Center for American Progress

Preventing Toxic Terrorism

How Some Chemical Facilities are Removing Danger to American Communities

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Progressive Ideas for a Strong, Just, and Free America

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Executive Summary

Across the country, some 14,000 chemical plants, manufacturers, water utilities and other facilities store and use extremely hazardous substances that can injure or kill employees or residents in nearby communities if suddenly released. Approximately 450 of these facilities each put more than 100,000 people in harm's way.

The Department of Homeland Security and numerous security experts have warned that terrorists could turn hazardous chemical facilities into improvised weapons of mass destruction. Some of these facilities have replaced acutely hazardous chemicals with safer, readily available alternatives—making themselves less appealing terrorist targets, while also removing the ever-present danger of a serious accident. At these facilities, no failure in safety or security can send a catastrophic gas cloud into a nearby community.

The Center for American Progress, with assistance from the National Association of State PIRGs and National Environmental Trust, conducted a survey to identify such facilities and spotlight successful practices that have removed unnecessary chemical dangers from our communities. This survey (which covered facilities that no longer report using extremely hazardous substances under the federal Risk Management Planning program) found that facilities across the country, representing a range of industries, have switched to safer alternatives from a variety of hazardous chemicals, producing dramatic security and safety benefits at a reasonable cost.

Key findings from the survey include the following:

- Some 284 facilities in 47 states have dramatically reduced the danger of a chemical release into nearby communities by switching to less acutely hazardous processes or chemicals or moving to safer locations.
- As a result of these changes, at least 38 million people no longer live under the threat of a major toxic gas cloud from these facilities.
- Eleven of these facilities formerly threatened more than one million people; a further 33 facilities threatened more than 100,000; and an additional 100 threatened more than 10,000.
- Of respondents that provided cost estimates, roughly half reported spending less than $100,000 to switch to safer alternatives and few spent over $1 million.
- Survey respondents represent a range of facilities small and large, including water utilities, manufacturers, power plants, service companies, waste management facilities, and agricultural chemical suppliers.
- Facilities reported replacing gaseous chlorine, ammonia, and sulfur dioxide, among other chemicals.
- The most common reasons cited for making changes included the security and safety of employees and nearby communities, as well as regulatory incentives and business opportunities.
- Facilities cut a variety of costs and regulatory burdens by switching to less hazardous chemicals or processes. These facilities need fewer physical security and safety measures and can better focus on producing valuable products and services.

Despite this progress, thousands of facilities that could switch to safer alternatives still have not done so. For example, several thousand water treatment plants, many situated in cities and towns, still use chlorine gas. Removing such hazards should be a national strategic priority. Unfortunately, more than four years after the 9/11 terrorist attacks, the White House and Congress have failed to act. Currently, no federal law or regulation requires hazardous chemical facilities to review or use readily available alternatives.

The facilities identified by the survey show that dramatic improvements are feasible if safety and security are given priority (see full list in Appendix A). For example:

- The Nottingham Water Treatment Plant in Cleveland, Ohio, now treats drinking water with liquid bleach instead of chlorine gas; some 1.1 million people are no longer at risk of a toxic gas release.
- The Wyandotte Wastewater Treatment Facility near Detroit, Mich., switched from chlorine gas to ultraviolet light; more than 1 million people are no longer at risk of a toxic gas release.
- Manhattan Products, in Carlstadt, N.J., now produces household cleaning products with liquid ammonia instead of gaseous ammonia, removing the threat to 160,000 residents.
- Solae Company dba DuPont Soy Polymers in Louisville, Ky., switched from anhydrous sulfur dioxide to the safer sodium bisulfite for producing food products from soy; the change removed the threat to 37,000 residents.
- Wisconsin Power's Pulliam Plant in Green Bay switched from anhydrous to solid sulfur dioxide for pollution control, removing the threat to 180,000 residents.
- U.S. Filter Recovery Services, in Roseville, Minn., changed treatment chemicals for certain hazardous waste recovery processes; the change eliminated the threat of a gas release to 62,000 residents.

"We are very pleased at no longer having one-ton cylinders of the dangerous chlorine and sulfur dioxide gases on our property."

–Operations Manager, Springbrook Water Reclamation Center, Naperville, Ill.

In some cases, facilities may be unable to identify a viable alternative to reduce chemical hazards, but may be able to improve safety and security by consolidating operations or relocating to a less populated area. For example, the Niklor Chemical Company moved from Carson, Calif., to a remote location near Mojave, removing a chlorine-gas danger from an area of 3.5 million residents.

Adopting safer alternatives, however, is the only certain way to prevent a catastrophic chemical release. Many chemical facilities have already taken this step thereby protecting millions of Americans. Millions more could be taken out of harm's way with a concerted national effort to convert other high-risk facilities to safer chemicals and processes.

Background

Risk Management Planning

Certain extremely hazardous industrial chemicals, when released in worst-case conditions, can form dense ground-hugging plumes of gas that remain lethal over many miles—areas that may include homes, schools, hospitals, parks or shopping centers. Some 14,000 facilities that use these chemicals over threshold amounts are regulated under the federal Risk Management Planning (RMP) program, which is carried out by the Environmental Protection Agency (EPA). Each of these facilities prepares a Risk Management Plan that includes a hazard assessment, a prevention plan and an emergency response plan. The facilities must estimate how far a chemical could travel off-site in a worst-case release, along with the number of people living within the "vulnerability zone"—the area potentially affected by the release.[1]

These plans save lives, prevent pollution and protect property by guiding companies in managing chemical hazards. Since the RMP program's inception in 1999, there has been a decline in hazardous chemical facilities that report a vulnerability zone of more than 10,000 people. From 2000 to 2005, the number of these high-hazard facilities declined by as many as 544, from 3,055 facilities[2] to 2,511.[3]

The terrorist threat heightens the risk presented by facilities that still have large vulnerability zones. However, the RMP program does not currently address the potential for a deliberate terrorist release of chemicals. Nor does any federal law require companies to assess readily available alternative chemicals and processes that pose fewer dangers.

Survey Scope

Chemical facilities deregister from the RMP program upon notifying EPA that they no longer use a regulated substance; have reduced chemicals below reporting thresholds; or have terminated, merged or moved operations. The Center for American Progress surveyed deregistered facilities to see if they had switched to "less acutely hazardous chemicals or processes" that significantly reduced or eliminated the *possibility* of a catastrophic chemical release.[4]

The survey identified 284 such facilities that reduced hazards or moved operations to safer locations, listed in Appendix A. This list represents a strong sample but is not comprehensive. Many other facilities use less hazardous alternatives. In particular, with a few rare exceptions,[5] the survey did not include facilities that:

- Eliminated some but not all RMP substances;
- Reduced RMP substances below reporting thresholds;[6]
- Selected a less hazardous process prior to the RMP program (prior to 1999); or
- Did not respond to the survey or did not follow requirements to deregister from the RMP program.

The survey consisted of a cover letter and response form (Appendix C), designed for response in a few minutes by mail or fax. The Center for American Progress mailed the survey to some 1,800 deregistered RMP facilities. For most of these facilities the reason for deregistering was not known; many had closed. Follow-up phone calls generated additional responses. (For details on survey scope and responses, see Appendix B, Methodology).

Warnings and Inaction

Numerous federal agencies and other observers have warned that terrorists could turn hazardous chemical facilities into improvised weapons of mass destruction. These agencies include the Department of Homeland Security,[7] Department of Justice,[8] Government Accountability Office,[9] Environmental Protection Agency,[10] Agency for Toxic Substances and Disease Registry,[11] Army Surgeon General,[12] and Naval Research Laboratory,[13] among others. The non-governmental Brookings Institution,[14] Rand Corporation,[15] PACE International Union,[16] and Center for Strategic and International Studies[17] also have documented the threat. Investigative news reporters have found lax security at more than 80 hazardous chemical facilities, including at least 20 covered by voluntary industry security programs.[18]

The good news is that this threat can be substantially reduced. Public interest organizations and labor unions have long pressed for effective, readily available techniques to reduce chemical hazards, including materials substitution, just-in-time manufacturing, inventory reduction and hardened storage, among other options. A year ago, in April 2005, the Center for American Progress recommended a 12-month action plan to reduce the risk posed by the nation's most vulnerable chemical facilities using these techniques.[19] Recent reports also illustrate the broad potential for less acutely hazardous chemical operations in three industries: wastewater treatment, petroleum refineries and power plants.[20]

Nonetheless, the chemical industry and Bush administration have focused on physical site security rather than technological progress to safer chemicals and processes. Even with improvements, physical site security and safety measures will never be able to fully assure the security and safety of surrounding communities. There will always be the danger of a terrorist strike or catastrophic accident. Indeed, the EPA has recognized that eliminating hazardous characteristics during facility or process design is generally preferable to adding on safety equipment or security measures.[21]

Despite ample opportunities for improvements, there has been almost no federal effort to move facilities to less acutely hazardous chemicals or processes. The Bush administration has stifled specific proposals to reduce chemical hazards, while Congress has failed to pass comprehensive legislation (see box).

