INVENTORY OF MERCURY SUPPLY, USE, AND TRADE IN THE UNITED STATES 2020 REPORT

Office of Chemical Safety and Pollution Prevention
Reporting Year 2018

Table of Contents

List of Tables

List of Figures

Background

Mercury is a naturally occurring element that originates in the earth's crust and exists as elemental mercury or mercury compounds. Elemental mercury (CASRN 7439-97-6) is a shiny, silver-white metal that is liquid at room temperature. Mercury does not degrade, cannot be destroyed, and is a persistent and bioaccumulative toxicant. Emitted elemental mercury can be transported in the atmosphere on local, regional, and global scales as it cycles through air, land, and water.[1] Some of the emitted elemental mercury following deposition and transformation into divalent mercury can be biotransformed into methylmercury.[2] Methylmercury can bioaccumulate and biomagnify in fish, and can be consumed by humans, as well as marine mammals.[3]

Mercury compounds are formed when elemental mercury reacts with another substance, either in nature or intentionally by humans. The U.S. Environmental Protection Agency (EPA) Toxic Substances Control Act (TSCA) Chemical Substance Inventory lists 69 mercury compounds as commercially available in the United States (see *Appendix B* of this report).[4]

Global Agreement on Mercury

The United States is a Party to the Minamata Convention on Mercury (Minamata Convention), which entered into force on August 16, 2017. The objective of the Minamata Convention is to protect human health and the environment from the adverse health effects of mercury.[5] As of January 2020, there are 128 signatory countries and 116 countries that have approved, accepted, ratified, or acceded to the Convention. The Minamata Convention includes a number of provisions to reduce exposure to mercury, including a ban on new mercury mines and the phase-out of existing ones, and the phase-out and phase-down of mercury use in a number of specified products and processes. Some articles of the Convention pertain only to elemental mercury while others apply to mercury compounds as well. As discussed in the mercury inventory reporting rule, EPA intends to use the collected information from the mercury inventory to assist in the United States' national reporting for the Minamata Convention.[6]

U.S. Laws Affecting Supply and Trade of Elemental Mercury and Mercury Compounds

Prior to the enactment of the Mercury Export Ban Act of 2008 (MEBA), [7] elemental mercury was exported from the United States. In passing MEBA, Congress expressed concern about the use of U.S. mercury in dispersive practices involving mercury in other countries and the impacts of global

[1] EPA. Basic Information about Mercury. (No date). Available at https://www.epa.gov/mercury/basic-information-about-mercury.
[2] Ibid.
[3] EPA. How People are Exposed to Mercury. (No date). Available at https://www.epa.gov/mercury/how-people-are-exposed-mercury.
[4] EPA. TSCA Chemical Substance Inventory. (No date). Available at https://www.epa.gov/tsca-inventory.
[5] United Nations Environment Programme (UNEP). Minamata Convention on Mercury. (No date). Available at http://www.mercuryconvention.org.
[6] "Reporting Requirements for TSCA Mercury Inventory: Mercury." 83 Fed. Reg. 30054 (June 27, 2018).
[7] Mercury Export Ban Act of 2008. Pub. L. No. 110-414 (2008).

mercury releases on the United States. Beginning in 2013, the law prohibited exports of elemental mercury (with very limited exceptions),[8] provided for long-term management and storage of elemental mercury in the United States,[9] and prohibited the sale, distribution or transfer of elemental mercury held by U.S. federal agencies.[10] While the export of pure elemental mercury is illegal, the export of elemental mercury-added products (including those containing elemental mercury) is generally not prohibited, except if the intent of the export is to recover elemental mercury for resale or reuse.[11] In 2016, the Frank R. Lautenberg Chemical Safety for the 21st Century Act (Lautenberg Act) amended TSCA and expanded the export ban to include five mercury compounds: mercury (I) chloride or calomel; mercury (II) oxide; mercury (II) sulfate; mercury (II) nitrate; and cinnabar or mercury sulfide.[12] The ban took effect on January 1, 2020.

The Lautenberg Act also directed that "[n]ot later than April 1, 2017, and every 3 years thereafter, the Administrator shall carry out and publish in the Federal Register an inventory of mercury supply, use, and trade in the United States."[13] To assist in the preparation of the inventory, EPA was also directed to promulgate a rule by June 22, 2018 to establish reporting requirements applicable to persons who manufacture mercury or mercury-added products or who otherwise intentionally uses mercury in a manufacturing process.[14] In administering this mercury inventory, the Agency will "identify any manufacturing processes or products that intentionally add mercury; and . . . recommend actions, including proposed revisions of Federal law or regulations, to achieve further reductions in mercury use."[15] EPA finalized the mercury inventory reporting rule in June 2018.

[8] 15 U.S.C. § 2611(c)(1) and (4). MEBA authorizes EPA to provide limited essential use exemptions by rule for the export of no more than 10 metric tons of elemental mercury under specified conditions. There are seven specific findings EPA must make to grant an essential use exemption from the export ban. Requests for an essential use exemption would only be granted through notice-and-comment rulemaking. The exemption must contain terms and conditions that minimize export and ensure that conditions for granting the exemption are met. No exemption shall last longer than three years or exempt more than ten metric tons of mercury.
[9] 42 U.S.C. § 6939f(a)(2).
[10] 15 U.S.C. § 2605(f).
[11] EPA. Questions and Answers on the Mercury Export Ban Act (MEBA) of 2008. (No date). https://www.epa.gov/mercury/questions-and-answers-mercury-export-ban-act-meba-2008.
[12] 15 U.S.C. § 2611(c)(7)(A)(i)-(v). TSCA section 12(c)(7) uses the term "mercury sulphide," which is an alternative spelling of "mercury sulfide." Throughout this report, EPA is using "mercury sulfide" to be consistent with how the chemical substance is listed in the TSCA Chemical Substance Inventory.
[13] 15 U.S.C. § 2607(b)(10)(B).
[14] 15 U.S.C. § 2607(b)(10)(D)(i).
[15] 15 U.S.C. § 2607(b)(10)(C).

Introduction to the Inventory of Mercury Supply, Use, and Trade

EPA prepared this national inventory report of supply, use, and trade of mercury as directed by the Lautenberg Act, which defines "mercury" as "elemental mercury" or "a mercury compound."[16] The Agency promulgated its mercury inventory reporting rule to provide the reporting requirements, process, and schedule for persons who manufacture mercury or mercury-added products or who otherwise intentionally use mercury in a manufacturing process. Based on the information collected under the rule, the Agency, as appropriate, will identify any manufacturing processes or products that intentionally add mercury and recommend actions to achieve further reductions in mercury use as required by TSCA (see *Conclusion and Data Interpretation* section).

In 2017, EPA released its initial mercury inventory report,[17] which was a compilation of publicly available data on commodity mercury and was published prior to the promulgation of the mercury inventory reporting rule and establishment of the electronic reporting application. The initial mercury inventory fulfilled the statutory requirement and deadline to publish on or before April 1, 2017,[18] but the information and data were notably limited in applicability for many aspects of supply, use, and trade and, in some cases, were from outdated sources. The Agency also derived information from other federal and state programs, including EPA's Chemical Data Reporting (CDR) program, the Interstate Mercury Education and Reduction Clearinghouse (IMERC) Mercury-added Products Database, and the U.S. International Trade Commission (ITC), as well as other publicly available sources, and industry responses to EPA subpoenas.

This 2020 report is the first report in which the supply, use, and trade of mercury is presented based on data collected by EPA under the mercury inventory reporting rule (40 CFR. Part 713). Persons subject to the reporting requirements in 40 CFR Part 713 submitted information directly to EPA via the Mercury Electronic Reporting (MER or reporting) application, which is organized as a fill-in-the-blanks form with drop-down menus and lists of check-box options. The MER application is accessed through the Agency's Central Data Exchange (CDX). The deadline for reporting mercury information to EPA was July 1, 2019 for reporting activities that occurred in the calendar year 2018, and the inventory collection and reporting cycle will continue every three years thereafter to inform future inventories.[19] Given the divergent information collection methods between the 2017 and the 2020 inventories, the 2020 report intentionally does not draw any comparisons between the initial 2017 inventory and the information reported in the 2020 report. The Agency expects to be able to provide such comparisons no later than the 2023 inventory report.

[16] 15 U.S.C. § 2607(b)(10)(A).
[17] "Mercury; Initial Inventory Report of Supply, Use, and Trade" 82 Fed. Reg. 15522 (March 29, 2017). See also https://www.regulations.gov/document?D=EPA-HQ-OPPT-2017-0127-0002.
[18] 15 U.S.C. § 2607(b)(10)(B).
[19] The next report will be published on or before April 1, 2023 and will cover the reporting period of January 1 to December 31, 2021. The next deadline for reporting is July 1, 2022.

As set forth in the mercury inventory reporting rule, EPA expected to supplement certain data elements with information reported to CDR and IMERC, as necessary, in order to avoid duplicative reporting.[20] However, after the 2018 reporting period closed, EPA's assessment found: (1) the use of supplementary data from the CDR program or ITC was not necessary; and (2) information updated by IMERC in 2018 (for the amount of mercury in products sold in the United States in 2016) would be necessary to supplement data presented for domestic distribution in commerce of mercury-added products (see *Products Sold in the United States* section).

Reporting Requirements

The reporting requirements for supply, use, and trade of mercury are categorized based on the following terms: manufacture, import, use, distribution in commerce, storage, and export (refer to the *Explanation of Key Terms* in *Appendix A*). Persons are required to report the amounts of mercury in pounds (lbs) used in such activities with the purpose of obtaining an immediate or eventual commercial advantage[21] during a designated reporting year. Reporters are also required to identify specific mercury compounds, mercury-added products, manufacturing processes, and how mercury is used in manufacturing processes, as applicable, from preselected lists. For certain activities, reporters are required to provide additional, contextual data (e.g., North American Industry Classification System (NAICS) codes for mercury or mercury-added products distributed in commerce). For purposes of this report, the reporting activities are described as follows:

1. Imported mercury
2. Mercury manufactured in the United States
3. Imported products
4. Products made in the United States (including certain assembled products)
5. Mercury used in a manufacturing process other than for manufacturing mercury-added products or mercury compounds (hereafter referred to as "use in a manufacturing process")

Generally, under each reporting activity, EPA collected the following information in support of this inventory report:

- Amount of mercury manufactured, imported, stored, used, sold, or exported;
- Types of products made;
- Types of manufacturing processes and how mercury was functionally used;
- Business sectors, or industries, to which mercury or mercury-added products were sold;
- Country of origin of imported mercury or mercury-added products; and

[20] 15 U.S.C. § 2607(a)(5)(a) and 15 U.S.C. § 2607(b)(10)(D)(ii).

[21] The Agency incorporated existing TSCA-defined terms "with the purpose of obtaining an immediate or eventual commercial advantage" (see 15 U.S.C. § 2607(f) and 40 CFR 704.3) to be consistent with the statutory mandate at 15 U.S.C. § 2607(b)(10)(C)(i) to "identify any manufacturing processes or products that intentionally add mercury." In addition, the Agency interprets "commercial advantage" to extend to benefits beyond profits, such as not incurring additional operational costs by continuing to use mercury rather than use non-mercury substances or technologies. Thus, to be required to report to the mercury inventory, persons must intentionally engage in activities that introduce mercury into supply, use, and trade in the United States with the purpose of obtaining an immediate or eventual commercial advantage.

- Destination country for exported mercury (mercury compounds only)[22] or mercury-added products.

Information Not Required to Be Reported

TSCA requires EPA to publish a national inventory of mercury supply, use, and trade. The focus of this report is on the data provided directly to EPA by those subject to the reporting requirements. As described in the mercury inventory reporting rule, EPA determined that certain activities are beyond the scope of the rulemaking (see list below and 40 CFR 713.7) and, therefore, are not reported to the Agency. This includes amounts of mercury involved in in the following activities and circumstances:

- An activity that is not for an immediate or eventual commercial advantage;
- The manufacture or import of mercury that exists only as an impurity;
- Activities by companies, organizations, and/or individuals engaged only in the generation, handling, or management of mercury-containing waste, unless mercury is recovered to be used in commerce;
- Mercury that is present during a manufacturing process, but was not intentionally added to the product or process (e.g., mercury in equipment or tools); and
- Assembled products that contain mercury only in a component.

In other instances, reporting requirements were designed to prevent the duplication of information submitted to other programs.[23] For example, the final bullet in the list above describes information that would be reported to IMERC (i.e., sale of assembled products that contain mercury only in a component). In certain scenarios (e.g., a person first imports or manufactures a mercury-added component and then uses it to produce an assembled product), EPA would collect information on amounts of mercury in an assembled product. In such cases, Agency anticipated coordinating with IMERC to ensure the completeness of products-related data in the mercury inventory.

Overview of Information by Reporting Activity and Type of Reporter

EPA received a total of 99 individual submissions for reporting year 2018. EPA's reporting application allows for reporters to provide information on multiple reporting activities within one submission. As a result, a total of 117 activities were reported among the 99 individual submissions. Figure 1 illustrates the breakdown of the five reporting activities and the percent of reports received for each activity.

