



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

Binational Toxics Strategy Mercury Progress Report

DATE: November 29, 2004

SUBJECT: PROGRESS UPDATE: U.S. MERCURY RELEASE AND USE REDUCTION CHALLENGES

FROM: ALEXIS CAIN, USEPA, Region 5

TO: BINATIONAL TOXICS STRATEGY MERCURY WORKGROUP

The Binational Toxics Strategy sets the following mercury reduction challenge for the United States: *"Seek by 2006, a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity. The release challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin. This challenge is considered an interim reduction target and, in consultation with stakeholders, will be revised if warranted, following completion of the Mercury Study Report to Congress."*

This memo provides an update on the status of progress toward meeting the 50 percent release reduction challenges. For mercury emissions, it provides several different estimates. Best available data indicates that significant progress is being made in reducing releases, with a reduction of more than 43 percent to 47 percent between 1990 and 1999. The prospects are good for meeting the 50 percent reduction challenge by 2006. For mercury use, best available data indicate that the challenge has already been achieved.

Trends in Mercury Releases

While the mercury release challenge refers to the aggregate of mercury emissions nationwide and mercury releases to water in the Great Lakes Basin, this memo will discuss mercury air emissions only, for two reasons. First, we lack trend data on mercury releases to water within the Great Lakes basin. Second, mercury water releases in the Great Lakes Basin are thought to be very small in comparison with nationwide mercury emissions, and therefore do not significantly impact the aggregate total. Thus, it is reasonable to assess progress through examination of national emissions data only.

The baseline year for assessing reductions in mercury releases is 1990, the year of the most recent mercury emissions inventory available at the time the Binational Toxics Strategy was signed (the draft Mercury Report to Congress 1990 emissions inventory). The U.S. Environmental Protection Agency subsequently updated its 1990 inventory in the National Emissions Inventory (NEI) for 1999. The 1999 inventory has been revised several times. The most recent data is summarized below.

U.S. National Air Emissions Inventory (tons)

Source Category	1990	1999
Utility Boilers	52.09	48.41
Coal-fired boilers	(51.05)	(47.91)
Oil-fired boilers	(1.04)	(0.5)
Industrial Boilers	11.83	11.91
Gold Mining	0.16	11.52
Hazardous Waste Incineration	6.57	6.58
Mercury Cell Chlor-alkali Plants	9.96	6.53
Municipal Waste Combustion	56.73	5.10
Medical Waste Incineration	49.73	2.84
Portland Cement Manufacturing	2.35	2.35
Refuse Systems	0.08	2.11
Pulp and Paper Production	1.9	1.62
Stationary Reciprocating Internal Combustion Engines	0.15	1.33
Industrial Inorganic Chemicals, NEC	0.25	1.2
Residential Heating: Distillate Oil	1.27	1.15
Petroleum Refineries, Catalytic Cracking and Reforming and Sulfur Plant Units	1.41	1.17
Lamp Breakage	1.5	1.01
Lime Manufacturing	0.1	1
Sewerage Systems	1.8	0.9
Primary Lead Smelting	1.3	0.0001
Hydrochloric Acid Production	2.98	0.0005
Other	7.38	8.84
Total	209.57	115.59

Total estimated emissions decreased 45 percent between 1990 and 1999. In some cases, this data may present a somewhat misleading estimate of the trend in mercury emissions, because for some categories, changes in emissions may reflect changes in estimating technique or improved knowledge about the source category, rather than actual changes in emissions. In the gold mining category, the apparent increase in emissions between 1990 and 1999 is clearly the result of improved estimating, not of a real increase in emissions. If we assume that mercury emissions from mining have held steady in relation to gold mine production, 1990 mercury emissions from this source would be an estimated 9.9 tons, in comparison with the 11.5 tons estimated for 1999. If this amount is added to the 1990 total, making a new baseline of 219.47 tons, mercury emissions declined 47 percent between 1990 and 1999.

U.S. National Air Emissions Inventory, Revised with 1990 Gold Mining Estimate (tons)

Source Category	1990	1999
All Sources other than Gold Mines	209.41	104.07
Gold Mining	9.90	11.52
Total	219.31	115.59

However, this estimate also does not include some recent information about mercury emissions from iron and steel foundries and electric arc furnaces. These facilities melt scrap, including vehicles, appliances, and other machinery contaminated with mercury-containing devices. EPA's Office of Air Quality Planning and Standards (OAQPS) has completed an emissions standard for iron and steel foundries, and is developing a standard for electric arc furnaces. As part of these efforts, OAQPS has developed emissions estimates for these sectors which were not included in the 1990 or 1999 inventory. Including these estimates, adjusted to reflect likely changes in the mercury content of scrap between 1990 and 1999, yields an estimate of a 44 percent reduction in total mercury emissions between 1990 and 1999.

National Air Emissions Inventory, Revised with 1990 Gold Mining Estimate and Estimates for Electric Arc Furnaces and Iron and Steel Foundries (tons)

Source Category	1990	1999
All Sources other than Gold Mines and Steel Production	209.41	104.07
Gold Mining	9.90	11.52
Electric Arc Furnaces*	8.56	10.70
Iron and Steel Foundries**	1.40	1.75
Total	229.27	128.04

* 1999, based on preliminary estimate of current emissions by OAQPS. 1990, based on assumption that 50% of emissions from these facilities are caused by mercury in vehicles, and that mercury content of end-of-life vehicles has approximately doubled between 1990 and 1999, and that 50 percent of emissions are from appliances and industrial equipment, and that the amount of mercury in such equipment that gets disposed of improperly, ending up in these facilities, has declined roughly 50 percent since 1990.