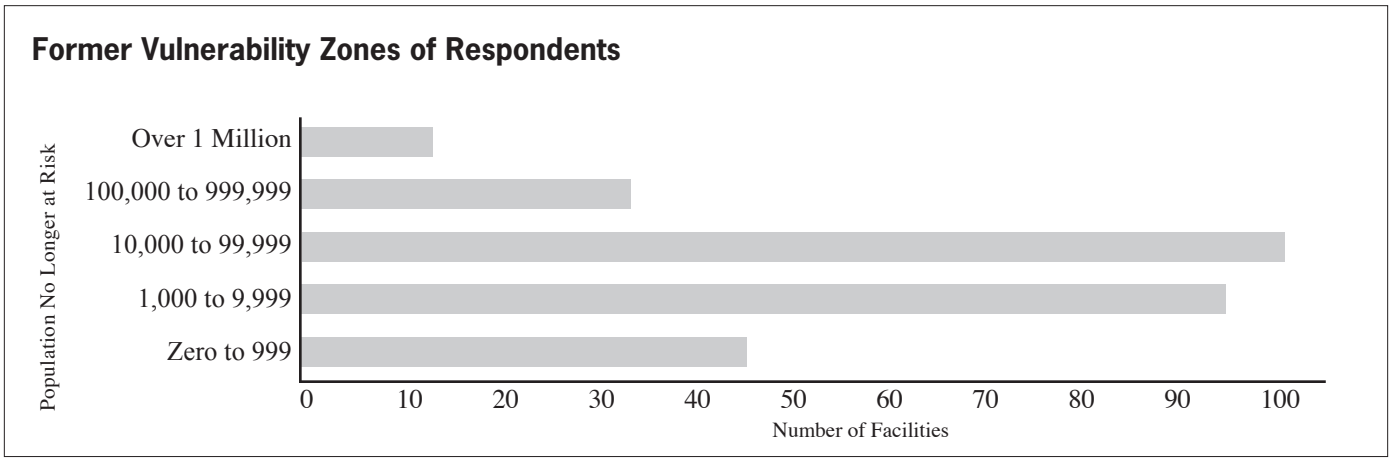
Chemical Security Timeline

- In 1999, Sen. Frank Lautenberg (D-NJ) introduced a chemical-plant security bill, S.1470, which included a requirement that chemical facilities review safer technologies where available. Sen. Lautenberg's bill did not receive a hearing despite requests.[22]
- In 2002, the EPA and then-Office of Homeland Security jointly prepared federal chemical security standards, which would have required that facilities review options to reduce unnecessary chemical dangers. The White House killed the initiative under pressure from the chemical industry.[23]
- In July 2002, the Senate Environment and Public Works Committee unanimously passed chemical security legislation, S.1602, introduced by Sen. Jon Corzine (D-NJ), which also required companies to review less hazardous chemicals. This bill later stalled, however, under pressure from seven senators who had voted for the measure in committee.[24]
- In 2003, Sen. Corzine again introduced legislation, S.157, while Sen. James Inhofe (R-OK), put forward a weak industry-backed bill, S.994. The Senate Environment and Public Works Committee strengthened S.994 in October 2003 by adding a requirement that facilities evaluate "alternative approaches"—such as using less hazardous substances, processes or quantities—to make themselves less attractive terrorist targets. However, this bill received no action by the full Senate.
- Rep. Frank Pallone (D-NJ) has introduced chemical security legislation, including provisions for safer design and maintenance, in the last three sessions of Congress—as H.R.2237 in 2005, H.R.1861 in 2003, and H.R.5300 in 2002. These bills were never voted out of committee to the House floor.
- In April 2005, Rep. Edward Markey (D-MA) offered strong chemical security amendments to the homeland security authorization bill in the House Homeland Security Committee. These amendments were later included in a comprehensive homeland security measure offered on the House floor by Rep. Bennie Thompson (D-MS), the ranking member of the Homeland Security Committee. These amendments failed on near party line votes.
- Pending legislation includes S.2145, introduced by Sens. Susan Collins (R-ME) and Joseph Lieberman (D-CT), and an identical bill, H.R.4999, introduced by Reps. Christopher Shays (R-CT) and Jim Langevin (D-RI). These bills have modest requirements for facilities to review safer alternatives. A stronger bill, S.2486, introduced by Sens. Lautenberg, Barack Obama (D-IL) and others, requires chemical facilities to thoroughly review and use safer technologies where practicable.

Major Findings

Safety and Security Improvements

Some 284 respondents in 47 states reported they had switched to less acutely hazardous chemicals or processes or moved to safer locations. As a result, more than 38 million Americans no longer live under the threat of a harmful toxic gas release from these facilities.[25] Eleven of these facilities formerly threatened more than one million people; another 33 facilities threatened more than 100,000; and an additional 100 threatened more than 10,000.



Reasons for Change

The survey asked facilities to indicate why they had switched to safer chemicals or processes. The most common reasons cited were safety, security, regulatory requirements and community expectations. Below are the aggregated responses of the 284 facilities identified in Appendix A. Facilities were presented with these possible explanations and selected all that applied.

Concern over an accidental chemical release and improved safety	217
Concern over terrorism and improved security[26]	117
Legal or regulatory requirements	106
Meeting community expectations	56
Improved operations efficiency or business opportunities	38
Projected cost savings	35
Other	29
No answer[27]	46

Costs and Savings

Of the 284 survey respondents that reported switching to less acutely hazardous chemicals or processes, 195 provided general information on the cost of making the change. Of these 195 facilities, 95 (49 percent) reported the changes cost less than $100,000; 75 (38 percent) reported costs between $100,000 and $1 million; 20 (10 percent) reported costs between $1 million and $10 million; three (two percent) reported costs between $10 million and $20 million; and two (one percent) reported costs over $20 million. The remaining 89 facilities did not respond to or were not surveyed on this question.[28] Facilities that reported the largest costs often also reported major facility upgrades (an opportune time for switching to safer technologies).[29]

Adopting safer technologies can also produce significant cost savings. Using less acutely hazardous chemicals can reduce or avoid many security and safety costs (see box). Some 226 respondents provided general information on cost savings from switching to safer alternatives. Of these 226 facilities, 76 (34 percent) expected changes to result in cost savings or improved profitability, 103 (45 percent) did not expect cost savings and 47 (21 percent) expected little change in costs.[30] The remaining 58 facilities did not respond to or were not surveyed on this question.[31] Respondents did not typically consult detailed figures on actual or potential cost savings.[32]

Costs Avoided with Safer Alternatives

Survey respondents identified a variety of costs and regulatory burdens that facilities fully or partly eliminated as a result of switching to less hazardous substances or processes. Avoided costs mentioned in survey responses include the following:

- Theft and theft prevention
- Personal protective equipment (such as gas masks)
- Safety devices (such as leak detection or scrubbers)
- Safety inspections
- Higher risk-group insurance premiums
- Potential liability
- Regulatory certifications, permits, and fees
- Compliance staff
- Certain chemical purchases
- Specialized emergency response teams
- Hazardous materials safety training
- Lost work time from chemical exposures
- Chemical damage to infrastructure
- Certain fire code requirements
- Certain physical security measures
- Unreliable chemical supply lines
- Placards and material safety data sheets
- Community notification
- Evacuation and contingency plans
- Background checks
- Compliance with OSHA Process Safety Management
- Compliance with EPA Risk Management Planning

Survey Examples: Switching to Less Hazardous Alternatives

"Making changes was cheaper than complying with RMPs."

–Plant Manager, City of Vicksburg Water Treatment Facility, Vicksburg, Miss.

The survey identified facilities in a diverse range of industries that switched to safer alternatives, including water utilities, manufacturers, power plants, waste management facilities, pool service companies and agricultural chemical suppliers. These facilities have together dramatically reduced chemical dangers to millions of Americans. Notably, most of the changes rely on common and available technologies rather than new innovations. Thousands of additional facilities across a range of industries could make similar changes. Below are examples of facilities, grouped by major industry category, that have improved safety and security by switching to less acutely hazardous alternatives.

Drinking Water and Wastewater

Some 114 wastewater facilities and 93 drinking water plants reported switching to less acutely hazardous chemicals. These facilities generally replaced chlorine gas with liquid chlorine bleach (sodium hypochlorite) or ultraviolet light. Some generate bleach on-site in a dilute solution. Some also replaced anhydrous sulfur dioxide with sodium bisulfite for removing chlorine after treating wastewater. Despite these improvements, approximately 1,150 wastewater facilities and 1,700 drinking water plants remain in the RMP program for extremely hazardous chemicals, primarily chlorine gas.

"When the Risk Management Plan was submitted, the off-site consequence analysis indicated that 5,000 people would be adversely affected if an accidental chlorine release occurred. So for the safety of the public and plant operators, the City switched to a non-hazardous substitute for chlorine gas."

–Director, McMinnville Wastewater Plant, McMinnville, Tenn.

From Chlorine Gas to Liquid Bleach

Some 166 respondents are water utilities that switched from chlorine gas to liquid bleach. Respondents frequently noted that liquid chlorine bleach is safer to work with than chlorine gas. Chemical costs tend to be higher for liquid bleach than chlorine gas, but overall costs are competitive when the full dangers and costs of safety and security are considered, according to respondents. More than 33 million people are no longer at risk of being exposed to toxic gas from these water utilities.

Hazards remain at the few facilities that manufacture the liquid bleach. Nonetheless, shipping chlorine gas to many locations is arguably more hazardous than securing a few manufacturing facilities in less populated areas. Other substitutes for chlorine gas, such as ultraviolet light or dilute bleach generated on-site, do not involve off-site chemical manufacturing and bulk storage.

Survey Examples

- City of Wilmington Water Pollution Control, Wilmington, Del., 560,000 people no longer at risk
- Middlesex County Utilities Authority, Sayreville, N.J., 10.7 million people no longer at risk
- Metropolitan Wastewater Treatment Plant, St. Paul, Minn., 520,000 people no longer at risk
- Nottingham Water Treatment Plant, Cleveland, Ohio, 1.1 million people no longer at risk
- Blue Plains Wastewater Treatment Plant, Washington, D.C., 1.7 people no longer at risk

From Chlorine Gas to Ultraviolet Light

Some 42 respondents switched from chlorine gas to ultraviolet light for water treatment, eliminating chemical danger to over 3.5 million people. The use of ultraviolet light also eliminates the hazards of transporting and working with chlorine gas.

More than 3,000 water facilities in the United States use ultraviolet light, primarily in wastewater treatment. More drinking water facilities are expected to use ultraviolet light, often in conjunction with other treatments, as a result of new EPA regulations to reduce disinfection byproducts and enhance surface water treatment.[33] Ultraviolet light and other options such as ozone are more effective than chlorine against certain biological agents such as anthrax that could contaminate drinking water. A multiple barriers approach, such as ultraviolet light and bleach with appropriate site security, has the best chance of preventing deliberate contamination of drinking water.[34]

Survey Examples

- White Slough Water Pollution Control Facility, Lodi, Calif., 606,500 people no longer at risk
- South Valley Water Reclamation Facility, West Jordan, Utah, 131,968 people no longer at risk
- R. M. Clayton WRC, Atlanta, Ga., 1.1 million people no longer at risk
- Stamford Water Pollution Control Facility, Stamford, Conn., 70,000 people no longer at risk
- Wyandotte Wastewater Treatment Facility, Wyandotte, Mich., 1.1 million people no longer at risk

From Chlorine Gas to Bleach Generated On-Site

A dozen survey respondents now treat water by generating bleach disinfectant on-site.[35] This practice eliminates bulk storage and transportation of hazardous chemicals. The process uses salt, water and electricity to produce a dilute bleach solution. Survey respondents noted that this dilute solution is even safer than the stronger bleach that many utilities receive by truck or rail. Generating bleach on-site virtually eliminates potential community and workplace exposure to toxic chemicals. An estimated 2,000 municipal drinking water systems now generate bleach on-site, with additional applications in wastewater, cooling towers and food processing.[36]

Survey Examples

- Ketchikan Chlorination Plant, Ketchikan, Alaska, 5,510 people no longer at risk
- Yorba Linda Water District, Placentia, Calif., 27,000 people no longer at risk
- LaVergne Water Treatment Plant, Lavergne, Tenn., 3,400 people no longer at risk
- East & West Site Water & Wastewater Facilities, Margate, Fla., 98,000 people no longer at risk
- Edison Filtration Plant and Well Field, South Bend, Ind., 18,815 people no longer at risk

From Chlorine Gas to Calcium Hypochlorite

One wastewater facility, **Town of Garner WWTP, Garner, N.C.,** reported switching from chlorine gas to calcium hypochlorite, a solid. This land-disposal facility spray-irrigates some 300 acres of hay fields with over a million gallons of treated wastewater each day. Calcium hypochlorite is less potentially harmful to soil than alternative sodium hypochlorite. Switching to calcium hypochlorite eliminates the risk of a chlorine gas leak to employees and 205 nearby residents.

