

**TESTIMONY OF ARTHUR E. DUNGAN**

**ON BEHALF OF**

**THE CHLORINE INSTITUTE, INC.  
1300 WILSON BOULEVARD  
ARLINGTON, VA 22209  
703-741-5760**

**BEFORE THE**

**COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS**

**UNITED STATES SENATE**

**PERTAINING TO MERCURY LEGISLATION**

**MERCURY MARKET MINIMIZATION ACT OF 2007 (S. 906)**

**MERCURY EMISSIONS CONTROL ACT (S. 2643)**

**MERCURY EXPORT BAN ACT OF 2007 (H. R. 1534)**

**MAY 13, 2008**

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## **Introduction**

Madam Chairman and Members of the Committee:

I am Art Dungan, President of the Chlorine Institute and I am here representing the Institute, the Chlorine Chemistry Division of the American Chemistry Council, and the mercury cell chlor-alkali producers in the United States. I appreciate the opportunity to testify before you concerning mercury legislation. My testimony will cover the Mercury Market Minimization Act of 2007 (S. 906) and the Mercury Export Ban Act of 2007 (H. R. 1534). While electricity is a major raw material in the manufacture of chlorine and co-product sodium hydroxide, the Chlorine Institute has not been involved in evaluating emission control technologies from electrical utility steam generating units. Accordingly, I will not be commenting upon S. 2643.

The Chlorine Institute, Inc., founded in 1924, is a 220-member, not-for-profit trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. The Institute's mission is the promotion of safety and the protection of human health and the environment in the manufacture, distribution and use of chlorine, sodium hydroxide, potassium hydroxide and sodium hypochlorite, plus the distribution and use of hydrogen chloride. The Institute's North American Producer members account for more than 98 percent of the total chlorine production capacity of the U.S., Canada, and Mexico.

Everyday life would be very different without the benefits of chlorine chemistry. Combined with the power of human innovation, chlorine chemistry plays an essential role in providing the indispensable products of modern life. From providing one of the most basic human needs — clean drinking water — to contributing to the production of high-tech first responder equipment,

sustainable building materials, food protection chemicals, computer microprocessor chips and more than 90 percent of prescription pharmaceuticals, chlorine chemistry is essential to everyday life in America.

In the United States, there are currently six facilities that produce chlorine using the mercury cell process accounting for approximately 6% of the annual chlorine production. All are members of the Chlorine Institute. Of these six facilities, two have announced their intention to convert to another technology. Both conversions are expected to occur within the next 12 -24 months. The remaining four plants, and possibly the plants scheduled for conversion, would be affected by S. 906 and H. R. 1534.

### **The Chlorine Institute and the Mercury Cell Producers' Commitment to Mercury Reduction**

The Chlorine Institute and the chlor-alkali producers using the mercury cell technology have worked diligently to address mercury use and release issues since they first surfaced nearly 40 years ago. In the 1950s and 1960s, the mercury cell technology was the technology of choice because the sodium hydroxide co-product was felt by many customers to be superior in quality. Exhibit 1 provides a brief description of this technology. As a result, in the United States, mercury cell technology increased from less than 10% of chlorine capacity in the early 1950s to nearly 30% in the 1970s. In the early 1970s there were approximately 30 mercury cell plants in operation in the United States. It was at this time that environmental concerns about the effects of mercury releases became an issue. Since that time, no new mercury cell plants have been built in the United States. As chlor-alkali plants reached the end of their economic life, they

have either closed or converted to a different technology. In the last twenty years, all new chlor-alkali plants in the United States have utilized the membrane cell technology (which does not use mercury).

The mercury cell chlor-alkali producers individually and through the Chlorine Institute have worked aggressively and voluntarily to reduce mercury use and releases to the environment and have worked cooperatively with all agencies as they set regulatory standards limiting such releases. The Chlorine Institute established technical teams beginning more than forty years ago to address mercury issues. The first such teams focused on worker protection with the goal to minimize human exposure to mercury.

In the early 1970s, technical teams were established to reduce releases to the environment. Technologies were voluntarily shared between the mercury cell producers. These technologies first addressed emissions to water, then to air, and then to solid wastes. When EPA proposed the land disposal restrictions pertaining to solid wastes in the late 1980s, through the Chlorine Institute, the industry embarked on a nearly \$4 million research program that would allow the mercury from these wastes to be recovered, prior to disposal, in a more environmentally friendly manner. The information that was developed enabled many mercury cell producers to utilize new methods to recover mercury utilizing equipment that allowed for reduced air emissions when compared with the traditional mercury retorting technology.

In 1996, the Chlorine Institute and the mercury cell producers voluntarily agreed to reduce mercury use by 50 percent by 2005 compared to the base years of 1990-1995. This commitment was made to help the United States achieve its mercury reduction goals as part of the United

States - Canada Binational Toxics Strategy Agreement (BTS). As part of its voluntary commitment, the Chlorine Institute agreed to issue annual reports highlighting the progress being made. The Tenth Annual Report was issued last year (Exhibit 2), and the eleventh report will be issued in the coming weeks. As indicated in the Tenth Annual Report, the overall reduction in annual mercury usage in the tenth year was 92%.

In order to meet this commitment, the Institute established several new technical teams to address a variety of issues. In addition to meeting numerous times, the teams held several workshops and developed additional guidance documents to address mercury issues (Exhibit 3).

When the commitment to the BTS was made, 14 mercury cell plants were operating. Today six plants continue in operation. Two of these plants are scheduled to convert within the next 24 months. The remaining four plants intend to operate until the end of their economic life. Exhibit 4 provides a list of the fourteen plants and their current status.

In addition, the Chlorine Institute and the Chlorine Chemistry Division of the American Chemistry Council are active participants in the World Chlorine Council (WCC). WCC has been an active supporter of the United Nations Environment Programme (UNEP) Global Mercury Program and has made a sustained effort to help mercury-based chlorine producers around the world reduce mercury uses and emissions. As part of this effort, WCC is supporting and contributing to the UNEP Global Mercury Partnership. The Global Mercury Partnership builds upon WCC's long-standing commitment to share best practices globally for reducing the use and release of mercury from mercury cell chlor-alkali facilities. WCC has contributed significant time, expertise and financial resources and has worked with governments, chlor-alkali

producers, and UNEP to help make this partnership a success. (See <http://www.chem.unep.ch/mercury/partnerships/progress-reports/WCC%20Submission.pdf> ).

