S. HRG. 113–714

OVERSIGHT OF FEDERAL RISK MANAGEMENT AND EMERGENCY PLANNING PROGRAMS TO PREVENT AND ADDRESS CHEMICAL THREATS, INCLUDING THE EVENTS LEADING UP TO THE EXPLOSIONS IN WEST, TX AND GEISMAR, LA

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

JUNE 27, 2013

Printed for the use of the Committee on Environment and Public Works

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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED THIRTEENTH CONGRESS
FIRST SESSION

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C O N T E N T S

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THURSDAY, JUNE 27, 2013

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the committee) presiding.

Present: Senators Boxer, Vitter, Fischer, Barrasso, and Boozman.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. Good morning, everyone. Senator Vitter and I are here because of tragedies that have occurred in our Nation. We want to look at these and see what we can do.

Before I start my time, so we will not start it now, I have a couple of items of business.

In the audience, I am just looking for him, is Timothy White. Timothy, where are you? Would you stand? Timothy White is the brother-in-law of Kevin Sanders, a firefighter who was killed in the explosion in West, Texas, and he is here representing their family. He is also a chemist who wrote us a very thoughtful letter and, before I place it in the record, I am just was going to quote a little part of it. If I could have the last page of the letter? Thank you.

He starts off by saying let me begin by thanking you for the opportunity to address the Committee regarding the explosion at the fertilizer plant in West. My brother-in-law, Kevin, was one of the first responders that was killed in the explosion. The profound impact of this tragedy continues to affect our family and while the changes proposed here will not bring Kevin back to us, they will help ensure that other families and our Country do not experience this type of tragedy again.

And so, I am going to place, without objection, your full letter in the record and the importance of finding alternatives to these highly explosive materials that are used in fertilizer and, in the meantime, storing these in an appropriate fashion. So, we will put that in the record. We really thank you for being here. It means a lot to us.

So, we will start my time. We have votes at 11:30, so we are going to have to finish this entire discussion by 11:45.

What brings us here today is the tragic loss of life and injuries caused by a chemical explosion in West, Texas. After we announced our hearing, another tragic chemical explosion occurred in Louisiana. We must look at why these tragedies and others occur and what we can do to help prevent such disasters in the future.

Let us walk through what happened at West. On April 17th, a massive explosion and fire destroyed a fertilizer distribution plant and caused widespread destruction. At least 14 people died, hundreds of people were injured and homes, businesses and three unoccupied schools were damaged or destroyed. An owner of a local business there said "It was like a war zone last night. It was like a nightmare, something you would see in a movie."

Just 2 weeks ago another deadly tragedy occurred in Louisiana where more than 100 people were injured and two workers lost their lives. In that case, a vapor cloud of flammable petroleum gases exploded at a petrochemical refinery, releasing more than 62,000 pounds of toxic chemicals and causing a serious fire.

And then, in August 2012 in my State of California in Richmond, a refinery released flammable petroleum gases and formed a vapor cloud that ignited. Six workers were injured, thousands of people from nearby residential areas went to local hospitals for medical treatment.

I want to express my deepest condolences to the first responders, the workers and others who lost the lives or were injured in chemical disasters in these communities and others across this Nation.

Federal safety and health officials must use all of their available tools, including, and most important, updated risk management plans which are required under the law. They must also use the best training methods and new technologies. Lives are at stake and action must be taken now. Not tomorrow. Not down the road. We do not need new legislation for a lot of this. We can do it now.

Our Federal Risk Management and Emergency Response laws were written after two tragic disasters in the mid–1980's. In 1984, a facility in Bhopal, India released a toxic chemical that killed over 2,000 people. The following year, a facility in West Virginia released thousands of pounds of dangerous chemicals into a nearby community, sending more than 100 people to the hospital.

In 1986, Congress passed the Emergency Planning and Community Right to Know Act to enhance to address chemical disasters. And in the 1990 amendments to the Clean Air Act, which passed with a huge bipartisan vote, Congress required risk management planning to help save people's lives at facilities that handle dangerous chemicals.

Those risk management plans have to, and I want to thank the Chemical Safety Board for their clarity on this, the risk management plans have to address the risk. If they leave out an obvious risk, such as the regulation or storage of ammonium nitrate, they are not addressing the risks.

In the days following the West, Texas disaster, I wrote to the Chemical Safety Board and the EPA requesting information about the explosion, the Risk Management Program, the safeguards under the law. This is part of the CSB's, the Chemical Safety Board's, letter to me. The CSB considers the West explosion to be among the most serious U.S. chemical incidents affecting the public in many decades. That is what they said.

So, this should be a wake up call for all of us. And we must take steps to ensure that all such disasters never happen again. And here is the good news. EPA can strengthen safety at facilities that handle dangerous chemicals under existing law. They have the power, the authority, and indeed, I would argue, the responsibility to do it.

The CSB has already identified problems that may have contributed to the disaster at West including large amounts of combustible materials stored in the same areas as wooden containers that hold ammonium nitrate which can explode when heated. This CSB also found that the West, Texas facility was not required to install sprinklers or other fire suppression systems and that EPA's Risk Management Program does not require the special handling for reactive or explosive materials like ammonium nitrate.

I look forward to the CSB's final reports on West and on their final reports on Louisiana and California and to the adoption of any recommendations that CSB makes to help prevent other tragic explosions and loss of life.

You know, this is an entity that does not get much credit. And I want to say today thank you, because roughly 72 percent of your recommendations have already been adopted. That is a good thing. But it does mean that 28 percent of those recommendations have not been adopted. And I hope the EPA and other Federal agencies and the industry itself will act quickly to adopt safety measures that will save lives.

In 2002, the CSB recommended that EPA strengthen the Risk Management Program by including ammonium nitrate and other dangerous chemicals. Again, that was a very prescient call. And it did not happen. Unfortunately, EPA has not acted on CSB's 2002 recommendation. And I am calling on EPA today to adopt this critical safeguard and to report back to me on this request within the next 2 weeks. Acting on just that safety measure alone is critically important because, hear me, there are thousands of facilities across the Nation that handle ammonium nitrate. And we do know that if this dangerous chemical is not handled safely, disaster and loss of life could follow.

As we review what happened and the recent explosions, we must make safety the highest priority so we can protect not only the first responders but the workers there and the people in the community.

You know in West, I talked to some local people about the facility at West. When it started, there was hardly anyone around that facility. But over the years, population moved in, schools were built, nursing homes were built, very close to the facility. You have to look at a risk management plan not just once, but over the years.

Local authorities can play a key role in enhancing safety protections. Mr. Randall Sawyer is here from my home State of California to testify on behalf of Contra Costa's Health Department. I look forward to hearing from him, as well as other witnesses, on the steps that the EPA, State and local authorities and industry can take to eliminate these chemical disasters.

We need action. And again, really, we do not need legislation.

Again, I want to thank Tim White for his heartfelt letter and for his dedication to call for enhanced safety measures so that other families do not have to suffer the same loss that his family did.

And with that, I call on Senator Vitter.

[The referenced letter follows:]

June 26, 2013

Timothy D. White

Senator Barbara Boxer
Majority Chairman of the Environment and
Public Works Committee

Dear Senator Boxer and Members of the Committee on Environment and Public Works,

Let me begin by thanking you for the opportunity to address the committee regarding the explosion at the fertilizer plant in West, Texas. My brother-in-law Kevin Sanders was one of the first responders that was killed in the explosion that day. Like many still grieving their loved ones, I would like to see changes made to the policies related to hazardous material regulation and use, but my career as a chemist and my upbringing in a Midwest farm family balance this need for change with the realization that change must be brought about with well thought out solutions that take all perspectives into account. The profound impact of this tragedy continues to affect our family daily and while the changes proposed here will not bring Kevin back to us, they will help ensure that other families and our country do not experience this type of tragedy again.

The explosion in West was preventable and while on the surface it appeared the necessary regulations were in place, the multiple agencies involved were not all adequately informed, which lead to a situation that ended in tragedy. While the current laws required the plant to report the amount of hazardous materials they had on-site, the Department of Homeland Security was not informed of the presence of ammonium nitrate that was well above the levels that require monitoring. Beyond reporting directly to an agency, there needs to be a mechanism in place to ensure that ammonium nitrate, and other dangerous chemicals, are tracked accurately which seems feasible when we are talking about tons and not ounces of material. Tracking railcars of material coming into facilities and then subsequent tracking by those facilities, like the one in West, should allow an easy electronic and constantly updated account of the amount of any hazardous substance on site. This would require a financial investment by those companies but the technology to track shipments is readily available and the companies that manufacture the materials in bulk should also be accountable for helping the smaller distributors like Adair Grain Inc. in West, Texas.

The most immediate impact when there is a lack of communication about material at a facility is felt by the local fire department, which has to be aware of the hazards at any location they are asked to enter. Their assessment of the situation in West would have differed significantly if they had known that multiple tons of a compound which can explosively decompose were on-site. We rely every day on the heroic actions of the brave first responders that protect us and they deserve to understand the potential additional dangers beyond the fire itself that they are encountering.

The current system requires small companies to report information to a number of agencies involved in protecting and monitoring potential safety issues. At this time, information provided to one agency is not necessarily shared with other agencies that require the same information to guarantee safety to our country. The inability of these agencies to coordinate the information they are given was highlighted during the investigation as well when the ATF hampered the subsequent efforts of the Chemical Safety Board. Additionally, discrepancies in the events from the day of the explosion as reported by the ATF bring the overall findings of the report into question. This again highlights the importance of the communication between agencies that are all looking out for the safety of America that often overlap in sometimes unexpected ways. Electronic documentation of reports to these agencies should be able to automatically trip an alert to other agencies that require the same information.

Everything I've highlighted above is necessary to fix the problem of tracking dangerous chemicals and keeping local authorities informed, but I think it is important to also consider the hazards of ammonium nitrate itself. While ammonium nitrate has been used for decades as an important, cost effective fertilizer in agriculture, the key liability that manifested itself on April 17^{th} was the explosive decomposition that is possible when the compound is exposed to the wrong conditions. Urea is an example of a valuable alternative that is successfully utilized when conditions in the soil have the appropriate moisture content and pH. Unfortunately, the dry pasture of Texas is perfect for volatilization of the nitrogen in urea due to the absence of regular soil moisture, so minimal levels of fertilizer actually remain in the ground when urea is used. This is the key reason that ammonium nitrate use is still prevalent in regions where these dry conditions exist for most of the year.