Manufacturing

Some 18 manufacturing facilities reported process changes that reduced the danger of an off-site gas release. As a result, more than 1.5 million people are no longer threatened at these facilities. These manufacturers represent diverse industries and made an array of changes. Examples are provided below. Notably, the majority of these facilities reported neutral costs or anticipated cost savings from their changes. Roughly 2,300 non-food manufacturing facilities[37] are still regulated for extremely hazardous substances under the RMP program.

Cleaning Products

- **Manhattan Products, Carlstadt, N.J.,** manufactures household ammonia cleaners and other cleaning products. This mid-sized company switched from gaseous ammonia to liquid ammonia below RMP reportable thresholds. The switch involved altering pumps and material feed lines. This change created a safer workplace and eliminated the chance of a toxic release affecting any of 160,000 people who live within the facility's former vulnerability zone.

"The change to the ammonia solution results in an inherently safer workplace, and the chance of a toxic release affecting the public is negated."
–Regulatory Manager, Manhattan Products, Carlstadt, N.J.

- **The Proctor and Gamble Company, Alexandria Plant, Pineville, La.,** makes surfactants for detergents and dry laundry products. Previously, the company purchased oleum (fuming sulfuric acid) from another company. As part of a major plant upgrade, the facility installed a sulfur-burning unit that makes sulfur trioxide on demand for immediate use. This "just-in-time" production eliminated the need to transport and store large quantities of oleum. The new production method eliminated the danger of a chemical release to some 2,200 residents in the community, as well as to schools, churches and a Wal-Mart nearby.

Paper

- **SCA Tissue (formerly Wisconsin Tissue Mills), Menasha, Wis.,** is a large recycled paper mill that formerly used chlorine gas as a bleaching aid. The facility revamped the deinking process to use sodium hydrosulfite and hydrogen peroxide. This change significantly reduced workplace and community chemical hazards, while avoiding costs of complying with pollution rules, such as certain testing, sampling and permit reporting. Switching to different chemicals eliminated the danger of a chemical release to any of 210,000 people living within the facility's former vulnerability zone.

- **Wausau-Mosinee Paper Corporation, Brokaw, Wis.,** manufactures printing and writing paper. The mill switched from chlorine for bleaching pulp to an oxygen and hydrogen peroxide process. This change improved environmental security and safety by eliminating both the danger of a chlorine gas release and chlorine byproducts from waste streams. The change eliminated a chlorine gas vulnerability to an area containing 59,000 people.

- **Katahdin Paper (formerly Great Northern Paper), East Millinocket, Maine,** manufactures newsprint and telephone directory paper. Under new ownership, the mill eliminated chlorine gas and switched to chlorine bleach for treating incoming process water. The change eliminated a vulnerability zone of 3,200 nearby residents.

Glass

- **PPG Industries, Works No. 15, Fresno, Calif.,** manufactures flat glass used in windows and architectural applications. In 2000, the facility went from air natural gas combustion to oxygen natural gas combustion, called "oxyfuel." Using this different firing method eliminated the need for anhydrous ammonia in pollution control. The change was part of a larger $40 million upgrade that reduced nitrous oxide emissions to meet air quality requirements. In addition, the company realized improved manufacturing efficiency and product quality, while eliminating the danger anhydrous ammonia formerly posed to some 14,300 nearby residents.

- **AFG Industries, Victorville, Calif.,** a manufacturer of flat glass, formerly used an ammonia injection system to control nitrous oxide emissions. This system required storing anhydrous ammonia. To further reduce air emissions from glass furnaces, the company adopted a natural gas process (Pilkington 3R technology). The change eliminated a vulnerability zone of 82,000 people.

Circuit Board Manufacturing

- **Photocircuits Corporation, Glen Cove, N.Y**., manufactures printed circuit boards for use in computers, cars, phones and many other products. The facility formerly used chlorine gas in the copper etching process used to make circuit boards, but switched to sodium chlorate. This change reduced hazards to employees and eliminated an off-site vulnerability zone that encompassed 21,000 people.

- **Sanmina-SCI (formerly Hadco), Phoenix, Ariz.**, manufactures high-end printed circuit boards and switched from chlorine gas to sodium chlorate in a closed loop system that directly feeds the etching process. The change eliminated the threat of a gas release to employees and 4,000 Phoenix residents.

Food Products

- **Cargill, Inc. plants, Memphis, Tenn., and Eddyville, Iowa,** produce products such as corn oil, corn syrup and animal feed from corn. These plants formerly used anhydrous sulfur dioxide to soak and soften corn kernels in the corn-milling process. Both switched to the less hazardous—but still effective—sodium bisulfite as a replacement. This industry best practice eliminated off-site vulnerability to 19,000 people in Eddyville and 370,000 people in Memphis.

> *"Switching to the safer sodium bisulfite is a good best practice for the industry."*
>
> *–Environmental Manager, Cargill, Inc., Memphis, Tenn.*

- **Solae Company, dba DuPont Soy Polymers (formerly Protein Technologies International), Louisville, Ky.,** extracts protein from soybean flakes for use in products such as soy flours, concentrates and isolates. The facility formerly used anhydrous sulfur dioxide to bleach products, stabilize drying, and lower pH. To improve safety, Solae switched to sodium bisulfite, a less acutely hazardous chemical. The change improved the safety of more than 37,000 residents and others who work in Louisville.

Metal Products

- **Kaiser Aluminum Trentwood Works, Spokane, Wash**., is a large aluminum rolling mill. The facility formerly used large volumes of chlorine gas from 90-ton rail cars in fluxing operations that remove impurities from molten aluminum. Workers on the plant's safety and health committee and plant management became concerned with recurring chlorine leaks and injuries as well as corrosion of tools and infrastructure. After further investigation, the facility changed the fluxing process to a solid magnesium chloride salt injected with nitrogen gas. This change greatly improves worker safety, reduces maintenance costs and eliminates the danger of a major chlorine gas release to any of 137,000 nearby residents.

- **Henkel Surface Technologies, Calhoun, Ga.,** makes industrial coating products for cleaning and treating metal surfaces. The facility formerly used highly concentrated (70 percent) hydrofluoric acid. Henkel switched to less concentrated (less than 49 percent) hydrofluoric acid as a result of a company-wide safety policy. While still hazardous upon contact, less concentrated hydrofluoric acid in an aqueous solution is less volatile and does not readily form a toxic gas cloud that can drift off-site if released. The change eliminated a vulnerability zone that is home to 300 nearby residents.

- **The Ford Meter Box Company, Inc., Pell City, Ala.,** makes water utility equipment such as clamps and repair sleeves. The company formerly used hydrofluoric acid in a dip tank to clean and make the surface of metal parts less reactive for use in harsh environments underground. The company switched to a process that uses ammonium bifluoride to generate less hazardous hydrofluoric acid solution. This change eliminated a vulnerability zone encompassing 50 people.

Chemical Manufacturing

- **PVS Technologies, Augusta, Ga.,** manufactures ferric chloride, which is used in the water and wastewater treatment industries as a flocculent and coagulant. The manufacturing process uses chlorine gas, formerly delivered in 90-ton rail cars. The company eliminated rail cars from the site by constructing a direct pipeline to the chlorine producer, a nearby facility. Eliminating rail transportation removes the dangers of filling, moving, and unloading a large vessel, including more likely incidents such as transfer-hose failures as well as a potential worst-case rupture into an area encompassing 290,000 people.

- **Calgon Carbon Corporation, Neville Island Plant, Pittsburgh, Pa.,** produces activated carbon for use in respirators and other products. The company previously treated the carbon with aqueous ammonia that was produced on-site from anhydrous ammonia. The company

retained the same carbon treating process, but now starts with the aqueous ammonia. Savings on safety and security compliance offset slightly increased shipping costs. The change eliminated a vulnerability zone that formerly encompassed 120,000 people.

Electric Power Production

Eleven power plants reported switching to less acutely hazardous substances, eliminating previously reported off-site vulnerabilities to more than a million people. Examples of the various changes made are provided below. Electric power plants primarily report using anhydrous ammonia or aqueous ammonia in air pollution control equipment or chlorine gas to prevent fouling of cooling towers. Approximately 320 power plants are regulated under the RMP program.

From Anhydrous to Aqueous Ammonia

- **GWF Power Systems, Calif.,** produces electricity. At six California power plants, GWF formerly used anhydrous ammonia gas in air pollution control devices. GWF switched all six plants to aqueous ammonia below RMP thresholds as a safeguard to protect surrounding communities. Aqueous ammonia below RMP thresholds retains certain hazards, but is unlikely to form a gas cloud that can affect people off-site. (A less hazardous option than either gaseous or aqueous ammonia is dry urea, which allows power plants to generate ammonia on demand.) These six facilities combined formerly had more than 100,000 people living in their vulnerability zone areas.

> *"The conversion was considered a safeguard from impacting the communities in which we operate."*
>
> *–Director of Environment and Safety, GWF Power Systems, Calif.*

From Anhydrous to Solid Sulfur Dioxide

- **Wisconsin Power's Pulliam Plant, Green Bay, Wis.,** switched from anhydrous sulfur dioxide, used to capture particulates in pollution control equipment, to a safer solid form of the chemical. The change eliminated potential off-site injury to any of 180,000 people.

Eliminating Anhydrous Sulfur Dioxide

- **Xcel Energy's Arapahoe Station (formerly New Century Energies), Denver, Colo.,** retired two older power-generating units to reduce overall emissions as part of a larger voluntary regional air pollution agreement. These older units used anhydrous sulfur dioxide, which is not used in the currently operating units. This facility formerly reported 915,000 people living within range of an anhydrous sulfur dioxide gas release.

From Chorine Gas to Bleach

- **The Public Service Company of Oklahoma (PSO)** produces electricity. At three power plants, PSO switched from chlorine gas to chlorine bleach as a water treatment to prevent algae and fouling of cooling towers. Before making this simple change, these three facilities together endangered some 3,500 nearby residents in Oklahoma. Additional examples of the

same change include **Xcel Energy's Pawnee Station, Brush, Colo.,** with just 88 people in its former vulnerability zone, and **PPL Montana, Colstrip, Mont.,** which formerly threatened 1,400 people.

Pool Service

From Chlorine Gas to Chlorine Tabs or Liquid Bleach

Some swimming pool service companies switched from chlorine gas to chlorine tabs or liquid bleach. These facilities typically transferred chlorine gas from one-ton cylinders into 20-pound containers for use at residential pools. This transfer process could endanger people who live or work nearby. Using bleach or tabs eliminates any need for the pool service company to transfer chlorine gas out of one-ton cylinders. Some pools also may generate ozone or chlorine on-site, or use ionizers, further reducing transportation. One respondent noted that homeland security regulations now require background checks on drivers who handle chlorine gas. These background checks can take four to eight weeks, a significant impediment for a seasonal business. Such delays, along with increasingly strict regulatory requirements and concern for public safety, motivated the switch to bleach or tabs.