[22] See EPA. Questions and Answers on the Mercury Export Ban Act (MEBA) of 2008. (No date). Available at https://www.epa.gov/mercury/questions-and-answers-mercury-export-ban-act-meba-2008. See also discussion of mercury export prohibitions in *U.S. Laws Affecting Supply and Trade of Elemental Mercury and Mercury Compounds* and *Exported Mercury* sections.

[23] Reporting requirements are different for submitters that report under the Interstate Mercury Education and Reduction Clearinghouse or EPA's CDR program. The legal requirements for persons who must report can be found at 40 CFR 713.7.

Figure 1. Percent of Reporters Per Reporting Activity

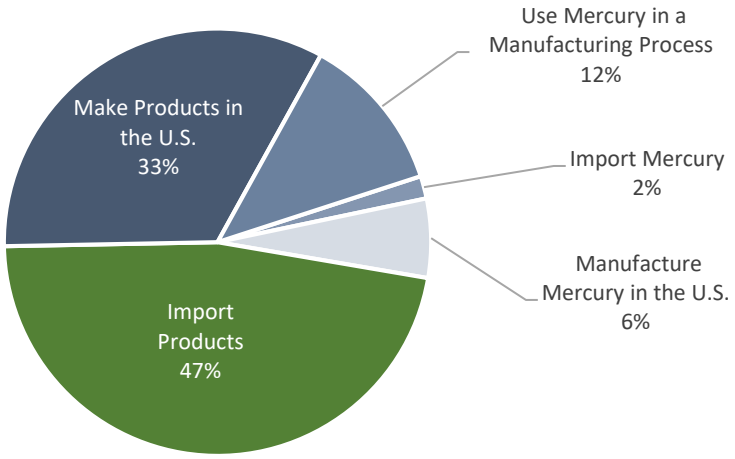


Table 1 presents a culmination of data based on three types of reporters: (1) those who manufacture or import mercury; (2) those who manufacture or import mercury-added products; and (3) those who otherwise use mercury in a manufacturing process. Values are provided for elemental mercury, mercury compounds, and the two combined for the total amount of mercury. For each type of reporter and mercury, the table indicates the number of reporters, the amount of mercury either manufactured, imported or used, as applicable, the amount of mercury stored, the amount mercury distributed in commerce, and the amount of mercury exported.

Table 1. Overview of Mercury Information Received Based on Type of Reporters

Type of Reporter		Reported Activities[a]	Amount (lbs)			
			Mfr'd/ Imp'd/ Used[b]	Stored[c]	Distributed	Exported[d]
Elemental Mercury	Mercury Manufacturer or Importer	4	72,614	105,355	72,103	0
	Product Manufacturer or Importer	43	21,528	N/A	8,546	3,867
	Use in a Manufacturing Process	8	540,538	45,210	N/A	N/A
Mercury Compound	Mercury Manufacturer or Importer	5	457	1,382	1,393	148
	Product Manufacturer or Importer	51	3,364	N/A	441	2,052
	Use in a Manufacturing Process	6	34	213	N/A	N/A
Total[e]	Mercury Manufacturer or Importer	9	73,071	106,737	73,496	148
	Product Manufacturer or Importer	94	24,892	N/A	8,987	5,919
	Use in a Manufacturing Process	14	540,572	45,423	0	0

[a] Some submissions contain multiple reporting activities, thus the total number of reported activities (117) is greater than the total number of individual submissions received in the MER application (99).

[b] Based on type of reporter, this refers to the amount of mercury manufactured and imported, the amount in manufactured and imported products, or the amount used in a manufacturing process.

[c] Product manufacturers and importers are not required to provide information on stored mercury.

[d] It is illegal to export elemental mercury and certain mercury compounds. Processors are not required to provide amounts of mercury exported in mercury-added products because it is considered an unintended impurity.

[e] A combined total for elemental mercury and mercury compounds is provided as a snapshot of "mercury supply, use, and trade in the United States" (15 U.S.C. § 2607(10)(A) and (B)).

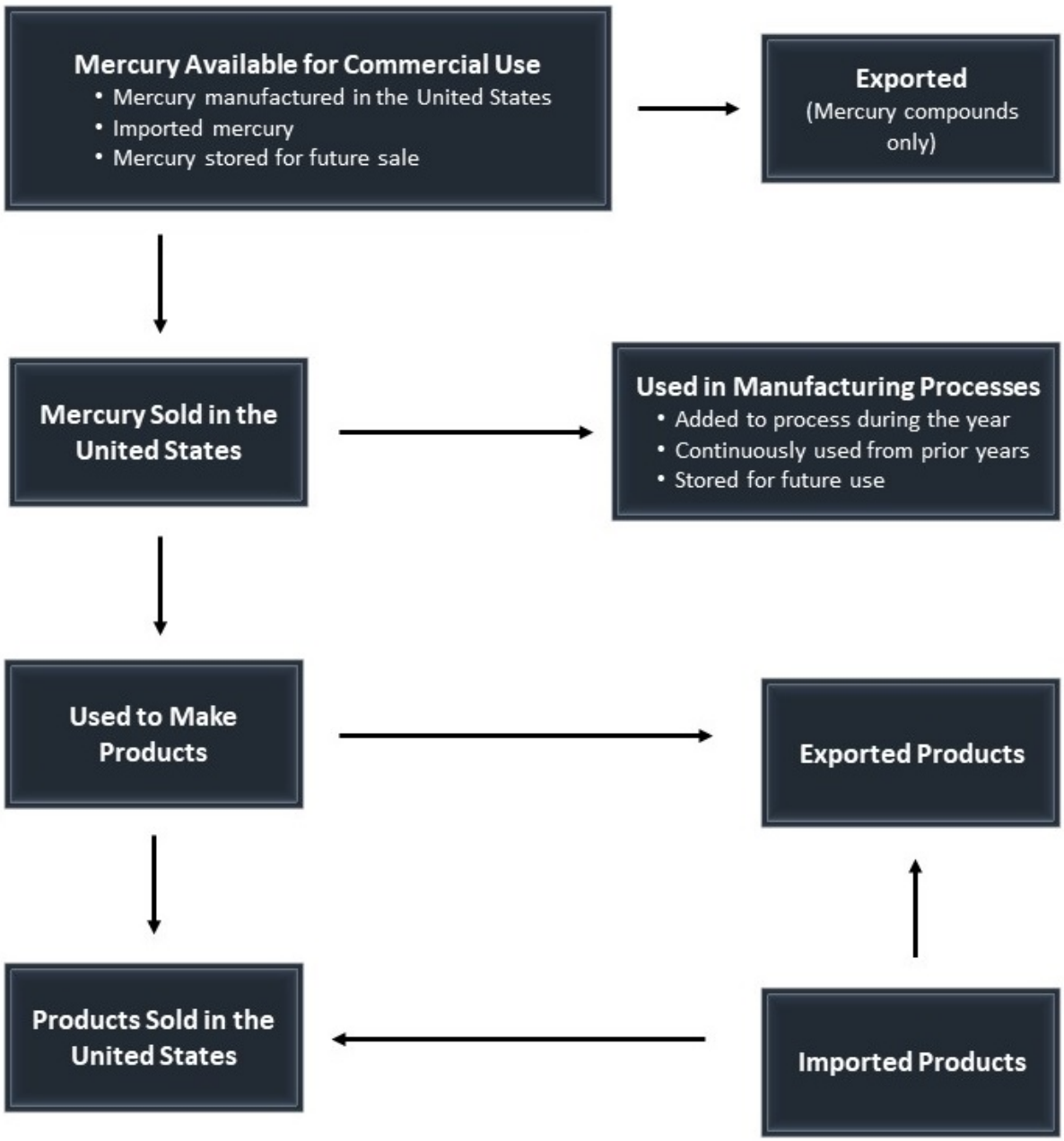
The diagram of the U.S. mercury market in Figure 2 provides the overall context for the commercial activities detailed in the inventory and how those activities relate to one another. Figure 2 includes sources of commodity mercury and shows the way it moves in the economy. From initial production ("manufacturing") and import, mercury can be stored, distributed domestically, or, in the case of mercury compounds, exported. Once distributed, it can be used by manufacturers of products or by processors in other manufacturing processes. Products can be distributed in the United States or exported. In some cases, mercury remains in use in a product until it becomes waste (e.g., dental amalgam). In other cases, a manufacturing process may use a quantity of mercury on a continuous basis from year to year. For example, facilities producing chlorine keep elemental mercury in use year after year and add a much smaller amount to the

reservoir of continuously used elemental mercury during any given year to replace losses.[24] This explains why the reported amounts of elemental mercury used in manufacturing processes are substantial.

Because of the ways that amounts of mercury can be accounted for in supply, use, and trade phases, there are instances where there could be overlap. For example, the same mercury can be manufactured, stored, distributed in the United States, and used within the same year. In some cases, mercury can be manufactured in one year and distributed in the next. In others, as mentioned above in the case of chlor-alkali production, the use of a quantity of mercury could be considered to be essentially static, which would frustrate an attempt to capture the total flow of mercury through supply, use, and trade as a linear illustration. Therefore, Figure 2 captures a snapshot of 2018 data based on the three groups of reporters: (1) those who manufacture or import mercury; (2) those who manufacture or import mercury-added products; and (3) those who otherwise use mercury in a manufacturing process.

[24] Chlor-Alkali Industry 2008 Mercury Use and Emissions in the United States—Twelfth Annual Report (August 2009). Available at https://archive.epa.gov/region5/mercury/web/pdf/12thcl2report.pdf.

Figure 2. U.S. Mercury Market



Data Quality Considerations

EPA issued a compliance guide and held webinars to explain the reporting requirements and how to use the MER application.[25] Despite these outreach efforts and notwithstanding the self-certified accuracy of that information, information submitted to the EPA's reporting application is subject to submitter error. For example, while reviewing data quality of the reports, EPA discovered that several submissions under the reporting activity for use of mercury in a manufacturing process were misreported and, after contacting the reporter, determined that the reported amount belonged under the reporting activity of mercury-added products made in the United States. For such submissions, the Agency manually calculated and transferred the numbers to the appropriate reporting activity. In other instances, EPA directly contacted the reporters to request amended submissions when the data provided appeared inaccurate (e.g., extremely high quantities of stored mercury for several reporting activities within a single submission). EPA worked collaboratively with the regulated community to ensure the accuracy of the information received and will continue to do so going forward.

The MER application was designed to accurately capture the supply, use, and trade of mercury, while collecting data in such a way as not only to allow for flexibility in the terms used by reporters (e.g., manually-typed entries to "other" data fields), but also to allow for the relevant provision of, and processes regarding, confidential business information (CBI). As a result, in a few limited cases certain reporting activities relevant to supply, use, and trade may seemingly lack a detailed account of specific quantities and its uses. In such instances, EPA lists contextual information (e.g., sub-categories of products, countries of origin or destination, or NAICS codes) with a generalized description of a reporting activity and/or total amount of mercury. So, for example, if a reporter imported multiple products such as lighting, measuring instruments, and formulated products, the amounts of mercury for each of the three products and any relevant subcategories are unknown because only one data field is available for the total amount of mercury in imported products. The same applies to countries; if a reporter imported these products from multiple countries, the amounts of mercury in products imported from each country are unknown, and again, one total amount is indicated.

Lastly, EPA learned during an information collection effort in 2015 that companies working with mercury operate differently from one another and may account for mercury flow in different ways. For example, a company's business practices may result in mercury being manufactured in a non-reporting year and stored both during that year and the reporting year (i.e., amount of mercury reported for storage during the reporting year only). Therefore, as expected, the inventory does not show that the overall amounts of mercury imported and manufactured equal the amounts of mercury used, distributed, and exported. For example, the total amount of mercury compounds used to make products and used in manufacturing processes in 2018 (1,941 lbs) does not equal the sum of mercury compounds reported as manufactured and imported (457 lbs) during the same year.

[25] To assist in reporting to the mercury inventory, EPA provided outreach materials (see https://www.epa.gov/mercury/resources-mercury-inventory-reporting-rule). The compliance guide is available at https://www.epa.gov/sites/production/files/2019-05/documents/reporting_requirements_for_the_mercury_inventory_final.pdf, and the webinars can be found at https://www.epa.gov/mercury/webinars-mercury-inventory-reporting-rule-0.

Organization of Inventory – Mercury Supply, Use, and Trade

Following this introduction, the inventory is presented in three sections: supply, use, and trade. Each section discusses both elemental mercury and mercury compounds. In this report, the term "mercury" used alone means both elemental mercury and mercury compounds. The five reporting activities (imported mercury, mercury manufactured in the United States, imported products, products made in the United States, and mercury used in a manufacturing process) are integrated with other data to help provide context to the national mercury inventory.

EPA recognizes that the categories of data can be defined in different ways (see *Appendix A* for a detailed explanation of key terms). For the purposes of this inventory report, domestic manufacture and storage of mercury are considered supply because they are the sources of mercury that can enter the U.S. market for sale. Mercury that was sold (distributed) in the United States could be considered either: (1) supply of mercury (because it was supplied to purchasers); (2) use of mercury (because sales information helps to illustrate use of mercury and mercury-added products); or (3) trade of mercury (because sales are a measure of domestic commerce). In this inventory, sale of mercury is categorized as use along with the manufacture and sale of mercury-added products, and the intentional use of mercury in a manufacturing process. As explained in the final rule, EPA requires contextual information on distribution, storage, and export in support of the mercury inventory. For the purpose of this report, distribution is discussed under use of mercury because the Agency is viewing the sale of mercury and mercury-added products through the lens of the purchaser, who uses the mercury or mercury-added products. In this way, the distribution of the supplied mercury is similar to the economic term of demand.

