Responsible Mercury Management Post-MEBA

by Michael S. Giannotto and Matthew C. Brewer

Goodwin Procter LLP
Washington, D.C.

I. Introduction

Several domestic industries have historically produced elemental mercury as either a main product or a byproduct of their operations. This mercury has typically been sold to third parties that have utilized it in the production of certain types of consumer products (e.g., lamps, batteries, medical equipment). In recent years, due to government pressure and a growing knowledge of the adverse health and environmental effects of exposure to mercury, the domestic market for mercury has decreased dramatically, and companies in the United States have sold the great bulk of their mercury to customers in foreign countries. The option to sell elemental mercury to foreign customers ceased on January 1, 2013, when the ban on export of elemental mercury imposed by the Mercury Export Ban Act of 2008 (MEBA)[1] took effect. In anticipation of and subsequent to the export ban, companies that generate mercury and certain mercury compounds (particularly calomel) have been grappling with how to manage their mercury in a responsible, cost-effective, and legal manner.

This article explores the current sources of mercury in the United States, historical mercury management, and post-MEBA options for responsibly and legally managing mercury and calomel. Several steps that mercury generators may wish to take to increase the options available to them are suggested.

II. Mercury Sources in the United States

Elemental mercury, or "quicksilver," has not been intentionally mined in the United States since 1992, when the last mine to produce mercury as its principal product—the McDermitt Mine in northern Nevada—ceased operations.[2] The closing of the McDermitt Mine, and other mercury mines

[1] Pub. L. No. 110-414, 122 Stat. 4341.

[2] *See* David R. Wilburn, "Changing Patterns in the Use, Recycling, and Material Substitution of Mercury in the United States," (U.S. Geological Survey (USGS) Scientific Investigations Report 2013–5137) (2013 USGS Report), http://pubs.usgs.gov/sir/2013/5137/.

before it,[3] was brought about by declining commercial demand for elemental mercury in the United States, in large part the result of a decades-long government-led effort to limit human exposures to mercury by reducing the intentional use of mercury in consumer and industrial products.[4]

Although no longer a principal mining product, certain domestic industries generate significant quantities of elemental mercury, as well as mercury compounds such as mercury(I) chloride (known as "calomel"), as a concomitant of their manufacturing or other operations.[5] Currently, the largest generators of mercury in the United States are:

- Precious metal (i.e., gold and silver) mining, which generates mercury as a byproduct of air pollution control operations, and produces between 102 and 135 tons of elemental mercury and approximately 65 tons of calomel, per year;[6]
- Decommissioning, or conversion, of four mercury-cell technology chlor-alkali[7] production facilities in the United States, which is expected to generate more than 1,200 tons of elemental mercury over the next decade;[8] and

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[3] Between 1850 and 1961, more than 3.2 million 76-pound flasks of mercury were produced at 87 mines in the United States. *See* Bureau of Mines, *Mercury Potential of the United States*, at tbl. 2 (1965). The majority of this mercury, more than 2.3 million flasks, was produced at eight large mines (each producing more than 100,000 flasks) in California, while another significant percentage, approximately 750,000 flasks, came from 25 medium-size mines (each producing from 10,001 to 100,000 flasks) spread across six states. *Id.* The remainder, approximately 172,000 flasks, came from 156 small mines (each producing from 101 to 10,000 flasks) spread out over nine states. *Id.*

[4] *See* U.S. Envtl. Prot. Agency (EPA), *EPA's Roadmap for Mercury* (EPA-HQ-OPPT-2005-0013 July 2006). Since the early 1970s, annual demand for mercury in the United States has declined from about 2,000 tons to an estimated 70 tons in 2010. *See* 2013 USGS Report, *supra* note 2, at 3.

[5] Elemental mercury is mercury that has not reacted with another substance. When mercury reacts with another substance, it forms a compound.

[6] *See* U.S. Dep't of Energy (DOE), *Final Long-Term Management and Storage of Elemental Mercury Supplemental Environmental Impact Statement*, at tbl. 1-1 (DOE/EIS-0423-S1 Sept. 2013) (Elemental Mercury FSEIS) (estimate of annual elemental mercury produced over 40 years, in metric tons); EPA, *Report to Congress: Potential Export of Mercury Compounds from the United States for Conversion to Elemental Mercury*, at tbl. ES-1 (Oct. 14, 2009) (2009 EPA Report to Congress) (estimate of 25 metric tons of elemental mercury in calomel produced in 2004, which corresponds to approximately 65 tons of calomel).

[7] *See* 2013 USGS Report, *supra* note 2, at 13. The chlor-alkali process is an industrial process for the electrolysis of aqueous sodium chloride solution (brine) to produce a variety of products, including sodium hydroxide (caustic soda), which is chlorine-free when produced using the mercury-cell method.