### **The Chlorine Institute's Position on S. 906**

The Chlorine Institute wishes to comment on Sections 3 and 4 of the proposed bill.

The Institute supports Section 3 which prohibits the sale or distribution of mercury by the Department of Defense or the Department of Energy. Mercury needed by United States industries can amply be supplied by private mercury sources. The permanent storage of mercury may be an available option for the government. However, private industry can not permanently store such mercury and be in accordance with RCRA regulations regarding land disposal restrictions of mercury.

Concerning Section 4 of the bill, the Institute is opposed to establishing a ban on mercury exports until the United States has a program established and in place for the permanent storage of mercury.

Implementation of an export ban will not only affect the remaining mercury cell plants, but also other sources of mercury. Depending on the number of mercury cell plants affected by the bill, between 1,100 and 1,700 (short) tons of mercury from chlor-alkali plants would require permanent storage at some time in the future. When examined in a short time frame, this quantity is large when compared with other domestic mercury supplies. However, over a 40 year horizon, it is likely that other domestic sources of mercury (by-product mining and recycling programs) would have a far greater contribution to the US mercury supply. At the June 14, 2007

meeting of EPA's Advisory Committee on Commodity Mercury, it was stated that the current quantity of net mercury exports is about 300 tons per year. With an export ban in place, this surplus mercury will have to be stored somewhere. The generators might temporarily store the mercury, which is a commodity, at various sites in the hope that it could eventually be sold. While most of this mercury would be stored safely and without any adverse effects to the environment, few of the private sites would have the safeguards in place that a permanent federally managed storage site would have.

### **Establishment of a Federal Stockpile for the Permanent Storage of Surplus Mercury**

For nearly six years the Institute has publicly supported the establishment of a federal stockpile for mercury. In the spring of 2002, the mercury cell producers through the Chlorine Institute endorsed six key principles pertaining to the retirement of mercury (Exhibit 5). These principles were first presented at a mercury conference co-sponsored by the USEPA and the Northeast Waste Management Officials' Association (NEWMOA). In July 2002, we reiterated our support of such a stockpile in a letter to your distinguished Committee (Exhibit 6).

The Institute believes that the principles it endorsed in 2002 are still sound today. We see no viable alternative other than a stockpile under the control of the federal government. We believe the mercury stockpile should be located at as few sites as possible. Because of the relatively small footprint involved (mercury is more than 13 times denser than water), it is very likely all the surplus mercury could be stored at a single site.

For example the Defense Logistics Agency (DLA) has stored mercury safely for more than 50 years. This mercury had been acquired as part of the U. S. government's policy to have a strategic reserve of essential materials, but it is no longer needed. Earlier this decade, the DLA undertook a very public process to examine how the long term storage of its surplus mercury should be addressed. The conclusion was that the mercury could continue to be safely stored for a long term period by the DLA, but that the multiple storage sites should be consolidated to store at a single site. The DLA is currently consolidating all of its nearly 5,000 tons of mercury to a single site. In addition, the Department of Energy has about 500 tons of surplus mercury that is being stored at a single site. Currently, there are no plans to consolidate this mercury to the DLA site.

While the Institute does not have verified data on mercury generated annually from recycling and by-product mining operations, it would appear that the US government would account for about 50% of the mercury which would need to be stored over the next 40 years. [Basis: 5,500 tons of mercury currently owned by the government; 1,100 - 1,700 tons of surplus mercury from the four to six chlor-alkali plants; and 100 tons per year of surplus mercury generated by the recycling and mining industries.] The contribution of the chlor-alkali industry is only about 15% of the total.

The Chlorine Institute recognizes that it is beyond the current mission of the DLA and the Department of Energy to manage the long term storage of all the surplus mercury generated in the United States. However, the Institute believes it is sound public policy for the United States government to provide for the long term management of surplus mercury in a safe and environmentally friendly way.

## **H. R. 1534**

The Chlorine Institute respectfully asks the Committee on Environment and Public Works to consider H. R. 1534, The Mercury Export Ban Act of 2007. When originally proposed in March of 2007, H.R. 1534 was very similar to S. 906. H.R. 1534, as passed, is the result of several affected stakeholders working cooperatively to produce a bill. On November 8, 2007 in a joint letter (Exhibit 7) to members of the House of Representatives, the leading officials of the Natural Resources Defense Council, the Environmental Council of States, the American Chemistry Council, the National Mining Association, and the Chlorine Institute urged the House to pass the bill. On November 13, 2007 the House passed the bill by voice vote.

Our unique coalition negotiated several important changes to H.R. 1534 that we believe ultimately resulted in the bill's passage. Utmost was a long-term mercury management and storage solution. Section 5 of H.R. 1534 requires the Secretary of Energy to accept custody of surplus mercury for a reasonable fee, thereby providing an important, viable, long-term storage solution prior to an export ban. It is important to note that H.R. 1534 additionally allows for private, long-term storage options, should they ultimately be found viable.

Finally, H.R. 1534 importantly provides several provisions necessary for a safe and secure, long-term mercury storage and management solution, including performance criteria, indemnification, and fees for service. The Chlorine Institute therefore urges this honorable Committee to adopt this much improved and carefully crafted legislation

## **Conclusion**

In summary:

1. The Institute is opposed to a prohibition on the export of mercury unless and until the United States has a program established and in place for the permanent storage of mercury.
2. The Institute supports the establishment of a federal stockpile for the permanent storage of surplus mercury.
3. The Institute supports H.R. 1534 as passed by the House and urges the Senate to pass the same legislation.

I thank you again for the opportunity to appear before the Committee and share the Chlorine Institute's views.

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## EXHIBITS 1 – 7 PERTAINING TO THE TESTIMONY OF ARTHUR E. DUNGAN

### *Exhibit 1*

#### **Chlorine Manufacture**

Most chlorine is manufactured electrolytically by the mercury, the diaphragm or the membrane cell process. In each process, a salt (sodium chloride) solution is decomposed by the action of direct electric current in an electrolytic cell which converts the solution to elemental chlorine, and co-products sodium hydroxide and hydrogen. United States chlorine production is approximately 13 million short tons per year or about 30% of the global production.

