons per year). Although these amounts are relatively large, based on existing information, such releases are generally not considered to be as environmentally harmful as releases to air because the mercury may be less mobile and less likely to reach surface waters and fish. Nevertheless, because of the large quantities of mercury in waste being placed on the land, it is prudent for EPA to conduct further investigations to determine the risks associated with these releases.

The vast majority of U.S. land releases are the result of mining activities. Mercury is no longer mined domestically in the U.S., but is a byproduct of metals mining, particularly gold mining. The 2004 TRI data indicate that 2079 metric tons of mercury were released to the land. Of that, 1.461 million pounds were released to "other surface impoundments"[31] and 2.620 million pounds were released to "other land disposal".[32] Three metal mining facilities accunted for over 74 percent of the total mercury land releases in 2004. The majority of TRI land releases is due to gold, silver, and zinc mining, and may continue to rise over the next few years due to increased gold production.

The Agency is beginning to investigate and characterize mercury releases and

risks from mine tailings and mining processes, as well as other land releases. EPA plans to use the latest TRI data to evaluate trends for how mercury is being released to land.

A small percentage of releases to land reported in TRI are not related to mining activities. The majority of these releases is attributed to the disposal of mercury in waste in hazardous or non-hazardous regulated landfills or surface impoundments.

Progress to date. EPA has made substantial progress reducing the volume of mercury-containing devices disposed of in landfills since 1990. This progress is largely due to the Battery Act[33] which places limits on mercury used in batteries. The promulgation of the Municipal Incinerator Rules[34] also helped reduce the amount of mercury going into the waste streams by limiting mercury emissions from these incinerators, which in turn encouraged localities to begin collection and recycling programs for mercury-containing devices. The Universal Waste Rule[35] is another example of a regulation helping to facilitate proper management of mercury-containing devices to keep them out of incinerators and landfills. In August 2005, EPA finalized its proposal to add mercury-containing devices (e.g., thermometers and switches) to the federal Universal Waste Rule.[36] For these widely-generated hazardous wastes, this rule streamlines entry into the waste management system, encourages recovery and recycling, and keeps wastes out of the municipal waste stream. States and localities have made substantial progress promoting recycling of discarded mercury-containing products. Many states are also involved in banning certain mercury-containing devices and actively promoting the use of mercury substitutes, where available.

Future focus. Because there is a steady increase in reported land releases, the Agency will expand its efforts to better characterize and address land releases of mercury from the mining sector. The Agency intends to evaluate these releases to determine whether further action is needed.

Using the latest TRI data, EPA will continue to analyze long-term trends and monitor sectors that are not addressing their mercury releases to assess appropriate voluntary or regulatory avenues for addressing mercury releases.

EPA will continue to address mercury releases at remediation sites with significant mercury contamination consistent with the priorities set by the Superfund National Priorities List[37] and the RCRA Corrective Action baseline for high-priority facilities.[38] EPA will continue to coordinate with states to assist in cleaning up serious spills of mercury in order to protect public health. In addition, EPA is looking into mercury issues associated with abandoned mines relative to downstream water quality.

EPA will continue to work toward reducing risk associated with mercury from the nation's waste streams and from potential releases to land by promoting cost-effective reductions in mercury use in products and processes and by promoting the collection and recycling of discarded mercury-containing products.

State, Tribal, and Local Government Release Reduction Efforts

Many state, tribal, and local governments have been leaders in addressing mercury

releases. States have developed innovative mercury release and use reduction laws and regulations that supplement, and in some cases provide a model for, national efforts.

For example, the state of Maine passed a law requiring removal of mercury convenience lighting switches from automobiles prior to crushing the automobiles for scrap metal.[39] The purpose of the legislation is to reduce mercury releases from Electric Arc Furnaces (EAFs) used to melt scrap metal for steel production. The source of mercury from EAFs has been determined to be mercury components contained in the scrap metal melted by such furnaces. Scrap automobiles are the largest mercury-containing feedstock for these furnaces.[40] Several other states are pursuing their own auto switch removal programs, including Pennsylvania, New York, New Jersey, Illinois, Colorado, Washington, Oregon, and Idaho. As a result of this state leadership, auto manufacturers no longer install mercury switches for convenience lighting and are actively investigating ways to keep mercury out of vehicles. In addition, EPA is engaging in discussions with various stakeholders, including auto dismantlers, shredders, steel makers, auto manufacturers, environmental groups, and states, with the aim of developing a collaborative national approach to removing mercury switches from the large inventory of autos in use today prior to their disposal, crushing, and smelting.