[8] *See* Elemental Mercury FSEIS, *supra* note 6, at 2-7 & tbl. 1-1. In 1996, 14 mercury-cell chlor-alkali plants were operating in the United States. *See* 2013 USGS Report, *supra* note 2, at 8, 13. By 2010, the number of operating mercury-cell chlor-alkali plants had decreased

- Facilities engaged in the recycling of mercury-containing products (e.g., certain lamps, batteries, and medical equipment), which are expected to generate approximately 69 tons of elemental mercury per year over the next four decades.[9]

The elemental mercury generated by these industries, were it to be discarded or intended for discard, would constitute a "solid waste" and a regulated "hazardous waste" under regulations promulgated by the U.S. Environmental Protection Agency (EPA) pursuant to subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA).[10]

Prior to 2013, companies that generated mercury or calomel generally sold it to domestic third parties as a commodity, either "as is" or after purification or other processing, for commercial use in such products as batteries, paint, dental amalgam, certain lamps and electrical switches.[11] In recent years, a substantial decline in the domestic mercury market led to much of the elemental mercury generated by domestic industries being sold to entities in foreign countries, where a market for this mercury still exists.[12] Because the mercury was sold (either domestically or overseas) for legitimate use (rather than discard), it did not constitute a "solid waste" or "hazardous waste" under RCRA, and was consequently not subject to the comprehensive RCRA regulatory program applicable to hazardous waste.

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to four, and by November 2012, only two such plants remained in operation (PPG Industries, Inc. in New Martinsville, West Virginia and Ashta Chemical, in Ashtabula, Ohio). *Id.* at 13. The two plants that ceased operation between 2010 and 2012, and the two operating plants, are expected to be decommissioned, generating 1,100 metric tons of mercury over approximately the next decade. *See* Elemental Mercury FSEIS, *supra* note 6, at tbl. 1-1.

[9] *See* Elemental Mercury FSEIS, *supra* note 6, at tbl. 1-1 (estimating a total of 2,500 metric tons—or 2,750 short tons—of mercury produced over the next 40 years).

[10] 42 U.S.C. §§ 6921–6931. *See* 40 C.F.R. § 261.2 (definition of solid waste). A solid waste is a hazardous waste if it exhibits at least one hazardous characteristic described in 40 C.F.R. §§ 261.20–.24, or is specifically listed in 40 C.F.R. §§ 261.31–.33. If elemental mercury is a solid waste, then it would also be a hazardous waste subject to RCRA regulation because it would possess the Toxicity Characteristic Leaching Procedure (TCLP) hazardous characteristic for mercury under 40 C.F.R. § 261.24 and potentially because it would be a listed 40 C.F.R. § 261.33 commercial chemical product that was now destined for discard.

[11] *See* 2013 USGS Report, *supra* note 2, at 2.

[12] Prior to the MEBA export ban taking effect, the United States was a net exporter of elemental mercury and, according to the USGS, exported 506 metric tons of elemental mercury more than it imported during the period 2000 through 2004. *See* 2013 USGS Report, *supra* note 2. From 1999 to 2011, the principal destinations of mercury exports were India, the Netherlands, Vietnam, Mexico, Peru, and Canada. *Id.* at 15.

III. Mercury Export Ban Act of 2008 (MEBA)

The ability of domestic businesses to sell their elemental mercury, or calomel processed into elemental mercury, in foreign markets came to an end on January 1, 2013 when, pursuant to MEBA, a ban on the export of elemental mercury took effect. MEBA, with limited possible exceptions for certain "essential uses," prohibits the export of elemental mercury as of that date.[13] The statute on its face does not distinguish between the export of elemental mercury for sale or use as a commodity, and export for disposal as a waste, and thus arguably bans the export of mercury for either purpose.

The enactment of MEBA is part of a global movement to protect human health and the environment, and in particular persons living in developing countries, from the adverse effects of mercury exposure.[14] Mercury has been found to be highly toxic to humans, ecosystems, and wildlife.[15] Banning its export is intended, in large part, to "protect women, children, and others in other countries that end up being exposed to mercury exported from the United States."[16] One of the primary ways mercury enters the environment is through its use by artisanal and small-scale miners in developing countries, who use elemental mercury to extract gold from sediment.[17] Such use of mercury often results in contamination of nearby waterways, creating health hazards in populations that use the

[13] MEBA § 4(2) (codified at 15 U.S.C. § 2611(c)). Pursuant to MEBA § 4(2), where criteria established to ensure legitimate and safe use are met, EPA may grant an "essential use exemption" for export of a limited amount (up to 10 metric tons) of elemental mercury for a specific use at an identified foreign facility.