In the mercury cell process recirculating mercury serves as the cathode. Chlorine is removed from the gas space above the anodes and elemental sodium is formed at the cathode. The sodium amalgamates with the mercury. The sodium-mercury amalgam then flows to a decomposer where it is reacted with purified water to produce sodium hydroxide and hydrogen with the mercury being recirculated. The mercury cell requires a relatively large amount of mercury inventory, but make-up to replenish losses is quite small. The typical mercury cell plant, depending on the size, may have 200 to 400 tons of mercury in inventory. A mercury cell plant may have between 25 and 100 of these electrolytic cells. Typically these cells are located in a cell room whose dimensions approximate a football field.

In the diaphragm cell process, sodium chloride brine is electrolyzed to produce chlorine at the positive electrode (anode) while sodium hydroxide and hydrogen are produced at the negative electrode (cathode). In order to prevent the reaction of sodium hydroxide and hydrogen with the chlorine, the anode and cathode chambers are separated by a porous diaphragm.

The membrane cell process electrolyzes sodium chloride brine to produce chlorine at the positive electrode (anode) while sodium hydroxide and hydrogen are produced at the negative electrode (cathode). An ion selective membrane prevents the reaction of sodium hydroxide and hydrogen with chlorine.

Chlorine is also produced in a number of other ways, for example, by electrolysis of potassium chloride brine in membrane and mercury cells with co-production of potassium hydroxide; by electrolysis of molten sodium or magnesium chloride to make elemental sodium or magnesium metal; by electrolysis of hydrochloric acid; and by non-electrolytic processes. A good reference for additional information is the Kirk-Othmer Encyclopedia of Chemical Technology which contains a section on chlorine and sodium hydroxide.

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*Exhibit 2*

**TENTH ANNUAL REPORT TO EPA**  
**CHLOR-ALKALI INDUSTRY**  
**MERCURY USE AND EMISSIONS**  
**IN THE UNITED STATES**  
**For the Year 2006**

**August 13, 2007**

**THE CHLORINE INSTITUTE, INC.**  
1300 Wilson Boulevard, Arlington, VA 22209  
[www.chlorineinstitute.org](http://www.chlorineinstitute.org)



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**TENTH ANNUAL REPORT TO EPA**  
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**MERCURY USE AND EMISSIONS**  
**IN THE UNITED STATES**  
**For the Year 2006**

**INTRODUCTION and SUMMARY**

The Chlorine Institute, Inc. (“Institute” or “CI”) continues to be a proactive leader in the effort to reduce mercury use and emissions in the United States. This Tenth Annual Report to the U. S. Environmental Protection Agency (“EPA”) illustrates the chlor-alkali industry’s continuing progress in voluntarily reducing mercury use and emissions.

In 1996, the Chlorine Institute volunteered to reduce mercury use by 50 percent over the base years of 1990 through 1995. Since then the Institute and its members have worked cooperatively with federal and state authorities to meet and exceed that goal. Since 1995, an eleven-year period, total annual mercury used by the chlor-alkali industry has been reduced by over 92%.

CI’s member companies that use mercury cell technology to manufacture chlorine are safe and perform above and beyond all applicable laws and regulations pertaining to mercury use and emissions. The chlor-alkali industry reaffirms its support for the sound management of mercury by committing to four action steps:

- Continue to account fully for mercury used;
- Further reduce the mercury used;
- Continue to improve methods to more accurately measure emissions from the cell rooms at each mercury cell chlor-alkali facility; and
- Further reduce air emissions by over 90% from facilities by implementing the extensive new work practice standards contained in and fully complying with EPA’s new National Emission Standard for Hazardous Air Pollutants: Mercury Emissions from Mercury Cell Chlor-Alkali Plants (“NESHAP”).

The remainder of this report will focus on the following:

- Status of chlor-alkali mercury cell facilities in the United States;
- Mercury purchases and use during the calendar year 2006;
- Reductions in mercury emissions to the environment; and
- Key initiatives by companies, the Chlorine Institute and the World Chlorine Council to further the industry’s commitment to the safe use of mercury.

### MERCURY CELL FACILITIES

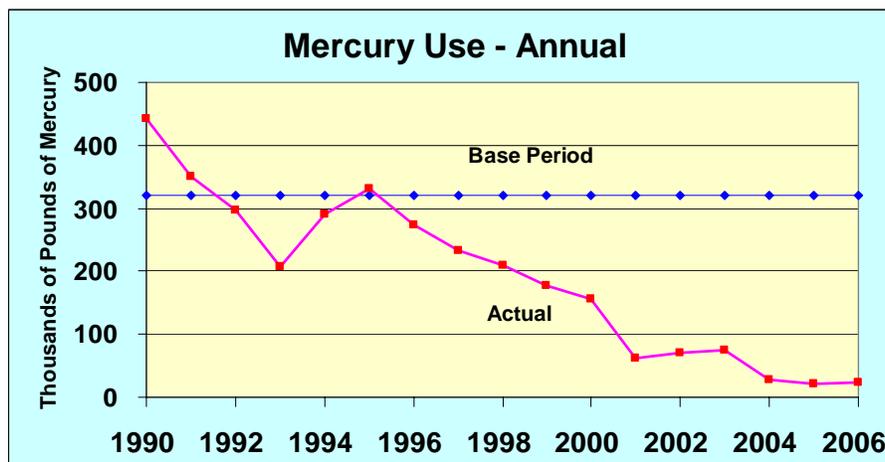
No mercury cell facilities closed in the calendar year 2006. As of the date of this report one facility will complete conversion to the membrane cell process by the end of August 2007. Two additional facilities have announced conversion to membrane technology by the end of 2008 and 2009. A fourth facility intends to close by the end of 2008. These actions will further reduce the chlor-alkali industry’s mercury use and emissions. Based on the currently announced plans, only four mercury cell facilities will be in operation in the United States at the end of 2009.

In 1996, when the industry’s original commitment to mercury reductions was made, there were 14 operating mercury cell plants. Of the nine facilities that have eliminated or plan to eliminate the use of mercury, three have or will have converted to membrane technology and six have or will have simply closed.

### MERCURY USE AND PURCHASES

Using 1990 to 1995 as the baseline, the chlor-alkali industry has reduced its mercury usage by over 92% (see Figure 1 below). Mercury use in 2006 was 24,000 pounds. Mercury use is detailed in Table 1 found in Appendix A.