As a chemist, everyday I'm confronted with reactions where cheaper but potentially more hazardous options exist to accomplish the chemistry at hand. Part of my job for the past several years has been to seek out safer ways to improve the synthesis of chemical compounds, but this change often comes with a financial cost. With this in mind, there are two important aspects to making an overall improvement beyond the current options, the biggest will be the innovation necessary to develop something that does not currently exist. The second will be financial help for small farmers that are not equipped to absorb the increased expense of new technology until the advances become common practice and thereby cost effective. I grew up on a small farm in Illinois and my mother still owns and lives on that land so I personally understand how every penny matters for today's small farmers. An example of a potential replacement could be encapsulated urea where the urea would not be exposed until water is present to dissolve the outer coating revealing the urea inside and then, in the presence of water, would be readily incorporated into the soil. Also, because urea increases the acidity of the soil the the encapsulation could potentially also include a basic component to correct the pH.

In closing, what has allowed our family to get through this horrible experience has been the outpouring of support especially from the brotherhood of firefighters. The firefighters are asked to perform dangerous and heroic work each and every day and need the help of the entire country to ensure they can be as safe as possible. This is the opportunity for this committee to impart change to ensure this never happens again by monitoring the use and storage of ammonium nitrate and other dangerous chemicals along with developing new and innovative ways to ensure safer practices for fertilizer. This will require compromise, but the potential of subsidies to farmers where ammonium nitrate is the best option to help offset the cost for the innovation of a new delivery method should provide the necessary drive for everyone to achieve the goal of a safer and better country.

Respectfully,

Timothy D. White

OPENING STATEMENT OF HON. DAVID VITTER, U.S. SENATOR FROM THE STATE OF LOUISIANA

Senator VITTER. Thank you, Chairman Boxer, for convening this important hearing today. And I, too, would like to begin by saying our thoughts and prayers are with all of the people of Geismar, Louisiana, Donaldsonville, Louisiana and West, Texas who were affected by these recent horrible accidents.

In particular, our deepest sympathies to the families of Rocky Morris of Belle Rose, Louisiana, Scott Thrower of St. Amant and Zachary Green of Hammond, all of whom lost their lives in the two Louisiana explosions, as well as the families of the 15 people who were killed in West, Texas.

I am pleased to welcome all of our witnesses today. In particular, I want to acknowledge and welcome Rick Webre who serves as the Director of the Ascension Parish Office of Homeland Security and Emergency Preparedness and Dr. M. Sam Mannan who is not only an expert in process safety and chemical security, but also a registered professional engineer in Louisiana and Texas.

You know, when horrible accidents like these occur, it is imperative that they are thoroughly and expeditiously investigated so we can all understand their causes and ensure that future incidents are prevented.

I was pleased to talk to Chairman Rafael Moure-Eraso of the Chemical Safety Board shortly after the horrible accident in Geismar and I am encouraged that the CSB could be on the ground in Louisiana to begin investigation so quickly. And I thank the Chairman for that follow up.

Louisiana, as in some other places, is experiencing a boom in new chemical plants and expansions driven by low natural gas prices and our strategic advantages. Louisiana economic development counts more than $30 billion in investments announced in Louisiana starting in 2011. And that does not even include a number of upgrades.

While we certainly welcome that investment in our State and all of the jobs it means, of course we must ensure that all of these facilities are absolutely as safe as possible for the workers and for the local communities.

Despite these horrible accidents we are discussing today, the good news is the chemical industry has a strong safety record overall. It has an injury rate about 45 percent lower than overall manufacturing in the U.S. Bureau of Labor Statistics. And in 2012, the industry invested nearly $15 billion in environmental and health and safety and security programs. So, that is the good news.

But obviously we always can do better and that is what we are going to learn about today. As we do that, of course, we need to have all of the facts and all of the officials directly investigating these incidents, local, State and Federal, including CSB, need the time to conclude their investigations before we reach any specific conclusions about these incidents.

It is vital we take that time to properly understand what caused these horrible accidents and work hard to make sure something like this never happens again.

Again, Madam Chair, thanks for holding this important hearing.

Senator BOXER. Senator Vitter, thank you very much. Again, my heart goes out to you and your State.

Senator Fischer.

OPENING STATEMENT OF HON. DEB FISCHER, U.S. SENATOR FROM THE STATE OF NEBRASKA

Senator FISCHER. Thank you, Madam Chairman, and Ranking Member Vitter, for holding this hearing today.

I would also like to thank our witnesses for being here and for their willingness to share their time and their expertise with our Committee.

In Nebraska where agriculture is our No. 1 industry, we are very mindful of the key role chemicals play in enhancing our productivity and efficiency. There are 870 million undernourished people in the world today. As we work to grow food and provide other necessities for a world population that is expected to exceed 9 billion by 2050, we know we will become increasingly reliant upon chemical solutions.

Innovation in chemical products has helped to grow our economy and improve lives across the globe. Chemical users understand that our utilization of these powerful products is not without risk. Recent events in Texas and Louisiana are devastating reminders of our responsibility to remain vigilant in our efforts to prevent, mitigate and address chemical threats.

I am pleased that we are meeting today to conduct oversight of our Federal Risk Management and Emergency Planning Programs that we rely upon for occupational safety, environmental protection and homeland security. Industry-led initiatives are also an important part of our chemical risk management efforts. I am encouraged that producers, manufacturers, transporters and retailers have established an industry working group to develop a code of practice and management system to promote continuous improvement in the storage and handling of fertilizer and other chemicals.

Among the guiding principles for such a code of practice is coordinate communication with employees, communities and emergency responders, as well as a third-party auditing and inspection process for those facilities. These industry-driven approaches are essential to improving chemical safety in a way that is workable for both regulatory authorities and the regulated community.

Thank you again, Madam Chair, for holding this hearing. I look forward to the testimony and questions.

Senator BOXER. Thank you so much.

We will turn to our honored speakers. Our first panel, Rafael Moure-Eraso, Chairman of the Chemical Safety Board. Please proceed. I am going to hold you to 5 minutes, each witness, just because we have those votes in an hour or so.

Go ahead.

STATEMENT OF RAFAEL MOURE-ERASO, CHAIRPERSON, U.S. CHEMICAL SAFETY BOARD

Mr. MOURE-ERASO. Chairman Boxer, Senator Vitter, Senator Fischer and distinguished Committee members, thank you for inviting me today and thank you for the kind words about the CSB that you said.

I am CSB Chairperson Rafael Moure-Eraso. The two explosions that we are discussing today, West Fertilizer and Williams Olefins, are tragedies of the kind that should be prevented. The destruction I personally saw in West, the obliteration of homes, schools and businesses by an ammonium nitrate explosion, was almost beyond imagination. The loss of life was horrible.

The CSB has determined that ammonium nitrate fertilizer, its storage, falls under a patchwork of U.S. safety standards and guidances, a patchwork that has many large holes. Those holes include allowing the use of combustible wooden buildings and wooden storage bins, the lack of the sprinklers that are not required, and there is no Federal, State or local rules restricting the storage of large amounts of ammonium nitrate near homes, schools and hospitals.

Existing fire codes have some useful provisions for ammonium nitrate. But Texas, among its counties, has no fire code. So at West, the fire code provisions were strictly voluntary and West Fertilizer had not volunteered. Our investigators learned that combustible seeds were stored near the ammonium nitrate, not separated by any fire-resistant partitions.

OSHA had some similar provisions for ammonium nitrate fertilizer in its explosives standard, 1910.109. However, OSHA has not focused extensively on ammonium nitrate storage and had not inspected West since 1985.

Other nations have gone much further than the U.S. on ammonium nitrate safety. The UK recommends dedicated non-combustible storage buildings and non-combustible bins. The U.S. manufacturer, CF Industries, recommends the same and sprinklers as well. But the fertilizer industry tells us that U.S. sites commonly store ammonium nitrate still in wooden buildings and use wooden bins, even near homes, schools and other facilities. This situation must be addressed.

Preventing the risk of fire essentially eliminates the potential for an explosion like we saw in West by removing one of the preconditions of detonation. Facilities like West fall outside existing Federal explosive safety standards which were developed in the 1990s and are list based. Ammonium nitrate would likely have been included if EPA had adopted our 2002 recommendation to include in the list reactive chemicals under its Risk Management Program. But the RMP program of EPA is not a panacea. It already covers large refineries of Petra Chemical's size, including Williams Olefins. And yet, we still have serious accidents.

The Williams plant has over 100 workers producing ethylene and propylene. On June 13, there was a catastrophic failure involving a heat exchanger and associated piping which broke loose from a distillation tower. The ensuing explosion led to the deaths of two employees. We join and mourn in their loss. It is too soon in our investigation to tell why the equipment failure occurred.

The biggest picture in process safety is that EPA and OSHA resources are under duress. Regulations need to be modernized but more inspection and prevention are needed as well. In the meantime, we are finding encouraging alternatives to the current situation. Following the Chevron refinery fire last year, and acting upon CSB recommendations, California is poised to triple the number of dedicated process safety inspectors funded by industry fees.

Another promising approach is the safety case successfully used in other nations which insurers say have much lower petrochemical accident rates than we do. Companies identify and commit to follow the best safety standards from around the world, subject to approval and oversight of a competent and well-funded regulator. Many experts believe this is the best safety regime for complex technological industries rather than the U.S. system which calls upon a prescriptive and often outdated rule book.

Thank you again for the opportunity to testify today.

[The prepared statement of Mr. Moure-Eraso follows:]

Testimony of Rafael Moure-Eraso, Ph.D.
Chairperson, U.S. Chemical Safety Board
Before the U.S. Senate Committee on Environment and Public Works
June 27, 2013

Chairman Boxer, Ranking Member Vitter, and distinguished members of the Committee – thank you for the opportunity to testify before you this morning. I am Dr. Rafael Moure-Eraso, and I am providing this testimony in my capacity as chairperson of the U.S. Chemical Safety Board, or CSB.

The CSB is an independent federal agency that investigates major chemical accidents and hazards, and develops safety recommendations to prevent their recurrence in the future. The Board is a non-regulatory, scientific, investigative agency. It has an annual budget, after the sequester, of $10.6 million and approximately 42 employees. In addition to investigations, safety studies, and recommendations, we do extensive outreach to companies and other organizations to inform them of our findings. Companies throughout the U.S. and the world use the information and recommendations developed by the CSB to help create what we hope are safer workplaces.

Congress frequently calls upon the CSB to investigate the root causes of some of the most complex and tragic industrial accidents across the country. Currently the CSB is involved in investigations of the Deepwater Horizon blowout in the Gulf of Mexico, the 2010 Tesoro refinery fire in Washington State, the 2012 Chevron refinery fire in California, and many other cases. Over the past two months, the CSB has begun investigations of the devastating explosion at West Fertilizer in West, Texas, on April 17, and the June 13 explosion at Williams Olefins in Geismar, Louisiana.

I will summarize the status of these two investigations and our preliminary findings, and then present some general thoughts on how the oversight of chemical safety might be improved.