** 1999— final air emissions standard for iron and steel foundries (implied by estimate that rulemaking will achieve 80 percent reduction from current emissions, or 1.4 tons of reduction). See 69 FR 21910. 1990, based on assumption that 50% of emissions from these facilities are caused by mercury in vehicles, and that mercury content of end-of-life vehicles has approximately doubled between 1990 and 1999, and that 50 percent of emissions are from appliances and industrial equipment, and that the amount of mercury in such equipment that gets disposed of improperly, ending up in these facilities, has declined roughly 50 percent since 1990.

Prospects for Meeting the Mercury Release Reduction Challenge

It is likely that mercury emissions reductions have continued beyond 1999. For each of the largest mercury-emitting sectors, the likely reductions since 1999, and the prospects for additional reductions, are discussed below:

- utility coal boilers: On December 15, 2003, USEPA proposed maximum available control technology standards (MACT) for coal-fired electric utility boilers, and also proposed an alternative “cap-and-trade” system. Neither would limit mercury emissions until after 2006. However, existing and prospective regulations limiting emissions of sulfur dioxide and oxides of nitrogen may lead to small reductions in mercury emissions by 2006.
- industrial boilers: A MACT standard has been developed for industrial and commercial boilers. This standard was finalized during 2004, with compliance required within three years. Compliance with the standard as proposed would reduce emissions from this category to 10 tons from 12 tons currently. This reduction, however, will likely not be required until after 2006.
- gold mining: A voluntary project between Nevada Department of Environmental Protection, USEPA and four Nevada gold mining companies has set a goal of achieving 50 percent reduction by 2005 in emissions from operations at the four mining companies. It is expected that a 50 percent reduction from the gold mining sector will be achieved.
- hazardous waste: MACT for hazardous waste combustors was finalized in 1999. As a result of court challenges, USEPA will promulgate a revised standard by 2005. In the meantime, interim standards went into effect in September 2003. These interim standards are expected to reduce mercury emissions by less than 50 percent.
- chlor-alkali: As a result of plant closures, chlorine production capacity at U.S. mercury cell plants declined 22 percent between the end of 1999 and the end of 2002, and by 27 percent between 1998 and 2002. Mercury use declined 66 percent during this period, or 55 percent in capacity-adjusted terms. A MACT standard for this sector has been finalized, and is expected to achieve a 74 percent reduction (1500 pounds) from point source emissions within chlor-alkali plants, and unquantified reductions from mercury cell rooms and other sources. Compliance will not be required until the end of 2006, but factories may move toward early compliance.
- municipal waste: Compliance with MACT for large municipal waste combustors was not required nationwide until November 2000, although compliance was required earlier in some states. Nationwide compliance with MACT at small municipal waste combustors will be required in 2005. As a result of full implementation of these standards, mercury emissions from municipal waste combustors are expected to decline to four tons annually. Additional reductions are being achieved through household hazardous waste collections and decreased use of mercury in products.
- medical waste: For medical waste incinerators, compliance with MACT was not required nationwide until September 2002. Full implementation reduced estimated emissions from this category to one ton annually.
- iron foundries and electric arc furnaces: the MACT standard for iron foundries will go into effect in 2005; the work practice standard for the electric arc furnace regulation may go into effect during 2006.

Based on the projected reductions for medical and municipal incinerators, gold mining, and iron foundries and electric arc furnaces, it appears likely that approximately 50 percent reduction mercury emissions will be achieved in the United States by 2006.

Trends in Mercury Use

Although it is clear that mercury use has decreased since 1995, the trend is difficult to quantify because the U.S. Geological Survey (USGS) stopped reporting estimated U.S. mercury consumption after 1997. However, on the basis of data reported by the chlor-alkali industry and the lamp industry, it appears that mercury use declined more than 50 percent between 1995 and 2003, assuming that mercury use has remained constant since 1997 (see Figure 1-2). The chlor-alkali industry accounted for an estimated 35 percent of mercury use in 1995, and its total mercury use decreased 76 percent between 1995 and 2003 (including the impact of plant closures). The fluorescent lamp industry has reported that mercury use in 2003 was 6 tons, compared with 32 tons estimated by the USGS for 1997. These reductions are the result of reductions in the mercury content of lamps sold in the U.S., as well as an increase in lamp imports and a decline in U.S. fluorescent lamp production. Lamp manufacturers use mercury both in lamps themselves and in the production process.

It is likely that mercury use has declined even more than portrayed in the table below, because mercury use in categories other than chlor-alkali and lamps has also decreased. While these reductions have not been quantified, reductions have been achieved in the use of mercury in measurement and control devices, switches and relays, and dental amalgam. These reductions are not visible in the table below.

U.S. Mercury Use (tons)

Industry/Product Category	1995*	1997*	2003*
Chlor-alkali Production**	160	116	38
Wiring Devices and Switches	92	63	63
Measurement and Control Devices	47	26	26
Dental	35	44	44
Lighting***	33	32	6
Other	102	40	40
Total	469	321	217

* Source for 1995 and 1997 (except chlor-alkali data)-- U.S. Geological Survey, *Minerals Yearbook*, 1995 and 1997-- converted to short tons. For 2003, assume that use has not changed, except for in chlor-alkali and lighting categories.

** Chlorine Institute, *Seventh Annual Report to EPA*, July 22, 2004. Mercury “used” rather than mercury “purchased.” Under this definition of “use,” mercury purchased and placed in inventory or added to cells to increase working stock of mercury does not count as “use.”

*** E-mail from Ric Erdheim, National Electrical Manufacturers Association, May 27, 2004.