Figure 1



Chlor-alkali mercury use in the United States per ton of chlorine capacity for 2006 was 0.02 lb/ton chlorine capacity (see Figure 2 below).

**Figure 2**

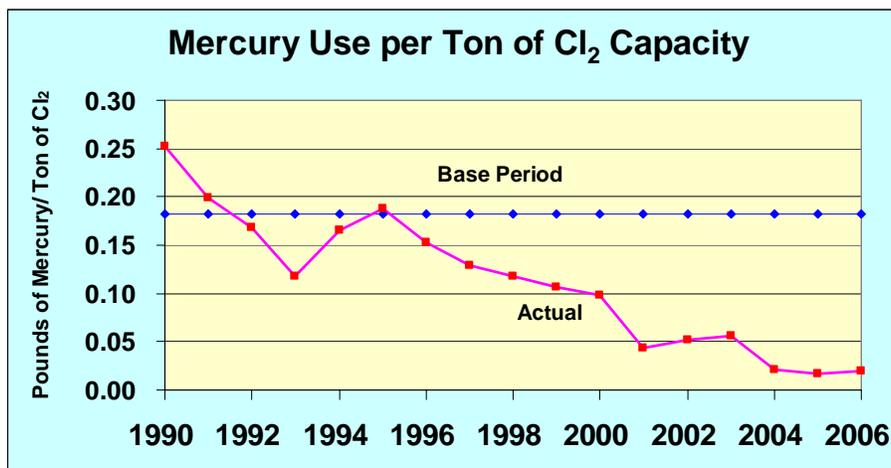
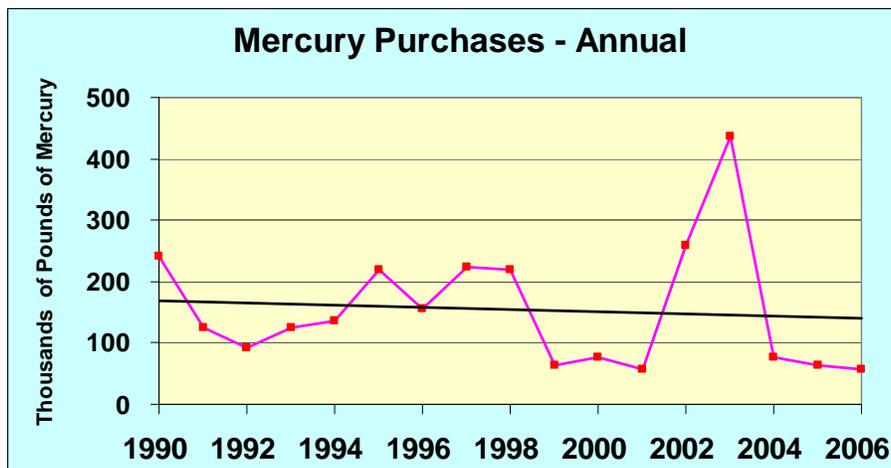


Figure 2 clearly shows that the chlor-alkali industry has significantly reduced its use of mercury, not just because of facility closures, but more importantly because of the more efficient utilization of mercury. This is reflected in an 89% reduction in the 2006 mercury used per ton of chlorine capacity when compared to the 1990 through 1995 baseline.

As is evident from both Figures 1 and 2, reductions in mercury use have slowed. This trend can be attributed to the effectiveness of past reduction efforts.

Mercury purchases in 2006 were 58,000 pounds (see Figure 3 next page). As explained in past reports, mercury purchases do not necessarily equate to mercury use. Process upgrades can necessitate the use of higher volume equipment and longer piping runs require that more mercury be added to the process. More mercury in the process does not equate to greater mercury emissions. In fact, most upgrades typically instituted as part of programs to upgrade cell room technology and improve system performance, also minimize mercury releases. Installation of new and better designed equipment minimizes fugitive emissions. Other upgrades allow the facilities to operate longer between cell maintenance. Less frequent cell maintenance means fewer openings of the cell and thus a reduction in mercury emissions. Annual mercury purchases rise or fall depending on the quantity of upgrades.

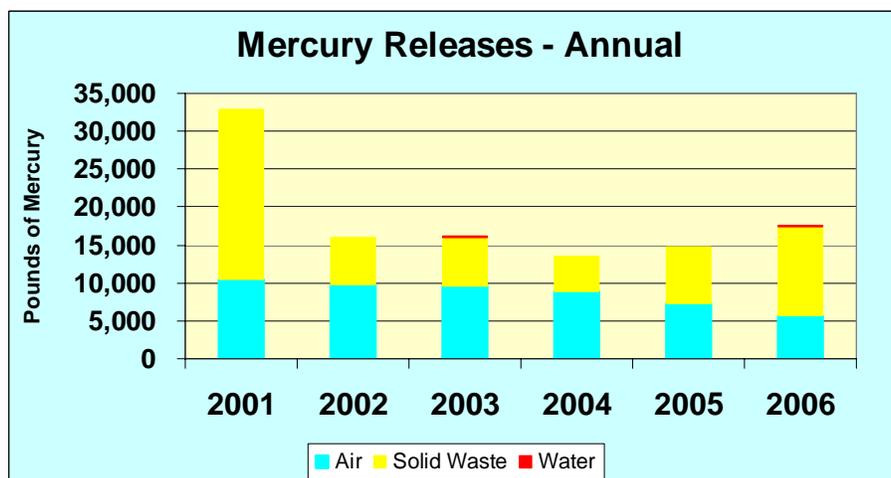
Figure 3



**MERCURY RELEASES TO THE ENVIRONMENT**

Mercury releases to the environment from the chlor-alkali industry were approximately 17,500 pounds (see Figure 4 below). Mercury emissions are detailed in Table 2 found in Appendix A. This latest information shows a 47% reduction in the chlor-alkali industry mercury emissions<sup>1</sup> since 2001. These emissions are a very small portion (approximately 8%) of the total mercury releases occurring in the United States<sup>2</sup> and have fallen at a greater rate than the overall decline.

Figure 4



<sup>1</sup> Mercury releases to water are not easily depicted in Figure 4 since these quantities are less than 0.1% of the total.

<sup>2</sup> 2002 U.S. mercury releases estimated at 111.4 tons (GLBTS 2006 Progress Report, February 2007).