States, tribes, and local governments have played a key role in outreach to the business community and to the general public about the importance of properly disposing of mercury-containing products and about alternatives to such products. Many states and local governments have sponsored mercury collection programs for businesses and households. For example, cities such as San Francisco, California, and states, such as Florida and New Hampshire, are conducting outreach to dentists on the proper handling and disposal of mercury-containing dental amalgam, including efforts to promote increased use of dental amalgam separators that reduce the amount of mercury discharged into the POTWs from dental wastewater.

Priority Activities for Addressing Mercury Releases

- ***Standard for Coal-Fired Power Plants*** – On March 15, 2005, EPA finalized the Clean Air Mercury Rule which establishes standards of performance for electric power plants based on a market-based cap-and-trade methodology. This rule will build on EPA's Clean Air Interstate Rule (CAIR) to significantly reduce emissions from coal-fired power plants. The standards address mercury air emissions from new and existing coal-fired electric utility steam generating units. When fully implemented, these rules will reduce power plant emissions of mercury from 48 tons per year to 15 tons per year, a reduction of nearly 70 percent.[41] **Timeline: CAMR will reduce emissions from 48 tons to 31 tons beginning 2010 and declining thereafter until emissions are reduced to 15 tons when the program is fully implemented**

- ***MACT Standard for Industrial Boilers*** – EPA promulgated a MACT standard for mercury air emissions from industrial boilers in September 2004. This effort should result in a 17 percent reduction in mercury emissions from this sector since 1990. **Timeline: Implementation by 2007**

- ***MACT Standard for Hazardous Waste Combustors*** – In October 2005, EPA published emission standards for mercury and other hazardous air pollutants for incinerators, cement kilns, lightweight aggregate kilns, industrial/commercial/institutional boilers and process heaters, and hydrochloric acid production furnaces that burn hazardous waste. An interim standard that took effect in 2003 has already reduced mercury emissions from levels in 2000 for incinerators, cement kilns, and lightweight aggregate kilns. The final MACT standard is estimated to further reduce mercury air emissions from all hazardous waste combustors by an additional 39 percent (from 2.4 tons/year to 1.5 tons/year).[42] **Timeline: Implementation by 2008**

- ***MACT Standard for Chlor-Alkali Sector*** – In December 2003, EPA promulgated a rule to regulate emissions of mercury from mercury-cell chlor-alkali plants.[43] Mercury-cell chlor-alkali plants produce chlorine and caustic soda (used to neutralize acidic compounds) using mercury cells. The rule will also require rigorous work practice standards that will reduce mercury emissions from fugitive sources. Although EPA is not able to accurately quantify the reductions associated with these work practice standards, the requirements will reduce mercury air emissions industry-wide. **Timeline: Implementation by December 2006**

- ***MACT Standard for Iron and Steel Foundries*** – In 2004 EPA issued a final rule to reduce toxic air emissions, including mercury, from iron and steel foundries. Iron and steel foundries melt scrap, ingot, and other forms of iron and steel and pour the resulting molten metal into molds to produce shaped products. The rule includes emission limits for manufacturing processes and pollution prevention-based requirements to reduce air toxics from furnace materials and coating/binder formulations. Implementation of the rule is expected to reduce mercury emissions by 1.4 tons—an 80 percent reduction from current levels.[44] **Timeline: Implementation by 2007**

- ***Area Source Program*** – Under the Urban Air Toxics Strategy, EPA is developing standards to control emissions of toxic air pollutants (hazardous air pollutants or HAP) from area sources. Area sources are those sources that emit less than 10 tons annually of a single HAP or less than 25 tons annually of a combination of HAP.

  The Clean Air Act (CAA) requires EPA to identify a list of at least 30 HAP that pose the greatest potential health threat in urban areas, and in the 1999 strategy, EPA identified 33 such pollutants. Of those 33 identified pollutants, EPA determined that 30 stem from area source emissions. Through three separate listings (including a list in the Urban Air Toxics Strategy), EPA has identified a total of 70 area source categories which represent 90 percent of the aggregate emissions of the 30 listed area source HAP. Of these 70 area source categories, 16 have been regulated, and EPA is currently collecting data and information for many other source categories. **Timeline: Ongoing**

- ***Rule on Electric Arc Furnaces (EAFs)*** – In 2006, EPA plans to propose a comprehensive rule for steel mills that

use EAFs to address emissions of mercury, lead, and other metals and organic hazardous air pollutants. EPA will also pursue voluntary programs in parallel with the development of regulations to ensure mercury emissions reductions. These actions collectively should greatly reduce mercury air emissions from EAFs and other scrap consumers over the course of the next 10 years. **Timeline: Propose rule in 2006**