Survey Examples

- Nevada Chemical Company, Las Vegas, Nev., 60,000 people no longer at risk
- Blue Water Pool Chemical Company, Scottsdale, Ariz., 8,300 people no longer at risk
- RBD Enterprises dba Pure Water Pool Services, Austin, Texas, 4,800 people no longer at risk
- Splash Pool Chemicals, Las Vegas, Nev., 7,720 people no longer at risk
- CalChem Water Treatment, in Visalia, Fresno, and Modesto, Calif., combined 153,000 people no longer at risk

Hazardous Waste

Hazardous waste management facilities treat or dispose of a wide variety of chemical wastes generated by other industries. Two hazardous waste facilities responded to the survey; one reported changing processes and the other improved inventory accounting to store RMP chemicals only in lesser amounts. Approximately two-dozen or more RMP facilities still accept hazardous waste for incineration, treatment or disposal.

From Anhydrous Sulfur Dioxide and Chlorine Gas to Sodium Metabisulfite and Bleach

- **U.S. Filter Recovery Services, Roseville, Minn.,** treats and recovers industrial wastes that contain heavy metals and cyanide. This process involves precipitating toxic materials out of the wastes through chemical reactions. The facility formerly used anhydrous sulfur dioxide to treat chromium waste but switched to sodium metabisulfite. The facility formerly also used chlorine gas to treat cyanide wastes but switched to sodium hypochlorite (bleach). The changes were part of a larger reevaluation of business needs, costs and technologies. These and other changes eliminated the danger of a catastrophic chemical release to some 62,000 nearby residents.

Agricultural Ammonia

From Anhydrous Ammonia Gas to Liquid or Granular Fertilizers

More than 4,000 current RMP facilities supply agricultural chemicals, principally anhydrous ammonia for use as fertilizer. Many of these facilities are small and located in less populated areas. Two-dozen facilities reported eliminating anhydrous ammonia in favor of less acutely hazardous fertilizers. These facilities often already sold liquid nitrogen or dry urea fertilizers, the commonly reported alternatives. These alternate fertilizers eliminate the danger of an ammonia gas release to employees, customers and the general public. This change also cuts potential liability, eliminates the burden of complying with hazardous materials regulations and prevents siphoning from fertilizer tanks for illegal methamphetamine (meth) production.

No longer handling anhydrous ammonia (NH3) has "safety benefits for our employees, customers and general public because of health hazards if there was a sudden release. Theft of NH3 for use in illegal drug manufacturing has been eliminated."

–Manager, Leone Grain & Supply, Peru, Ill.

A number of respondents in this industry cited theft of anhydrous ammonia for illegal meth labs, a pervasive problem. One survey respondent reported that night cameras and automatic dialers to the state police generated 28 arrests over a two-year period at just one facility. Thieves also can cause emergency releases.[38] Common liquid or dry nitrogen fertilizers are not suitable for illegal meth production or for improvising explosives (such as the ammonium nitrate bomb used at the Oklahoma City federal building).

Survey Examples

- Battle Creek Farm Bureau Association, Climax, Mich., 2,500 people no longer at risk
- Helena Chemical Company, Mesquite, N.M., 12,659 people no longer at risk
- Lawhorn Farm Services, McCrory, Ark., 1,900 people no longer at risk
- Agro Distribution, Plainview, Texas, 7,500 people no longer at risk
- Robertsdale 142 (Royster-Clark), Robertsdale, Ala., 3,300 people no longer at risk

Oil Refineries

From Hydrofluoric Acid to Sulfuric Acid or Solid Acid Catalysts

The universe of surveyed facilities did not include any currently operating oil refineries that formerly used extremely hazardous toxic chemicals. Nonetheless, recent press reports have generated interest in intended changes announced by the Sunoco Philadelphia Refinery.[39] This refinery recently announced plans to switch from highly hazardous hydrofluoric acid to somewhat safer modified hydrofluoric acid. This change will substantially reduce the facility's vulnerability zone but still leave thousands of people—and downtown Philadelphia—in harm's way. Of the

148 petroleum refineries across the country, 50 use hydrofluoric acid, while the other 98 already use a safer alternative that does not endanger surrounding communities, such as sulfuric acid. An additional option, solid acid catalyst, eliminates the need to use either hydrofluoric acid or sulfuric acid—while eliminating chemical-release hazards to the public. This technology is currently in the demonstration phase in European refineries, and is commercially available, but inertia in the oil industry has so far prevented its use in the United States.[40]

Survey Examples: Additional Options for Improving Safety and Security

Switching to less acutely hazardous chemicals and processes is the first option for improving safety and security, as it is the only alternative that can eliminate the possibility of a toxic gas release. However, there may be cases where safer technologies are not readily available. In these cases, there are other options facilities can pursue that improve both safety and security. The Center for American Progress discussed some of these options in recommendations issued last year.[41]

This survey identified facilities that reduced the number of people in danger by consolidating multiple facilities to fewer locations or relocating to less populated areas. Such changes can produce significant safety and security benefits, but may still leave some people in danger of a toxic gas release.

Consolidating Locations

Consolidating operations to fewer locations can reduce the overall number of people in danger, but significant populations may still live within the vulnerability zones of consolidated locations. Companies reported consolidating for business efficiency reasons rather than, or in addition to, safety and security.

Among ammonia fertilizer suppliers, for example, consolidating or moving to more remote or more secure locations is relatively common. Tanks may move as customers' needs change. Ammonia tanks were often originally located at rail lines and terminals. Towns grew up around these rail hubs as well. Tanks may still be in town by the rail line even in cases where ammonia is now delivered by truck. Efficiency may be the main motivation for consolidating operations—it takes two deliveries to fill tanks in two places—but consolidating does reduce transfer operations and take some populations out of harm's way. Examples from the survey include **Producers Cooperative Association #2, Girard, Kan.**, with 2,900 people formerly in its vulnerability zone; and **Big Flag Farm Supply Gibbon Anhydrous, Gibbon, Neb**., with 1,968 people formerly in its vulnerability zone.

Below are other companies that reported consolidating to fewer but already existing locations.

- **Oregon Cherry Growers, Salem, Ore.,** consolidated cherry brining operations from populous locations in Salem, Oregon's capital city, to less populated eastern Oregon. Cherry brining uses anhydrous sulfur dioxide as a feedstock in preserving and firming cherries for year-round food processing. Transporting anhydrous sulfur dioxide is hazardous. (Producing sodium metabisulfite from sulfur dioxide generated on-site could eliminate this transportation hazard.) Nonetheless, consolidating operations improved business efficiency and eliminated a large vulnerability zone that encompassed 1.2 million people in Salem and surrounding areas.

- **Nalco Chemical Company Plant 1, Chicago, Ill.,** consolidated production of epichlorohydrin, dimethylamine and cyclohexylamine at other facilities. These other locations manufacture the chemicals into less hazardous polymers that are then distributed through this Chicago warehouse. This facility formerly had 870 people in its vulnerability zone.

- **Hill Brothers Chemical Co., Los Angeles, Ca.,** consolidated ammonia processing at two locations into one existing location. These facilities processed anhydrous ammonia into aqueous ammonia. The company ceased this operation at its downtown Los Angeles facility; a potential ammonia gas release formerly threatened 469,000 people at this site.

- **U.S. Steel Group—Fairless Works, Fairless Hills, Pa.,** formerly employed a process called "tin-free steel" manufacturing that used anhydrous sulfur dioxide to reduce chromium in wastewater. For business reasons unrelated to safety, the company entirely discontinued this process at Fairless Hills. Two other U.S. Steel plants, located in Indiana, already produced tin-free steel and never used sulfur dioxide for wastewater treatment, relying instead on sodium metabisulfite. While sodium metabisulfite is corrosive and can irritate the skin and eyes, it is much less dangerous than anhydrous sulfur dioxide in an emergency release. More than 200,000 people lived in the former vulnerability zone of the Fairless Hills facility.

Moving Locations

Facilities may also decide to relocate in safer or remote settings, farther from off-site populations. Some facilities can relocate more readily than others. For example, a chemical distributor may find a remote location less congested, but a wastewater treatment facility must be near the population it serves. (Some facilities may also buy-out and relocate nearby residents, a disruptive option for communities that is beyond the scope of this survey.)

- **Niklor Chemical Company, Inc.** moved from Carson, Calif., in Los Angeles County to a remote location near Mojave, Calif. The facility uses chlorine gas in processing and manufacturing. The move to Mojave eliminated the hazard to 3.5 million people around the Carson site and reduced chemical transportation through a busy metropolis.

Conclusion and Recommendations

This survey shows that many chemical facilities have made significant, cost-effective improvements in safety and security by switching to less acutely hazardous chemicals and processes. Millions of Americans are safer as a result of these changes.

Nonetheless, thousands of other facilities could make similar changes but have not done so. They continue to use high-hazard chemicals when safer alternatives are available. Nearly 3,000 drinking water and wastewater treatment plants, for example, still use chlorine gas instead of ultraviolet light or liquid bleach. Many of these plants sit near cities and towns.

Congress and the Bush administration have so far not required these facilities to evaluate and adopt readily available alternatives that eliminate the danger to communities, nor has the chemical industry set public goals to do so. As a result, millions of people remain unnecessarily vulnerable.

A catastrophic chemical release at just one of the nation's most dangerous facilities could kill, injure or sicken tens of thousands. Adopting less acutely hazardous chemicals or processes is the only *certain* way to protect the public from a toxic gas cloud.

Many facilities achieved significant safety and security improvements with relatively minor expenditures, and some reported cost savings. Nonetheless, many other facilities that could make similar improvements remain potential terrorist targets. Accordingly, the chemical industry and government should make conversion of high-hazard facilities to safer available technologies a national strategic priority. Specifically:

- Where safer alternative chemicals and processes are available, each chemical facility should establish a timeline and measurable goals to eliminate the possibility of a catastrophic chemical release into surrounding communities.
- Where safer chemicals or processes are not feasible, chemical facilities should develop other options, such as consolidating locations or moving to less populated areas.
- Congress should enact legislation that promotes systematic review and adoption of less acutely hazardous chemicals and processes. This legislation should authorize the Department of Homeland Security (DHS) and EPA to require high-hazard facilities to identify, evaluate and adopt safer alternatives that are feasible and cost effective.
- EPA and DHS should use existing authorities and resources to make it a general duty of high-risk facilities to review and switch to less acutely hazardous chemicals and processes, particularly in cases where similar facilities have already successfully done so.
- DHS should develop methodologies to evaluate the impact of different production technologies on a facility's security. These methodologies should identify savings, costs, hazards and the technical feasibility of alternatives.
- DHS should allocate homeland security grants, where necessary and appropriate, to convert priority facilities to safer technologies. In prioritizing funding for chemical plant security, reducing unnecessary chemical hazards should be the top concern.
- Congress and the administration should provide academic institutions and the National Institute for Standards and Technology resources to identify, research and provide technical assistance on substitutes for industrial applications of acutely toxic chemicals.
- Congress and the administration should fund training grants through the National Institute for Environmental Health Sciences to help facility employees identify and evaluate security and safety improvements afforded by safer technologies.