[14] See, e.g., Regulation (EC) No 1102/2008, which banned exports from European Union member countries of elemental mercury, cinnabar ore, mercury(I) chloride, mercury(II) oxide, and mixtures of metallic mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95% by weight as of March 15, 2011. This global movement culminated in January 2013 with the adoption of the Minamata Convention on Mercury by over 140 countries, including the United States. *See* United Nations Environment Programme (UNEP), Draft Minamata Convention on Mercury, Annex to *Report of the Intergovernmental Negotiating Committee to Prepare a Global Legally Binding Instrument on Mercury on the Work of Its Fifth Session*. If ratified, the Minamata Convention will require signatory countries to take actions to reduce mercury emissions to air from power plants and other sources, phase out the use of mercury in a variety of products, and in countries where artisanal and small-scale mining is "more than insignificant," develop and implement national action plans to reduce the use of elemental mercury in such mining.

[15] MEBA § 2(1).

[16] S. Rep. No. 477, 110th Cong., 2d Sess. (2008).

[17] *Id.* Mercury is used during the amalgamation process as a method of collecting small gold particles. Once mercury and gold are combined to create amalgam, the amalgam is typically burned with a blowtorch or over an open flame to separate the mercury from the gold.

waterways as a source of water or food.[18] EPA estimates that approximately 20% of the world's gold is produced by artisanal and small-scale mining,[19] and in 2013, the United Nations Environment Programme (UNEP) estimated that, worldwide, artisanal and small-scale mining is the single largest anthropogenic source of mercury to the environment.[20]

MEBA prohibits the export only of elemental mercury. It does not prohibit the export of mercury compounds, such as calomel, cinnabar ore (mercury(II) sulfide), mercury(II) sulfate, mercury(II) chloride, mercury(II) oxide, or mercury(II) nitrate.[21] MEBA does, however, direct EPA to prepare and submit to Congress a report on mercury compounds that assesses the potential for these compounds to be processed into elemental mercury after export from the United States.[22] In 2009 EPA completed the report, which identifies four mercury compounds—calomel, mercury(II) sulfate, mercury(II) nitrate, and mercury(II) oxide—that the Agency concludes can feasibly be processed into elemental mercury after export.[23]

EPA has interpreted the MEBA export ban to apply to mixtures and alloys that contain elemental mercury, including elemental mercury that has been mixed, though not reacted, with another substance (i.e., diluted).[24] However, EPA also has stated that certain materials containing elemental mercury do not fall within the scope of MEBA's export ban so long as there is no intent to recover the elemental mercury for resale or reuse. These materials include:

- products (consumer and non-consumer), including discarded products
- dental amalgam (pre-dosed capsule form)

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[18] *See* Charles W. Schmidt, "Quicksilver & Gold: Mercury Pollution from Artisanal and Small-Scale Gold Mining," 120(11) *Environmental Health Perspectives* A424 (Nov. 2012), http://ehp.niehs.nih.gov/120-a424/.

[19] *See* EPA, "Reducing Mercury Pollution from Artisanal and Small-Scale Gold Mining," http://www.epa.gov/international/toxics/mercury/asgm.html.

[20] *See* UNEP, *Global Mercury Assessment 2013: Sources, Emissions, Releases and Environment Transport* (Jan. 2013). UNEP estimated that, globally, a minimum of 1,000 metric tons of mercury is released to water each year, with total releases from artisanal and small-scale mining comprising 800 metric tons per year. *Id.* at iii.

[21] *See* EPA, "Questions and Answers about the Mercury Export Ban Act of 2008," at No. 5 (EPA MEBA Q&A), http://www.epa.gov/hg/exportban-ques.htm.

[22] *See* MEBA § 4 (codified at 15 U.S.C. § 2611(c)(3)(A)).

[23] *See* 2009 EPA Report to Congress, *supra* note 6, at 36. In December 2012, in the 112th Congress, bills were introduced in both the Senate and the House of Representatives that, if enacted, would have extended MEBA's export ban to include the four mercury compounds identified by the 2009 EPA Report to Congress. *See* H.R. 6686, 112th Cong. (2012); S. 3697, 112th Cong. (2012). These bills, if enacted, would also have prohibited, after a date certain, the manufacture, processing and distribution of many mercury-bearing products, including batteries, thermometers, relays, switches, thermostats and pesticides.

[24] *See* EPA MEBA Q&A, *supra* note 21, at No. 11.

- scrap metal and used electronics
- media (including groundwater, surface water, soils and sediment) and debris that are managed for implementing cleanup
- reference materials in which the mercury occurs as contamination in media (e.g., soil, sediment, water, sludge) ;
- industrial, commercial and remediation residuals
- byproducts of coal combustion.[25]

In EPA's view, banning the export of these mercury-containing materials for subsequent treatment and disposal (i.e., where there is no "intent to recover the elementary mercury for resale or reuse") is not consistent with the "intent of the legislation, and the Act's findings and legislative history."[26]

MEBA was enacted with the full support of the domestic precious metals mining and chlor-alkali industries, which are committed to ensuring that the elemental mercury they generate is not used in an environmentally irresponsible manner. Given the small and shrinking domestic market for mercury, however, there was concern in these industries that, if elemental mercury could no longer be exported, there would be no legal way for companies to manage their mercury in the United States. Specifically, if, in the absence of a foreign market, the elemental mercury generated by these industries could not be used or sold for a legitimate commercial purpose in the United States, the mercury could be deemed "intended for discard" by EPA, and therefore a RCRA "solid waste" and "hazardous waste." If this happened, there would be no legal method for effectively treating and disposing of the elemental mercury that had become a RCRA hazardous waste.