Trade in this inventory refers to international trade (i.e., imports and exports). As with distribution of mercury, there is more than one category in which to place imports. Imported commodity mercury could be considered part of supply (because the mercury can enter the domestic market for sale), but because trade is defined as international trade for this report, imported commodity mercury is placed in the section on trade, along with mercury exports. Limiting the category of trade to international transactions is consistent with the organization of the 2016 EPA Report to Congress on Mercury Global Supply and Trade.[26] In this inventory, trade also includes import and export of mercury-added products. Overall, this organization of supply, use, and trade parallels the presentation of information in EPA's initial mercury inventory report of 2017.

Supply	Manufacture (or production) and storage of mercury in the United States
Use	Sale of mercury throughout the United States, manufacture and sale of mercury-added products, and use of mercury in a manufacturing process
Trade	Import and export of mercury and mercury-added products

[26]EPA. Report to Congress on the Global Supply and Trade of Elemental Mercury. December 2016. Available at https://www.epa.gov/sites/production/files/2017-01/documents/mercury_global_supply_and_trade_rtc_and_signed_transmittal_letters.pdf.

Table 2 provides a summary of the amount of elemental mercury, mercury compounds, and total mercury for each reporting activity and contextual detail (e.g., amount stored, distributed, and exported) as it pertains to supply, use, and trade.

Table 2. Summary of Supply, Use, and Trade of Mercury in 2018

Supply, Use, and Trade of Mercury		Elemental Mercury (lbs)	Mercury Compounds (lbs)	Total[a] (lbs)
Supply	Mercury Manufactured in the United States	72,614	209	72,823
	Stored On-site (max)	150,565	1,410	151,975
	Stored Off-site (max)	0	185	185
Use	Mercury Sold in the United States	72,103	1,393	73,496
	Products Made in the United States	19,840	1,907	21,747
	Products Sold in the United States	8,546	441	8,987
	Mercury Used in a Manufacturing Process	540,538	34	540,572
Trade	Imported Mercury	0	248	248
	Imported Products	1,548	1,458	3,006
	Exported Mercury	0	148	148
	Exported Products	3,867	2,052	5,919

[a]A combined total for elemental mercury and mercury compounds is provided as a snapshot of "mercury supply, use, and trade in the United States" (15 U.S.C. § 2607(10)(A) and (B)).

Finally, the inventory report will discuss, where relevant, aspects of supply, use, and trade related to international and domestic obligations. As described in the *Background* section, such topics include the Minamata Convention (e.g., "mercury-added products" and "manufacturing processes in which mercury or mercury compounds are used"), as well as MEBA and Lautenberg Act amendments, which prohibit the export of elemental mercury and certain mercury compounds, respectively.

In some contexts, amounts of mercury in supply, use, and trade are reported in kilograms and metric tons. For reader convenience, the following conversions are offered:

1 kilogram = 2.205 pounds
1 metric ton = 2,205 pounds

Supply of Mercury

EPA included in mercury supply the domestic manufacture (or production) and storage of mercury for commercial use (see Table 3). Elemental mercury is no longer intentionally mined in the United States but is produced as both a byproduct of mining and processing of other metal ores and when

mercury waste is recycled.[27] Mercury compounds are generally produced by the chemical manufacturing industry. Stored mercury that is available for commercial use is part of supply, regardless of whether it was manufactured or imported. The inventory does not include waste,[28] such as discarded excess elemental mercury, industrial waste containing mercury, or contaminated soil. When mercury waste is recycled, elemental mercury is recovered and can be sold; this pure mercury is considered "manufactured" and reportable. Due to an excess of supply, some privately held, pure elemental mercury is in long-term storage and by law cannot be placed in commerce.[29] In addition, the U.S. Department of Defense (DOD) and the U.S. Department of Energy (DOE) store thousands of tons of elemental mercury, which are unable to be placed for sale on either the United States or global market and are not contributing to the available domestic or global mercury supply.[30] This inventory report does not include any of the elemental mercury in such long-term storage.[31]

Table 3. Supply of Mercury in the United States (2018)

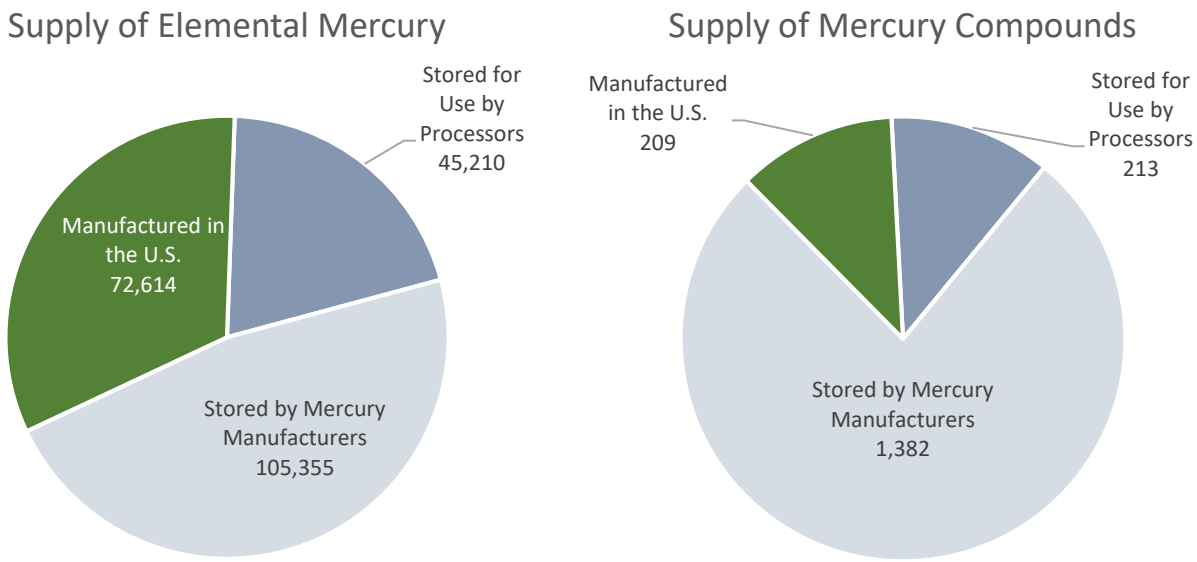
Supply of Mercury	Elemental Mercury (lbs)	Mercury Compounds (lbs)	Total[a] (lbs)
Manufactured in the United States	72,614	209	72,823
Stored On-site (max)	150,565	1,410	151,975
Stored Off-site (max)	0	185	185

[a]A combined total for elemental mercury and mercury compounds is provided as a snapshot of "mercury supply, use, and trade in the United States" (15 U.S.C. § 2607(10)(A) and (B)).

The pie charts in Figure 3 show how much elemental mercury and mercury compounds are stored by processors, stored by manufactures, and produced by manufactures in the United States.

[27] United States Geological Survey. Mercury Mineral Commodity Data Sheet 2019. Available at https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-mercu.pdf.
[28] 15 U.S.C. § 2607(b)(10)(D)(iii).
[29] 42 U.S.C. § 6939(f).
[30] 15 U.S.C. § 2605(f).
[31] EPA determined that elemental mercury waste, whether generated from mining or another process, that is being stored (or accumulated on-site and destined for storage) for eventual transfer to the DOE long-term mercury storage facility, should, in accordance with TSCA section 8(10)(D)(iii), not be subject to the reporting requirements because it is waste. If any person manufactures elemental mercury, including recovery from waste or as a byproduct from mining or any other activity, and has not made the decision to store it for transfer to the DOE storage facility or to otherwise handle it as waste, then that person must report that mercury. The Agency considers such mercury to be a commodity, not waste, and, therefore, part of the U.S. mercury supply.

Figure 3. Amount (lbs) of Mercury Supplied and Stored by Type of Reporter



Mercury Manufactured in the United States

In 2018, a total of 72,823 lbs of mercury were manufactured in the United States. Four companies manufactured 72,614 lbs of elemental mercury and three companies manufactured 209 lbs of mercury compounds.

In 2015, the Agency gathered information from facilities engaged in large-scale domestic recycling of elemental mercury in the years 2010 and 2013. In 2013, a total of 171,581 lbs was reported for the manufacture of elemental mercury, as compared to the 72,614 lbs reported by persons subject to the mercury inventory reporting rule in 2018. This represents a decrease of 98,967 lbs (>57 percent) between 2013 and 2018.

The types of mercury compounds made in the United States are identified in Table 4;[32] however, specific amounts of manufactured, distributed, and exported mercury compounds cannot be determined due to the listing of multiple compounds within the submission forms.

[32] A list of mercury compounds identified as "[m]ercury for which information must be reported" can be found at 40 CFR 713.5(b). See also *Appendix B*.

Table 4. List of Mercury Compounds Made in the United States (2018)

CASRN	Mercury Compounds
54-64-8	Mercurate(1-), ethyl[2-(mercapto-.kappa.S)benzoato(2-).kappa.O]-, sodium (1:1)
6283-24-5	Mercury, (acetato-.kappa.O)(4-aminophenyl)-
7774-29-0	Mercury iodide (HgI_2)
13257-51-7	Acetic acid, 2,2,2-trifluoro-, mercury (2+) salt (2:1)
312623-78-2	Perchloric acid, mercury salt (1:1) tetrahydrate

For purposes of the mercury inventory reporting rule, the MER application, and the inventory report, EPA describes mercury compounds as they are listed in the TSCA Chemical Substance Inventory. In some contexts, mercury compounds may be more familiar as described by their International Union of Pure and Applied Chemistry (IUPAC) name, which may be found via the PubChem chemistry database of the National Institutes of Health (see https://pubchem.ncbi.nlm.nih.gov/).

Stored Mercury in the United States

Mercury storage, either on-site or off-site, was reported by manufacturers, importers, and processors of mercury. Those who store mercury as waste or manufacture or import mercury-added products are not required to report mercury storage.[33] The manufacturing processes for which mercury was stored include chlorine production and quality control testing and analysis.

Mercury Stored On-Site

In total, the maximum amount of mercury stored onsite in the United States at any given time during 2018, as reported by manufacturers, importers, and processors of mercury, was 151,975 lbs. The maximum amount of elemental mercury stored was 150,565 lbs and the maximum amount of mercury compounds stored was 1,410 lbs.

Mercury Stored Off-Site

Elemental mercury was not reported as stored off-site in 2018. One company reported storing up to 185 lbs of mercury compounds off-site for use in the quality control test manufacturing process.

[33] 40 CFR 713.9.

In 2015, the Agency gathered information from facilities engaged in large-scale domestic recycling of elemental mercury in the years 2010 and 2013. In 2013, a total of 364,539 lbs was reported for the storage of elemental mercury, as compared to the 105,355 lbs reported by persons subject to the mercury inventory reporting rule in 2018. This represents a decrease of 259,184 lbs (>71 percent) between 2013 and 2018. Note that this comparison does not include mercury stored for use by processers (see Figure 3 and Table 2), which explains the difference in the "Stored On-site (max)" amount shown in Table 3.

Use of Mercury

Use of mercury includes the sale of mercury in the United States, the manufacture and sale of mercury-added products, and the intentional use of mercury in manufacturing processes (see Table 5 and Figure 4). For the purpose of this report, distribution is discussed under use of mercury because the Agency is viewing the sale of mercury and mercury-added products through the lens of the purchaser, who uses the mercury or mercury-added products. In this way, the distribution of the supplied mercury is similar to the economic term of demand. To avoid counting the same mercury twice, the amounts of mercury used for these four activities are not totaled.