Facility Name**	City	State	Industry Type	Previous EHS Chemicals***	Change Made	Former Vulnerability Zone Population
Ketchikan Chlorination Plant	Ketchikan	AK	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	5,510
Sugar Creek Wastewater Treatment Plant	Alexander City	AL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	660
The Ford Meter Box Company, Inc.	Pell City	AL	Hardware manufacturing	Hydrofluoric acid (concentration >50%)	Switched to ammonium bifluoride treatment	50
Robertsdale, AL 142 [Royster-Clark]	Robertsdale	AL	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	3,300
Massard Wastewater Treatment Facility	Barling	AR	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	2,701
Berryville, City of-WWTP	Berryville	AR	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	4,000
Lawhorn Farm Services, Inc.	Mc Crory	AR	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	1,900
Goodyear 157th Ave. Wastewater Treatment Plant	Goodyear	AZ	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	200
Southeast Water Reclamation Plant	Mesa	AZ	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	2,400
Hadco Phoenix, Inc [now Sanmina-SCI]	Phoenix	AZ	Printed circuit board manufacturing	Chlorine gas	Switched to sodium chlorate etching	4,000
Blue Water Pool Chemical Company, Inc.	Scottsdale	AZ	Swimming pool treatment	Chlorine gas	Switched to chlorine tabs	8,300
Wilbur West Power Plant [GWF Power]	Antioch	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	36,000
Wilbur Avenue East Power Plant [GWF Power]	Antioch	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	22,000
Canyon Chlorination Facility	Azusa	CA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	5,000
Canyon Filtration Plant	Azusa	CA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	5,000
Tapia Water Reclamation Facility	Calabasas	CA	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to liquid bleach and sodium bisulfite	23,000
Niklor Chemical Company, Inc.	Carson	CA	Agricultural chemical manufacturing	Chlorine gas	Moved to less populated location	3,500,000
Joint Water Pollution Control Plant	Carson	CA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	210,000
CalChem Water Treatment	Fresno	CA	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	18,000
PPG Industries, Inc., Works No. 15, Fresno	Fresno	CA	Flat glass manufacturing	Ammonia (anhydrous)	Changed combustion process	14,312
Hanford Power Plant [GWF Power]	Hanford	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	2,200
3A Treatment Plant	Laguna Niguel	CA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	42,000
Regional Wastewater Facility	Lake Elsinore	CA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,070
White Slough Water Pollution Control Facility	Lodi	CA	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	606,505
Hill Brothers Chemical Co. - Los Angeles	Los Angeles	CA	Chemical product manufacturing	Ammonia (anhydrous) and ammonia (aqueous)	Consolidated EHS chemicals to another location	469,144
City of Merced Wastewater Treatment Facility	Merced	CA	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switched to liquid bleach and sodium bisulfite	68,270
CalChem Stanislaus County Inc.	Modesto	CA	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	55,000
CalOaks Pumping Station	Murietta	CA	Drinking water treatment	Chlorine gas	Switching to generating bleach on-site	4,200
Regional Plant #1	Ontario	CA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	350,000
Western Farm Service, Paso Robles	Paso Robles	CA	Farm supply	Ammonia (aqueous)	Sells alternate fertilizers	576

Loveridge Road Power Plant [GWF Power]	Pittsburg	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	55,000
East Third Street Power Plant [GWF Power]	Pittsburg	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	40,000
Nichols Road Power Plant [GWF Power]	Pittsburg	CA	Electric power generation	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	13,000
Yorba Linda Water District	Placentia	CA	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	27,000
Lake Mathews Reservoir	Riverside	CA	Drinking water treatment	Chlorine gas (occasional use)	Switched to liquid bleach chlorination	94,000
South Tahoe Public Utility District	South Lake Tahoe	CA	Wastewater treatment	Chorine gas	Switched to liquid bleach disinfection	27,000
D.C. Tillman Water Reclamation Plant	Van Nuys	CA	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to liquid bleach and sodium bisulfite	112,000
AFG Industries, Inc. - Victorville	Victorville	CA	Flat glass manufacturing	Ammonia (anhydrous)	Changed combustion process	82,364
CalChem Tulare County	Visalia	CA	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	80,000
Arvada Water Treatment Plant	Arvada	CO	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	23,878
Ralston Water Treatment Plant	Arvada	CO	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	23,878
Pawnee Station [Xcel Energy]	Brush	CO	Electric power generation	Chlorine gas	Switched to bleach anti-fouling	88
Arapahoe Station [Xcel Energy]	Denver	CO	Electric power generation	Sulfur dioxide (anhydrous)	Retired older power generation units	915,000
City of Golden Water Treatment Plant	Golden	CO	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	5,900
Clean Harbors of Connecticut, Inc.	Bristol	CT	Hazardous waste disposal	Phosphorus oxychloride and 19 other RMP chemicals	Improved inventory accounting	17,312
Mianus Water Treatment Plant-Aquarion Water Co.	Cos Cob	CT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	9,700
BHC Easton LakeTreatment Plant	Easton	CT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	26,000
Lake Gaillard Water Treatment Plant	North Branford	CT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	24,000
Stamford WPCF	Stamford	CT	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	70,000
BHC Stamford Water Treatment Plant	Stamford	CT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	30,000
City of West Haven Water Pollution Control Fac.	West Haven	CT	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	113,192
West River Water Treatment Plant	Woodbridge	CT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	29,000
Blue Plains Wastewater Treatment Plant	Washington	DC	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switched to liquid bleach and sodium bisulfite	1,700,000
City of Wilmington Water Pollution Control Fac.	Wilmington	DE	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	560,000
BSU Water Treatment Plant	Bonita Springs	FL	Drinking water treatment	Chlorine gas and ammonia (anhydrous)	Switched to liquid bleach; ammonia below threshold	300
Brennan Water Treatment Plant	Daytona Beach	FL	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	75
Hudson Wastewater Treatment Plant	Hudson	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	6,200
Buckman Water Reclamation Facility	Jacksonville	FL	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	360,000
Fairfax Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	57,000
Norwood Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	50,000
Arlington Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	45,000
McDuff Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	44,000
Lovegrove Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	30,000

Lakeshore Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	29,000
Main Street Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	29,000
River Oaks Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	28,000
Southwest Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	28,000
Highlands Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	18,000
Community Hall Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	17,000
Hendricks Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	17,000
Oakridge Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	15,000
Ridenour Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	15,000
Deerwood 3 Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	14,000
Marietta Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	12,000
Southeast Water Treatment Plant	Jacksonville	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	4,400
District II Water Reclamation Facility	Jacksonville	FL	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	3,000
Cypress Creek Pumping Station	Land O' Lakes	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	4,386
Lake Bridge Water Treatment Plant	Lutz	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	5,606
East & West Site Water & Wastewater Facilities	Margate	FL	Drinking water/wastewater treatment	Chlorine gas	Switched to generating bleach on-site	98,000
D. B. Lee Wastewater Treatment Facility	Melbourne	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	10,596
The City of Miramar East Water Treatment Plant	Miramar	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	35,000
Deer Park Wastewater Treatment Plant	New Port Richey	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	22,600
Embassy Hills Wastewater Treatment Plant	Newport Richey	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	7,900
City of North Port Water Treatment Plant	North Port	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	3,312
City of North Port Wastewater Treatment Plant	North Port	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,197
Water Reclamation Facility #1	Ocala	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	71
Water Reclamation Facility #2	Ocala	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	71
Eastern Regional Water Reclamation Facility	Orlando	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	576
R. Dwayne Huffman Reclaimed Water Plant	Port Orange	FL	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to liquid bleach disinfection	18,000
Northwest Regional WWTP	Sanford	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	4
Shady Hills Wastewater Treatment Plant	Spring Hill	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	2,900
Greater Pine Island Reverse Osmosis WTP	St. James City	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	290
City of Venice R. O. Water Treatment Plant	Venice	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	5,993
T. Mabry Carlton Water Treatment Facility	Venice	FL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	2,200
Wesley Center Wastewater Treatment Plant	Wesley Chapel	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	2,500
Polk County Central Regional WWTF	Winter Haven	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	14,316
Southeast Wastewater Treatment Plant	Zephyrhills	FL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	970

R. M. Clayton WRC	Atlanta	GA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,151,993
PVS Technologies, Inc. (Augusta)	Augusta	GA	Inorganic chemical manufacturing	Chlorine gas	Changed to pipeline delivery of chlorine	290,000
Henkel Surface Technologies	Calhoun	GA	Surface active agent manufacturing	Hydrofluoric acid (concentration >50%)	Changed to less concentrated hydrofluoric acid	320
Naval Submarine Base (NSB) Kings Bay	Kings Bay	GA	Drinking water/wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	652
Tybee Island Wastewater Treatment Plant	Tybee Island	GA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	2,000
Brewer Environmental Industries, LLC - Kahului	Kahului	HI	Warehousing and storage	Ammonia (anhydrous)	Handles aqueous ammonia	1,000
Brewer Environmental Industries, LLC - Port Allen	Liheu	HI	Warehousing and storage	Ammonia (anhydrous)	Handles aqueous ammonia	500
Eagle Point Water Plant	Dubuque	IA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	59,459
Cargill, Inc.	Eddyville	IA	Corn milling	Sulfur dioxide (anhydrous)	Switched to liquid sodium bisulfite	19,000
Hull Cooperative Association - NH3	Hull	IA	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	2,152
West Des Moines Water Works	West Des Moines	IA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	87,874
City of Boise- West Boise WWTP	Boise	ID	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	6,000
Nalco Chemical Company -- Plant 1	Chicago	IL	Chemical warehousing	Epichlorohydrin, cyclohexylamine, dimethylamine	Consolidated EHS production to another location	870
City of Elmhurst Wastewater Treatment Plant	Elmhurst	IL	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	100,000
Moline Water Treatment Plant	Moline	IL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	198,871
Springbrook Water Reclamation Center	Naperville	IL	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switched to liquid bleach disinfection	4,830
Leone Grain & Supply, Inc.	Peru	IL	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	250
Wilmette Water Plant	Wilmette	IL	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	50,000
Helena Chemical Company	Goshen	IN	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	12,315
White River Water Treatment Plant	Indianapolis	IN	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	968,579
Fall Creek Water Treatment Plant	Indianapolis	IN	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	771,633
Jasper Wastewater Treatment Plant	Jasper	IN	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	7,000
Lebanon Plant Food and Petroleum	Lebanon	IN	Farm supply	Ammonia (anhydrous)	Stores alternate fertilizers	4,368
Edison Filtration Plant and Well Field	South Bend	IN	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	18,815
Olive St. Well Field	South Bend	IN	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	14,158
Flint Lake Treatment Plant 2	Vallparaiso	IN	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	1,523
Producers Cooperative Association #2	Girard	KS	Farm supply	Ammonia (anhydrous)	Consolidated EHS chemicals to another location	2,900
Norcatur - NH3 Plant	Norcatur	KS	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	190
Topeka KS - N. Topeka Wastewater Treatment Plant	Topeka	KS	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switching to liquid bleach disinfection	39,000
Big Creek Fertilizer, Inc.	Wakeeney	KS	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	2,500
Sewage Treatment Plant No. 2	Wichita	KS	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	18,000
Dry Creek Wastewater Treatment Plant	Erlanger	KY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	5,900
Fort Thomas Filtration Plant	Fort Thomas	KY	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	47,706
Franklin Water Treatment Plant	Franklin	KY	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	3,100
London Wastewater Treatment Plant	London	KY	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	18,238