Disposal of hazardous wastes is permitted under RCRA only so long as the wastes are first treated to meet applicable treatment standards, known as land disposal restrictions, or "LDRs."[27] Depending on the waste, LDRs may be concentration-based treatment standards (i.e., a permissible concentration of a hazardous constituent in the waste), a specified treatment technology, or both.[28] The problem for generators of elemental mercury arises because EPA has not, for all intents and purposes, established an LDR for elemental mercury, and as a result, disposal of elemental mercury—including elemental mercury that has been treated to

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[25] *Id.* at No. 9.

[26] *Id.*

[27] *See* 40 C.F.R. pt. 268.

[28] *See* 40 C.F.R. § 268.40. Technology-based treatment standards specified in LDRs "require[] that hazardous wastes undergo fundamental physical or chemical changes so that they pose less of a [risk of contaminating] groundwater." EPA Office of Solid Waste and Emergency Response, "RCRA Training Module: Introduction to Land Disposal Restrictions (40 CFR Part 268)," at 4 (EPA530-K-05-013 Sept. 2005).

lessen or eliminate its environmental risks—is not allowed in the United States.[29] In fact, when developing LDRs for high mercury waste, EPA specifically did *not* establish an LDR for elemental mercury because it assumed that the mercury would be recycled back into commerce rather than discarded.[30] Based on a recent conversation with EPA's Office of Solid Waste, there currently are no plans to develop an LDR for elemental mercury that would allow its land disposal.[31] Moreover, under RCRA, a hazardous waste may be stored only if it is being stored for the purpose of accumulating sufficient quantities to facilitate proper treatment prior to disposal,[32] and since there is no applicable treatment standard, storage of elemental mercury is not allowed either.

IV. DOE Long-Term Mercury Storage Facility

To address this situation, MEBA provides for the Department of Energy (DOE) to establish and operate a facility specifically "for the purpose of long-term management and storage of elemental mercury generated within the United States."[33] MEBA authorizes DOE to charge a one-time fee to the mercury generator at the time of delivery of its mercury to the DOE storage facility, based on DOE's "pro rata cost of long-term

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[29] There is no concentration-based treatment LDR for elemental mercury. *See* 40 C.F.R. § 268.40. Theoretically, there is a technology-based LDR for high-mercury waste with a concentration of greater than 260 ppm total mercury, a criterion that elemental mercury, which is essentially 100% mercury, would satisfy. *Id.* However, the LDR treatment technology specified for such wastes is retorting or roasting in an industrial furnace (a process known as "RMERC"), so that the mercury in the waste is driven off and then condensed and collected. While RMERC works for removing mercury from wastes that contain high, but less than 100%, concentrations of mercury, retorting or roasting elemental mercury can only produce more elemental mercury, which, under the regulations, would then have to be retorted or roasted again, *ad infinitum*. In 2003, EPA published a Notice of Data Availability in which it reported the results of two studies intended to identify an LDR for elemental mercury. *See* 68 Fed. Reg. 4481 (Jan. 29, 2003). EPA evaluated three treatment processes: (1) sulfur amalgamation followed by thermoplastic encapsulation; (2) formation of mercuric sulfide followed by micro- and macroencapsulation with proprietary binders; and (3) sulfur amalgamation followed by addition of a proprietary precipitation reagent. *Id.* at 4485. EPA concluded that "[t]he results of the treatability studies outlined in this notice lead us to conclude that, at this time, we cannot establish a new national treatment standard allowing for disposal of high mercury and elemental mercury wastes" because "[n]o technology demonstrated adequate stability across the plausible range of pH conditions found in landfills." *Id.* at 4488–89.

[30] *See* 68 Fed. Reg. at 4489.

[31] *See also* Elemental Mercury FSEIS, *supra* note 6, at 4-2 ("There currently is no approved method of treating high-purity elemental mercury for disposal. It is not known when such a treatment method might become available.")

[32] *See* 40 C.F.R. § 268.50.