West Fertilizer

West Fertilizer was a small retail distribution center that served farmers in the surrounding community and had approximately 15 employees. The facility was built in 1961, and at the time of the incident had a handful of buildings, including a warehouse where fertilizers and other materials were stored. The current owner, who operated an adjacent seed business, purchased the facility from liquidation in 2004.

No manufacturing occurred at the site, only blending of fertilizers for retail customers. Fertilizers such as ammonium nitrate and anhydrous ammonia were delivered to the site by rail car or truck. The ammonium nitrate, a granular solid, was stored in the facility's fertilizer warehouse building in wood-framed bins with wooden walls. Both the warehouse building and the bins were constructed of combustible wooden material, and the building also contained significant quantities of combustible materials such as seeds stored near the bins of ammonium nitrate. The building had no automatic sprinkler or fire suppression features.

The facility straddles the city limit in the northeast section of West, Texas. When it was first built, the area was rural and there were few other structures nearby. Over time, many residences, a nursing home, an apartment complex, a high school, and an intermediate school were constructed within a 2000-foot radius of West Fertilizer.

On the evening of April 17, a fire of undetermined origin broke out at the facility, which had already closed for the day and was unattended. At 7:30 p.m. the fire was observed and reported to 9-1-1 dispatchers, who deployed the community's volunteer firefighting force with four pieces of equipment. Firefighters found the warehouse building in flames and were in the process of extending hoses to fight the fire, and were applying some water to the blaze. Although the firefighters were aware of the hazard from the tanks of anhydrous ammonia as a result of previous releases, they were not informed of the explosion hazard from the approximately 60 tons of fertilizer grade ammonium nitrate inside the warehouse.

At about 7:50 p.m., while firefighters were positioned nearby, the ammonium nitrate suddenly detonated. A shock wave, traveling faster than the speed of sound, crushed buildings, flattened walls, and shattered windows. Innumerable projectiles of steel, wood, and concrete – some weighing hundreds of pounds – were hurled into neighborhoods. Twelve firefighters and emergency responders were killed. At least two members of the public died as well. More than 200 were injured. If this incident had occurred earlier in the day, many more people might have been killed or injured.

Residents of the West Rest Haven nursing home were severely affected, and according to nursing home officials 14 patients have passed away since the April 17 explosion, dying at twice the expected rate. The nursing home itself was destroyed, as was the apartment complex across the street. Two large schools – the high school and the intermediate school – were structurally damaged beyond repair and will be torn down, and a third school was also badly damaged. Because of the hour of day, all the schools were unoccupied. Had the explosion taken place during the day, severe casualties could have occurred in the intermediate school, which was devastated by both blast and fire. Post-explosion damage assessments indicate that it would have been difficult for children and others to escape from the building. The CSB is currently evaluating the vulnerability of this structure, to understand the potential consequences if the explosion had occurred when children were present and to inform future siting decisions.

Nearly 200 homes were severely damaged or destroyed, a sizeable fraction of all the houses in West. Financial damage is still being assessed, but the cost to rebuild the schools alone will reportedly approach $100 million. Some reports suggest total damages to the town may exceed $230 million, an unimaginable blow to a town of just 2800 residents – more than $80,000 for each man, woman, and child living in West.

CSB Investigation

A large CSB investigation team was assembled in West the day after the incident, on April 18. To date the CSB has conducted detailed interviews of about 30 witnesses, and has issued approximately 13 document requests to West Fertilizer, contract firms, hospitals, and regulators.

The CSB has also engaged external experts in blast reconstruction, fire codes and fire protection, and explosion mechanisms.

West Fertilizer and other companies have cooperated fully with the investigation. The CSB has also received outstanding cooperation from the mayor of West and its police and fire departments, and from other local agencies. The investigation has faced significant challenges as well, since the accident site was treated as a criminal scene for approximately five weeks after April 17 and was extensively altered during that time period, including the removal of most surviving physical evidence.[1]

I visited West, Texas, on May 2, just a couple of weeks after the explosion. The damage to homes, schools, and businesses was almost beyond imagination – even by the standards of large-scale chemical disasters. My heart goes out to the people of West, as they work to rebuild their proud and historic community. But I can assure you that it will be years before even the physical scars of this terrible explosion begin to fade.

Ammonium nitrate (AN) is a crop nutrient that represents about 2% of the total applied nitrogen fertilizer in the U.S. It is used primarily on pasture and citrus; its use has been declining in recent years as security concerns have increased since the Oklahoma City bombing in 1995. Ammonium nitrate is a strong oxidizer that reacts energetically with organic materials; it is also reactive by itself and capable of a runaway decomposition reaction and detonation under certain conditions.

Ammonium nitrate has historically been involved in some of the most severe chemical accidents of the past century, including disastrous explosions in the United States, Germany, and France. Two of these accidents – in Oppau, Germany, in 1921 and in Texas City, Texas, in 1947 – each killed 500 or more people. Additional safeguards were adopted following the Texas City disaster, such as avoiding contamination with petroleum-based materials that sensitize AN. These changes are credited with reducing the risk of a mass explosion of AN, but the risk of detonation was not eliminated. In September 2001, for example, a large AN explosion occurred at a factory in Toulouse, France, killing 30, injuring thousands of others, and damaging up to 30,000 buildings. Other serious AN-related accidents have occurred in the U.S. and other countries over the years.

Heat, fire, shock, confinement, and contamination are all factors that can sensitize ammonium nitrate to detonation. To quote from a comprehensive 1985 review of the hazards of AN:

> *The main thrust of the safety precautions recommended in most literature is the minimization of the most likely hazard, namely, the risk of fire. Ammonium nitrate should not be stored where it can be affected by any source of heat or by combustible materials.*[2]

[1] Within the past three weeks, the ATF has begun producing records and evidence from its investigation to the CSB. The ATF released the remains of the West site from its control back to the company on May 24.
[2] Shah, K.D.; Roberts, A.G.; "Safety Considerations in the Processing, Handling, and Storage of Ammonium Nitrate;" In Keleti, C. (ed.); *Nitric Acid and Fertilizer Nitrates*; New York: Marcel Dekker Inc., 1985.

As simple as this sounds, this principle has not been fully adopted across the U.S., and was not implemented at West Fertilizer.

The CSB has made the following observations and preliminary findings to date, which are subject to further revision and development as the investigation unfolds:

1) The explosion at West Fertilizer resulted from an intense fire in a wooden warehouse building that led to the detonation of approximately 30 tons of AN stored inside in wooden bins. Not only were the warehouse and bins combustible, but the building also contained significant amounts of combustible seeds, which likely contributed to the intensity of the fire. According to available seismic data, the explosion was a very powerful event.

2) Whether additional factors such as material characteristics, shock, or contamination contributed to the incident remains to be determined. Company employees described a PVC plastic pipe that was located directly above the AN bin that detonated, and likely would have been melted by the fire. Additionally, large amounts of potentially flammable anhydrous ammonia were stored along the southern edge of the warehouse building.

3) The building lacked a sprinkler system or other systems to automatically detect or suppress fire, especially when the building was unoccupied after hours. By the time firefighters were able to reach the site, the fire was intense and out of control. Just 20 minutes after the first notification to the West Volunteer Fire Department, the detonation occurred.

4) Both National Fire Protection Association (NFPA) and the International Code Council (ICC), private organizations that develop fire codes that are widely applied across the U.S., have written code provisions for the safety of ammonium nitrate. Many of these safety provisions are quite old[3] and appear to be confusing or contradictory, even to code experts, and are in need of a comprehensive review in light of the West disaster and other recent accidents. For example the ICC's International Fire Code directs users to a defunct code for ammonium nitrate (NFPA 490, last issued in 2002) rather than the current code, known as NFPA 400.

5) The existing fire codes do contain some useful provisions; for example the codes do require a fire resistant barrier between AN and any stored flammable or combustible materials and have provisions to avoid AN confinement and promote ventilation during fire conditions. However, even the most current NFPA 400 standard *allows* AN to be stored in wooden buildings and in wooden bins, and does not mandate automatic sprinkler systems unless more than 2500 tons of AN is being stored – vastly more than the approximately 30 tons that was sufficient to devastate much of the town of West. In addition, the standard contains a "grandfathering" provision that allows existing buildings that were constructed prior to code adoption – and fail to meet all of its provisions – to continue in use.

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[3] NFPA 400 refers users to a 1953 publication by the U.S. Bureau of Mines for information on the explosive properties of AN.

6) Texas has not adopted a statewide fire code, and state law actually prohibits most smaller rural counties from adopting a fire code. McLennan County, where the West facility was located, had not adopted a fire code, although it technically had the authority to do so because of its proximity to the more populous Bell County. The West Fertilizer facility was thus not required to follow any NFPA or ICC recommendations for the storage of AN.

7) Although some U.S. distributors have constructed fire-resistant concrete structures for storing AN, fertilizer industry officials have reported to the CSB that wooden buildings are still the norm for the distribution of AN fertilizer across the U.S.

8) Industry has developed other forms of ammonium nitrate that are reported to reduce or eliminate the risk of accidental detonation. For example, compounding the ammonium nitrate with calcium carbonate (limestone) "practically eliminates any risk of explosion its storage, transportation, and handling," while preserving the AN's nutritive value.[4] Calcium ammonium nitrate fertilizers have been widely used in Europe. Ammonium sulfate nitrate also has been found to be non-explosive provided the percentage of AN is held below about 37%.[5]

9) The federal OSHA standard for "Explosives and Blasting Agents" (29 CFR 1910.109) does have requirements for ammonium nitrate fertilizer; its provisions are similar to the NFPA codes. Unlike the NFPA codes – which West was not legally required to follow under any fire code – the OSHA standard would have applied. Like NFPA, however, the OSHA standard does not prohibit wooden bins or wooden construction, and does not require sprinklers unless more than 2500 tons of AN is present. However, OSHA public records indicate that OSHA last inspected the facility in 1985, and no citations were issued under the "Explosives and Blasting Agents" standard.

10) OSHA's Process Safety Management standard (29 CFR 1910.119) or PSM was adopted in 1992 and is designed to prevent catastrophic workplace incidents involving highly hazardous chemicals. PSM requires companies to have a variety of management elements to prevent catastrophic incidents, such as conducting hazard analyses and developing emergency plans. Ammonium nitrate is not, however, one of the listed chemicals that triggers PSM coverage. The PSM standard also contains an exemption for retail facilities.

11) The EPA's Risk Management Program rule (40 CFR Part 68) or RMP was adopted in 1996 and is designed to prevent catastrophic offsite and environmental damage from extremely hazardous substances. As the name suggests, the rule requires covered facilities to develop a Risk Management Plan, implement various safety programs, and analyze offsite consequences from potential accidents. Once again, however, ammonium nitrate is not one of the listed chemicals that triggers RMP coverage. West Fertilizer was RMP-covered due to its stored ammonia, and the company's offsite consequence analysis considered only the possibility of an ammonia leak, not an explosion of ammonium nitrate.