Protein Technologies International [now Solae/DuPont]	Louisville	KY	Adhesive manufacturing	Sulfur dioxide (anhydrous)	Switched to liquid sodium bisulfite	37,153
Waste Water Treatment Plant, West	Owensboro	KY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	90,000
RWRA East Wastewater Treatment Plant	Owensboro	KY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	27,750
Jefferson Parish East Bank WWTP	Harahan	LA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	790,000
The Procter & Gamble Mfg. Company-Alexandria Plant	Pineville	LA	Soap and detergent manufacturing	Oleum (fuming sulfuric acid)	Changed to just in time sulfur trioxide	2,200
City of Attleboro Wastewater Treatment Plant	Attleboro	MA	Wastewater treatment	Chlorine gas	Switched to liquid bleach and sodium bisulfite	67,026
Lowell Regional Water Utility Intake Station	Lowell	MA	Drinking water treatment	Chlorine gas	Switched to generating chlorine dioxide on-site	7,552
Wyman-Gordon Company North Grafton Plant	North Grafton	MA	Forging	Hydrofluoric acid (concentration >50%)	Changed to less concentrated hydrofluoric acid	400
Back River Wastewater Treatment Facility*	Baltimore	MD	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,470,000
Ashburton Filtration Plant	Baltimore	MD	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	338,837
Broadwater Water Reclamation Facility	Churchton	MD	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switched to ultraviolet light disinfection	5,000
Patuxent Water Reclamation Facility	Crofton	MD	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switched to ultraviolet light disinfection	25,000
Great Northern Paper, Inc. [now Katahdin Paper]	East Millinocket	ME	Paper mill	Chlorine gas	Switched to liquid bleach process water treatment	3,200
Monson Companies, Inc.	South Portland	ME	Chemical product wholesale	Chlorine gas, sulfur dioxide (anhydrous), ammonia (anhydrous)	Provided no details	75,000
City of Adrian, MI - Water Treatment Plant	Adrian	MI	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	25,922
Battle Creek Farm Bureau Association	Climax	MI	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	2,500
CBPU Waste Water Treatment Plant	Coldwater	MI	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	0
City of Monroe Water Filtration Plant	Monroe	MI	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	18,000
Petoskey Wastewater Treatment Plant	Petoskey	MI	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,900
Pigeon Anhydrous Ammonia Site	Pigeon	MI	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	1,250
Wyandotte Wastewater Treatment Facility	Wyandotte	MI	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,100,000
Ypsilanti Community Ultilities Authority	Ypsilanti	MI	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	10,613
Zeeland Farm Services	Zeeland	MI	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	4,500
Cottage Grove Wastewater Treatment Plant	Cottage Grove	MN	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	3,100
Metropolitan Council - Empire WWTP*	Farmington	MN	Wastewater treatment	Sulfur dioxide (anhydrous) and chlorine gas	Switching to ultraviolet light disinfection	1,664
Metropolitan Council - Hastings WWTP	Hastings	MN	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	11,504
Metropolitan Council - Rosemount WWTP*	Rosemount	MN	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	351
US Filter Recovery Services Inc.	Roseville	MN	Hazardous waste disposal	Chlorine gas and sulfur dioxide (anhydrous)****	Switched to sodium metabisulfite and liquid bleach	62,000
Metropolitan Wastewater Treatment Plant*	St. Paul	MN	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switching to liquid bleach and sodium bisulfite	520,000
Van Waters & Rogers Inc.	Berkeley	MO	Chemical product wholesale	Hydrofluoric acid (concentration >50%)	Changed to less concentrated hydrofluoric acid	0
Liberty Water Treatment Plant	Liberty	MO	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	2,250

Maryville Water Treatment Plant	Maryville	MO	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	6,850
Tallahatchie Farmers Supply, Inc.	Charleston	MS	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	78
WWTP #2	Laurel	MS	Wastewater treatment	Chlorine gas	Switched to ultraviolet light/less chlorine	800
Laurel WWTP #1	Laurel	MS	Wastewater treatment	Chlorine gas	Switched to ultraviolet light/less chlorine	500
City of Vicksburg, Water Treatment Facility	Vicksburg	MS	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	3,417
PPL Montana	Colstrip	MT	Electric power generation	Chlorine gas	Switched to bleach anti-fouling	1,400
Havre Water Plant	Havre	MT	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	10,000
Ed Thomas Water Treatment Plant	Burlington	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	8,400
Sugar Creek Wastewater Treatment Plant	Charlotte	NC	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	13,200
Irwin Creek Wastewater Treatment Plant	Charlotte	NC	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	4,700
Williams Water Treatment Plant	Durham	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	9,800
Brown Water Treatment Plant	Durham	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	1,400
A.B.Uzzle, Jr. Water Plant	Erwin	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	3,100
Cross Creek Water Reclamation Facility	Fayetteville	NC	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	0
Rockfish Creek Water Reclamation	Fayetteville	NC	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	0
Town of Garner WWTP Facility	Garner	NC	Wastewater treatment	Chlorine gas	Switched to solid calcium hypochlorite	205
City of Kannapolis Water Treatment Plant	Kannapolis	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	12,770
City of Lincolnton Waste Water Treatment Plant	Lincolnton	NC	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	5,000
City of Sanford Water Treatment Plant	Sanford	NC	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	72
Big Flag Farm Supply Gibbon-Anhydrous	Gibbon	NE	Farm supply	Ammonia (anhydrous)	Consolidated EHS chemicals to another location	1,968
78th & Harrison Pump Station	Lavista	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	60,000
Walnut Hill Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	104,000
Turner Boulevard Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	93,000
36th & Edna Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	59,000
132nd & Harney Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	39,000
Maple Road Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	17,000
Rainwood Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	11,000
Skyline Pump Station	Omaha	NE	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	2,700
D & D Fertilizer - Auxiliary Storage	Weeping Water	NE	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	1,750
Manhattan Products, Inc.	Carlstadt	NJ	Cleaning compound manufacturing	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	160,000
Edward P. Decher Secondary Wastewater Trmt. Plant	Elizabeth	NJ	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	50,000
Middlesex County Utilities Authority	Sayreville	NJ	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	10,740,000
Little Falls Water Treatment Plant	Totowa	NJ	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	430,000
Helena Chemical Company, Mesquite, NM Facility	Mesquite	NM	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	12,659
Agro Distribution LLC - Vado	Vado	NM	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	800

Nevada Chemical Company	Las Vegas	NV	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	60,000
Splash Pool Chemicals Inc.	Las Vegas	NV	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	7,720
Truckee Meadows Water Reclamation Facility	Reno	NV	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	113,000
ECSD #2 - Big Sister Creek WWTP	Angola	NY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	8,789
City of Auburn Water Purification Plant	Auburn	NY	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	8,500
Erie County Southtowns WWTP	Buffalo	NY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	32,983
Photocircuits Corporation	Glen Cove	NY	Printed circuit board manufacturing	Chlorine gas	Switched to sodium chlorate etching	21,000
ECSD #6 - Lackawanna WWTP	Lackawanna	NY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	54,157
Hewitt Brothers, Inc.	Locke	NY	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	300
City of Niagara Falls Wastewater Treatment Plant	Niagara Falls	NY	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,100,000
Poughkeepsies' Water Treatment Facility	Poughkeepsie	NY	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	15,907
Oneida County Water Pollution Control Plant	Utica	NY	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to liquid bleach disinfection	13,500
City of Bowling Green Water Treatment	Bowling Green	OH	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	580
Mill Creek WWTP	Cincinnati	OH	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	860,000
Nottingham Water Treatment Plant	Cleveland	OH	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	1,100,000
Baldwin Water Treatment Plant	Cleveland	OH	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	38,300
Helena Chemical Company	Coldwater	OH	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	7,962
Jackson Pike Wastewater Treatment Plant	Columbus	OH	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	57,000
East Liverpool Water Department	East Liverpool	OH	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	25,500
Akron Water Supply Plant	Kent	OH	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	411,356
Middletown Wastewater Treatment Plant	Middletown	OH	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	21,000
Maumee River Wastewater Treatment Plant	Waterville	OH	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,500
Xenia Ford Road Wastewater Treatment Plant	Xenia	OH	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	6,510
PSO Southwestern Station	Anadarko	OK	Electric power generation	Chlorine gas	Switched to bleach anti-fouling	600
PSO Riverside Power Station	Jenks	OK	Electric power generation	Chlorine gas	Switched to bleach anti-fouling	1,700
City of Lawton Water Treatment Plant	Medicine Park	OK	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	500
PSO Northeastern Station	Oologah	OK	Electric power generation	Chlorine gas	Switched to bleach anti-fouling	1,200
Western Farm Service, LaGrande	Lagrande	OR	Farm supply	Ammonia (aqueous)	Sells alternate fertilizers	131
City of Myrtle Creek Wastewater Treatment Plant	Myrtle Creek	OR	Wastewater treatment	Chlorine gas	Switched to ultraviolet light and liquid bleach	7,200
Columbia Boulevard Wastewater Treatment Plant	Portland	OR	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	157,500
Oregon Cherry Growers, Inc. - Salem	Salem	OR	Fruit and vegetable canning	Sulfur dioxide (anhydrous)	Consolidated EHS chemicals to another location	1,200,000
Oregon Cherry Growers- Sigland Receiving Station	Salem	OR	Fruit and vegetable canning	Sulfur dioxide (anhydrous)	Consolidated EHS chemicals to another location	47,400
Matsunk Water Pollution Control Center	Bridgeport	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	14,361