[33] MEBA § 5(a)(1) (codified at 42 U.S.C. § 6939f(a)(1)).

management and storage of elemental mercury delivered to the facility."[34] In exchange for the one-time fee, DOE must take custody of the mercury and indemnify the generator from future liability resulting from release of the mercury after it is delivered to the facility.[35] Because MEBA applies only to domestic elemental mercury, DOE has made clear that it will *not* accept mercury compounds, or mercury generated outside the United States, at the facility.[36]

MEBA directed DOE to select a location for the long-term storage facility by January 1, 2010, and to have the facility operational by January 1, 2013—the date that the mercury export ban took effect.[37] Between 2008 and 2010, DOE evaluated seven potential sites for the facility. Subsequently, DOE evaluated three additional potential sites at and in the vicinity of the Waste Isolation Pilot Plant near Carlsbad, New Mexico, which DOE operates for disposal of certain radioactive wastes.[38] In September 2013, DOE identified a site near Andrews, Texas as its preferred alternative for the mercury storage facility and announced that it intends to make a final decision regarding the long-term storage facility's location during fiscal year 2014.[39]

Regardless of whether DOE makes a final decision as to the location of the long-term storage facility in FY 2014, it is very unlikely that DOE will get the funding from Congress needed to construct or begin operations at the facility in FY 2014 or any other time in the foreseeable future. Beginning in FY 2011, Congress has not included any funding in the DOE budget to construct or operate a long-term mercury storage facility and there is no expectation that Congress will change course and provide such funding in the near future. This has been frustrating to mercury generators

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[34] MEBA § 5(b)(1) (codified at 42 U.S.C. § 6939f(b)(1)). These costs include "facility operation and maintenance, security, monitoring, reporting, personnel, administration, inspections, training, fire suppression, closure, and other costs required for compliance with applicable law(s)." MEBA § 5(b)(2) (codified at 42 U.S.C. § 6939f(b)(2)). Such costs do not include costs associated with land acquisition or permitting. *Id.* Building design and construction costs are included only to the extent that DOE finds that the management and storage of elemental mercury cannot be accomplished without construction of a new building or buildings. *Id.*

[35] *See* MEBA § 5(e)(1) (codified at 42 U.S.C. § 6939f(e)(1)).

[36] While EPA interprets MEBA's export ban to apply to mixtures and alloys, DOE does not intend to store mixtures and alloys; DOE has stated it will accept only elemental mercury with a purity of 99.5% or greater by volume. Therefore, elemental mercury of lower purity would need to be further purified before it could be stored at the DOE facility. *See* EPA MEBA Q&A, *supra* note 21, at No. 8. *See also* Elemental Mercury FSEIS, *supra* note 6, at 2-1.

[37] MEBA § 5(a)(1), (2) (codified as 42 U.S.C. § 6939f(a)(1), (2)).

[38] *See* 78 Fed. Reg. 23,548, 23,549 (Apr. 19, 2013).

[39] *See* Elemental Mercury FSEIS, *supra* note 6, at 1-5, 2-15. *See also* DOE, Office of Chief Fin. Officer, "FY 2014 Congressional Budget Request—Environmental Management," at EM-256 (DOE/CF-0088, vol. 5, Apr. 2013).

who were counting on the DOE facility to take their mercury, particularly given that estimated costs of construction are only $15 million—a trifle by congressional standards—and those costs would be largely if not entirely recouped by DOE from the fee that would be charged to mercury generators when they deliver their mercury to the facility.

To guard against the possibility that the DOE facility would not be operational by the statutory deadline, at the urging of the gold mining industry, Congress included a "safety valve" provision in MEBA that provides that, in the event the DOE facility is not operational by January 1, 2013, mercury may be stored at a facility that has been issued any kind of RCRA permit, regardless of whether the RCRA permit deals with mercury or mercury wastes, so long as the owner or operator of that facility certifies to DOE that it will ship the mercury to the DOE facility once it is operational.[40] To date, seven entities have notified DOE of their intent to accumulate and store mercury at their RCRA-permitted facilities in accordance with MEBA.[41]

V. Options Currently Available to Generators of Elemental Mercury and Calomel

In light of the MEBA export ban, generators of mercury may have to alter the manner in which they manage their elemental mercury and calomel, and indeed many generators have already begun to alter their practices. Post-MEBA, there remain several options available for management of elemental mercury and calomel generated domestically, as follows.

[1] Store the mercury at any RCRA-permitted facility

As discussed, MEBA provides that, in the absence of an operational DOE facility, generators may store elemental mercury at any private, RCRA-permitted facility. The facility does not need a RCRA permit specifically for storage or treatment of mercury or mercury compounds. Thus, any mercury generators that may already have a RCRA permit, for example chlor-alkali plants and some mercury recycling facilities, can store

[40] *See* MEBA § 5(g)(2)(B) (codified at 42 U.S.C. § 6939f(g)(2)(B)).