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[4] Calcium ammonium nitrate (CAN) must still be protected from contamination with other chemicals that can re-sensitize it to detonation. See Popovici Ipochim, N.N.; Icechim, M.M.; "Other Ammonium Nitrate Fertilizers;" In Keleti, C. (ed.); *Nitric Acid and Fertilizer Nitrates*; New York: Marcel Dekker Inc., 1985.

[5] *Ibid.*

12) OSHA considered adding ammonium nitrate along with other highly reactive chemicals to its list of PSM-covered substances in the late 1990's. However, this proposal was shelved in 2001. In developing the RMP regulation, the EPA did not explicitly include explosives or reactive chemicals in the list of covered chemicals. In 2002, the CSB issued a study on reactive hazards, identifying 167 prior reactive incidents (including a 1994 explosion at an ammonium nitrate manufacturer). The Board recommended that both OSHA and EPA expand their standards to include reactive chemicals and hazards. However, neither agency has yet acted upon the recommendations.

13) No federal, state, or local standards have been identified that restrict the siting of ammonium nitrate storage facilities in the vicinity of homes, schools, businesses, and health care facilities. In West, Texas, there were hundreds of such buildings within a mile radius, which were exposed to serious or life-threatening hazards when the explosion occurred on April 17.

14) West volunteer firefighters were not made aware of the explosion hazard from the AN stored at West Fertilizer, and were caught in harm's way when the blast occurred. NFPA recommends that firefighters evacuate from AN fires of "massive and uncontrollable proportions." Federal DOT guidance contained the Emergency Response Guidebook, which is widely used by firefighters, suggests fighting even large ammonium nitrate fertilizer fires by "flood[ing] the area with water from a distance." However, the response guidance appears to be vague since terms such as "massive," "uncontrollable," "large," and "distance" are not clearly defined. All of these provisions should be reviewed and harmonized in light of the West disaster to ensure that firefighters are adequately protected and are not put into danger protecting property alone.

15) While U.S. standards for ammonium nitrate have apparently remained static for decades, other countries have more rigorous standards covering both storage and siting of nearby buildings. For example, the U.K.'s Health and Safety Executive states in guidance dating to 1996 that "ammonium nitrate should normally be stored in single storey, dedicated, well-ventilated buildings that are constructed from materials that will not burn, such as concrete, bricks or steel."[6] The U.K. guidance calls for storage bays "constructed of a material that does not burn, preferably concrete."

16) CF Industries, a principal manufacturer of AN that was one of the suppliers to West, also recommends more rigorous safeguards in its Material Safety Data Sheet (MSDS) for the chemical. In the section entitled "Handling and Storage," CF recommends that "Storage construction should be of non-combustible materials and preferably equipped with an automatic sprinkler system."[7] Although companies are required to issue MSDS's, the recipients of this information like West Fertilizer are not obligated to follow the recommended safety precautions. West lacked these safeguards.

17) The Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) has regulations for ammonium nitrate used as an explosive but these do not apply to ammonium nitrate used as fertilizer. The U.S. Department of Homeland Security has reporting

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[6] U.K. Health and Safety Executive: "Storing and Handling Ammonium Nitrate;" Available from http://www.hse.gov.uk/pubns/indg230.pdf

[7] http://www.cfindustries.com/pdf/Ammonium-Nitrate-Amtrate-MSDS.pdf

requirements for companies that have a threshold amount of fertilizer grade ammonium nitrate. However, the authority of DHS is to require security measures to protect against theft, diversion, or other intentional acts; DHS does not regulate the safety of ammonium nitrate to prevent conditions leading to accidental detonation.

18) The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) contains an exemption from hazardous chemical reporting for "fertilizer held for sale by a retailer to the ultimate customer." The EPA has interpreted this provision as not applying to firms, like West, that make custom blends of bulk fertilizer for customers' use. In 2012, West Fertilizer filed an EPCRA Tier II report with the McLennan County Local Emergency Planning Committee (LEPC). West reported the presence of up to 270 tons of ammonium nitrate, as well as anhydrous ammonia, at the site. The company did not provide the LEPC or the West Fire Department with an ammonium nitrate MSDS indicating the material's hazards, nor does EPCRA automatically require that information to be provided. There is no indication that West's filing with local authorities resulted in an effort to plan for an ammonium nitrate emergency.

It is important to bear in mind the limitations on Local Emergency Planning Committees that operate in communities around the country. While these committees are required to exist under EPCRA, they are largely staffed by either volunteers or local officials who likely have many collateral duties. The law did not establish any funding stream for the LEPC's, and they do not have any regulatory authority over chemical facilities. Their fundamental role is in emergency preparedness and coordination. The primary responsibility for developing and enforcing safety standards belongs to other federal and state agencies.

To summarize, the safety of ammonium nitrate fertilizer storage falls under a patchwork of U.S. regulatory standards and guidance – a patchwork that has many large holes. Specifically, the CSB has not identified any U.S. standards or guidance that prohibit or discourage many of the factors that likely contributed to the West disaster. Combustible wooden buildings and storage bins are permitted for storing AN across the U.S. – exposing AN to the threat of fire. Sprinklers are generally not required unless very large quantities of AN are being stored or fire authorities order sprinklers to be installed. Federal, state, and local rules do not prohibit the siting of AN storage near homes and other vulnerable facilities such as schools and hospitals.

The CSB has had a number of discussions with fertilizer industry representatives since April 17, including officials from The Fertilizer Institute and the Agricultural Retailers Association. We believe the industry has a strong and sincere interest in learning from the tragedy in West and taking steps to prevent future incidents involving ammonium nitrate, including the development of new audit tools and product stewardship programs. I applaud these efforts and encourage these organizations to draw upon the best science as well as the strongest safety recommendations from the U.S. and overseas, to ensure that U.S. fertilizer firms are applying the highest safety standards available anywhere in the world.

These voluntary programs should complement a thorough effort by the federal government to review and improve the comprehensive safety oversight of ammonium nitrate fertilizer distribution. The time for that effort is now.

Williams Olefins Explosion

On June 13, an explosion and fire occurred at the Williams Olefins plant in Geismar, Louisiana. This plant produces ethylene and propylene, which are raw materials for common plastics, and employs over one hundred workers. At the time of the incident, hundreds of contract workers were also present at the site for a major expansion project.

The CSB deployed a team of seven to the site, and CSB investigators have had a continuous presence in Geismar since June 15. The team has interviewed at least 28 witnesses and has reviewed documents and other information obtained from the company. Williams Olefins and other companies at the site have provided excellent cooperation with the investigation.

The incident involved a large distillation tower that processes propylene, propane, and other highly flammable hydrocarbons. The equipment was in normal operation on June 13. At 8:36 a.m. there was a sudden catastrophic failure involving a heat exchanger and associated piping attached to the distillation tower. The steel shell of the heat exchanger ripped open, and piping detached where it connected to the tower. The exact sequence and cause of these events remains to be determined.

In any event, there was a large-scale release of propylene, propane, and other hydrocarbons from multiple release points, forming a vapor cloud more than 200 feet high that is visible in surveillance video from the site. Within four seconds the vapor cloud ignited. Two Williams employees were fatally burned and approximately 105 other Williams employees and contractors were injured. The resulting fire burned for over four hours.

All of us at the CSB offer our deepest condolences and prayers for the families of the victims and for the injured. We are committed to a thorough investigation to determine why this horrible accident occurred.

CSB investigators have surveyed the scene from ground level and from the air, but currently the immediate area of the ruptured equipment remains too hazardous for entry due to overhanging debris. During the course of this week the area will be made safe for human entry, and this will allow investigators to observe the positions of key valves and obtain other important information. In addition we plan to recover and perform metallurgical tests on the heat exchanger and other piping. This testing will help determine whether the equipment that failed had weakened or deteriorated prior to the rupture, or some other factors were at play.

We are also working with the company to recover electronic control system data that will reveal process conditions at the time of the incident, such as material flows, pressures, and temperatures as well as valve positions. These data will also be important to understanding what occurred.

The assessment of the site and equipment is occurring in close coordination with federal OSHA inspectors. Within a few days of the incident, the CSB, OSHA, and the company entered into a written site and evidence control agreement to ensure that the evidence at the site is properly preserved in as-found condition, and all parties participate in the identification and testing of evidence. So far it has been a good model for how all incident sites should be handled.

CSB Investigative Capacity

The recent tragedies in West and Geismar have further taxed the CSB's already overstretched staffing and resources. When the Congress requested that the CSB conduct a root-cause investigation of the Deepwater Horizon blowout, we informed Congress that this vital work would have unavoidable adverse effects on many other cases the CSB had already begun. The CSB already faced a record backlog of cases in 2010, when I became the chair. Not only have these adverse effects occurred, but Transocean – the operator of the Deepwater Horizon – has engaged in a lengthy legal challenge to the CSB's authority to investigate the incident. On April 1, 2013, a federal district court in Houston ruled completely in the CSB's favor and confirmed our offshore jurisdiction, but Transocean has indicated its intention to appeal the decision and seek a stay of enforcement. This unfortunate legal situation has continued to delay the CSB's access to many documents and witnesses relevant to the investigation of the blowout.

The West and Geismar investigations have very significant financial costs associated with them and West in particular has required the diversion of a very large percentage of CSB's investigators, who already had many months of work in the pipeline ahead of them when the tragedy struck. I would like to engage in a discussion with the Committee over the coming weeks about the impact of these new investigations on the CSB's capacity to finish existing investigations – many of which have important stakeholders who have already been waiting a long time for answers. I also wish to notify the Committee that I believe the CSB has no capacity at this point to undertake any new investigative work, beyond what has already been promised and begun.

Possible Approaches for Reducing Risk

Since the CSB was established in 1998, the Board has made a number of safety recommendations for improving the oversight of facilities that handle hazardous substances. The CSB has made a number of recommendations to the Environmental Protection Agency, including the above-mentioned recommendation to broaden the application of the Risk Management Program to encompass reactive hazards that could have an impact on communities. The CSB has also recently recommended that the EPA strengthen the safety provisions for disposing of hazardous waste; this followed a recent tragedy in Hawaii where five federal subcontractors were killed disposing of illegal fireworks seized by the government.

In another recent case, the CSB urged the EPA to make greater use of its general duty clause authorities under the Clean Air Act by warning operators of their responsibility to safeguard remote oil and gas production sites; the CSB investigation found that 44 members of the public – children and young adults – died in explosions at these unsecured hazardous sites.

The Board has made a number of safety recommendations to OSHA as well. Among the improvements we have sought are a new regulatory standard for combustible dust; broadening the PSM standard to cover reactive chemicals and atmospheric storage tanks and to require more effective management of change reviews; modernization of standards for acetylene and compressed gases; and developing a new safety standard for fuel gases.