- ***Mercury Automobile Switches*** – Many pre-2003 domestic passenger vehicles have mercury-containing switches in convenience light assemblies and anti-lock braking systems (ABS). Building on and coordinating with successful state and local automotive switch removal efforts, EPA hopes to develop a partnership with automobile dismantlers, scrap shredders, steelmakers, and the automotive industry to remove mercury switches from scrapped autos in the U.S. prior to disassembly, shredding, and melting in steelmaking furnaces. **Timeline: 2006**

- ***Characterize Mining Releases*** – EPA is examining the issue of mercury-bearing materials being placed on land at active gold mines and any subsequent releases which are not covered by TRI (air, surface, water, or ground water) associated with that placement. An effort is underway to assess the releases and their potential impact to determine if further action is warranted. **Timeline: 2006**

- ***Characterize Mercury Discharges to Surface Water*** – As mentioned in the progress to date section, EPA recently developed a new analytical method for use in water discharge permitting programs that will improve EPA's understanding of point source mercury contributions to surface waters. Based on that information, EPA is providing guidance to Publicly Owned Treatment Works (POTWs) on how to characterize sources of mercury to the collection system and how to develop mercury minimization measures where appropriate. Mercury in POTW collection systems may come from the medical sector, dental offices, schools, and certain industries. EPA is continuing to explore opportunities for pollution prevention in the dental sector and other sources. **Timeline: Ongoing**

- ***Issue Mercury Water Quality Criterion Implementation Guidance*** – EPA currently intends to issue implementation guidance to states and tribes for the fish-tissue-based mercury water quality criterion and how to incorporate it into permits and TMDLs. Once states and tribes adopt the water quality criterion into their water quality standards, officials can incorporate appropriate controls where necessary into TMDLs and watershed management decisions. State environmental officials can incorporate appropriate controls where necessary into permits and enforce these requirements. **Timeline: 2007**

- ***Improve Tools for Tracking Mercury in Fish Tissue*** – EPA continues to improve its models for tracking methylmercury in fish tissue and air deposition trends.[45] EPA will also begin to estimate the expected effectiveness of proposed Hg source reduction activities in terms of reduced fish tissue methylmercury concentrations. This effort may involve the continued evolution of the Mercury Maps model-

ing framework, and its integration with sophisticated air deposition model outputs (e.g., CMAQ [Community Multiscale Air Quality]). In addition, EPA will continue to refine its air emission inventories to provide an assessment of emission reductions gained through implementation of its regulatory programs. **Timeline: To be determined**

- ***Develop Alternative Approaches and Tools for Identifying Mercury Impairments and Developing Mercury TMDLs –*** EPA will work with states, tribes, and stakeholders to determine how best to use TMDLs to provide a basis for reducing mercury releases to water, including those from air deposition, to meet state water quality standards and Clean Water Act goals. EPA will provide updated mercury deposition modeling results to states for use in TMDLs, including the major sources of mercury deposition to each state. EPA will also evaluate approaches for identifying mercury impairments and developing mercury TMDLs, such as regional-scale TMDLs and approaches that acknowledge strong state mercury reduction programs, in order to make progress toward attaining state water quality standards. **Timeline: Ongoing**

- ***Promote The Proper Collection and Recycling of Dental Office Amalgam Waste –*** EPA is currently developing a dental office amalgam recycling program called its "gray bag" program. This program will assist dentists in properly collecting and managing dental amalgam wastes generated in their offices to minimize mercury releases to air, land, and water. This program also will ensure that dental amalgam is sent to responsible recyclers who can adequately minimize mercury releases by keeping the amalgam waste out of the wastewater stream and out of municipal and medical incinerators. **Timeline: In 2006**

- ***Fluorescent Lamp Recycling –*** EPA is administering a grant program to increase the recycling rate of mercury-containing lamps. Grants are used to create lamp recycling outreach programs targeting commercial and industrial users of mercury-containing lamps. State environmental agencies, tribes, non-profit organizations, lamp manufacturers, and recyclers are all partners in implementing this program. EPA is currently providing national coordination of these efforts as well as technical expertise on regulatory issues. EPA will build upon the results of this grant program to increase the national rate of bulb recycling. EPA is also working with Regions and states to develop guidance on the conditions under which drum top crushing of waste lamps can be permitted without unacceptable mercury releases or danger to personnel who operate the crushers. **Timeline: In 2006**

- ***Analyze Sectors and Trends for Mercury Releases in the TRI/NEI Databases –*** EPA will continue to evaluate the "other" smaller sources, as appropriate, that cumulatively release significant amounts of mercury to the environment. EPA will monitor existing data on how mercury is managed onsite and/or off-site and will examine potential sectors for expanding voluntary mercury reduction programs. **Timeline: Ongoing**