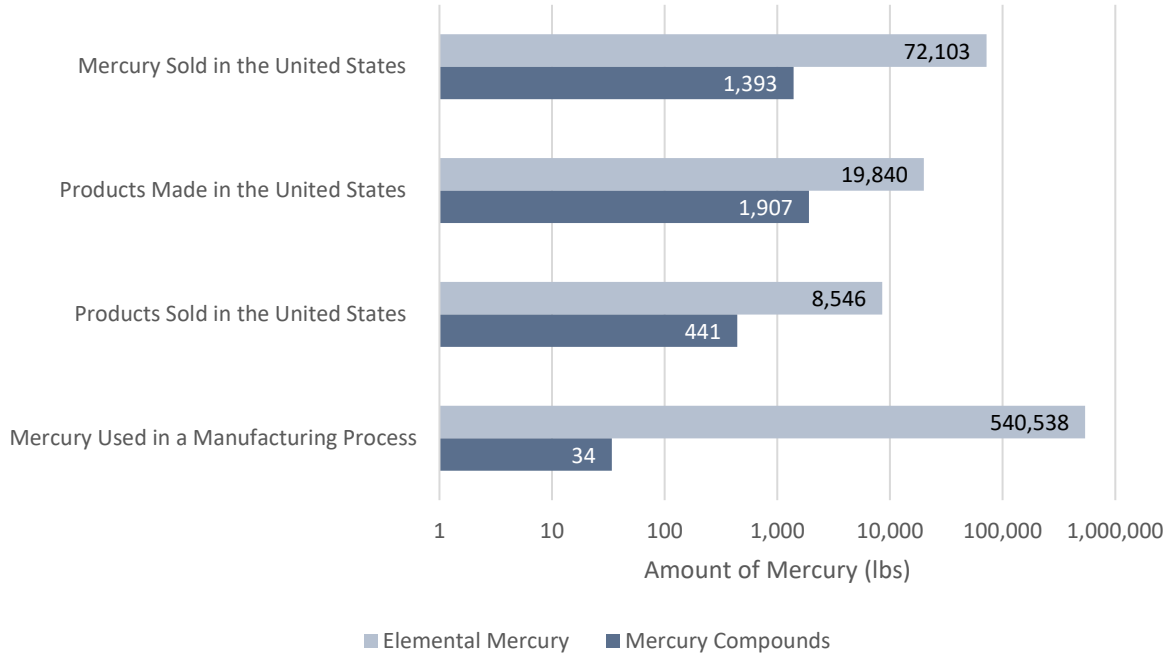
Table 5. Use of Mercury in the United States (2018)

Use of Mercury	Elemental Mercury (lbs)	Mercury Compounds (lbs)	Total[b] (lbs)
Mercury Sold in the United States	72,103	1,393	73,496
Products Made in the United States	19,840	1,907	21,747
Products Sold in the United States	8,546	441	8,987
Mercury Used in a Manufacturing Process	540,538[a]	34	540,572

[a]In addition to the amount of mercury compounds manufactured, one mercury compound manufacturer also indicated the amount of elemental mercury used to make the compounds; similarly, one manufacturer of mercury compound-added products reported the amount of elemental mercury used in addition to the amount of mercury compounds used to make the products. Therefore, the amount of elemental mercury involved in these two reporting activities for mercury compounds is included under the reporting activity of "otherwise used mercury in a manufacturing process."

[b]A combined total for elemental mercury and mercury compounds is provided as a snapshot of "mercury supply, use, and trade in the United States" (15 U.S.C. § 2607(10)(A) and (B)).

Figure 4. Amount of Mercury Used by Activity in 2018[34]



Mercury Sold in the United States

Elemental mercury that is manufactured or imported into the United States can only be distributed or sold for use within the United States because it is unlawful to export it. During the reporting year, mercury compounds were allowed to be exported. In 2018, 72,103 lbs of elemental mercury and 1,393 lbs of mercury compounds were distributed nationwide, totaling 73,496 lbs of distributed mercury (see Table 5 and Figure 4). According to reporters, elemental mercury and mercury compounds were distributed to a variety of industries, which were identified by NAICS code.

Elemental mercury was distributed to the following industries:

- All Other Miscellaneous Chemical Product and Preparation Manufacturing (325998)
- All Other Miscellaneous Electrical Equipment and Component Manufacturing (335999)
- Analytical Laboratory Instrument Manufacturing (334516)
- Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing (335122)
- Dental Equipment and Supplies Manufacturing (339114)
- Other Basic Inorganic Chemical Manufacturing (325180)
- Secondary Smelting, Refining, And Alloying of Nonferrous Metal (Except Copper and Aluminum) (331492)
- Testing Laboratories (541380)

[34] As a note to readers, figures in this document are reported in a logarithmic scale to account for a wide range in mercury quantities. See *Explanation of Key Terms* section for additional information on logarithmic scales.

Mercury compounds were distributed to the following industries:

- Administration of Air and Water Resource and Solid Waste Management Programs (924110)
- All Other Basic Organic Chemical Manufacturing (325119)
- Biological Product (Except Diagnostic) Manufacturing (325114)
- Colleges, Universities, And Professional Schools (611310)
- Electron Tube Manufacturing (334411)
- Elementary and Secondary Schools (611110)
- General Medical and Surgical Hospitals (622110)
- In-Vitro Diagnostic Substance Manufacturing (325413)
- Medical Laboratories (621511)
- Medicinal and Botanical Manufacturing (325411)
- Other Chemical and Allied Products Merchant Wholesalers (424690)
- Process, Physical Distribution, And Logistics Consulting Services (541614)
- Research and Development in Biotechnology (541715)

Products Made in the United States

In total, 21,747 lbs of mercury were used for the domestic manufacture of mercury-added products in 2018. Of this total, 19,840 lbs of elemental mercury were used to manufacture elemental mercury-added products, and 1,907 lbs of mercury compounds were used to manufacture mercury compound-added products (see Table 5 and Figure 4). The types of mercury-added products manufactured in the United States are identified in Table 6 for elemental mercury and Table 7 for mercury compounds.[35] For each product category, the amount of mercury used, distributed, and exported in products is provided. EPA identified "products that intentionally add mercury" [36] and in the *Conclusion and Data Interpretation* section noted those products that it was unaware of prior to receiving the 2018 reporting data.

EPA identified the following additional uses of mercury in mercury-added products through the information submitted under the mercury inventory reporting rule:

- *The "burners" aspect of "low UV gas discharge lamps and burners"*
- *Wheel emblem*
- *Lead in water sensor*
- *Mercury analyzer*
- *Air cylinders*
- *Connector pins*
- *Mass flow controllers*
- *Printed circuit board*
- *Motors*

[35] A list of mercury-added products identified as "[s]pecific requirements for which information must be reported." can be found at 40 CFR 713.11(b). See also *Appendix C*.

[36] 15 U.S.C. § 2607(b)(10)(C).

Table 6. List of Products Made in the United States and Amount of Elemental Mercury Used, Distributed, and Exported

Products Made in the United States – Elemental Mercury			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Dental Amalgam	9,287	0	2,624
Lighting, Lamps, and Bulbs	1,637	18	362
Compact Fluorescent High Pressure Sodium Linear Fluorescent Mercury Vapor Metal Halide U-Tube and Circular Fluorescent			
Miscellaneous/Novelty	1		
Plasma Display (Fill Tubes at Seal Pump and Burst at RTV Operation)			
Switches, Relays, Sensors, and Valves	8,915	8,519	315
Displacement Relay Float Switch Tilt Switch			
Total	19,840	8,537	3,301

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

Table 7. List of Products Made in the United States and Amount of Mercury Compounds Used, Distributed, and Exported

Products Made in the United States – Mercury Compounds			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Batteries	119	0	0
Silver-Zinc			
Formulated Products Preservative (Vaccine Usage)	290	151	121
Other Formulated Products	1,496	85	1,767
In-Vitro Diagnostics Pharmaceuticals Preservative (Non-Vaccine Usage) Reagents (Catalysts, Buffers, and Fixatives) Testing Kits			
Lighting, Lamps, and Bulbs	1		1
Electrodeless Discharge			
Miscellaneous/Novelty	1		
Plasma Display (Fill Tubes at Seal Pump and Burst at RTV Operation)			
Total	1,907	236	1,889

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

Figures 5 and 6 provide visual representations of the amounts of elemental mercury and mercury compounds used to make products in the United States.

Figure 5. Amount (lbs) and Percent of Total Elemental Mercury Used to Make Products by Category

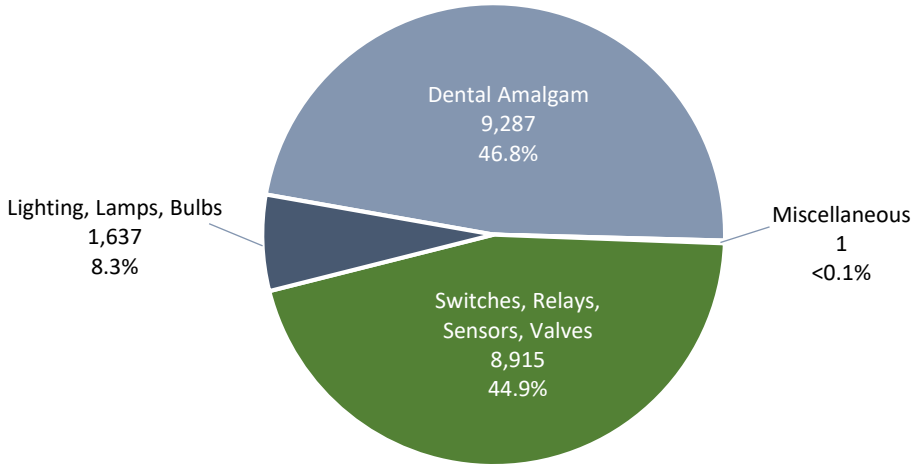
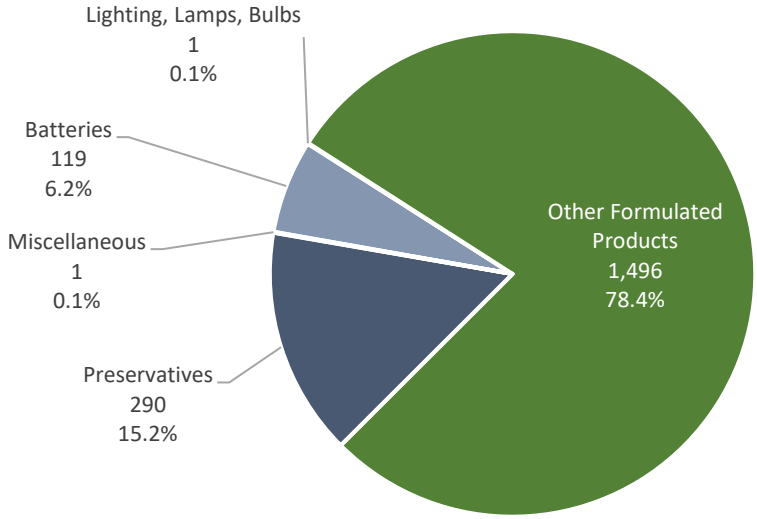


Figure 6. Amount (lbs) and Percent of Total Mercury Compounds Used to Make Products by Category



Products Sold in the United States

Mercury-added products are sold, or distributed, throughout the United States by both product manufacturers and importers (see *Trade of Mercury* section for more information on imported mercury-added products). As described in the mercury inventory reporting rule, EPA sought to avoid duplicative reporting for persons who traditionally report nationwide sales data to the IMERC Mercury-Added Products Database.[37] As such, the Agency, as necessary, supplements data reported directly to the MER application with the most recent available data from IMERC. In this report, the Agency presents nationwide sales data as a range between 2018 data reported to EPA and data updated by IMERC in 2018 (for the amount of mercury in products sold in the United States in 2016), as a combined "mercury" total.

In 2018, the total amount of mercury distributed in mercury-added products in the United States was between 8,987 and 75,619 lbs.[38] For amounts reported to the EPA's reporting application, those products contained 8,546 lbs of elemental mercury and 441 lbs of mercury compounds. Specific amounts of mercury for each product are not required to be reported by the rule;[39] however, analysis of the reports indicates that lighting products were reported by the greatest number of persons reporting for mercury-added product distributed in the United States. Tables 8 and 9 contain lists of categories and sub-categories of mercury-added products sold in the United States.[40] The number of reporters and the NAICS codes to which elemental mercury-added products and mercury compound-added products were distributed in the United States are presented in Tables 10 and 11.

[37] 83 Fed. Reg. 30062.
[38] New England Waste Management Officials' Association, IMERC Fact Sheet: Current Fact Sheets – Updated December 2018. Accessible at http://www.newmoa.org/prevention/mercury/imerc/FactSheets/index.cfm.
[39] 40 CFR 713.9.
[40] A list of mercury-added products identified as "[s]pecific requirements for which information must be reported." can be found at 40 CFR 713.11(b). See also *Appendix C*.