[41] *See* Elemental Mercury FSEIS, *supra* note 6, at 1-9. According to its website, DOE has received storage notifications from the following six facilities: Chemical Waste Management, Inc. & Waste Management Mercury Waste, Inc.; Clean Harbors Environmental Services, Inc. (Phoenix, AZ and Wichita, KS facilities); EQ Detroit, Inc.; Lamp Environmental Industries, Inc.; and Veolia ES Technical Solutions, LLC. *See* http://www.mercurystorageeis.com/library.htm#storage. In a recent conversation, DOE stated that one additional company, the Environmental Quality Company, also has submitted a mercury storage notification. Based on conversations with representatives of these companies, at least one, Lamp Environmental Industries, Inc., intends to store only mercury generated by its own recycling operations.

their excess mercury on-site, so long as they notify DOE that they will ship the mercury to the DOE facility when it is operational.

For those facilities that do not have RCRA permits, including most, if not all, precious metal producers, on-site storage (for longer than 90 days)[42] is not an option. These facilities can, however, send their mercury to a third-party storage facility with any kind of RCRA permit. This option is relatively costly. At this time, the cost of mercury storage at the DOE facility is not clear because, despite the October 1, 2012 deadline mandated by MEBA,[43] DOE has yet to publish a fee schedule. However, prior to the enactment of MEBA, the Congressional Budget Office (CBO) estimated that the one-time fee would be approximately $3 per pound, or $6,600 per metric ton.[44] By comparison, quoted storage fees from the private companies that have notified DOE of their intent to store mercury range from approximately $100 to $500 per ton of mercury per month, or $1,200 to $6,000 per ton *per year*. Because private facilities charge storage fees on an ongoing basis, as opposed to the one-time fee that must be charged by DOE pursuant to MEBA, a generator's yearly costs for private storage will increase over time since mercury delivered each year, from year one, will continue to be subject to additional charges in each subsequent year. In addition, while the one-time DOE facility fee may be increased from year to year, the higher fee would apply only to new mercury shipments. In contrast, increases in monthly storage fees at private facilities could apply to both new shipments and to mercury already in storage. Finally, the fees paid to private facilities do not include the long-term storage fee that will be charged by DOE once the DOE facility is operational, and the private facility is obligated to send its accumulated mercury to the DOE facility. Thus, the generator ultimately will pay the DOE facility fee on top of the private facility fees and also will bear the cost (and attendant environmental risks) of shipping the mercury twice—once to the private facility and again to the DOE facility. As a result, MEBA's "safety valve" provision, while providing a temporary solution to the generators' mercury storage problem, adds significant additional costs that must be borne by generators that do not already have a RCRA permit.

[2] Continue to manage elemental mercury as a commodity

Although the domestic market for mercury has declined in recent years, there still remain some commercial uses of mercury, including in dental amalgam, paint, various lamps (including fluorescent, compact fluorescent, mercury vapor, UV and HID lamps), LCD and CRT displays,

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[42] MEBA specifically allows generators of elemental mercury to store on-site for up to 90 days mercury destined for the DOE storage facility. *See* MEBA § 5(g)(2) (codified at 42 U.S.C. § 6939f(g)(2)(A)).

[43] *See* MEBA § 5(b)(1)(A) (codified at 42 U.S.C. § 6939f(b)(1)(A)).

[44] *See* S. Rep. No. 110-477, at 13 (2008), *reprinted in* 2008 U.S.C.C.A.N. 1815, 1826.

certain batteries, and collision or motion sensing switches.[45] According to U.S. Geological Survey (USGS) estimates, in 2010, total domestic mercury consumption for product fabrication was approximately 52 metric tons[46]—roughly 18–20% of the 291–324 tons of elemental mercury that DOE estimates will be generated annually over the next decade.[47] Elemental mercury, if it is deemed a commodity destined for legitimate use, would not be subject to RCRA regulation. Nor, as a commodity, would the mercury be subject to the RCRA "speculative accumulation" rules that limit how long materials may be stored before they are presumed to be a solid waste. If a particular mercury generator has a reasonable basis for believing that its elemental mercury will eventually be put to legitimate use or sold for legitimate use, the generator could take the position that the stored mercury is in fact a commodity, and not subject to RCRA regulation.[48] It is unclear at this point how EPA or authorized RCRA states[49] will approach the issue of whether the stored mercury is a commodity or a solid waste. If mercury has been stored for a long period of time, the generator has no contract to sell it, there are no customers that have indicated a desire to purchase the mercury, and domestic supplies of mercury continue to greatly exceed domestic uses, EPA, or a particular authorized RCRA state, could, and likely would, claim that the mercury was in fact a hazardous waste, and not a commodity.[50] In that instance, if

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[45] *See* Interstate Mercury Education & Reduction Clearinghouse (IMERC), "Mercury-Added Products Database," https://imerc.newmoa.org/publicsearch/NEWMOA_IMERC.aspx#/CustomizedSearch. The Minamata Convention calls for the phase-out of some of these uses by 2020.

[46] *See* 2013 USGS Report, *supra* note 2, at 11, 12. Although the USGS no longer surveys domestic companies' mercury use, in 2012 USGS estimated domestic consumption of elemental mercury to be less than 50 tons. *See* USGS, *2012 Minerals Yearbook—Mercury [Advance Release]*, at 48.1 (July 2013).