Easton Area Joint Sewer Authority WPCF	Easton	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	8,735
U.S. Steel Group - Fairless Works	Fairless Hills	PA	Steel mill	Sulfur dioxide (anhydrous)	Closed process; consolidated in other facilities	210,000
Northeast Water Pollution Control Plant	Philadelphia	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,575,971
Southeast Water Pollution Control Plant	Philadelphia	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	1,182,741
Samuel S. Baxter Water Treatment Plant	Philadelphia	PA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	787,271
Calgon Carbon Corp. Neville Island Plant	Pittsburgh	PA	Inorganic chemical manufacturing	Ammonia (anhydrous)	Switched to aqueous ammonia below thresholds	120,000
Joint Municipal Authority of Wyomissing Valley	Reading	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	64,000
St. Marys Wastewater Treatment Plant	St. Marys	PA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	770
Williamsport Sanitary Authority - West Plant	Williamsport	PA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	38,000
Quonset Point Wastewater Treatment Facility	North Kingstown	RI	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	12,200
Warwick Wastewater Treatment Facility	Warwick	RI	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	100
City of Bishopville Wastewater Treatment Facility	Bishopville	SC	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,300
Plum Island WWTP	Charleston	SC	Wastewater treatment	Chlorine gas	Switched to generating bleach on-site	7,500
Middle Branch WWTP	Easley	SC	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	137
City of Johnsonville Wastewater Treatment Plant	Johnsonville	SC	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	2,600
City of Aberdeen Wastewater Treatment Plant	Aberdeen	SD	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	15,000
Tabor Lumber Coop	Tabor	SD	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	490
Wastewater Treatment Plant	Yankton	SD	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	10,000
Jonesborough Water Treatment Plant	Jonesborough	TN	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	3,000
LaVergne Water Treatment Plant	Lavergne	TN	Drinking water treatment	Chlorine gas	Switched to generating bleach on-site	3,400
McMinnville Wastewater Plant	Mcminnville	TN	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	5,000
Warren County Utility District Water Treat. Plant	Mcminnville	TN	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	1,200
Cargill, Inc.	Memphis	TN	Corn milling	Sulfur dioxide (anhydrous)	Switched to liquid sodium bisulfite	370,000
Newport Utilities Board Wastewater Treatment Plant	Newport	TN	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	9,595
RBD Enterprises DBA Pure Water Pool Service	Austin	TX	Swimming pool treatment	Chlorine gas	Switched to liquid bleach	4,800
Lakeway MUD - Wastewater Treatment Plant S-4	Lakeway	TX	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	576
Helena Chemical Company, Pearsall Facility	Pearsall	TX	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	253
Agro Distribution LLC - Plainview	Plainview	TX	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	7,500
Seabrook Wastewater Treatment Plant	Seabrook	TX	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	61,036
Wastewater Treatment Plant	Sherman	TX	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	2,800
Water Treatment Plant #3	Layton	UT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	4,125
Water Treatment Plant #2	Ogden	UT	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	8,475

South Valley Water Reclamation Facility	West Jordan	UT	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light disinfection	131,968
Kenneth B. Rollins Memorial Water Filtration Plant	Leesburg	VA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	6,000
Town of South Hill Regional WWTP	South Hill	VA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	260
Ni River Water Treatment Plant	Spotsylvania	VA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	1,884
Smith Lake Water Treatment Facility	Stafford	VA	Drinking water treatment	Chlorine gas	Switched to liquid bleach disinfection	17,000
City of St. Albans Wastewater Treatment Facility	St. Albans	VT	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to liquid bleach and sodium bisulfite	3,500
City of Edmonds Wastewater Treatment Plant	Edmonds	WA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	8,800
Central Kitsap Tr. Plant	Poulsbo	WA	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	8,330
Lemolo Chlorine Station, L.S. 96	Poulsbo	WA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	3,453
South Treatment Plant*	Renton	WA	Wastewater treatment	Chlorine gas	Switched to liquid bleach disinfection	650,000
Kaiser Aluminum & Chemical Corp. - Trentwood Works	Spokane	WA	Aluminum rolling mill	Chlorine gas	Switched to magnesium chloride fluxing	137,000
City of Walla Walla Wastewater Treatment Facility	Walla Walla	WA	Wastewater treatment	Chlorine gas and sulfur dioxide (anhydrous)	Switched to ultraviolet light and on-site bleach	5,200
Wisconsin River Agronomy LLC - Adams Plant	Adams	WI	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	4,491
Wausau-Mosinee Paper Corporation (Brokaw, WI)	Brokaw	WI	Pulp and paper mill	Chlorine gas	Switched to oxygen and peroxide bleaching	59,000
Wisconsin Public Service Corp, Pulliam Power Plant	Green Bay	WI	Electric power generation	Sulfur dioxide (anhydrous)	Changed to solid sulfur dioxide	180,000
Fertilizer Plant -- Kiel	Kiel	WI	Farm supply	Ammonia (anhydrous)	Sells alternate fertilizers	924
Wisconsin River Agronomy LLC - Mauston Dry Plant	Mauston	WI	Farm supply	Ammonia (anhydrous)	Consolidated EHS chemicals to another location	5,060
Wisconsin Tissue Mills, Inc. [now SCA Tissue]	Menasha	WI	Paper mill	Chlorine gas	Hydrogen peroxide and sodium hydrosulfite bleaching	210,000
Crow Creek Wastewater Facility	Cheyenne	WY	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	1,492
Dry Creek Wastewater Facility	Cheyenne	WY	Wastewater treatment	Chlorine gas	Switched to ultraviolet light disinfection	477

* Facility is still registered under Risk Management Planning program or is in the process of deregistering.

** Except where noted in brackets, facility names appear as formerly registered under EPA's Risk Management Planning program. Current facility names may have changed.

*** Except where otherwise noted, the first chemical listed is the basis chemical from which the facility calculated its vulnerability zone population.

**** Facility used anhydrous ammonia when calculating its vulnerability zone population.

Appendix B – Methodology

The survey consisted of a cover letter and response form (Appendix C). The response form was designed to enable a knowledgeable person to respond in a few minutes. The Center for American Progress mailed the survey to some 1,800 facilities that had deregistered from EPA's Risk Management Planning (RMP) program as of Nov. 1, 2005. These 1,800 facilities were able to deregister from the RMP program because they no longer used extremely hazardous substances above threshold amounts.

An additional 800 facilities had deregistered from the RMP program, but were not included in the survey because their reasons for deregistering were unlikely to be related to less acutely hazardous chemicals or processes—for example if a facility terminated business operations.[42] Another 165 deregistered facilities (EPA's "Program 1" facilities) were not included in the survey because they had not reported potential off-site consequences or recent accidents.

Some 615 surveys proved to be undeliverable at a facility's last reported address. This was not unexpected, since many deregistered facilities have closed. Since June 2004, EPA has required facilities to indicate why they are deregistering, but the agency did not require that information during the first five years of the reporting program from June 1999 to May 2004. Thus, it was not known which facilities that deregistered during this period had closed.

A total of 115 facilities completed the survey by mail or fax. Follow-up calls to approximately 400 facilities by the Center for American Progress, National Association of State PIRGs, National Environmental Trust and the survey author generated an additional 221 responses. Callers found at least 80 of these facilities had closed and many others were unreachable. A follow-up emailing netted an additional eight responses. Eleven facilities completed the survey that deregistered from the RMP program after Nov. 1, 2005 or that plan to deregister in the near future. An additional 25 facilities were included in the survey based on having reported safer technology information to EPA or other sources. Of the facilities surveyed, 284 reported using less acutely hazardous chemicals or processes (Appendix A).

Appendix C – Survey Cover Letter and Response Form

Center for American Progress

1333 H Street, NW, 10th Floor
Washington, DC 20005
Tel: 202 682.1611 • Fax: 202 682.1867

www.americanprogress.org

December 8, 2005

Attn: {RMP Contact}
{Facility Name}
{Facility Street 1}
{Facility Street 2}
{Facility City}, {State} {Zip}

Dear {RMP Contact} or Facility Manager:

The Center for American Progress invites your response to a brief survey to identify successes in American industry on an important national priority: preventing the possibility of a sudden spill or terrorist release of hazardous chemicals into American communities.

You are receiving this survey because your facility formerly reported under the EPA's Risk Management Plan (RMP) program but no longer reports storing threshold amounts of an extremely hazardous substance.

We are interested if you have adopted less acutely hazardous chemicals or processes. For example, many wastewater plants have switched from chlorine gas to chlorine bleach or other safer alternatives. We intend to recognize companies that have successfully reduced or eliminated catastrophic chemical release hazards. However, the survey report won't use facility or company names if you request that we not use them.

This survey does not seek and will not publish information about site security measures. The survey covers substances that your facility formerly reported under the RMP program, but you may provide information about measures to reduce hazards of additional acutely hazardous chemicals if appropriate.

Your answers to the questions on the attached page will help us document and recognize progress in reducing chemical dangers in American communities.

If you have any questions, feel free to contact Paul Orum at 202-548-4020.

We greatly appreciate your response, and will be glad to provide you a completed survey report if you request.

Sincerely,

Reece Rushing
Associate Director for Regulatory Policy
Center for American Progress

Progressive Ideas for a Strong, Just and Free America

Survey of American Progress: Chemical Security
December 2005

You may mail your completed survey to Center for American Progress,
1333 H Street, NW - 10th Floor; Washington, DC 20005,
or fax to the attention of Reece Rushing at 202-682-1867 (fax).

Please provide any necessary corrections:

Attn: {RMP Contact}, {RMP Contact Title}
{Facility Name}
{Facility Street 1}
{Facility Street 2}
{Facility City}, {State} {Zip}
EPA Facility Identifier: {EPA Facility Identifier}
Facility phone: {Facility Phone}, Operator phone: {Operator Phone}
Operator name: {Operator Name}

Respondent's name: _____ Job title: _____

Phone: _____ Email: _____

1) Please tell us why your facility is no longer covered by the chemical Risk Management Plan (RMP) program:

[ ] Facility switched to less acutely hazardous chemicals or processes.
[ ] Facility terminated operations.
[ ] Facility changed business activities.
[ ] Facility reduced RMP substance below thresholds.
[ ] Facility is otherwise not covered by RMP program.
[ ] Other: _____

If your facility is no longer covered by the RMP program because it switched to less acutely hazardous chemicals or processes, please respond to the following.

2) Briefly describe the changes you made.

(Page 1 of 2, Continued…)

(Survey of American Progress: Chemical Security, Page 2 of 2)

3) Why did you decide to make these changes? Check all that apply.

[ ] Concern over terrorism and improved security.
[ ] Concern over an accidental chemical release and improved safety.
[ ] Projected cost savings.
[ ] Legal or regulatory requirements.
[ ] Improved operations efficiency or business opportunities.
[ ] Meeting community expectations.
[ ] Other (please explain):

4) How much did it cost to make these changes?

[ ] Less than $ 100,000
[ ] Between $ 100,000 and $1 million
[ ] Between $ 1 million and $10 million
[ ] Between $ 10 million and $ 20 million
[ ] More than $ 20 million

Do you expect these changes to result in cost savings and/or improved profitability?
[ ] Yes [ ] No

5) Please provide any additional information that you think would be helpful in interpreting these changes at your facility (e.g., health and safety or other benefits).