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## KEY PROJECTS – NEW AND CONTINUING

### Facility Specific Projects in 2006

Below is a summary of key projects completed and/or started at mercury cell facilities during the 2006 calendar year. These projects resulted in reduced mercury emissions but may have also resulted in a short term increase in mercury purchases since sometimes these projects require an increase in mercury process inventories. Process modifications resulted in an increase of process mercury inventory by 20 tons. Most of this mercury was added as virgin mercury obtained from existing corporate stockpiles or from purchases. Approximately 10% came from in-process recovery<sup>3</sup>.

The following process modifications occurred in 2006:

- Plant A converted to larger decomposers which required the addition of mercury (approximately 37,000 pounds) into the process inventory;
- Plant B enlarged some decomposers resulting in the addition of 1,990 lbs of mercury to the process inventory; and
- Plant C added 1,900 pounds of mercury. The increase in mercury inventory was necessary when the volume of mercury residing in the cells was increased as part of an upgrade to raise the cell chlorine production efficiency. This also required the installation of larger impellers in the mercury pumps.

These process changes allow for reductions of mercury emissions in two ways. First, because much of the newer equipment being installed is larger than the previously installed equipment, operating cycles between maintenance activities are lengthened. Maintenance activities nearly always require equipment openings. Even though many improvements in techniques to reduce mercury emissions during equipment openings have been made, emissions can not be totally eliminated. Therefore, a lower number of openings results in reduced mercury emissions. Secondly, newer equipment is better designed to reduce fugitive emissions. Sealless mercury pumps, sealed end boxes, and improved hydrogen cooler design are examples of equipment changes that result in reduced fugitive emissions.

### Industry-Wide Efforts

Besides aggressively pursuing specific facility-based opportunities for mercury use and emissions reductions, the U.S. chlor-alkali industry's voluntary efforts have also focused more broadly both domestically and worldwide. Since issuing its Ninth Annual Report to EPA, the Institute has continued to coordinate the industry's ongoing efforts to reduce mercury use and emissions. Specifically, CI and its member companies have worked on the following projects:

- Mercury NESHAP

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<sup>3</sup> In-process recovery: Mercury can accumulate in filters, tanks, etc. When this mercury is recovered it is placed back in the facility's mercury inventory.

The new Mercury NESHAP (40 CFR Part 63) became effective on December 19, 2006. This new regulation replaces the old Part 61 NESHAP rule. The new regulation contains numerical emission limits for the three primary air sources of mercury at mercury cell facilities: 1) end-box ventilation system vents, 2) by-product hydrogen system vents, and 3) mercury thermal recovery unit vents. It also requires that the plants either install continuous mercury emission monitors or test each vent at least once per week.

The rule also contains a set of work practice standards (representing the best practices of the industry) that are considerably more stringent than the fugitive emissions limits or procedures required under the old Part 61 Mercury NESHAP. The new rule contains an alternative program that involves continuous mercury air concentration monitoring and problem correction when a fugitive emission action level is exceeded. All operating mercury cell facilities are in compliance with this new regulation<sup>4</sup>.

- Chlorine Institute - 14<sup>th</sup> Annual Mercury Issues Workshop

Held at the Chlorine Institute's Annual Meeting in Houston, TX on March 18, 2007, session topics included:

- Overview of Mercury Fugitive Emissions from Chlor-Alkali Facilities
- Update from the U.S. EPA on the Mercury NESHAP
- Fugitive Emissions Monitoring – Report on Side-by-Side Testing with EPA
- Mercury NESHAP Compliance
- United States Government Activities on Mercury
- International Activities on Mercury
- Working with NGOs

The event was well attended and continues to serve as a useful forum for both U.S. and international users of mercury cell technology.

- World Chlorine Council

The World Chlorine Council (“WCC”) ([www.worldchlorine.com](http://www.worldchlorine.com)) is a global network of national and regional chlor-alkali associations in over 27 countries and five continents, representing more than 80 percent of global chlorine and caustic-soda production. The WCC voluntarily engages in global programs to reduce mercury use, consumption and emissions from the mercury cell manufacturing process. CI is a WCC managing partner.

It is well understood that mercury in the environment is not entirely attributable to local sources. Mercury released in other parts of the world can be deposited in the United States. Mercury is a global pollutant and thus requires globally coordinated solutions. International efforts by CI (through the WCC) to reduce mercury emissions are a critical component of the industry's mercury reduction efforts.

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<sup>4</sup> The US EPA has given ERCO Worldwide, Port Edwards, WI a one year deferral on compliance with the Mercury NESHAP to allow the facility to evaluate conversion to a non-mercury technology. The facility is on schedule to be in compliance by Dec 19, 2007.

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WCC's global programs augment the programs and commitments made by regional WCC organizations. Emissions from this sector will continue to decline as the industry implements best available techniques and transitions to alternative, non-mercury technologies.

As part of these efforts, the WCC has been an active supporter of the United Nations Environmental Program (“UNEP”) Global Mercury Program and has made a sustained effort to help mercury cell chlor-alkali producers around the world reduce mercury use and emissions. Furthermore, the WCC agreed to support and contribute to the *UNEP Global Partnership on Mercury Reduction in the Chlor-Alkali Sector*. The Global Mercury Partnership builds upon WCC's long-standing commitment to share best practices globally for reducing the use and release of mercury from mercury-cell chlor-alkali facilities. WCC has strived with governments, chlor-alkali producers, and the UNEP to help make this partnership a success.