[47] *See* Elemental Mercury FSEIS, *supra* note 6, at tbl. 1-1.

[48] Elemental mercury is a commercial chemical product listed in the RCRA regulations, 40 C.F.R. § 261.33, and the RCRA "speculative accumulation" provisions specifically state that commercial chemical products listed in section 261.33 are *not* subject to the "speculative accumulation" provisions. *See id.* § 261.2(c)(4).

[49] RCRA allows EPA to authorize states to be primarily responsible for administration and enforcement of the RCRA program in their state. *See* 42 U.S.C. § 6926.

[50] *See* 48 Fed. Reg. 14,472, 14,489–90 (Apr. 4, 1983) ("If . . . a recycling market does not develop and one is not expected within a reasonable time period [for a putative commercial chemical product], or if insufficient amounts of these materials are being recycled, we would consider these commercial chemical products as being stored for discard, and thus subject to regulatory control. We are not setting any time period for determining when these commercial chemical products would become wastes. However, we do expect persons storing these materials to have appropriate documentation or information to support their claim that these materials have recycling potential and that the materials are accumulating for eventual recycling."). EPA recently issued a memorandum providing guidance to assist its inspectors in determining whether materials are legitimately a commodity or a solid and hazardous waste under RCRA. *See* Memorandum from Betsy

the mercury was being stored at a facility without a RCRA permit, the generator could be subject to substantial civil penalties.[51]

[3] Arrange to have the mercury treated so that it is no longer elemental mercury and ship the treated mercury to a foreign country for further treatment and/or permanent disposal

While elemental mercury—either with or without treatment—cannot be disposed of in the United States, other countries do allow permanent disposal of elemental mercury after certain treatment. For example, there are no federal or province-wide standards in Canada that prohibit the land disposal of treated mercury or mercury wastes, and some Canadian facilities have facility-specific standards, specified in permits, that allow disposal of mercury after it has been stabilized by certain methods. At least one American company, Bethlehem Apparatus in Hellertown, Pennsylvania, is developing a process for converting elemental mercury into cinnabar and then shipping the cinnabar to a facility owned by Stablex in Quebec, Canada, where it will be further stabilized and permanently disposed of in accordance with Canadian law.[52] Similarly, Germany has for decades allowed permanent disposal of mercury in the form of cinnabar in underground salt mines, and has accepted foreign mercury for such disposal.[53] Because the transformed cinnabar is no longer elemental mercury, its export is not prohibited by MEBA and it could be shipped to a country such as Canada or Germany for disposal according to their laws.

Of course, processing of elemental mercury into a mercury compound for purposes of export for disposal would constitute "treatment" under RCRA, and almost certainly require a RCRA treatment permit; as such,

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Devlin, Director, EPA Materials Recovery & Waste Mgmt. Div., to RCRA Div. Directors, "Checklist to Assist in Evaluating Whether Commercial Chemical Products Are Solid and Hazardous Waste under the Resource Conservation and Recovery Act" (May 14, 2013). This memorandum includes a checklist of relevant inquiries, including in relevant part: (1) "Does the facility have 'active' customers or a market for the material?"; (2) "[C]an the facility provide a list of such customers and document recent shipments of the material for subsequent distribution in commerce, or provide copies of contracts from past or future sales?"; (3) "Can the facility identify any competitors for the sale of the material . . . ?"; (4) "Can the facility provide a list of inactive or past customers . . . ?"; (5) "Can the facility provide any information about a future market for the material?" *Id.* at 7.

[51] Under section 3008 of RCRA (42 U.S.C. § 6928(a)), as adjusted for inflation by 40 C.F.R. § 19.4, EPA may assess penalties of up to $37,500 per day for any violation of RCRA.

[52] According to Bethlehem Apparatus, the fee for stabilization and permanent disposal in Canada will be in the range of $8 to $10 per pound, or $16,000 to $20,000 per ton.

[53] *See* Lars Olof Höglund, UNEP Chemicals, "Technical options for storage and disposal of mercury," http://www.unep.org/hazardoussubstances/Portals/9/Mercury/Documents/supplystorage/Technical_options_for_storage_and_disposal_of_mercury.pdf. One German company, DELA GmbH, charges a fee for stabilization and permanent disposal of 2,000 euros per metric ton (approximately $3,000). *Id.* at tbl. 2.

this may not be an option that is immediately available to generators.[54] In addition, any export of treated mercury that possesses a RCRA hazardous characteristic would need to comply with RCRA export rules, which require notification and consent of both EPA and the importing country prior to shipment.[55]

[4] For certain mercury-containing materials, send directly to a foreign country for treatment and disposal

As discussed earlier, EPA interprets the MEBA export ban as *not* applying to a number of mercury-containing materials, including discarded consumer and non-consumer products, scrap metal, and used electronics, so long as they are not exported with the intent to recover the mercury for resale or reuse. Thus, one option for companies that otherwise would generate elemental mercury by processing such materials domestically is to instead send the unprocessed materials directly to a foreign country for treatment and disposal. Such exports also would be subject to RCRA's export rules.