Appendix D – Dangers of Selected Extremely Hazardous Substances

AMMONIA (ANHYDROUS)
Ammonia is a corrosive colorless gas with a strong odor. It is used in making fertilizer, plastics, dyes, textiles, detergents and pesticides. Acute ammonia exposure can irritate the skin; burn the eyes, causing temporary or permanent blindness; and cause headaches, nausea and vomiting. High levels can cause fluid in the respiratory system (pulmonary or laryngeal edema), which may lead to death. Chronic exposure damages the lungs; repeated exposure can lead to bronchitis with coughing or shortness of breath.

CHLORINE
Chlorine is a greenish-yellow gas with a strong, irritating odor. It is used in making other chemicals, as a disinfectant, in bleaching and for purifying water and sewage. Acute exposure can severely burn the eyes and skin, causing permanent damage, and may cause throat irritation, tearing, coughing, nose bleeds, chest pain, fluid build-up in the lungs (pulmonary edema) and death. Chronic exposure can damage the teeth and irritate the lungs, causing bronchitis, coughing and shortness of breath. A single high exposure can permanently damage the lungs.

EPICHLOROHYDRIN
Epichlorohydrin is a reactive colorless liquid with a slightly irritating, chloroform-like odor. It is used to make plastics, resins and glycerin. Acute exposure to epichlorohydrin vapor irritates the eyes, nose, bronchial tubes and lungs. High levels can chemically burn the lungs or cause dangerous fluid build-up, which may lead to death. Eye contact may cause permanent damage, and skin contact can cause painful blistering which may be delayed in onset for minutes or hours. Chronic exposure can damage the kidneys, liver and lungs. Epichlorohydrin is a probable human carcinogen and may decrease fertility in males.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID)
Hydrogen chloride is a corrosive colorless to slightly yellow gas with a strong odor. It is used in metal processing, analytical chemistry, and in making other chemicals. Acute exposure to hydrogen chloride can cause severe burns of the skin and eyes, leading to permanent damage and blindness. Breathing hydrogen chloride vapor irritates the mouth, nose, throat and lungs, causing coughing, shortness of breath, fluid build-up in the lungs (pulmonary edema) and possibly death. Chronic exposure damages the lungs and may erode the teeth.

HYDROGEN FLUORIDE (HYDROFLUORIC ACID)
Hydrogen fluoride is a corrosive colorless fuming liquid or gas with a strong irritating odor. It is used in etching glass and in making other chemicals, including gasoline. Breathing the vapor causes extreme respiratory irritation (with cough, fever, chills and tightness) that may be fatal. Contact can severely burn the skin and eyes, resulting in permanent eye damage or blindness. Long-term exposure may damage the liver and kidneys, and causes fluorosis, with symptoms of weight loss, malaise, anemia and osteosclerosis.

SULFUR DIOXIDE (ANHYDROUS)
Sulfur dioxide is a colorless gas with a sharp pungent odor. It may be shipped and stored as a compressed liquefied gas. Sulfur dioxide is used in the manufacture of sulfuric acid, sulfur

trioxide and sulfites; in solvent extraction; and as a refrigerant, among other uses. Acute exposure irritates the eyes and air passages. High exposures to the skin and eyes can cause severe burns and blindness, and breathing high levels can lead to permanent lung damage and death.

SULFUR TRIOXIDE

Sulfur trioxide is a corrosive colorless liquid that fumes in the air forming sulfuric acid vapor or mist. Its health effects in the air are essentially those of sulfuric acid (and are similar to sulfur dioxide and to oleum). Sulfur trioxide vapor can severely irritate and burn the skin, eyes, throat and lungs. Eye damage can include blindness. Breathing the vapor can lead to choking, spasm and pulmonary edema. Exposure can cause bronchitis, emphysema and permanent lung damage.

Endnotes

1 Vulnerability zone figures are residential populations at risk, not forecasts of potential casualties.

2 James Belke, U.S. Environmental Protection Agency, Chemical Accident Risks in U.S. Industry—A Preliminary Analysis of Accident Risk Data from U.S. Hazardous Chemical Facilities (Sept. 25, 2000).

3 Congressional Research Service, CRS Analysis of EPA RMP*National Database, requested by Congressman Edward Markey (May 2005). The number of facilities with over 10,000 people at risk may be as many as 2,841.

4 Cutting catastrophic hazards is not the same as absolute safety or "zero risk." However, at these facilities, no failure in safety or security can lead to the release of a major toxic gas cloud.

5 The survey includes five facilities that eliminated a significant chemical hazard but remain registered under the RMP program (see notes to Appendix A).

6 Facilities that reduced chemicals below RMP reporting thresholds were not included in this report unless they also changed to a less acutely hazardous chemical or process. When used below RMP thresholds, extremely hazardous substances in some cases still pose serious hazards.

7 Department of Homeland Security, Press Release: Statement by the Department of Homeland Security on Continued Al-Qaeda Threats (Nov. 21, 2003).

8 U.S. Department of Justice, Assessment of the Increased Risk of Terrorist or Other Criminal Activity Associated With Posting Off-site Consequence Analysis Information on the Internet (April 18, 2000); and, U.S. Department of Justice, A Method to Assess the Vulnerability of U.S. Chemical Facilities, National Institute of Justice (November 2002).

9 U.S. General Accounting Office, GAO-03-439, Homeland Security: Voluntary Initiatives Are Under Way at Chemical Facilities, but the Extent of Security Preparedness is Unknown (March 14, 2003); and, U.S. Government Accountability Office, GAO-06-150, Homeland Security: DHS is Taking Steps to Enhance Security at Chemical Facilities but Additional Authority is Needed (January 2006).

10 U.S. Environmental Protection Agency, Strategic Plan for Homeland Security (September 2002).

11 Agency for Toxic Substances and Disease Registry, Industrial Chemicals and Terrorism: Human Health Threat Analysis, Mitigation and Prevention (1999); and Agency for Toxic Substances and Disease Registry, Terrorist Use of Expedient Chemical Agents: Health Risk Assessment and Las Vegas Case Study, (1997).

12 Eric Pianin, *Study Assesses Risk of Attack on Chemical Plant*, The Washington Post, March 12, 2002.

13 Testimony of Dr. Jay Boris of the Naval Research Laboratory before the Committee on Public Works and the Environment of the Council of the District of Columbia, Jan. 23, 2004.

14 Brookings Institution, Protecting the American Homeland (March 2002).

15 RAND Corporation, Toxic Warfare, 2002.

16 Paper, Allied-Industrial, Chemical and Energy Workers International Union, PACE International Union Survey: Workplace Incident Prevention and Response Since 9/11, Paper, Oct. 27, 2004. PACE is now part of United Steelworkers.

17 Center for Strategic and International Studies, News Release: Chemical Facilities Vulnerable (Dec. 23, 2003).

18 Working Group on Community Right-to-Know, Chemical Plant Security Breaches in the News (January 2006).

19 Linda Greer for the Center for American Progress, New Strategies to Protect America: Securing our Nation's Chemical Facilities (April 6, 2005).

20 Environmental Defense, Eliminating Hometown Hazards: Cutting Chemical Risks at Wastewater Treatment Facilities (2003); U.S. Public Interest Research Group Education Fund, Needless Risk: Oil Refineries and Hazard Reduction (2005); Working Group on Community Right-to-Know, Unnecessary Dangers: Emergency Chemical Release Hazards at Power Plants (2004).

21 U.S. Environmental Protection Agency, EPA-K-550-002, Chemical Safety Alert, Chemical Accident Prevention: Site Security at 3 (February 2000).

22 Hearing request letter for S.1470 from Sen. Frank Lautenberg to Sen. James Inhofe, Chairman, Environment and Public Works Committee, April 28, 2000.

23 Douglas Waller and Mark Thompson, *It's Do-It-Yourself Security*, Time Magazine, Feb. 27, 2006; letter from Presidential Advisor Karl Rove to Michael Graff, BP Amoco Chemical Company, Oct. 31, 2002; letter from Michael Graff on behalf of American Chemistry Council to Karl Rove, Sept. 23, 2002; letter from Red Cavaney, President and CEO of American Petroleum Institute to James Connaughton, Chairman, Council on Environmental Quality, Sept. 6, 2002.

24 Senate "Dear Colleague" letter signed by Sens. James Inhofe, Arlen Specter, Pete Domenici, Kit Bond, Bob Smith, George Voinovich, and Mike Crapo, Sept. 10, 2002.

[25] This figure factors in overlapping vulnerability zones. The vulnerability-zone populations of the 284 facilities identified in this survey total 42 million.

[26] Some 59 respondents changed to safer alternatives before the terrorist attacks of Sept. 11, 2001, and 225 changed after the attacks. Of respondents that changed before the Sept. 11, 2001 attacks, 25 percent indicated security was a reason for making the change; of respondents that changed after the attacks 45 percent indicated that security was a reason.

[27] Approximately 25 facilities did not have the opportunity to provide information on costs or reasons for their changes because they were added to the list of facilities (in Appendix A) from information supplied to EPA or other sources.

[28] *Ibid.*

[29] Facilities noting major upgrades included PPG Industries (Fresno, Calif.) and Proctor and Gamble (Pineville, La.), among others.

[30] While the survey form provides for a yes/no answer to the question on cost savings, many facilities responding to phone interviews indicated that costs were about even.

[31] *Id.* at 28

[32] Previous studies show businesses often do not fully assess costs in business decisions, focusing on raw materials and equipment costs more than other compliance costs. See Hampshire Research Associates, Evaluation of the Effectiveness of Pollution Prevention Planning in New Jersey: A Program-Based Evaluation (May 1996). Further, risk-based security assessment methodologies typically do not systematically evaluate safer technologies. Rather, they focus on physical security options, such as guards and gates. These methodologies determine "acceptable" risks, but without consulting communities that are at risk, informing communities of options that can eliminate chemical spill dangers, or even assessing such safer options.

[33] 71 Fed. Reg. 388 (Jan. 4, 2006); and 71 Fed. Reg. 654 (Jan. 5, 2006).

[34] Findings of the Water Security Working Group delivered to the National Drinking Water Advisory Council, May 18, 2005.

[35] The survey did not ask, and respondents did not always indicate, whether they generate bleach on-site or receive deliveries.

[36] Rough estimate from MIOX Corporation; U.S. vendors include MIOX Corporation (MIOX), U.S. Filter (OSEC), and Severn Trent Services (Clortec).

[37] Several thousand additional food manufacturers are regulated under the RMP program solely for anhydrous ammonia used in refrigeration.

[38] Associated Press, *Attempted Theft Leads to Chemical Leak, Evacuations*, June 21, 2004.

[39] Harold Brubaker, *Sunoco Commits to Safety Project*, Philadelphia Inquirer, March 3, 2006.

[40] Meghan Purvis and Margaret Herman, U.S. Public Interest Research Group Education Fund, Needless Risk: Oil Refineries and Hazard Reduction (2005).

[41] *Id*. at 19

[42] Other reasons for deregistering include: facility reduced chemical inventory below thresholds; facility combined formerly separate RMP filings; facility erroneously reported to the RMP program; and facility used a substance that is no longer covered by the RMP program.

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