Activities have included:

- Promotion & Implementation of Best Practices – WCC continues to encourage the adoption of best management practices to facilitate reductions in mercury releases and use from mercury-cell facilities around the globe. A key mechanism for sharing and implementing these best practices has been in-country workshops designed to allow industry experts and facility managers to share best practices and analyze how these practices could be applied to a specific facility so as to further reduce mercury use and emissions. Where appropriate, these workshops have included follow-up demonstration projects that when implemented are expected to result in tangible reductions in the amount of mercury used and released at specific mercury-cell chlor-alkali manufacturing facilities. To date workshops and technical exchange programs have been held in India, Russia and Mexico.
- Mercury Reporting & Measuring Progress – WCC supports the partnership objective to collect data concerning mercury use and emissions within the chlor-alkali industry. WCC has worked to catalogue, to the best of its knowledge, those facilities utilizing mercury-cell technology. WCC is also working to facilitate the collection on mercury use and emissions from chlor-alkali facilities worldwide. As part of its commitment to the Global Mercury Partnership, WCC submits an annual report to UNEP summarizing regional mercury use, consumption, and emission. The First Annual WCC Report was presented at the 2007 UNEP Governing Council meeting.<sup>5</sup>

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<sup>5</sup> The document is available at: [http://www.chem.unep.ch/mercury/Sector-Specific-Information/Chlor-alkali\\_facilities.htm](http://www.chem.unep.ch/mercury/Sector-Specific-Information/Chlor-alkali_facilities.htm)

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Update on 2004 Commitments

In its 2004 Annual Report to EPA, The Chlorine Institute discussed two new commitments made to the Binational Toxics Strategy. Specifically, the Chlorine Institute and its members committed to 1) enhancing cell room air monitoring, and 2) fully accounting for the industry's mercury inventory. The following summarizes the status of these commitments:

- Enhancing Cell Room Air Monitoring

Three facilities completed installation of cell room mercury monitoring systems<sup>6</sup> in 2005/early 2006. EPA has completed system evaluation and side-by-side testing for fugitive emissions and/or facility-wide emissions at these three chlor-alkali facilities. This three-part study will assist the Agency as it finalizes issues regarding the Mercury NESHAP.

One study addressed whether the fugitive air emissions from a mercury cell chlor-alkali plant are on the order of magnitude of the historical assumption of 1,300 grams per day (0.5 tons per year) or on the order of magnitude of the unaccounted for mercury. As part of this study, EPA performed two emission test series in 2006. One test series was performed outside and downwind from the plant, and theoretically measured all mercury air emissions from the process, both inside the cell room and outside the plant. The other test series was performed inside the cell room. These test series have been completed and EPA is in the process of evaluating the data. Both test series also will compare the EPA data to the plants' continuous mercury cell room monitoring systems (MMS) that were in place during the EPA tests.

In a second study, EPA performed tests at three facilities to validate continuous MMS and flow measuring systems. Two of the three facility tests were completed in 2005 and one was completed in 2006. Reports for the 2005 tests are currently available to the public on request to EPA. The two 2005 test series showed that the MMS and flow measurements at the facilities were in good agreement with the EPA measurements.

The third study will attempt to determine the process, maintenance, and other operational activities that most significantly impact fugitive mercury air emissions. The EPA will use these data to evaluate whether relationships exist between fugitive mercury air emissions and cell room activities (maintenance and other operational activities), which could be used to develop an emissions factor that could be applied industry-wide.

The final reports should be issued late in 2007.

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<sup>6</sup> All of the remaining facilities have also installed systems as necessary to comply with the Mercury NESHAP.

- Fully Accounting for Mercury Inventory

The Chlorine Institute believes it has made outstanding progress in its efforts to fully account for the mercury the chlor-alkali industry uses. Nevertheless, CI continues to refine its data collection and analysis methodology. In 2004, in order to further clarify the facts, CI added a new table, Table 2 (Appendix A), to this report. Table 2 is a compilation of data for the calendar years 2002 through 2006 showing the differences between mercury purchases, mercury use, reported toxics release inventory (TRI) emissions, and mercury contained in chlor-alkali products. The key line item, “unaccounted for mercury”, is near the bottom of the table.

The Chlorine Institute stated then that it was not satisfied with the unaccounted for mercury reported in 2002 and 2003 even though this unaccounted inventory represented only one percent of the total mercury inventory for the industry. The industry committed then to fully account for the mercury it uses. In 2005 and 2006 the unaccounted for mercury amounted to three tons; a reduction of nearly 90% from the prior years.

Mercury process inventory is typically measured using the radioactive isotope technique discussed in Chlorine Institute publication, *Guidelines for Conducting a Mercury Balance*, May 1999. The methodology has a variability of between 0.1 and 0.3 percent. Applying this variability to the 2006 year ending mercury inventory of 2,579 tons reveals the data to be accurate to within two to eight tons. The 2006 unaccounted for mercury equaled 2.9 tons or 0.1 percent of the total inventory.

#### Past Efforts Continue to Provide Environmental Benefits

Since the industry’s commitment to mercury reductions, facilities have taken many steps to reduce mercury emissions. These changes have been detailed in prior reports but are summarized below because each historic process improvement continues to pay dividends in the form of mercury emissions reductions in every year that follows. Past activities have included the design, use and installation of:

- Improved collection devices to more effectively capture mercury during cell maintenance activities;
- New decomposer compression system design to improve efficiency of amalgam decomposition;
- New gasket materials to provide better seals on mercury containing equipment;
- Additional collection devices such as weirs to cell room trenches to more effectively recapture and reuse accumulated mercury;
- Process changes to reduce mercury carry-over with the water exiting the end boxes resulting in less mercury handling;

- More efficient electrical current distribution equipment; and
- Larger decomposers, thus lengthening the time between scheduled maintenance (i.e. reducing the need to open the equipment.)

## CONCLUSION

The Chlorine Institute believes it has proactively addressed many of the concerns regarding the use and release of mercury into the environment by mercury cell chlor-alkali facilities. In addition, the Institute's commitment to the Binational Toxics Strategy is completed. CI and its members believe this voluntary effort, no matter how it is measured, has been a success. Nevertheless, the Chlorine Institute plans to continue its efforts to reduce mercury use and environmental releases in the chlor-alkali sector both in the United States and internationally through its participation in the WCC and UNEP Global Mercury Program.

## ABOUT CI

The Chlorine Institute Inc., founded in 1924, is a non-profit trade association of companies and other entities involved or interested in the safe production, distribution and use of chlorine, sodium and potassium hydroxides, and sodium hypochlorite, and the distribution and use of hydrogen chloride.

Because of chlorine's nature and its widespread and varied applications, the promotion of its safe use and handling has long been an accepted responsibility of its producers, packagers, distributors and users. The Institute is the focal point for their joint efforts.

For more information on CI's mission, go to [www.chlorineinstitute.org](http://www.chlorineinstitute.org).