The majority of the CSB's recommendations have not been directed to federal regulators but rather to other organizations around the country, including state and local governments, labor unions, trade associations, and the bodies like the ICC and NFPA that are responsible for developing consensus standards. The overall acceptance rate for CSB recommendations now exceeds 70%, and we track all recommendations to completion.

Improved enforcement efforts are just as important as having effective standards. In the CSB's 2007 report on the explosion at BP's Texas City refinery, the Board called for OSHA to expand its enforcement of process safety requirements by "hiring or developing a sufficient cadre of highly trained and experienced inspectors." The Board report observed that there were few comprehensive OSHA inspections of refineries and other chemical sites, and OSHA had only a handful of inspectors with industrial process experience. By comparison, other countries like the U.K. had developed large bodies of specialized inspectors to perform ongoing, detailed safety inspections of hazardous facilities. OSHA responded in part to the recommendation by creating a new National Emphasis Program for refineries; the program was considered very effective by OSHA leaders, uncovering many safety problems in refineries. Unfortunately, OSHA did not have adequate resources to continue the program for more than a temporary period.

The EPA has also lacked the dedicated resources to conduct extensive enforcement of RMP program requirements. When this Committee conducted oversight of the program in 2007, the EPA told the late Senator Lautenberg that the total RMP-related fines collected for the entire country over nearly a four-year period (from fiscal year 2004-2007) were just over $3.5 million,[8] a modest sum for a program that covers over 12,000 facilities.

The CSB believes there are a number of serious challenges for improving industrial process safety in the U.S. As noted above, both OSHA and EPA process safety standards rely heavily upon list-based approaches for determining which facilities and companies have to comply with the most rigorous requirements. This concept of a hazardous chemical list was largely borrowed from environmental statutes of the 1970's and 1980's. However, process safety experts generally recognize that process hazards are a function of chemistry itself, and it makes little sense to assert that the overall risks from chemical processing and handling can be adequately captured using small lists of chemicals. Time and again the CSB has found large chemical hazards – capable of causing major disasters – residing in facilities that have largely escaped regulatory scrutiny. These facilities – of which West Fertilizer is but one example – fall outside the scope of existing regulatory standards, which were developed in the 1990's and have seen few updates since then. All too often, a tragedy like the one at West suddenly exposes the hazards of a chemical or process that had somehow been overlooked.

The effects of these regulatory and enforcement challenges are evident in the accident rates for U.S. refineries and petrochemical sites. In 2008, a leading reinsurance company, Swiss Re, told the CSB and federal regulatory agencies that property losses from U.S. refinery accidents were occurring at approximately four times the rate of the rest of the world. In a follow-up briefing, Swiss Re officials asserted the gap between refinery safety performance in the U.S. and in the

[8] Christopher P. Bliley, Associate Administrator, EPA; Letter to Senator Barbara Boxer, Chairman, Committee on Environment and Public Works, August 22, 2007.

rest of the world was continuing to widen. Many developed nations have adopted a different approach for controlling major process hazards. For example, nations in Europe and elsewhere have implemented a "safety case" regime, that requires hazardous facilities to continuously meet higher standards and reduce risk. Companies work directly with the regulator to identify the most appropriate safety standards from around the world, which they then are required to follow as a condition of operating. The focus is on preventing accidents in highly complex, technological systems rather than post-accident punishment.

Implementing an effective regulatory regime such as the safety case, with the ability to manage and regulate high hazard industries and prevent serious accidents, requires a number of inter-dependent features. First, the regulatory regime must be truly goal-setting in nature; another term for this is a performance-based regulatory regime. This approach provides industry the opportunity to tailor the regulations to its specific facilities with the goal of continuous risk reduction and incident prevention. The safety case regime also imposes a general duty on industry to reduce all risks in its operations to as low as reasonably practicable (ALARP). Such an approach places the impetus on industry to evolve with current best safety practices, wherever they have been developed anywhere in the world, to ensure that process hazards have been adequately identified, evaluated, and controlled. Furthermore, this regime requires industry to utilize leading and lagging indicators to drive risks involved in major hazard facilities to as low as reasonably practicable. Finally, for effective implementation, this type of regime requires an independent, competent, and well-funded regulator. Experience and competence in technical areas such as chemical engineering, human factors, and process safety management are necessary to provide effective auditing and regulatory oversight for prevention. In a recent federal OSHA forum on reforming process safety regulations, noted safety expert Andrew Hopkins pointed out that all of these elements are essential for an effective major accident prevention regime. Dr. Hopkins emphasized that the whole package of the safety case system needs to be introduced to make it work, including a competent, well-funded regulator.[9]

The CSB has begun to examine these alternative regulatory systems in the context of investigating the recent Chevron refinery fire in California and the Deepwater Horizon blowout in the Gulf. This April, the CSB issued its interim report on the Chevron refinery fire, which sent over 15,000 Richmond residents to the hospital in August 2012. California legislators have responded proactively to the accident and to the CSB's recent findings and recommendations. A bill now before the California governor for signature would effectively triple the number of dedicated process safety inspectors in the state. This expansion will be funded by fees collected from the industry, and will not significantly burden taxpayers. And state legislators as well as leaders from Contra Costa County, where the refinery is located, have been working to implement other CSB recommendations for safer equipment designs and materials, reporting of process safety indicators, and improved maintenance procedures. California's actions should be closely examined, we believe, as a potential model for other states and the federal government to follow.

Thank you again, Chairman Boxer and Ranking Member Vitter, for the opportunity to testify today.

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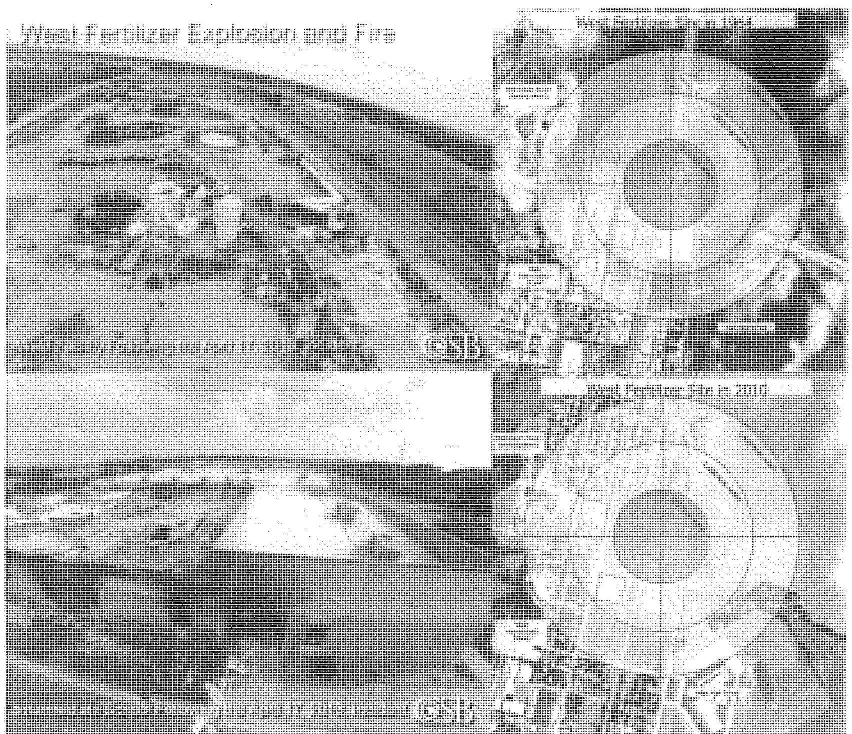
[9] OSHA Expert Forum on the Use of Performance-Based Regulatory Models in the U.S. Oil and Gas Industry, Offshore and Onshore; Texas City, Texas; September 20, 2012.


West Fertilizer Explosion and Fire


Photos from the June 13, 2013,
Williams Olefins Incident,
Geismar, LA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CSB

August 30, 2013

The Honorable Barbara Boxer
Chairman
U.S. Senate Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

The Honorable David Vitter
Ranking Member
U.S. Senate Committee on Environment and Public Works
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer & Ranking Member Vitter:

Thank you for the opportunity to testify on June 27, 2013, at the Committee on Environment and Public Works hearing entitled "Oversight of Federal Risk Management and Emergency Planning Program to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosion in West, TX and Geismar, LA."

Enclosed are formal responses to the questions submitted by Senators Gillibrand, Vitter, and Crapo for the hearing record.

Senator Kristen Gillibrand

1. In my State, fire destroyed a Columbia County transformer recycling facility in August 2012. Thankfully, no one was killed or seriously injured in this fire, but the immediate aftermath lead to confusion and more questions than answers by local officials. Fire broke out in an area of this facility that had a high concentration PCB-containing oils. There was presence of sodium and toxic chemicals in this facility. West, TX should be a lesson that the danger posed to first responders who respond to a fire call with no previous knowledge of the elements and compounds inside of a facility risk life, property and threaten the environment. My concern remains as to what obligation these companies, handling elements like this, or transporting them to and from their facilities over roads and rail, have to inform first responders to their presence?

Response:

40 CFR, Part 355 entitled "Emergency Planning and Notification" requires companies handling substances classified as extremely hazardous to notify first responders of the presence of that material. This responsibility is spelled out in the Emergency Planning and Community Right to Know Act (EPCRA), which is administered by the Environmental Protection Agency (EPA). Under the referenced regulation, companies are required to provide details related to emergency planning, emergency release notification, and additional provisions. Companies consult Appendices A and B of Part 355 to make a determination if they are covered. These appendices list substances either alphabetically or by CAS[1] number.

Additional requirements are found in 40 CFR, Part 370, "Hazard Chemical Reporting, Community Right to Know," which defines who must comply, specifies reporting requirements, and provides community access information.

Facilities covered by EPCRA must submit an Emergency and Hazardous Chemical Inventory Form to the Local Emergency Planning Committee (LEPC), the State Emergency Response Commission (SERC), and the local fire department annually. A covered company is required to report information contained in either the material safety data sheet (MSDS) for the chemical **or** Tier 2 submittals that list the hazardous chemicals at the site and their inventories. These reports are also forwarded to the LEPC, the local fire department, and the appropriate SERC. However, the covered company is not specifically required to submit the chemical specific MSDS to emergency responders—this was in fact what happened in the West Fertilizer incident. At West Fertilizer, the emergency responders were not provided with the MSDSs and were not aware of the explosion hazards of ammonium nitrate. The MSDSs can contain vital safety information such as the hazardous properties of the chemical, recommended fire fighting techniques and precautions to take in responding to emergencies. One West Fertilizer MSDS for ammonium nitrate in fact warned against storing the chemical in combustible buildings, a precaution that if followed, would have likely prevented the incident.