Table 8. List of Products Sold in the United States in 2018 – Elemental Mercury

Elemental Mercury-Added Products	
Product Category	**Product Subcategory**
Batteries	Lithium-ion Manganese Dioxide
Lighting, Lamps, and Bulbs	Cold Cathode Fluorescent
	Compact Fluorescent
	External Electrode Fluorescent
	High Pressure Mercury Vapor Lamps
	High Pressure Sodium
	Induction A-Lamps
	Linear Fluorescent
	Mercury Short Arc
	Mercury Vapor
	Metal Halide
	U-Tube and Circular Fluorescent
	UV and Germicidal
	Xenon Electric Discharge Lamp
Measuring Instruments	Flow Meter
	Hydrometer
	Hygrometer/Psychrometer
	Mercury Analyzer Thermometer
Switches, Relays, Sensors, and Valves	Float Switch
	Pressure Switch
	Temperature Switch
	Thermostat
	Tilt Switch
Miscellaneous and Novelty Products	Air Cylinders Connector Pins
	Mass Flow Controllers Printed Circuit Boards Motors Plasma Display (Fill Tubes at Seal Pump and Burst at RTV Operation)
	Pumps and Flow Meters

Table 9. List of Products Sold in the United States in 2018 – Mercury Compounds

Mercury Compound-Added Products	
Product Category	**Product Subcategory**
Formulated Products	Preservatives (Vaccination Usage)
	Reagents (Catalysts, Buffers, Fixatives)
Lighting, Lamps, and Bulbs	Cold Cathode Fluorescent
	Compact Fluorescent
	High Pressure Sodium
	Linear Fluorescent
	Low UV Gas Discharge Lamps and Burners
	Mercury Short Arc
	Mercury Vapor
	Metal Halide
	Purification/Germicidal
	Scanner Lamps
	U-Tube and Circular Fluorescent
	Ultra-High Efficiency
	UV and Germicidal
	UV Curable Lamp
	Xenon Electric Discharge Lamps
Miscellaneous/Novelty	Plasma Display (Fill Tubes at Seal Pump and Burst at RTV Operation) Wheel Emblem
Switches, Relays, Sensors, and Valves	Lead in Water Sensor
	Tilt Switch

Table 10. Distribution of Mercury-Added Products by Industry – Elemental Mercury

Industries that Purchased U.S. Manufactured and Imported Elemental Mercury-Added Products	
Industry Sector	**Number Reported**
Accommodation and Food Services	2
Administrative and Support and Waste Management and Remediation Services	1
Agriculture, Forestry, Fishing and Hunting	2
Arts, Entertainment, and Recreation	4
Construction	2
Educational Services	2
Manufacturing	84
Other Services (except Public Administration)	7
Professional, Scientific, and Technical Services	3
Real Estate and Rental and Leasing	1
Retail Trade	13
Utilities	1
Wholesale Trade	9

Table 11. Distribution of Mercury-Added Products by Industry - Mercury Compounds

Industries that Purchased U.S. Manufactured and Imported Mercury Compound-Added Products	
Industry Sector	**Number Reported**
Accommodation and Food Services	5
Agriculture, Forestry, Fishing and Hunting	3
Arts, Entertainment, and Recreation	2
Construction	7
Educational Services	6
Health Care and Social Assistance	5
Information	2
Manufacturing	53
Other Services (except Public Administration)	6
Professional, Scientific, and Technical Services	19
Public Administration	5
Real Estate and Rental and Leasing	1
Retail Trade	25
Transportation and Warehousing	2
Utilities	7
Wholesale Trade	39

Mercury Used in Manufacturing Processes

The otherwise intentional use of mercury in a manufacturing process means to use mercury to manufacture anything other than a mercury-added product or a mercury compound. Examples include the use of mercury as a catalyst, cathode, reactant, or reagent. In 2018, 540,538 lbs of elemental mercury were used in manufacturing processes, the bulk of which was in continuous use, and 34 lbs of mercury compounds were used. Thus, a total of 540,572 lbs of mercury were used in manufacturing processes in 2018 (see Table 5 and Figure 4).

In a manufacturing process, mercury performs a specific function and is used for a particular purpose. For elemental mercury and mercury compounds, Tables 12 and 13 respectively list the types of manufacturing processes, how mercury was functionally used, and the industries, if any, to which end products of that manufacturing process were distributed in the United States.[41] In some cases, end products that result from these manufacturing processes may contain trace amounts of mercury, but are not considered mercury-added products. No exports were reported by these processors.

[41] Lists applicable to manufacturing processes for which mercury is otherwise intentionally used identified as "[s]pecific requirements for which information must be reported." can be found at 40 CFR 713.11(c). See also *Appendix D*.

Table 12. Manufacturing Processes that Used Elemental Mercury in 2018

Use of Elemental Mercury in Manufacturing Processes		
Manufacturing Process	**Functional Use**	**Industry of Distribution**
Bonding Weld Head	Catalyst	None
Catalyst Porosity Testing	Catalyst	None
Chlorine Production (e.g., mercury-cell chlor-alkali process)	Cathode	Other Basic Inorganic Chemical Manufacturing
Molecular Beam Epitaxy	Molecular Beam Epitaxy	Guided Missile and Space Vehicle Manufacturing; Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing; Semiconductor and Related Device Manufacturing
Quality Analysis	Density Measurement of Tungsten Bars	None

Table 13. Manufacturing Processes that Used Mercury Compounds in 2018

Use of Mercury Compounds in Manufacturing Processes		
Manufacturing Process	**Functional Use**	**Industry of Distribution**
Impurity, Catalyst	Impurity, Catalyst, Reagent	None
Inactivation	Inactivation	Biological Product (Except Diagnostic) Manufacturing
Laboratory Test	Catalyst	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Pharmaceutical Manufacture and Storage for Lab Quality Control	Reagent	None
Quality Control Test	Small Arms Ammunition Case-Mercury Stress Crack	None

The Minamata Convention identifies the following manufacturing processes in which elemental mercury or mercury compounds are used:

- Chlor-alkali production
- Acetaldehyde production in which elemental mercury or mercury compounds are used as a catalyst
- Vinyl chloride monomer production
- Sodium or Potassium Methylate or Ethylate
- Production of polyurethane using mercury containing catalysts

In developing the mercury inventory reporting requirements, the Agency incorporated these processes in "[s]pecific requirements for which information must be reported" at 40 CFR 713.11(c). [42] These processes are subject to be phased out in those countries that are party to the Minamata Convention, beginning in 2018. With one exception, chlorine production (e.g., mercury-cell chlor-alkali process), the processes identified in the Convention have ceased to be used in the United States for several years.

Chlor-alkali production (labelled as "Chlorine production (e.g., mercury-cell chlor-alkali process)" in the Mercury Inventory Reporting Rule and the MER application) is the only process from the above list that was identified as actively practiced in the United States in 2018. There are two remaining facilities using this process, of which one began the process of converting to non-mercury processes in 2017.

EPA identified "manufacturing processes . . . that intentionally add mercury" [43] in the box below and in the *Conclusion and Data Interpretation* section those products that it was unaware of prior receiving the 2018 reporting data.

EPA identified the following additional uses of mercury in manufacturing processes through the information submitted under the mercury inventory reporting rule:

- Bonding weld head (catalyst)
- Molecular beam epitaxy
- Quality analysis (density measurement of tungsten bars)
- Inactivation
- Quality control test (small arms ammunition case-mercury stress crack)

Trade of Mercury

Elemental mercury and mercury compounds are commodities that are bought and sold worldwide, although the United States prohibits the export of certain mercury (see *Exported Mercury* section).

[42] After considering the public comments received on the Mercury Inventory Reporting Rule, EPA removed the term "Vinyl chloride monomer production" from the options of categories of manufacturing processes for which mercury may be intentionally used. See Response to Comments (RIN 2070-AK22; Final Rule); EPA-HQ-OPPT-2017-0421-0102). See also *Appendix D*.
[43] 15 U.S.C. § 2607(b)(10)(C).

Mercury-added products in which elemental mercury or mercury compounds are used are also imported to and exported from the United States. Table 14 and Figure 7 illustrate the amounts of mercury imported and exported for these reporting activities.

Trade in this inventory refers to international rather than domestic commerce, despite there being other ways to define it. Imported commodity mercury could be considered part of supply (because the mercury can enter the domestic market for sale), but because trade is defined as international trade for this report, imported commodity mercury is placed in the section on trade, along with mercury exports. Limiting the category of trade to international transactions is consistent with the organization of the 2016 EPA Report to Congress on Mercury Global Supply and Trade.[44]

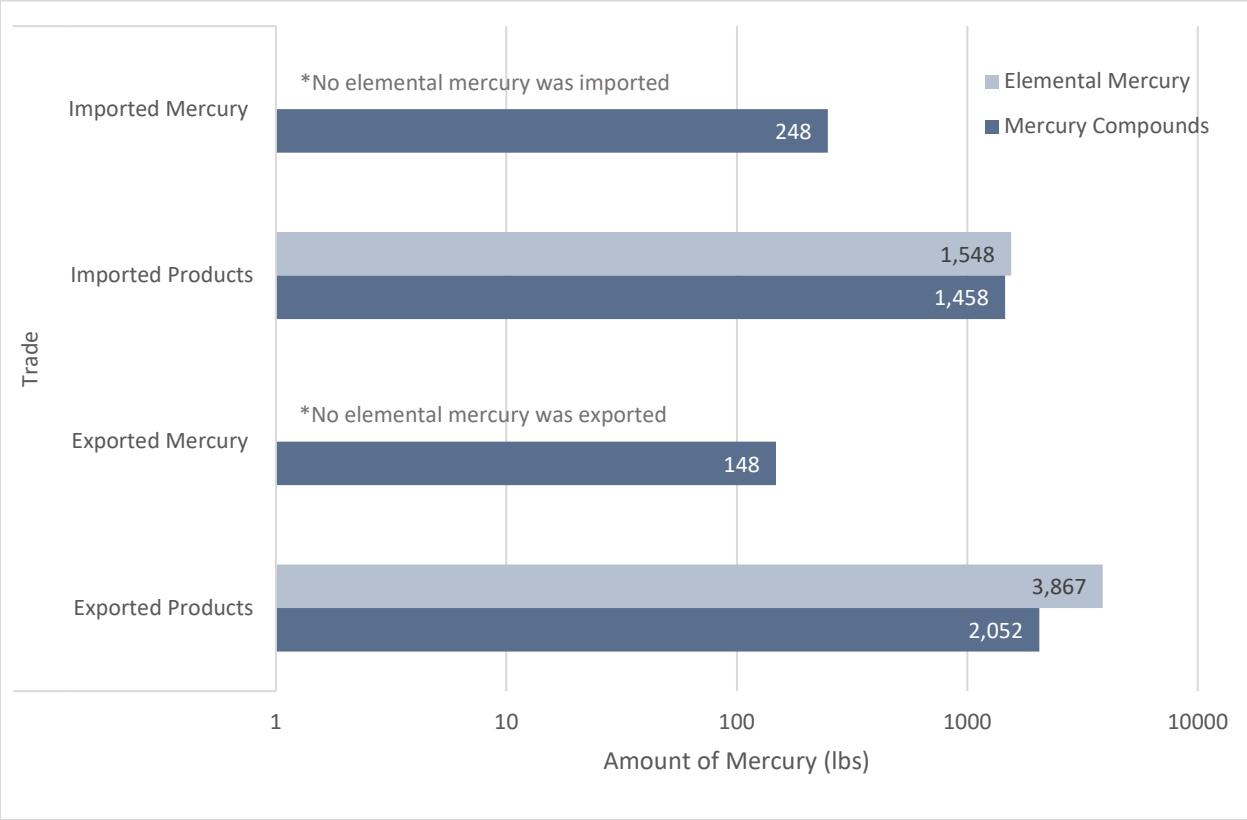
Table 14. U.S. Trade of Mercury and Mercury-Added Products (2018)

Trade of Mercury	Elemental Mercury (lbs)	Mercury Compounds (lbs)	Total[a] (lbs)
Imported Mercury	0	248	248
Imported Products	1,548	1,458	3,006
Exported Mercury	0	148	148
Exported Products	3,867	2,052	5,919

[a]A combined total for elemental mercury and mercury compounds is provided as a snapshot of "mercury supply, use, and trade in the United States" (15 U.S.C. § 2607(10)(A) and (B)).

[44] See https://www.epa.gov/sites/production/files/2017-01/documents/mercury_global_supply_and_trade_rtc_and_signed_transmittal_letters.pdf.

Figure 7. Amount of Mercury Traded in 2018[45]



Imported Mercury

Elemental mercury was not imported in 2018. Only 248 lbs of mercury compounds were imported to the United States from seven countries: Armenia, Czech Republic, Germany, India, Switzerland, Spain, and the United Kingdom (see *Appendix E*). The specific mercury compounds imported into the United States are identified in Table 15.[46]

[45] As a note to readers, figures in this document are reported in a logarithmic scale to account for a wide range in mercury quantities. See *Explanation of Key Terms* section for additional information on logarithmic scales.
[46] A list of mercury compounds identified as "[m]ercury for which information must be reported" can be found at 40 CFR 713.5(b). See also *Appendix B*.