For more information concerning the content of this report please contact:

David Dunlap  
Vice President Health, Environment, Safety and Security  
1300 Wilson Blvd  
Arlington, VA 22209  
703-742-5765  
ddunlap@CL2.com

**APPENDIX A**  
**Data Tables**

**Table 1**  
**Mercury Purchase and Usage<sup>1</sup>**  
**Chlor-Alkali Industry - Mercury Cell Process**

	BASELINE (Average 1990 – 95)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 <sup>2</sup>	2006
Total Mercury Purchases, lb.	296,408	242,015	320,460	340,658	214,749	172,885	69,932	259,069	437,434	75,982	63,829	57,304
Total Mercury Purchases, tons	148	121	160	170	107	86	35	130	219	38	32	29
Total Mercury Used, lb.	319,715	273,659	232,056	210,213	177,968	156,403	61,506	71,052	75,309	28,637	20,660	24,210
Total Mercury Used, tons	160	137	116	105	89	79	30	36	38	14	10	12
Annual Chlorine Capacity, 1,000 tons	1,758	1,784	1,801	1,785	1,676	1,589	1436	1355	1,353	1,363	1,221	1,206
Total Number of Mercury Cells	762	762	762	762	706	682	646	594	594	594	506	506
Mercury Used, lb/ton of Chlorine Capacity	0.182	0.153	0.129	0.118	0.106	0.102	0.044	0.052	0.056	0.021	0.017	0.020

**Notes:**

1 ton = 2,000 lb

<sup>1</sup> Data was collected from those plants operating at the end of the calendar year.

<sup>2</sup> In 2005, the Occidental Chemical Company plant in Delaware City, DE closed. Beginning in 2005, data for this facility is no longer collected and included in the totals.

**Table 2**  
**Mercury Balance and Release<sup>1, 2</sup>**  
**Chlor-Alkali Industry - Mercury Cell Process**  
**(in tons)**

		2002	2003	2004 <sup>3</sup>	2005	2006
1	Mercury Virgin Inventory as of Jan 1	67	46	166	90	44
2	Mercury Process Inventory as of Jan 1	2,478	2,593	2,654	2,493	2,561
3	Total Mercury Inventory as of Jan 1 [3] = [1] + [2]	2,545	2,639	2,820	2,583	2,605
4	Mercury purchases during calendar year	130	219	38	32	29
5	Total Mercury Available [5] = [3] + [4]	2,675	2,858	2,858	2,615	2,634
6	Mercury Virgin Inventory at on site storage as of Dec 31	46	166	96	45	34
7	Mercury Process Inventory as of Dec 31	2,593	2,654	2,748	2,560	2,579
8	Total Mercury Inventory as of Dec 31 [8] = [6] + [7]	2,639	2,820	2,844	2,605	2,613
9	Mercury Transferred Out <sup>4</sup>	0	0	1	0	9.2
10	Total Mercury Used (Consumed) [10] = [5] - [8] - [9]	36	38	13	10	11.8
11	Mercury Released to the Environment (TRI)	8.2	8.1	6.8	6.7	8.8
12	Mercury Contained in Products	0.2	0.1	0.1	0.1	0.1
13	Total Mercury Losses to Environment and Products	8	8	7	7	8.9
14	Unaccounted for Mercury [14] = [10] - [13]	28	30	6	3	2.9
15	Number of Mercury Cell Facilities Operating at End of Year	9	9	9	8	8

**Notes:**

<sup>1</sup> For facilities operating at year end in the calendar year.

<sup>2</sup> Numbers may not add due to rounding.

<sup>3</sup> 2004 ending inventory and 2005 beginning inventory data adjusted to reflect shutdown of Delaware facility.

<sup>4</sup> Sent off-site for recovery, not returned during calendar year.

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### *Exhibit 3*

#### **Documents Developed by the Institute's Technical Teams**

- **Guidelines: Medical Surveillance and Hygiene Monitoring Practices for Control of Worker Exposure to Mercury in the Chlor-Alkali Industry**
- **Guidelines for the Handling of Rubber-Lined Cell Parts Potentially Contaminated with Mercury**
- **Guidelines for Conducting a Mercury Balance**
- **Guidelines for Technologies to Reduce Mercury in Sodium Hydroxide**
- **Guidelines for Mercury Cell Chlor-Alkali Plants Emission Control: Practices and Techniques**
- **Guidelines For The Optimization Of Mercury Wastewater Treatment (Sulfide Precipitation Process) Systems**

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## *Exhibit 4*

### **Mercury Cell Plants Operating in 1996 and Current Status**

	Company	Location	Current Status
1	ASHTA Chemicals	Ashtabula, Ohio	In operation
2	Olin Corporation	Augusta, Georgia	In operation
3	Olin Corporation	Charleston, Tennessee	In operation
4	PPG Industries	New Martinsville, West Virginia	In operation
5	ERCO Worldwide	Port Edwards, Wisconsin	In operation; conversion in progress (completion expected within two years).
6	Olin Corporation	St. Gabriel, Louisiana	In operation; conversion in progress (completion expected within two years).
7	PPG Industries	Lake Charles, Louisiana	Converted
8	Westlake	Calvert City, Kentucky	Converted
9	Georgia Pacific	Bellingham, Washington	Closed
10	Holtra Chem	Orrington, Maine	Closed
11	Holtra Chem	Riegelwood, North Carolina	Closed
12	Occidental Chemical Corp.	Deer Park, Texas	Closed
13	Occidental Chemical Corp.	Delaware City, Delaware	Closed
14	Occidental Chemical Corp.	Muscle Shoals, Alabama	Closed (April 2008)

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## *Exhibit 5*



### **THE CHLORINE INSTITUTE, INC.**

1300 Wilson Boulevard, Arlington, VA 22209

Phone: 703-741-5760 Fax: 703-741-6068

<http://www.chlorineinstitute.org>

### **Chlor-alkali Industry Principles Concerning the Retirement of Mercury**

1. Mercury is a marketable commodity. It is not a hazardous waste. There are numerous beneficial uses for mercury that provide value to our society and which are likely to continue for the foreseeable future.
2. In the United States, the supply of mercury available from facilities (e.g., strategic reserve, converted/shutdown mercury cell plants) that no longer need it or that becomes available through reclamation processes exceeds the demand for such mercury. However, on a world wide basis, a net demand for additional mercury does exist. Currently, there is still at least one mine in operation for the express purpose of supplying virgin elemental mercury to meet this world demand.
3. Improper handling/use of mercury can lead to adverse environmental consequences (especially in countries where sufficient environmental restrictions are not in place). Therefore, it may be prudent for the United States to consider a national policy to identify which worldwide outlets are acceptable vs. the present free market approach. This restriction of outlets recognizes that the mining of fresh mercury will be encouraged to meet the demand for the identified unacceptable outlets outside of the US.
4. Any government policy related to the retirement of mercury must be predicated on the government's taking title to the mercury and assuming full responsibility for the permanent management of such mercury in a manner consistent with safety and environmental regulations and engineering standards.
5. In the event that recovery processes do not provide sufficient mercury to supply future needs, mercury from the permanent storage stockpile should be made available for the legitimate needs of users of mercury rather than the mining of virgin mercury.
6. Assuming that such a government policy regarding the retirement and storage of such mercury is developed, the chlor-alkali industry is willing to discuss options concerning how the chlor-alkali industry can best insure that any surplus mercury from idled or converted sites is placed into that permanent storage and is not allowed to enter poorly managed commercial markets.