Notification of local officials of safety and security plans is also required when transporting hazardous materials by road or rail. These regulations are found in 49 CFR, Subpart I, and apply to explosives, radioactive and large bulk materials.

Beyond the responsibility for reporting, these regulations provide structural guidance in reporting requirements for facilities processing, storing, or transporting highly hazardous substances.

[1] CAS Registry Numbers are unique numerical identifiers assigned by the Chemical Abstracts Service to every chemical described in the open scientific literature including elements, isotopes, organic and inorganic compounds, ions, ogonometellics, metals and nonstructural materials.

Senator David Vitter

1. **Could you please provide the Committee with the most up-to-date information from your investigation of the tragic accident in Geismar, LA?**

The CSB has completed a preliminary draft of its scoping document which summarizes the incident description, activities to date, investigative path forward and primary areas of interest for potential recommendations. Key points from the scoping document are presented below:

INCIDENT DATE: June 13, 2013

INCIDENT DESCRIPTION:

On June 13, 2013, at the Williams Olefins plant in Geismar, Louisiana, a heat exchanger catastrophically failed, releasing hydrocarbons that ignited, killing two Williams employees and injuring approximately 100 other workers. The explosion and subsequent fire caused the entire Williams plant to shut down and a shelter in place was issued for the surrounding area within a two-mile radius. The explosion occurred at 8:37 a.m. and the fire was put out around 2 p.m. the same day.

The Williams Olefins plant converts ethane and propane into ethylene and propylene. The heat exchanger that failed used hot water to heat propane and propylene for a distillation column which separated propane from propylene. Immediately prior to the failure, a supervisor was troubleshooting a flow issue in the heating water system and appears to have opened water valves on the heat exchanger that failed.

INVESTIGATION ACTIVITIES TO DATE:

An investigation team deployed to Williams on June 15, 2013, two days after the incident. The investigation team has conducted over 60 interviews with employees, eyewitnesses, and contractors who worked at the facility. The team has also requested and received a number of documents from Williams and local hospitals.

The team photo-documented the site and witnessed the removal of a small portion of the relevant equipment and samples. Two contractors provided structural engineering safety and metallurgical support during the initial deployment.

PATH FORWARD:

The immediate physical cause of the heat exchanger failure will not be known until metallurgical testing is performed because multiple possibilities exist. Possible scenarios include inadvertent overpressurization of the heat exchanger (and lack of pressure relief), low-temperature embrittlement of the metal, and explosive decomposition of a known unstable contaminant (methylacetylene propadiene or MAPD).

The CSB has contracted for metallurgical testing along with testing for the functioning of the valves connected to the heat exchanger. These tests should help us determine the physical cause of the incident.

ISSUES OF INTEREST:

- Adequacy of overpressure protection
- Adequacy of company's Process Hazard Analysis (PHA) for possible failure mechanisms of the heat exchanger
- Use of informal procedures
- Regulatory oversight by OSHA and EPA

2. **In your response to Senator Boxer's letter regarding the West, Texas, incident, you voiced concern with the level of CSB's access to investigate the root cause of the devastating explosion. It is my understanding that some 30 state, local and federal agencies created a task force and, with the exception of CSB, all agreed on parameters on how to proceed. Given that this was potentially a crime scene and all protocols governing evidence gathering and discovery needed to be strictly followed, why did CSB not agree to the initial parameters? What is CSB's policy when it comes to participation in an ongoing criminal investigation and how does the board usually try to cooperate in potential crime scene investigations with other agencies.**

Response:

After the CSB arrived at the West site, all agency representatives present at the site worked out verbal agreements for site access, interview process, and evidence preservation with ATF and other federal, state, and local agencies within the first few days. Participants on all sides acted cordially and professionally, and the CSB had no reason to believe this deployment would not proceed amicably.

The morning after site access and interview protocol agreements were reached, CSB investigators were denied access to the site and brought to a surprise meeting with representatives from ATF and the state agencies, which is when they were told the CSB could not do its own interviews or produce its own separate investigation report. The CSB did not agree to those terms, but certainly did not "refuse to participate" in the "task force." Rather, it seems the CSB was suddenly cut off from the planning process, even though our investigators thought everything was already decided, and the plans were changed without CSB involvement or input.

The CSB's enabling statute requires the agency to conduct its own independent, root cause investigations, and to publish its own independent safety reports that explain the causes of accidents and then propose needed safety recommendations intended to prevent recurrence. In fact, West Fertilizer provides a sound illustration why the CSB should conduct its own witness interviews: no other agency that responded was actually focused on health and safety above and beyond compliance with existing state or federal regulations. In sum, the CSB did not disagree to the initial parameters. We agreed to them and they were changed with no notice, reason, or explanation.

When the CSB responds to the scene of a chemical or petrochemical accident and discovers evidence of intentional criminal wrongdoing, the CSB's policy is to turn over any relevant information collected to law enforcement authorities in that jurisdiction, and withdraw from the scene. That is because the Clean Air Act limits the CSB's investigative jurisdiction to "accidental" releases. Thus, the agency cannot investigate intentional criminal acts that cause chemical accidents. To date, none of the incidents to which the CSB has deployed have been caused by intentional criminal acts.

At the West deployment, ATF and EPA were looking for evidence of regulatory or statutory violations. In contrast, the CSB embraces an "all cause" theory of accident investigation, which involves assessing why an accident occurred from all perspectives, including applicable EPA safety regulations. In the first couple of days of the West investigation, it became evident to law enforcement and first responders on scene (including the Texas State Fire Marshal, which is responsible for arson determinations) that criminal activities did not cause the West Fertilizer accident. No evidence of intentional criminality was found, and the criminal investigation remained only "theoretically" open as ATF sought to assist the Texas State Fire Marshal's Office with a point of origin determination for the fire that led to the explosion. Leaders of the ATF's National Response Team and members of the Texas State Fire Marshal's Office both informed members of the CSB's investigation team of their initial findings on this point. Combined with the CSB's review of ATF's evidence, this made the likelihood of criminal activity seem extremely low. Nevertheless, ATF continued to maintain its control over the accident scene, along with its extended presence on site with dozens of agents, an enforced secure perimeter, earth-moving equipment, trailers and the like.

While ATF controlled the West site, CSB investigators witnessed wind and rain damage to important physical evidence (including paper documents left outside), as well as undocumented examinations of evidence and excavations with heavy equipment. It is critical to understand that activities such as sample collection, excavation, and debris removal normally occur at an explosion site. But in this case, these events could have unfolded with the active participation of the CSB, in such a way that would have preserved the site and the physical evidence for the ongoing CSB health and safety investigation. For example, the position of valves on the anhydrous ammonia bulk storage tanks on site, and the status of the pressure relief valves on those tanks, was irrelevant to the ATF's criminal investigation, but could have been important to the CSB investigation.

The reality is that the CSB could have conducted its entire range of investigative activities shoulder-to-shoulder with ATF and other local, state, and federal agencies, with the end result being superior products for all agencies. The CSB's interests are the same as the other agencies: a high-quality investigation, carefully preserving evidence, and ensuring that all aspects of the investigation are done with appropriate skill and with recognition of the fact that other parallel proceedings would surely continue to unfold on their own separate courses – including civil litigation brought by the families of victims. Moreover, the CSB's own technical expertise, and the expertise of the nationally-recognized experts we retained, could have actually helped ATF inform their investigative processes.

At most incident deployments, the CSB is treated as a coequal among its sister federal agencies. Past accident investigations at refineries and other major chemical installations demonstrate that the CSB works well with EPA and OSHA through the use of jointly developed site control agreements, evidence collection and testing protocols, solid communication plans, and the like. In the West investigation, the CSB is still making up for lost time, seeking evidentiary support for safety recommendations aimed at accident prevention.

It is the CSB's desire to enter into a Memorandum of Understanding with DOJ to avoid problems like those encountered at the West deployment. Conversations are ongoing in accordance with the recent Executive Order on chemical safety and security.

3. **In your testimony you mention that some federal regulations have vague terms which should be clearly defined. The General Duty Clause of the Clean Air Act is a provision that uses a slew of vague terminology requiring chemical facilities to take "necessary steps" to address "extremely hazardous substances," "appropriate hazard assessment techniques," and "design and maintain a safe facility." Now not one of those terms is clearly defined in law- do you believe that this is another example where terms should be clear and defined?**

Response:

The CSB believes there are a number of serious challenges for improving regulations governing industrial process safety in the U.S. Both the EPA and OSHA rely on "General Duty Clauses" as part of their enforcement toolbox, along with specific standards and regulations. General Duty Clause (GDC) citations are often generated when agencies cannot identify a specific, clear regulatory standard that applies. They are used during the inspection process or after the occurrence of a serious incident. For example, OSHA's GDC requires covered employers to furnish a place of employment "free of recognized hazards." Voluntary safety organizations such as the National Fire Protection Association, various trade associations and industry consensus-setting organizations (API, ACC, CCPS, etc.) have developed voluntary guidelines that identify a particularly risky workplace environment, even if not stated in an explicit OSHA regulation, as a "recognized hazard" under the GDC. However, in some cases, serious hazards are not obvious, and both OSHA and EPA inspectors are required to establish a recognition of the hazard and its potential abatement under the GDC through application of voluntary standards and industry practices. This substantially multiplies the regulators' effort and investment required to demonstrate a violation, in contrast with the relatively simple compliance requirements contained in regulatory standards.

For these reasons, the CSB has generally encouraged regulators to develop and rely on specific clear standards rather than general duty clauses. An example from the OSHA realm is the CSB's recommendation to develop a clear and comprehensive standard for preventing combustible dust explosions in general industry, rather than relying on the General Duty Clause or other peripherally relevant standards that provide little guidance to companies.

At the same time, several of EPA and OSHA's specific standards for chemical process safety have limitations. The CSB's June 27, 2013, testimony noted that both OSHA and EPA process safety standards rely heavily on list-based approaches for determining which facilities and companies have to comply with the most rigorous requirements. This concept of a hazardous chemical list was largely borrowed from environmental statutes of the 1970's and 1980's. However, process safety experts generally recognize that process hazards are a function of chemistry itself, and it makes little sense to assert that the overall risks from chemical processing and handling can be adequately captured using small lists of chemicals. Time and again the CSB has found large chemical hazards – capable of causing major disasters – residing in facilities that have largely escaped regulatory scrutiny. These facilities – of which West Fertilizer is but one example – fall outside the scope of existing process safety regulatory standards, which were developed in the 1990's and scarcely updated since then. All too often, a tragedy like the one at West suddenly exposes the hazards of a chemical or process that had somehow been overlooked.

A number of CSB investigations have involved processes not covered by the aforementioned process safety standards, which exemplifies the importance of general duty clauses. If a company has a "recognized hazard" even if it is not covered under the list-driven process safety standards, the company is still responsible for providing a safe workplace.