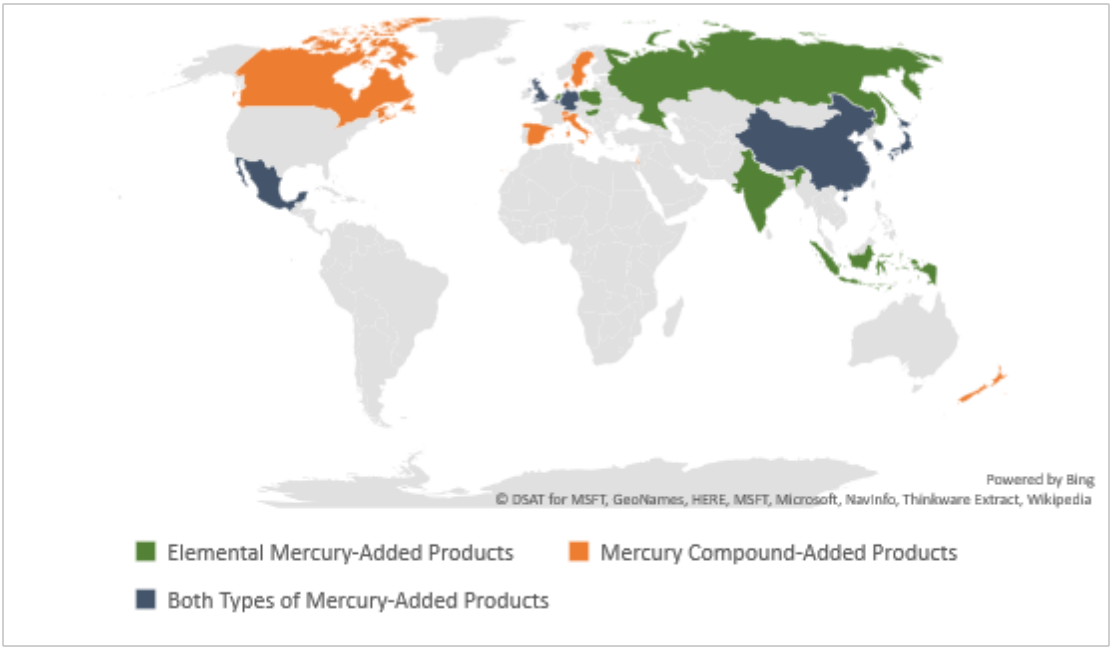
Table 15. Imported Mercury Compounds

CASRN	Mercury Compound
54-64-8	Mercurate(1-), ethyl[2-(mercapto-.kappa.S)benzoato(2-).kappa.O]-, sodium (1:1)
59-85-8	Mercurate(1-), (4-carboxylatophenyl)chloro-, hydrogen
62-38-4	Mercury, (acetato-.kappa.O)phenyl-
115-09-3	Chloromethylmercury
129-16-8	Mercurochrome Practical Grade
138-85-2	Mercurate(1-), (4-carboxylatophenyl)hydroxy-, sodium (1:1)
592-04-1	Mercury cyanide ($Hg(CN)_2$)
592-85-8	Thiocyanic acid, mercury(2+) salt (2:1)
1344-48-5	Mercury sulfide (HgS)
1600-27-7	Acetic acid, mercury(2+) salt (2:1)
7774-29-0	Mercury iodide (HgI_2)
7783-33-7	Mercurate(2-), tetraiodo-, potassium (1:2), (T-4)-
7783-34-8	Mercury(II) nitrate monohydrate
7783-35-9	Sulfuric acid, mercury(2+) salt (1:1)
8003-05-2	Basic phenylmercury nitrate
10045-94-0	Nitric acid, mercury(2+) salt (2:1)
145889-57-2	4,5,-Dimethyl-3-6-dioctyloxy-o-phenylene-bis(mercurytrifluoroacetate)
304656-34-6	Mercury(II) perchlorate hydrate
UNKNOWN	Estuarine sediment (total Hg and methylmercury) ERM® certified Reference Material

Imported Mercury-Added Products

In 2018, the United States imported mercury-added products from the following 23 counties: Belgium, Canada, China, Denmark, Germany, Hungary, India, Indonesia, Israel, Italy, Japan, the Republic of Korea, Mexico, the Netherlands, New Zealand, Poland, Russia, Singapore, Spain, Sweden, Switzerland, Taiwan, and the United Kingdom (see Figure 8).

Figure 8. Map of Countries of Origin of U.S. Imported Mercury-Added Products in 2018



The total amount of elemental mercury imported into the United States in mercury-added products was 1,548 lbs, while the total amount of mercury compounds in imported mercury-added products was 1,458 lbs. Thus, the total amount of mercury imported into the United States in mercury-added products was 3,006 lbs for reporting year 2018 (see Table 14). The types of imported mercury-added products are listed by category and subcategory in Tables 16 and 17 for elemental mercury and mercury compounds, respectively. Where available, values are provided for each product category; however, some reporters imported multiple products and the amount of mercury per product category is not available. Therefore, a combined total amount imported for multiple products is depicted.

Table 16. List of Products Imported into the United States and Amount of Elemental Mercury Used, Distributed, and Exported

Imported Products – Elemental Mercury			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Batteries	1	0	0
Lithium-Ion and Manganese Dioxide			
Lighting, Lamps, and Bulbs	948	8	276
Cold Cathode Fluorescent			
Compact Fluorescent			
External Electrode Fluorescent			
High Pressure Mercury Vapor Lamps			
High Pressure Sodium			
Induction A-lamps			
Linear Fluorescent			
Mercury Vapor			
Metal Halide			
Mercury Short Arc			
U-Tube and Circular Fluorescent			
UV and Germicidal			
Xenon Electric Discharge Lamp			
Switches, Relays, Sensors, and Valves			
Temperature Switch			
Measuring Instruments			
Mercury Analyzer			
Flow Meter			
Hydrometer			
Hygrometer/Psychrometer			
Miscellaneous/Novelty Products			
Air Cylinders			
Connector Pins			
Flow Meters			
Mass Flow Controllers			
Motors			
Printed Circuit Boards			
Pumps			
Other Imported Products Combined[b]	599	1	290
Total	1,548	9	566

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

[b]Reporters indicated imported products under multiple product categories: lighting, switches, measuring instruments, and miscellaneous products; therefore, amounts for each category are not discernible and a combined total is provided.

Table 17. List of Products Imported into the United States and Amount of Mercury Compounds Used, Distributed, and Exported

Imported Products – Mercury Compounds			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Formulated Products Preservative (Vaccine Usage)	13	7	1
Other Formulated Products			
Reagents (Catalysts, Buffers, Fixatives)			
Lighting, Lamps, and Bulbs	1,369	196	142
Cold Cathode Fluorescent Compact Fluorescent High Pressure Sodium Linear Fluorescent Low UV Gas Discharge Lamps and Burners Mercury Short Arc Mercury Vapor Metal Halide Purification/Germicidal Scanner Lamps U-Tube and Circular Fluorescent Ultra-High Efficiency UV and Germicidal UV Curable Lamp			
Miscellaneous/Novelty	1	1	
Wheel Emblem			
Switches, Relays, Sensors, and Valves	1	1	1
Lead in Water Sensor Tilt Switch			
Other Imported Products Combined[b]	74	1	20
Total	1,458	206	164

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

[b]Reporters indicated imported products under multiple product categories: lighting, switches, measuring instruments, and miscellaneous products; therefore, amounts for each category are not discernible and a combined total is provided.

Exported Mercury

Under the MEBA, it is illegal to export elemental mercury from the United States[47] and effective January 1, 2020, five mercury compounds are, like elemental mercury, also prohibited from export.[48] Those compounds are:

- Mercury (I) chloride or calomel (CASRN 10112-91-1)
- Mercury (II) oxide (CASRN 21908-53-2)
- Mercury (II) sulfate (CASRN 7783-35-9)
- Mercury (II) nitrate (CASRN 10045-94-0)
- Cinnabar or mercury sulfide (CASRN 1344-48-5)

For the 2018 reporting year, an aggregated total of 148 lbs of over twenty types of mercury compounds were exported from the United States (see Table 14). Specific amounts of each exported mercury compound cannot be differentiated due to the listing of multiple compounds within the submission forms. However, based on reports, most of the mercury compounds that are made in and imported into the United States are also exported. The specific mercury compounds imported into the United States are identified in Table 18.[49]

Only two of the five mercury compounds now prohibited from export (as reported "Sulfuric acid, mercury(2+) salt (1:1)" and "Nitric acid, mercury(2+) salt (2:1)") were reported as exported during the 2018 reporting period (i.e., prior to the export prohibition taking effect).

[47] 15 U.S.C. 2611(c)(1).

[48] 15 U.S.C. 2611(c)(7)(A)(i)–(v). However, the statute provides an exception to the export prohibition for export of listed mercury compounds to member countries of the Organization for Economic Co-operation and Development for environmentally sound disposal, on the condition that no mercury or mercury compounds so exported are to be recovered, recycled, or reclaimed for use, or directly reused, after such export. 15 U.S.C. 2611(c)(7)(D). Currently the United States is only able to export such waste to Canada in accordance with Article 11 of the Basel Convention. The statute also provides that EPA, on determining that exporting any additional mercury compound for the purpose of regenerating elemental mercury is technically feasible, may add by rule such mercury compound to the published list (15 U.S.C. 2611(c)(7)(A)(vi)). In addition, any person may petition EPA to issue a rule to add a mercury compound to this published list (15 U.S.C. 2611(c)(7)(C)).

[49] A list of mercury compounds identified as "[m]ercury for which information must be reported" can be found at 40 CFR 713.5(b). See also *Appendix B*.

Table 18. Mercury Compounds Exported from the United States in 2018

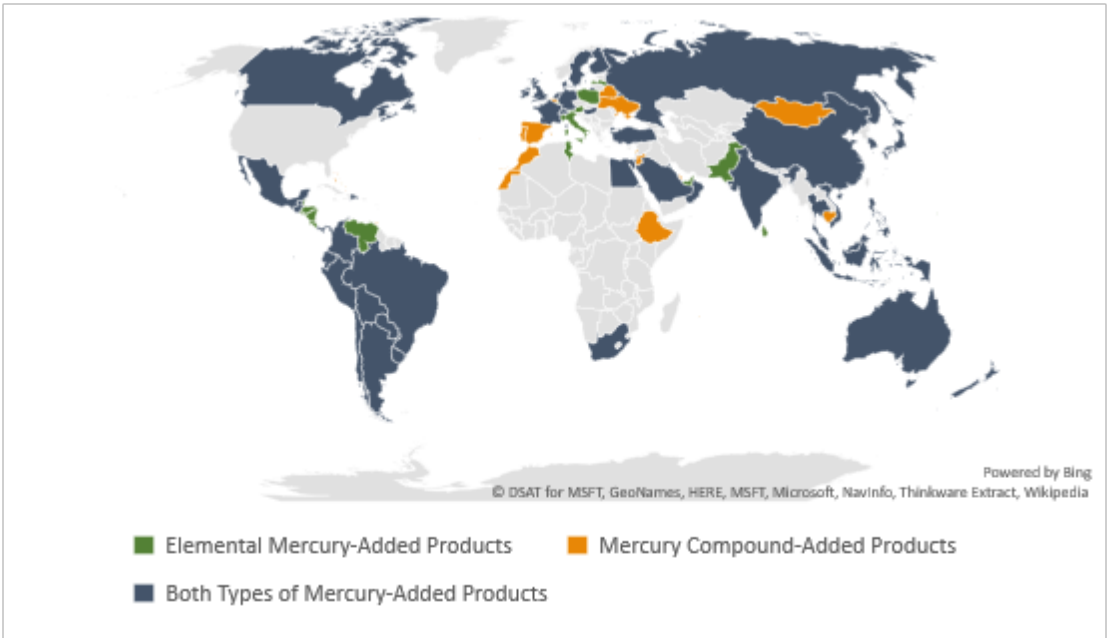
CASRN	Mercury Compound
54-64-8	Mercurate(1-), ethyl[2-(mercapto-.kappa.S)benzoato(2-).kappa.O]-, sodium (1:1)
59-85-8	Mercurate(1-), (4-carboxylatophenyl)chloro-, hydrogen
62-38-4	Mercury, (acetato-.kappa.O)phenyl-
138-85-2	Mercurate(1-), (4-carboxylatophenyl)hydroxy-, sodium (1:1)
115-09-3	Chloromethylmercury
129-16-8	Mercurochrome Practical Grade
592-85-8	Thiocyanic acid, mercury(2+) salt (2:1)
592-04-1	Mercury cyanide ($Hg(CN)_2$)
1344-48-5	Mercury sulfide (HgS)
1600-27-7	Acetic acid, mercury(2+) salt (2:1)
6283-24-5	Mercury, (acetato-.kappa.O)(4-aminophenyl)-
7783-35-9	Sulfuric acid, mercury(2+) salt (1:1)
7783-34-8	Mercury(II) nitrate monohydrate
7783-33-7	Mercurate(2-), tetraiodo-, potassium (1:2), (T-4)-
7774-29-0	Mercury iodide (HgI_2)
8003-05-2	Basic phenylmercury nitrate
10045-94-0	Nitric acid, mercury(2+) salt (2:1)
13257-51-7	Mercury bis(trifluoracetate)
145889-57-2	4,5,-Dimethyl-3-6-dioctyloxy-o-phenylene-bis(mercurytrifluoroacetate)
304656-34-6	Mercury(II) perchlorate hydrate
UNKNOWN	Estuarine sediment (total Hs and methylmercury) ERM® certified Reference Material

Exported Mercury-Added Products

While the export of pure elemental mercury is illegal, the export of elemental mercury-added products (including those containing elemental mercury) is generally not prohibited. Therefore, mercury-added products generally may be exported from the United States after first being manufactured domestically or imported, except if the intent of the export is to recover elemental mercury for resale or reuse. [50] The United States exports mercury-added products to 82 countries, which are depicted in the map in Figure 9, as well as in *Appendix E*.

[50] EPA. Questions and Answers on the Mercury Export Ban Act (MEBA) of 2008. (No date). Available at https://www.epa.gov/mercury/questions-and-answers-mercury-export-ban-act-meba-2008.