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## Exhibit 6



THE CHLORINE INSTITUTE, INC., 2001 L STREET, N.W., WASHINGTON, D.C. 20036 - 4919

202-775-2790

Fax 202-223-7225

<http://www.CL2.com>

Stephen R. Fitzgerald, *Chair*  
Carol A. Dudley, *Vice Chair*  
Dr. Robert G. Smerko, *President*

June 26, 2002

The Honorable James M. Jeffords, Chairman  
Environment and Public Works Committee  
410 Dirksen Senate Office Building  
Washington, DC 20510-6175

The Honorable Bob Smith, Ranking Member  
Environment and Public Works Committee  
456 Dirksen Senate Office Building  
Washington, DC 20510-6175

Dear Senators Jeffords and Smith:

Reference: S. 351

The Chlorine Institute, Inc. supports Senate Bill 351 as presented in the version dated June 25, 2002 and identified by the file name DEC02.471. While we support the portion of the bill pertaining to fever thermometers, we believe the key part of the bill is that which addresses the retirement of surplus mercury.

The United States government has approximately 6,000 tons of surplus mercury within the Department of Defense and the Department of Energy. In addition, approximately 3,000 tons of surplus mercury may become available over the next several decades from mercury cell chlorine production plants as they reach the end of their economic life. Mercury recycling and recovery programs already make the supply of mercury greater in the USA than the demand. The excess supply will increase in the future, as legitimate mercury needs decline. All of these reasons combine to make it highly desirable for the United States to develop a policy to address the retirement of surplus mercury.

The Institute worked with EPA and the Northeast Waste Management Officials' Association (NEWMOA) in helping to plan the Mercury Workshop held in Boston on May 1 - 3, 2002. At this workshop, the Institute presented its views on issues associated with the retirement of surplus mercury in a formal presentation made by one of our members. Attached is a framework presenting the principles that we support and have provided to the Mercury Policy Project. We believe that the current draft of Senate bill 351 embodies the essence of these principles.

The Chlorine Institute, Inc., founded in 1924, is a 220-member, not-for-profit trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. The



The Honorable James M. Jeffords  
The Honorable Bob Smith  
June 26, 2002  
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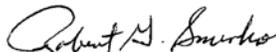
Institute's mission is the promotion of safety and the protection of human health and the environment in the manufacture, distribution and use of chlorine, sodium hydroxide, potassium hydroxide and sodium hypochlorite, plus the distribution and use of hydrogen chloride. The Institute's North American Producer members account for more than 98 percent of the total chlorine production capacity of the U.S., Canada, and Mexico. In the United States, there are ten facilities that produce chlorine using the mercury cell process accounting for 10% of the annual chlorine production. All are members of the Chlorine Institute.

The Chlorine Institute has long worked on a cooperative basis with various federal, state, and local agencies and other groups to address issues associated with mercury use in chlorine production. We believe that production of chlorine with mercury cell technology continues to be a safe, environmentally sound way to manufacture chlorine and chlorine-based products. Mercury cell facilities can be operated in a manner that meets or exceeds environmental standards. However, we remain committed to voluntary mercury reduction strategies. For example, in April of this year, the Institute submitted its fifth annual report to the USEPA concerning the commitment the Institute and the mercury cell chlorine producers made to the Binational Toxics Strategy in 1996 to reduce mercury use by 50% or more by 2005 and to provide the agency with an annual report of progress. In the fifth year of the program, the goal has been achieved. The overall reduction to date is 81%. We will continue to provide these reports to the agency as we strive to make further reductions.

The Institute has worked with EPA and other entities on a variety of other issues. These include issues such as the currently pending MACT standard for further reductions in mercury emissions from mercury cell chlorine production plants and RCRA issues associated with mercury containing materials. The Institute has also worked on international issues such as the United Nations Economic Commission for Europe (UN/ECE) Convention on the Long Range Transboundary Air Pollution Protocol on Heavy Metals (includes mercury). The Institute formally supported this protocol and urged our government to sign it -- which it has.

We have been most privileged to work with your committee staff on this bill.

Very truly yours,



Robert G. Smerko

## *Exhibit 7*



November 8, 2007

Re: HR 1534

Dear Representative:

HR 1534, the "Mercury Export Ban Act of 2007", which bans the export of surplus elemental mercury into global commerce, was reported out of the House Energy & Commerce Committee on October 30, 2007, by an overwhelmingly bi-partisan vote of 45-2. The undersigned organizations support this negotiated version of HR 1534 and urge its passage under Suspension of the Rules.

Collectively, our organizations negotiated in good faith to produce the bill as reported, which addresses our individual concerns, advances our shared objective of reducing global mercury pollution, and reflects good public policy.

Specifically, the Committee-reported version of HR 1534 establishes a practical and workable domestic framework for sequestering the elemental mercury prohibited from export under the legislation. To develop this framework, our organizations worked diligently and collectively to reach consensus, each of us agreeing not to raise related mercury matters which may have prevented a successful outcome. Therefore we hope the full House of Representatives will acknowledge the compromises made and approve HR 1534 without further changes.

In closing, the undersigned organizations urge your "YES" vote on HR 1534 in the coming days.

Sincerely,

Frances G. Beinecke, President  
Natural Resources Defense Council

R. Steven Brown, Executive Director  
Environmental Council of States

Jack N. Gerard, President & CEO  
American Chemistry Council

Arthur E. Dungan, President  
The Chlorine Institute, Inc.

Kraig R. Naasz, President & CEO  
National Mining Association