4. **The "Information and Data Sharing" section of the Memorandum of Understanding ("MOU") between EPA and CSB states:**

   "The CSB is an independent, non-enforcement agency. To ensure that during the conduct of an investigation the CSB is not perceived as an extension of a state or federal enforcement investigation, the CSB will not participate in compliance and enforcement activities conducted by other agencies. To avoid duplicative efforts, interview of witnesses and requests for documents will be conducted or requested jointly as often as possible; the

CSB, EPA, the company, or person(s) involved in the investigation may request to proceed separately."

In your view, is this section of the MOU being properly adhered to?

Response:

The purpose of this particular provision in the CSB's MOU with the EPA, which dates back to 2001, was to ensure that witnesses would not be dissuaded from speaking with CSB investigators, despite whatever misgivings they might have in talking with regulators or law enforcement officials. The CSB historically sought to distance itself from regulatory or law enforcement activities so that witnesses would not be afraid to share relevant information quickly, in the immediate aftermath of an accident, without fear of their statements being used against them, leading to fines, criminal charges, or employer retaliation. This remains the CSB's well-reasoned course of action.

The CSB's enabling statute and legislative history explains that the CSB should not be used to "assign blame." This should certainly restrict the CSB's investigators and work product from being used to indict one or more targets of a grand jury investigation. Moreover, not unlike the West Fertilizer investigation, no CSB investigator assigned to the Chevron refinery incident is aware of any evidence of a crime being committed that caused the accident in Richmond, California, on August 7, 2012. Nevertheless, EPA and DOJ continue to press the CSB, demanding production of witness transcripts, despite the harm that could come to the continuing Chevron Investigation (scheduled to be completed in December 2013) in the short term. A more general effect – harmful in the long term – will be to directly jeopardize the CSB's investigatory mission if witnesses in current and future CSB investigations become wary of cooperating voluntarily for fear that their interview transcripts will be shared with regulators or law enforcement personnel.

With that example in mind, it makes sense that witnesses would not want their interview transcripts to be shared with regulatory or law enforcement agencies. No worker, manager, or contractor would like something they say to lead to civil or criminal charges. Moreover, no one would willingly invite employer anger due to cooperation with CSB investigators, and the subsequent potential for retaliation. Both prospects become more likely if the CSB is forced to turn over its witness transcripts for use in criminal cases.

Where interviews can be done jointly with EPA or other agencies, the CSB engages in that practice. A good example of the type of interviews that can be done jointly includes interviews with government officials or representatives of industry or trade groups who were not eyewitnesses to an accident, but who had relevant background information. Obviously, these types of witnesses would have no fear of civil or criminal liability, and as such no "chilling effect" would be possible. Another example is interviews with severely injured patients, for whom medical conditions make extensive interviews difficult. In these instances, the CSB is open to collaborating with other agencies and minimizing the imposition on these individuals while maximizing resources and minimizing discomfort by engaging in joint interviews. However, in the CSB's experience, some witness interviews should unfold separately. This maximizes the chance for obtaining meaningful information from the witnesses, and minimizes any potential "chilling effect" that would starve the CSB of needed information that may not be available from any other source, impairing the CSB's opportunity for success during its complex investigations.

It is the CSB's desire to refresh its MOU with EPA, and to enter into an MOU with DOJ. Conversations with these other agencies are ongoing, in accordance with the recent Executive Order on chemical safety and security, which, among other things, seeks greater cooperation among Executive Branch agencies.

Senator Mike Crapo Questions:

1. **On Friday, February 8, 2013, the CSB's lead investigator in the August 6, 2012, fire at the Chevron refinery in Richmond, CA was served with a federal grand jury subpoena that demanded his testimony as well as the production of "all notes, audio recordings, and transcripts of every interview conducted in furtherance of the U.S. Chemical Safety and Hazard Investigation Board's accident investigation."**

   The subpoena is the result of an EPA criminal investigation overseen by Special Agent Amy Adair of the EPA's Criminal Investigation Division (CID) in San Francisco.

   What type of "chilling effect" will this have on the relationship between CSB and EPA?

Response:

The CSB is concerned that the EPA – particularly because the CSB has some statutory oversight powers with respect to EPA regulations – would work with DOJ to issue a federal grand jury subpoena for information with regard to the agency's Chevron investigation. As has been stated repeatedly in a number of settings, the CSB made extensive efforts to share every document, photograph, test result, and other relevant piece of evidence with EPA. Behind the scenes, CSB investigators have also had numerous informal conversations in which they have shared their thoughts about the case, and even recently traveled to Oakland to do a formal briefing for federal prosecutors and EPA special agents explaining the entire case, including the witness evidence gathered by the CSB. However, as stated before, for a number of important legal and policy reasons, the CSB has sought to avoid providing unrestricted access to the actual witness transcripts themselves, for any use in generating potential indictments.

As a result, the CSB is concerned that inter-agency relationships have been compromised. However, in terms of an actual "chilling effect," the CSB's biggest concern remains that witnesses in current – and in future – CSB investigations become wary of cooperating voluntarily with the CSB for fear that their transcripts will be shared with regulators or law enforcement personnel and that those statements will subsequently be used as the basis of civil or criminal charges against them. Even if witnesses are unaware of these practices, the small but highly specialized national bar of attorneys who represent chemical and petrochemical companies that have suffered major accidents will surely discover this development and will then, for good reason, advise their clients not to cooperate with the CSB on a voluntary basis. This will force the CSB to issue administrative subpoenas, to enforce them in court, and to conduct formal depositions weeks – and most likely months – after the events in question. This will impair CSB investigations with faded witness memories and cautionary advice from legal counsel, as well as employers pressuring employees not to give negative testimony against the employer's interests. In addition, witnesses will increasingly cite their Fifth Amendment right against self-incrimination, and out of an abundance of caution, simply refuse to talk with CSB investigators, denying us critical safety information. The CSB's subpoena authority cannot pierce Fifth Amendment privileges.

2. **It is my understanding that the CSB relies on goodwill to obtain the bulk of its witness statements, which are conducted voluntarily. If witnesses are aware that their statements are easily obtained for criminal investigations, they will be very reluctant to voluntarily speak with our investigators.**

    a. **Would you agree or disagree with this statement?**

Response:

The CSB agrees with this statement. As noted above, the potential for a "chilling effect" on witnesses in accident investigations is real and well documented in accident investigation literature. In this day and age, with well-founded fears of civil or criminal liability for all sorts of workplace decisions, people are growing increasingly reluctant to volunteer to get involved in a host of activities. Providing voluntary testimony to CSB investigators following a major accident at your employer's facility is no exception – especially where there has been significant property damage, injuries and loss of life, environmental damage, and threats to public safety – all of which are likely to draw the interest of prosecutors. If the CSB became known as a conduit for regulators and criminal law enforcement investigators to obtain their testimony, the goodwill that motivates these witnesses to come forward after a major accident in order to share direct, honest, untainted and timely testimony with CSB investigators would all but disappear. People would be justifiably afraid to cooperate, and their lawyers would have no choice but to counsel them to refrain from providing such testimony as well.

    b. **How are the goals of each agency (CSB & EPA) different?**

Response:

Many of the key goals of the CSB and the EPA are the same. For example, both agencies focus on chemical accident prevention and worker and public safety. Similarly, both agencies seek to prevent the release of hazardous substances into the air, water, and ground. Lastly, both agencies work to avoid destruction of private property, disrupting markets and temporarily or permanently harming jobs and local economies. However, the strategy underlying each agency's approach in reaching these shared goals can be quite different. The CSB conducts "root cause safety investigations" while OSHA, DOJ and EPA conduct regulatory compliance and criminal investigations. Both strategies are important, and both must succeed, in order to appropriately protect public interests.

The EPA is a large agency that enforces federal environmental laws. EPA's enforcement tools include permitting, clean-up of heavily polluted areas, the issuance of citations and fines, pursuit of civil damages and other relief obtained through a variety of judicial proceedings, and in some cases, pursuit of criminal charges in federal district court against alleged wrongdoers. In terms of investigations, however, EPA is focused on compliance with its regulations. If an accident or other incident occurs, the benchmark for whether a company (or individual) has done something wrong is determined by assessing whether the company or individual complied with an existing law or regulation. If not, an appropriate punishment is then pursued at EPA's discretion.

Conversely, the CSB is a much smaller agency whose responsibilities are more circumscribed. Pursuant to its statute, the CSB's mission is to investigate the causes of chemical accidents, to publish investigative reports detailing those findings, and to make appropriate safety recommendations to the Administrator of EPA, the Secretary of Labor, the Congress, and other federal, state, and local government entities, as well as industry and relevant trade associations. In some cases, the CSB points out as a finding that compliance with current regulations enforced by EPA and OSHA, as well as widely accepted industrial and trade group practices, was actually not enough to prevent an accident from occurring. That is another reason why the CSB was created – to serve as an institutional catalyst for improving the management of hazardous substances by identifying those regulations in place that proved ineffective to prevent an accident. The CSB's goal of preventing chemical accidents is accomplished by education, advocacy and identification of current ineffective regulation, not assignment of blame or fault to individuals. The CSB shares the lessons learned from chemical accidents while advocating for needed safety change based on careful research and analysis done in the course of each in-depth investigation. This is accomplished by formal recommendations to: OSHA, EPA and other regulatory agencies, companies, the industrial sector generally, and unions and other trade and professional organizations.

Although the CSB was deliberately created to be independent of EPA and, in part, to recommend changes to EPA regulations, I believe the two agencies can and should work together to improve chemical safety. This cooperation can best be achieved by mutual respect for statutory authorities. However, efforts to use CSB interview records for enforcement or criminal prosecution are short-sighted, self-defeating, and frustrate efforts at cooperation. With that in mind, I respectfully suggest that CSB witness transcripts be afforded protection from disclosure or prosecutorial use through an appropriate statutory amendment. This will allow both agencies to pursue their missions effectively.

Thank you for your continued support of the CSB's mission and activities.

Sincerely,

Rafael Moure-Eraso, Ph.D., CIH
Chairperson

Senator BOXER. Thank you very much.

And now we call on Mr. Barry Breen, Deputy Assistant Administrator, Office of Solid Waste and Emergency Response, U.S. EPA.

STATEMENT OF BARRY BREEN, DEPUTY ASSISTANT ADMINISTRATOR, OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. BREEN. Thank you, Chairman Boxer, and thank you, Senators.

I am Barry Breen, as you said, and thank you for the opportunity to testify today on EPA's Risk Management Program as well as the Emergency Planning and Community Right to Know issues. And thank you as well to Mr. White for being here. We appreciate it.

The West, Texas facility fire and explosion have highlighted the importance of properly managing the risks posed by chemical facilities and the need for an effective Community Right to Know Program.