Figure 9. Map of Countries to Where U.S. Exported Mercury-Added Products in 2018



In total, for reporting year 2018, 5,919 lbs of mercury were exported in mercury-added products. Elemental mercury used in mercury-added products that were exported from the United States totaled 3,867 lbs. Mercury compounds used in mercury-added products that were exported from the United States totaled 2,052 lbs (see Table 14). The types of exported mercury-added products are listed by category and subcategory in Tables 19 and 20 for elemental mercury and mercury compounds respectively.

Table 19. List of Products Exported from the United States and Amount of Elemental Mercury Used, Distributed, and Exported

Products Exported from the United States – Elemental Mercury			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Dental Amalgam	9,287	0	2,624
Lighting, Lamps, and Bulbs	2,084	20	638
Compact Fluorescent			
External electrode fluorescent			
High Pressure Mercury Vapor Lamps			
High Pressure Sodium			
Linear Fluorescent			
Mercury Vapor			
Metal Halide			
Mercury Short Arc			
U-Tube and Circular Fluorescent			
Measuring Instruments			
Flow Meter			
Hydrometer			
Hygrometer/Psychrometer			
Miscellaneous/Novelty Products			
Air Cylinders			
Connector Pins			
Flow Meters			
Mass Flow Controllers			
Motors			
Printed Circuit Boards			
Pumps			
Switches, Relays, Sensors, and Valves	8,915	8,519	315
Displacement Relay			
Float Switch			
Temperature Switch			
Tilt Switch			
Combined Exported Products[b]	581	1	290
Total	20,867	8,540	3,867

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

[b]Reporters indicated exported products under multiple product categories; therefore, amounts for each category are not discernible and a combined total is provided.

Table 20. List of Products Exported from the United States and Amount of Mercury Compounds Used, Distributed, and Exported

Products Exported from the United States – Mercury Compounds			
Product Category and Subcategory	**Amount in Products (lbs)**		
	Used	**Distributed[a]**	**Exported**
Formulated Products: Preservative (Vaccine Usage)	292	152	122
Other Formulated Products	1,568	85	1,785
In-Vitro Diagnostics Pharmaceuticals Preservative (Non-Vaccine Usage) Reagents (Catalysts, Buffers, and Fixatives)			
Lighting, Lamps, and Bulbs	1,160	153	142
Cold Cathode Fluorescent Compact Fluorescent Electrodeless Discharge High Pressure Sodium Linear Fluorescent Low UV Gas Discharge Lamps and Burners Mercury Short Arc Mercury Vapor Metal Halide U-Tube and Circular Fluorescent UV and Germicidal UV Curable Lamp			
Switches, Relays, Sensors, and Valves	1	1	1
Lead in Water Sensor Tilt Switch			
Other Exported Products Combined[b]	2	1	2
Total	3,023	392	2,052

[a]The range of 2018 data reported to the MER application and 2016 data reported to the IMERC Mercury-added Products Database is presented in the *Products Sold in the United States* section.

[b]Reporters indicated exported products under multiple product categories; therefore, amounts for each category are not discernible and a combined total is provided

Conclusion and Data Interpretation

The Lautenberg Act requires EPA to "identify any manufacturing processes or products that intentionally add mercury; and . . . recommend actions, including proposed revisions of Federal law or regulations, to achieve further reductions in mercury use."[51]

Identified Manufacturing Processes and Products

When developing the reporting requirements for the mercury inventory, EPA identified products and manufacturing processes via analysis of accumulated Agency resources and programs, as well as a review of other federal, state, and international materials. Through the information submitted under the mercury inventory reporting rule, EPA has identified the following additional uses of mercury through the information submitted under the mercury inventory reporting rule:

Manufacturing Processes

- Bonding weld head (catalyst)
- Molecular beam epitaxy
- Quality analysis (density measurement of tungsten bars)
- Inactivation
- Quality control test (small arms ammunition case-mercury stress crack)

Products

- The "burners" aspect of "low UV gas discharge lamps and burners"
- Wheel emblem
- Lead in water sensor
- Mercury analyzer
- Air cylinders
- Connector pins
- Mass flow controllers
- Printed circuit board
- Motors

As noted in earlier sections, complete lists of mercury-added products and manufacturing processes known at the time of the publication of the rule that established reporting requirements for the mercury inventory are listed at 40 CFR 713.11(b) and (c). These lists are also available for reference in *Appendices B* and *C*, respectively.

[51] 15 U.S.C. § 2607(b)(10)(C).

Traditionally, the Agency has relied on IMERC data for the amount of mercury in many products sold in the United States. Due to state laws in certain IMERC member states, the number for switches, relays, sensors, and valves has not been updated since 2010. At that point, the amount of mercury for switches, relays, sensors, and valves sold in the United States was 39,242 lbs.

In designing the mercury inventory reporting requirements, EPA sought not only to collect more recent data, but also to differentiate between the amounts of mercury that such products are made in, imported into, and exported from the United States. Based on the data submitted in the 2018 reporting period:

- 8,915 lbs of elemental mercury was used to make switches, relays, sensors, and valves in the United States
- 8,519 lbs of elemental mercury was contained in switches, relays, sensors, and valves sold in the United States
- 315 lbs of elemental mercury was contained in switches, relays, sensors, and valves exported from the United States
- 1 lb of mercury compounds was contained in switches, relays, sensors, and valves imported into, distributed in, and exported from the United States

Recommended Actions

As noted in the previous section, after identifying processes and products that intentionally add mercury, EPA is to make recommendations for actions to further reduce mercury use. EPA will carefully consider the reporting results in light of such factors as quantities of use and availability of safer, cost-effective alternatives and, as appropriate, will not hesitate to recommend future legal or regulatory actions in accordance with the statute. In addition, EPA will continue to implement U.S. obligations under the Minamata Convention on Mercury and to participate in the UNEP Global Mercury Partnership, both of which are designed to reduce the adverse effects of mercury.

In addition, based on information received, as well as feedback from reporters, the Agency is considering the following actions that would enhance the administration of the mercury inventory and the MER application:

- Amending regulatory text of the mercury inventory reporting rule to complement expected changes in the forthcoming CDR program amendments.
- Improving the level of detail for imported, manufactured, distributed, and exported products and mercury compounds (e.g., amending the reporting form to allow for reporters to provide a greater level of detail on such contextual information).
- Continuing to coordinate with IMERC and directly comparing/contrasting information received via EPA's reporting application with information received via IMERC's Mercury-Added Products Database.

Appendix A: Explanation of Key Terms

The explanations in this appendix pertain only to certain key terms as used in this document. The U.S. Environmental Protection Agency (EPA) is providing explanations of terms in simplified informal language to improve the readability of this mercury inventory report.[52] To see the formal, legal definitions of some of these terms, EPA recommends consulting section 2 of the Toxic Substances Control Act (TSCA),[53] the mercury inventory reporting rule,[54] and particular citations provided. In addition, the explanations in this report were developed to apply to key terms as they are used in this mercury inventory report and may vary from definitions for the same terms used elsewhere by EPA. Examples of such terms are: "component," "import," "manufacture," and "mercury-added product."

Assembled product is a product that was manufactured with the inclusion of a component that is a mercury-added product. An example is a watch containing a mercury-added battery.

CASRN is the Chemical Abstracts Service Registry Number.

Commercial advantage refers to activities undertaken intentionally to create an immediate or eventual benefit (e.g., sale of goods, generation of profits, reduction of costs, etc.). If a company manufactures mercury or a mercury-added product, then uses it rather than placing it in commerce, it is considered to result in a commercial advantage.[55]

Component refers to a mercury-added product that is installed as part of the manufacture of an assembled product.

Distribute in commerce means selling or transferring mercury or mercury-added products within the United States.[56] Sales or transfers to another country are categorized separately here as exports.

Elemental mercury is a shiny, silver-white metal that is liquid at room temperature; its CASRN is 7439-97-6. The Harmonized Tariff Schedule Code for mercury is 2805.40.00.

Export means to determine and control the sending of mercury and mercury-added products for a destination outside of the customs territory of the United States.[57] In this report, exports are categorized as trade and considered separately from distribution in commerce, which here encompasses only domestic activities.

Import means to bring mercury, mercury added products, and assembled products into the customs territory of the United States.[58] In this report, imports will be considered separately from other

[52] Note: These explanations are not legally-binding on EPA.
[53] 15 U.S.C. § 2601 et seq.
[54] EPA. "Reporting Requirements for TSCA Mercury Inventory: Mercury." 83 Fed. Reg. 30054 (June 27, 2018).
[55] See 40 CFR 704.3 for definition in the context of manufacturing, importing, and processing "for commercial purposes."
[56] See 15 U.S.C. § 2602(5).
[57] See 40 CFR 707.63(b).
[58] See 15 U.S.C. § 2602(9).

manufacture, which here encompasses only domestic production. While import is part of the statutory definition of manufacture, import is categorized separately from other manufacture in this mercury import report and the Mercury Electronic Reporting (MER or reporting) application, in order to more effectively distinguish between activities that constitute mercury supply, use, and trade for purposes of TSCA section 8(b)(10)(B). In this report, import is categorized as trade.

Impurity refers to mercury that is present unintentionally in a final product of a manufacturing process.

Logarithmic scale is a non-linear scale, which means that distances between certain values are not the same as would be a linear scale. These non-linear scales are easier to visualize for data containing a range of values. For example, in a linear scale, the distance between a value of 10 and 11 are equal to the distance between 11 and 12. In a non-linear scale, this distance is not equal. Rather, each interval is increased by a factor of the base, which for this report, is a base of ten (e.g., 1, 10, 100, 1,000, 10,000, and so on). As a note to readers, some figures in this document are reported in a logarithmic scale to account for a wide range in mercury quantities. Readers should be aware of this scale when comparing different factors and values.

Manufacture means to produce.[59] The manufacture of elemental mercury occurs through secondary production (recovery). Materials from which elemental mercury is recovered include byproducts from mining or mineral processing, residuals from air pollution control, industrial waste, contaminated media, discarded products, and other materials. Other terms for recovery of elemental mercury include reclamation, retorting, distillation, separation, and purification. Recovered elemental mercury may be either a commodity or a waste. If it is a waste, elemental mercury is not reported in EPA's reporting application. A mercury compound is generally produced as a commercial chemical product (see also "mercury-added product"). In this report and in the MER application, import will be categorized as a separate activity from other manufacture, in order to more effectively distinguish between activities that constitute mercury supply, use, and trade for purposes of TSCA section 8(b)(10)(B).

MER is the Mercury Electronic Reporting application where information is submitted to EPA directly by persons who must report under the mercury inventory reporting rule.

Mercury means elemental mercury and mercury compounds.[60] The term "mercury" also includes mixtures that include mercury and/or mercury compounds. An example of a mercury mixture is dental amalgam, a mixture of mercury with other metals such as silver. An example of a mercury compound mixture is a vaccine that contains the mercury-compound, thimerosal, which is used as a preservative.

Mercury-added product is an item to which mercury is intentionally added when a product is manufactured. The mercury remains present in the final product for a particular purpose. The final mercury-added product can be a formulated product such as a vaccine or an article such as a

[59] See 15 U.S.C. § 2602(9).
[60] See 15 U.S.C. § 2607(b)(10)(A).

fluorescent light bulb, thermostats, or dental amalgam capsules. In regard to a component and an assembled product, the Agency views the inclusion of a mercury-added product that is a component within an assembled product differently from the act of intentionally inserting mercury (i.e., chemical substance) into the component itself.[61] As a result, the Agency does not require information to be reported on the manufacture (including import) of assembled products that include a component that is a mercury-added product.[62]

Mercury compound is formed when elemental mercury reacts with another substance, either in nature or intentionally by humans.[63]

NAICS refers to the North American Industry Classification System, which is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.[64]

Otherwise intentionally use mercury in a manufacturing process means to use mercury to manufacture anything other than a mercury-added product or a mercury compound. General examples are use of mercury as a catalyst, cathode, reactant, or reagent, and as a specific example, mercury-cell diaphragms are used in the chlorine production process. Otherwise intentional use of mercury in a manufacturing process does not include the use of tools or equipment that contain mercury nor the installation of a component that contains mercury as part of the manufacture of an assembled product.

Person is used in this report consistent with its use in TSCA and refers to any individual, firm, company, corporation, joint venture, partnership, sole proprietorship, association, or any other business entity; any state or political subdivision thereof; any municipality; any interstate body; and any department, agency, or instrumentality of the federal government.[65]

Processor is a manufacturer who uses mercury in a process other than making a mercury-added product (e.g., using elemental mercury as catalyst to make final product in which any remaining mercury has no functional purpose).

Reporting activity refers to any commercial activity involving mercury that must be reported to EPA under the mercury inventory reporting rule (e.g., intentionally using mercury to manufacture a product). EPA divided reporting activities into the following five categories: import of mercury, manufacture of mercury in the United States, import of mercury-added products, manufacture of mercury-added products in the United States, and use of mercury in a manufacturing process.

Reporter is a person (i.e., manufacturer, processor, or importer) that submitted information through EPA's reporting application, as required by the mercury inventory reporting rule.

[61] 83 Fed. Reg. 30061.
[62] See 40 CFR 713.7(b).
[63] See 40 CFR 713.5.
[64] See https://www.census.gov/eos/www/naics.
[65] See 40 CFR 704.3

Supply are the sources of mercury that can enter the market for sale which, for the purposes of this inventory report, include domestically manufactured and stored mercury (see box on page 11). In this report and in the MER application, import is categorized as a separate activity from other manufacture in order to more effectively distinguish between activities that constitute mercury supply, use, and trade for purposes of TSCA section 8(b)(10)(B).