[5] In the case of mercury compounds, send them directly to a foreign country

Prior to MEBA, mining companies generally sent the calomel they generated to third parties for processing into elemental mercury prior to exporting. Since MEBA applies only to elemental mercury, there is no current export ban with respect to mercury compounds such as calomel. Thus, one option for companies that generate calomel would be to eliminate the processing step and to ship the compounds to another country for use, for conversion into elemental mercury, and/or for treatment/disposal. If the compounds are intended for disposal in the importing country, they would be considered hazardous waste and would be subject to RCRA's export rules.

VI. Steps to Potentially Increase the Options Available for Mercury Management

There are steps that mercury generators (particularly precious metals producers that do not have RCRA permits) could consider taking to increase the options available to them for long-term management of

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[54] Under the RCRA regulations, "treatment" includes

> any method . . . or process . . . designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, . . . or so as to render such waste non-hazardous, or less hazardous; [or] safer to transport, store, or dispose of . . . .

40 C.F.R. § 260.10.

[55] *See* 40 C.F.R. pt. 262, subpts. E, H.

mercury—options that might prove to be more efficient and less costly than temporary long-term storage at private RCRA facilities.

[1] Seek an opinion from EPA that elemental mercury may be exported for treatment and disposal

As noted earlier, EPA has determined that the MEBA export ban does not apply to certain mercury-containing materials, such as consumer products, so long as those materials are not exported with the intent to recover the elemental mercury for resale or reuse (i.e., so long as the elemental mercury they contain is destined for proper treatment and disposal). In EPA's view, Congress did not intend when enacting MEBA to prohibit the export of such mercury-containing materials when the mercury will not be recovered for resale or reuse. Assuming the validity of EPA's view, a generator can reasonably argue that neither did Congress intend to prohibit the export of pure elemental mercury, so long as the export was for purposes of proper treatment and disposal in the importing country. Therefore, one option available to generators of mercury would be to seek an opinion from EPA that, similar to mercury-containing products, elemental mercury in any form that is subject to proper treatment and disposal in the importing country does not fall within the scope of the MEBA export ban.

[2] Petition EPA to develop an alternative LDR for elemental mercury and other high mercury wastes

A generator wishing to treat elemental mercury and dispose of the treated mercury in the United States could petition EPA to develop an alternative LDR for elemental mercury and other high mercury wastes (> 260 ppm) that would allow land disposal of the treated mercury.[56] Under RCRA, the petitioner would have to demonstrate to EPA that the alternative LDR would "substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized."[57] In practice, a petitioner for an alternative treatment standard would have to show that the new standard "provides a measure of performance equivalent to that achieved by" the existing LDRs.[58] Judging from EPA's efforts in 2003 to develop an alternative mercury LDR, the petitioner would likely have to demonstrate "adequate stability [of the mercury waste] across the plausible range of pH conditions found in landfills."[59] Based upon informal discussions with EPA

[56] *See* 40 C.F.R. § 268.42(b).

[57] 42 U.S.C. § 6924(m)(1).

[58] 40 C.F.R. § 268.42(b).

[59] 68 Fed. Reg. 4481, 4489 (Jan. 29, 2003). *See also supra* note 29 (discussion of EPA's most recent attempt to develop an elemental mercury LDR). Under RCRA, a generator also

personnel, it would take many years for EPA to review any data gathered by a petitioner and approve any such petition.

[3] Pursue federal legislation that would allow efficient and responsible mercury management post-MEBA

In addition to the above options, mercury generators could pursue legislative amendments to MEBA that would:

- Explicitly allow export of elemental mercury with the consent of EPA and the importing country for purposes of treatment and disposal;
- Require EPA, within a fixed period of time, to develop an LDR for elemental mercury that would allow treated mercury disposal in the United States; and/or
- Provide funding for the construction and operation of the DOE long-term mercury storage facility.

While getting legislation enacted in Congress is always difficult, and is especially so in the current political climate, the major interest groups that were responsible for the enactment of MEBA itself (i.e., environmental groups, and the mining and chlor-alkali industries) would potentially be supportive of these amendments, since they would allow more responsible options for generators to manage their elemental mercury in a way that does not present any health or environmental risks.

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could petition EPA for an exemption from the current LDRs pursuant to 40 C.F.R. § 268.6 or seek a variance from an LDR treatment standard pursuant to 40 C.F.R. § 268.44. The standards under the RCRA regulations for obtaining such an exemption or variance are difficult to satisfy and, based upon informal discussions with EPA personnel, it would take many years to prepare and obtain approval of a successful petition for either.