Trade means the international import and export of mercury, mercury compounds, and mercury-added products (see box on page 11). In this report and in the MER application, import is categorized as a separate activity from other manufacture and domestic distribution is categorized as a separate activity from other distribution in order to more effectively distinguish between activities that constitute mercury supply, use, and trade for purposes of TSCA section 8(b)(10)(B). Limiting the category of trade to international transactions is consistent with the organization of the 2016 EPA Report to Congress on Mercury Global Supply and Trade.

Use of mercury for this inventory includes domestic distribution or sale of mercury and mercury-added products and the intentional use of mercury to manufacture products or in a manufacturing process (see box on page 11). In this report and in the MER application, domestic distribution is categorized as a separate activity from other distribution in order to more effectively distinguish between activities that constitute mercury supply, use, and trade for purposes of TSCA section 8(b)(10)(B). More specifically, distribution is discussed under use of mercury because the Agency is viewing the sale of mercury and mercury-added products through the lens of the purchaser, who uses the mercury or mercury-added products. In this way, the distribution of the supplied mercury is similar to the economic term of demand.

Appendix B: List of Mercury Compounds in the TSCA Chemical Substance Inventory

CASRN	Mercury Compound
10045-94-0	Nitric acid, mercury(2+) salt (2:1).
100-57-2	Mercury, hydroxyphenyl-.
10112-91-1	Mercury chloride (Hg2Cl2).
10124-48-8	Mercury amide chloride (Hg(NH2)Cl).
103-27-5	Mercury, phenyl(propanoato-.kappa.O)-.
10415-75-5	Nitric acid, mercury(1+) salt (1:1).
104-60-9	Mercury, (9-octadecenoato-.kappa.O)phenyl-.
1191-80-6	9-Octadecenoic acid (9Z)-, mercury(2+) salt (2:1).
12068-90-5	Mercury telluride (HgTe).
13170-76-8	Hexanoic acid, 2-ethyl-, mercury(2+) salt (2:1).
13302-00-6	Mercury, (2-ethylhexanoato-.kappa.O)phenyl-.
1335-31-5	Mercury cyanide oxide (Hg2(CN)2O).
1344-48-5	Mercury sulfide (HgS).
1345-09-1	Cadmium mercury sulfide.
13876-85-2	Mercurate(2-), tetraiodo-, copper(1+) (1:2), (T-4)-.
138-85-2	Mercurate(1-), (4-carboxylatophenyl)hydroxy-, sodium (1:1).
141-51-5	Mercury, iodo(iodomethyl)-.
14783-59-6	Mercury, bis[(2-phenyldiazenecarbothioic acid-.kappa.S) 2-phenylhydrazidato-.kappa.N2]-, (T-4)-.
15385-58-7	Mercury, dibromodi-, (Hg-Hg).
15785-93-0	Mercury, chloro[4-[(2,4-dinitrophenyl)amino]phenyl]-.
15829-53-5	Mercury oxide (Hg2O).
1600-27-7	Acetic acid, mercury(2+) salt (2:1).
1785-43-9	Mercury, chloro(ethanethiolato)-.
19447-62-2	Mercury, (acetato-.kappa.O)[4-[2-[4-(dimethylamino)phenyl]diazenyl]phenyl]-.
20582-71-2	Mercurate(2-), tetrachloro-, potassium (1:2), (T-4)-.
20601-83-6	Mercury selenide (HgSe).
21908-53-2	Mercury oxide (HgO).
22450-90-4	Mercury(1+), amminephenyl-, acetate (1:1).
24579-90-6	Mercury, chloro(2-hydroxy-5-nitrophenyl)-.
24806-32-4	Mercury, [.mu.-[2-dodecylbutanedioato(2-).kappa.O1:.kappa.O4]]diphenyldi-.
26545-49-3	Mercury, (neodecanoato-.kappa.O)phenyl-.
27685-51-4	Cobaltate(2-), tetrakis(thiocyanato-.kappa.N)-, mercury(2+) (1:1), (T-4)-.
29870-72-2	Cadmium mercury telluride ((Cd,Hg)Te).
3294-57-3	Mercury, phenyl(trichloromethyl)-.
33770-60-4	Mercury, [3,6-dichloro-4,5-di(hydroxy-.kappa.O)-3,5cyclohexadiene-1,2-dionato(2-)]-.

CASRN	Mercury Compound
3570-80-7	Mercury, bis(acetato-.kappa.O)[.mu.-(3′,6′-dihydroxy-3oxospiro[isobenzofuran-1(3H),9′-[9H]xanthene]-2′,7′diyl)]di-.
537-64-4	Mercury, bis(4-methylphenyl)-.
539-43-5	Mercury, chloro(4-methylphenyl)-.
54-64-8	Mercurate(1-), ethyl[2-(mercapto-.kappa.S)benzoato(2-).kappa.O]-, sodium (1:1).
55-68-5	Mercury, (nitrato-.kappa.O)phenyl-.
56724-82-4	Mercury, phenyl[(2-phenyldiazenecarbothioic acid.kappa.S) 2-phenylhydrazidato-.kappa.N2]-.
587-85-9	Mercury, diphenyl-.
592-04-1	Mercury cyanide (Hg(CN)2).
592-85-8	Thiocyanic acid, mercury(2+) salt (2:1).
593-74-8	Mercury, dimethyl-.
59-85-8	Mercurate(1-), (4-carboxylatophenyl)chloro-, hydrogen.
623-07-4	Mercury, chloro(4-hydroxyphenyl)-.
62-38-4	Mercury, (acetato-.kappa.O)phenyl-.
62638-02-2	Cyclohexanebutanoic acid, mercury(2+) salt (2:1).
627-44-1	Mercury, diethyl-.
6283-24-5	Mercury, (acetato-.kappa.O)(4-aminophenyl)-.
628-86-4	Mercury, bis(fulminato-.kappa.C)-.
629-35-6	Mercury, dibutyl-.
63325-16-6	Mercurate(2-), tetraiodo-, (T-4)-, hydrogen, compd. with 5-iodo-2-pyridinamine (1:2:2).
63468-53-1	Mercury, (acetato-.kappa.O)(2-hydroxy-5-nitrophenyl)-.
63549-47-3	Mercury, bis(acetato-.kappa.O)(benzenamine)-.
68201-97-8	Mercury, (acetato-.kappa.O)diamminephenyl-, (T-4)-.
72379-35-2	Mercurate(1-), triiodo-, hydrogen, compd. with 3-methyl2(3H)-benzothiazolimine (1:1:1).
7439-97-6	Mercury.
7487-94-7	Mercury chloride (HgCl2).
7546-30-7	Mercury chloride (HgCl).
7616-83-3	Perchloric acid, mercury(2+) salt (2:1).
7774-29-0	Mercury iodide (HgI2).
7783-33-7	Mercurate(2-), tetraiodo-, potassium (1:2), (T-4)-.
7783-35-9	Sulfuric acid, mercury(2+) salt (1:1).
7783-39-3	Mercury fluoride (HgF2).
7789-47-1	Mercury bromide (HgBr2).
90-03-9	Mercury, chloro(2-hydroxyphenyl)-.
94070-93-6	Mercury, [.mu.-[(oxydi-2,1-ethanediyl 1,2benzenedicarboxylato-.kappa.O2)(2-)]]diphenyldi-.

Appendix C: Categories and Subcategories of Mercury-Added Products

Category	Subcategory
Batteries	—Button cell, silver. —Button cell, zinc-air. —Button cell, alkaline. —Stacked button cell batteries. —Manganese oxide. —Silver oxide. —Mercuric oxide, non-button cell. —Button cell, mercuric oxide. —Button cell, zinc carbon. —Other [Manufacturer(s) specifies].
Dental amalgam	[No subcategories].
Formulated products (includes uses in cosmetics, pesticides, and laboratory chemicals)	—Skin-lightening creams. —Lotions. —Soaps and sanitizers. —Bath oils and salts. —Topical antiseptics. —Preservatives (*e.g.,* for use in vaccines and eye-area cosmetics when no preservative alternatives are available). —Pharmaceuticals (including prescription and over-the-counter drug products). —Cleaning products (not registered as pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act). —Pesticides. —Paints. —Dyes. —Reagents (*e.g.,* catalysts, buffers, fixatives). —Other [Manufacturer(s) specifies].
Lighting, lamps, bulbs	—Linear fluorescent. —Compact fluorescent. —U-tube and circular fluorescent. —Cold cathode fluorescent. —External electrode fluorescent. —Mercury vapor. —Metal halide. —High pressure sodium. —Mercury short arc. —Neon. —Other [Manufacturer(s) specifies].
Measuring instruments	—Barometer. —Fever thermometer. —Flow meter. —Hydrometer. —Hygrometer/psychrometer. —Manometer. —Non-fever thermometer. —Pyrometer. —Sphygmomanometer. —Other [Manufacturer(s) specifies].
Pump seals	[No subcategories].
Switches, relays, sensors, valves	—Tilt switch. —Vibration switch. —Float switch. —Pressure switch. —Temperature switch. —Displacement relay. —Wetted reed relay. —Contact relay. —Flame sensor. —Thermostat. —Other [Manufacturer(s) specifies use].
Miscellaneous/novelty mercury-added products	—Wheel weights. —Wheel rotation balancers/stabilizers. —Firearm recoil suppressors. —Carburetor synchronizers. —Joint support/shock absorption bands. —Other [Manufacturer(s) specifies].

Note: The mercury-added product categories and sub-categories reflect the list of such products known at the time of the promulgation of the mercury inventory reporting rule. See 83 Fed. Reg. 30054 (June 27, 2018) and 40 CFR 713.11(b).

Appendix D: Manufacturing Processes for which Mercury is Otherwise Intentionally Used and Relevant Function Uses

Manufacturing Process
Chlorine production (*e.g.*, mercury-cell chlor-alkali process)
Acetaldehyde production
Sodium/potassium methylate/ethylate production.
Polyurethane/plastic production
Other [Manufacturer(s) specifies process]
Functional Use
Catalyst
Cathode
Reactant
Reagent
Other [Manufacturer(s) specifies use]

Note: The manufacturing processes and relevant function uses reflect the list of such products known at the time of the promulgation of the mercury inventory reporting rule. See 83 Fed. Reg. 30054 (June 27, 2018) and 40 CFR 713.11(c).

Appendix E: Countries of Origin and Destination of Imported and Exported Mercury and Mercury-Added Products

	Imported*			Exported*		
	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products
Argentina				X	X	X
Armenia	X					
Aruba					X	
Australia				X	X	X
Austria					X	
Bahamas						X
Bahrain						X
Belarus						X
Belgium		X	X	X		X
Belize					X	
Bolivia				X	X	X
Brazil				X	X	X
Cambodia						X
Canada			X	X	X	X
Chile				X	X	X
China		X	X		X	X
Colombia				X	X	X
Costa Rica					X	X

	Imported*			Exported*		
	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products
Czech Republic	X					
Denmark			X		X	X
Dominican Republic					X	X
Ecuador					X	X
Egypt					X	X
El Salvador					X	
Ethiopia						X
Fiji						
Finland					X	X
France					X	X
Germany	X	X	X		X	X
Guam					X	
Guatemala					X	X
Honduras					X	
Hong Kong					X	X
Hungary		X			X	X
India	X	X			X	X
Indonesia		X			X	X
Ireland					X	X
Israel			X		X	X
Italy			X		X	X
Jamaica						

	Imported*			Exported*		
	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products
Japan		X	X	X	X	X
Jordan						X
Korea, Republic of		X	X	X	X	X
Kuwait					X	X
Latvia					X	
Lebanon						X
Luxembourg					X	
Malaysia				X	X	X
Mauritius						X
Mexico		X	X	X	X	X
Mongolia						X
Morocco				X		X
Netherlands		X			X	X
New Zealand			X		X	X
Nicaragua					X	
Oman					X	X
Pakistan					X	
Panama				X	X	X
Paraguay				X	X	X
Peru				X	X	X
Philippines				X	X	X
Poland		X			X	

	Imported*			Exported*		
	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products
Portugal						X
Puerto Rice					X	X
Qatar						X
Russia		X			X	X
Saint Kitts And Nevis					X	
Saudi Arabia					X	X
Singapore		X	X		X	X
South Africa				X	X	X
Spain	X		X			X
Sri Lanka					X	
Sweden			X		X	X
Switzerland	X		X		X	X
Taiwan		X	X	X	X	X
Thailand				X	X	X
Trinidad And Tobago				X		X
Tunisia					X	
Turkey					X	X
Ukraine						X
United Arab Emirates					X	X
United Kingdom	X	X	X		X	X
United States					X	X

	Imported*			Exported*		
	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products	Mercury Compounds	Elemental Mercury-Added Products	Mercury Compound-Added Products
Uruguay					X	X
Venezuela					X	
Vietnam				X	X	X
Virgin Islands, U.S.					X	

*Elemental mercury is neither imported to nor exported from the United States.