The Clean Air Act provides the authority for EPA's Risk Management Program. Those regulations apply to the owner or operator of a stationary source producing, processing, handling or storing more than a threshold quantity of a covered, regulated substance. The list includes 63 flammable gases and liquids and 77 acutely toxic chemicals.

Many of these substances are also included on the Emergency Planning and Community Right to Know Act Extremely Hazardous Substance List. Approximately 12,800 facilities are currently covered under EPA's Risk Management Program.

Risk Management Program facilities must develop and submit a risk management plan that includes facility hazard assessments including worse case release and alternative release scenarios, facility accident prevention activities such as the use of special safety equipment, employee safety training programs and processed hazard analyses, past chemical accidents at a facility and facility emergency response programs and plans.

Under Section 112(r) of the Clean Air Act there is also a general duty to identify hazards which may result from releases using appropriate hazard assessment techniques to design and maintain a safe facility taking such steps as are necessary to prevent releases and to minimize the consequences of accidental releases which may occur.

The Emergency Planning and Community Right to Know Act establishes authorities for emergency planning and preparedness, emergency release notification reporting, Community Right to Know reporting, and toxic chemical release reporting. It is intended to encourage State and local planning for and response to releases of hazardous substances and to provide the public, local governments, fire departments and other emergency officials with information concerning chemical hazards present in their communities.

Subtitle A of EPCRA established the framework for local emergency planning, while Subtitle B established Community Right to Know requirements to ensure information on chemicals in the community is provided to the public as well as emergency responders. The Act requires that EPA publish a list of extremely hazardous substances. The list was established by EPA to identify chemical substances that could cause serious, irreversible health effects from accidental releases.

EPA was directed to establish a threshold planning quantity for each extremely hazardous substance. The purpose of the list is to focus initial efforts in the development of State and local contingency plans. Inclusion of a chemical on the list indicates a need for the community to undertake a program to investigate and evaluate the potential for accidental exposure associated with the production, storage or handling of a chemical at a particular site and to develop a chemical emergency response plan around those risks.

Under EPCRA, a facility that has an extremely hazardous substance onsite in excess of its threshold planning quantity must notify the State Emergency Response Commission and local Emergency Planning Committee as well as participate in local emergency planning activities. Under the statute, the LEPC then develops a Community Emergency Response Plan. Emergency response plans contain information that community officials can use at the time of a chemical accident.

EPA will continue its efforts to help prevent chemical accidents and releases under the Risk Management Program. Strong chemical accident prevention, preparedness and response programs rely on effective partnerships with the public at all levels of government. We will continue our outreach efforts to stakeholders and work with our Federal, State and local partners to promote chemical safety, address chemical process safety issues and explore opportunities for improving chemical safety.

Chairman Boxer, that concludes my statement and I would be happy to answer any questions you or other members may have.

[The prepared statement of Mr. Breen follows:]

TESTIMONY OF
BARRY N. BREEN
PRINCIPAL DEPUTY ASSISTANT ADMINISTRATOR
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

June 27, 2013

Good morning Chairman Boxer and members of the Committee, I am Barry Breen, Principal Deputy Assistant Administrator for the U.S Environmental Protection Agency's Office of Solid Waste and Emergency Response. Thank you for the opportunity to testify today on the EPA's Risk Management Program and emergency planning and community right-to-know issues.

West, Texas Facility and Geismar, LA Incidents

On April 17, 2013, a fire and explosion occurred at the West Fertilizer plant in the town of West, Texas, causing multiple injuries and fatalities. The explosion shock wave caused multiple fires within a six block radius. The EPA responded as part of a multi-agency effort, including the U.S. Chemical Safety Board (CSB), the Federal Bureau of Alcohol Tobacco and Firearms (ATF), the Texas Commission on Environmental Quality (TCEQ), and Texas Fire Marshal Office. As part of the EPA's role, the agency conducted air monitoring using both stationary sites and a mobile monitoring team in the neighborhoods west of the facility. The EPA monitored for airborne contaminants including volatile organic compounds, ammonia, carbon monoxide, and lower explosive limits of methane gas. The EPA also deployed emergency response personnel to the site of the explosion and fire at the Williams Olefin facility in Geismar, LA. The agency is conducting its post-accident assessment efforts in coordination with the other federal, state and local agencies for both incidents.

The Emergency Planning and Community Right-To-Know Act

In response to the devastating chemical disaster in Bhopal, India in 1984, Congress passed the Emergency Planning and Community Right-to-Know Act (EPCRA) in 1986 to ensure that local communities have the authority they need to prevent, prepare for, and respond to chemical accidents. The EPCRA provisions help increase local planners, responders, and the public's knowledge and access to information on chemicals at individual facilities and risks associated with them. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment. The implementing regulations for emergency planning, emergency release notification, and the chemicals subject to these regulations are codified in 40 CFR part 355. The implementing regulations for community right-to-know reporting (or hazardous chemical reporting) are codified in 40 CFR part 370.

Subtitle A of EPCRA establishes the framework for local emergency planning. The Act requires that the EPA publish a list of extremely hazardous substances (EHSs). The EHS list was established by the EPA to identify chemical substances that could cause serious irreversible health effects from accidental releases {(See 40 CFR part 355 (52 FR 13378, April 22, 1987)}. The Agency was also directed to establish a threshold planning quantity (TPQ) for each extremely hazardous substance.

The purpose of the EHSs list is to focus initial efforts in the development of state and local contingency plans. Inclusion of a chemical on the EHSs list indicates a need for the community to undertake a program to investigate and evaluate the potential for accidental exposure associated with the production, storage or handling of the chemical at a particular site and develop a chemical emergency response plan around those risks.

Under EPCRA section 302, a facility that has an EHS on-site in excess of its TPQ must notify the State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC), as well as participate in local emergency planning activities. Under the Statute, the LEPC shall then develop a community emergency response plan. Emergency Response plans contain information that community officials can use at the time of a chemical accident.

The EPA and the National Oceanic and Atmospheric Administration (NOAA) have developed a system of software applications used widely by States and local emergency planning committees to plan for and respond to chemical emergencies. This system is called the Computer-Aided Management of Emergency Operations (CAMEO) and it was developed to assist front-line chemical emergency planners and responders. Emergency responders and planners use CAMEO to access, store, and evaluate information critical for developing emergency plans. In addition, CAMEO supports regulatory compliance by helping users meet the chemical inventory reporting requirements of EPCRA. The CAMEO system integrates a chemical database and a method to manage the data, an air dispersion model, and a mapping capability. All modules work interactively to share and display critical information in a timely fashion.

Subtitle B of EPCRA established community right-to know requirements in order to ensure information on chemicals in the community is provided to the public as well as emergency responders. Under ECPRA sections 311 and 312, facilities that have either (1) a hazardous chemical present at or above 10,000 pounds or (2) an EHS present at or above its TPQ or 500 pounds—whichever is the lesser, are required to submit an Emergency and Hazardous Chemical Inventory form (Tier II) and a Material Safety Data Sheet (MSDS) for that chemical to their SERC, LEPC and local fire department. A chemical is hazardous as defined under the Hazard Communication Standard (HCS) of the Occupational Safety and Health Act (OSHA). There is not a separate list of hazardous chemicals. If a facility is required by OSHA to develop and/or maintain a MSDS for that chemical and it is present at or above the threshold discussed above, it must be reported. Local fire departments receive this information and should use it to understand the chemical(s) present at facilities in their community and precautions they may need to take in responding to an accident at the facility.

Sections 311 and 312 of EPCRA make available to the local and state emergency planners information on other chemicals and facilities, beyond those identified under section 302, that they may wish to include in their emergency planning efforts. The EPA has specified in guidance that Tier II information under section 312 will provide specific information on the quantities and locations of hazardous chemicals. Thus, sections 311 and 312 provide information supportive of the emergency planning required under Subtitle A. The facilities identified as a result of that subtitle are only a "first cut" of the facilities and potential chemical hazards for which emergency planning may be necessary.

Risk Management Program

The Clean Air Act (CAA) 112(r) provisions build on the planning and preparedness groundwork laid by EPCRA. CAA 112(r) provides the authority for the EPA's Risk Management Program (RMP). RMP regulations apply to the owner or operator of a stationary source with more than a threshold quantity of a CAA section 112(r) regulated substance in a process. Section 112(r) chemicals and thresholds may overlap with chemicals listed under other rules, but are not identical to those on any other list. The section 112(r) list includes 63 flammable gases and liquids and 77 acutely toxic chemicals. To develop the list, several statutory factors were considered, including the severity of any acute adverse health effects associated with accidental releases of the substance, the likelihood of accidental releases of the substance, and the potential magnitude of human exposure to accidental releases of the substance. An accidental release is an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source. Many of these substances are also included on the EPCRA extremely hazardous substance (EHS) list. The section 112(r) chemical list and corresponding thresholds for each chemical are published at 40 CFR 68.130. Under CAA section 112 (r), the EPA is required to review the list of chemicals every 5 years or by its own motion or by petition. The EPA also provides an ongoing review of new chemicals and hazards to see if any chemical warrants listing or delisting.

Under the RMP regulations, a covered facility is required to review the hazards associated with the covered substance, process and procedures, as well as develop an accident prevention program and an emergency response program. The "Hazard Review" must identify opportunities for equipment malfunction or human error that could in turn cause the accidental release of the covered substance, as well as safeguards to prevent the potential release, and steps to detect and monitor for a release. A facility's compliance with these requirements is documented in a Risk Management Plan that is submitted to the EPA. Covered facilities must implement the Plan and update them every 5 years or when certain changes occur. The goal of the EPA's Risk Management Program is to prevent accidental releases of substances to the air that can cause serious harm to the public and the environment from short-term exposures, and to mitigate the severity of releases that do occur. Approximately 12,800 facilities are currently covered under Risk Management Program regulations.

Under the CAA section 112(r) RMP facilities must submit a risk management plan which includes:

- Facility hazard assessments, including worst-case release and alternative release scenarios;
- Facility accident prevention activities, such as use of special safety equipment, employee safety training programs, and process hazards analyses conducted by the facility;
- Past chemical accidents at a facility; and
- Facility emergency response programs and plans.

Another key component of Section 112(r) of the Clean Air Act, is section 112(r)(1), which is the General Duty Clause. This provision requires owners and operators of any stationary sources producing, processing, handling or storing an RMP substance or any other extremely hazardous substance to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which may occur. This requirement is all encompassing and is used proactively to prevent accidents when hazards are observed that could lead to a chemical accident, or after an accident, if a facility failed to properly carry out this statutory requirement. Under the General Duty, facilities are expected to comply with recognized and generally accepted good engineering practices.

Both EPCRA and the CAA section 112(r) Risk Management Program encourage communication between facilities and the surrounding communities about chemical safety and chemical risks. Regulatory requirements, by themselves, will not guarantee safety from chemical accidents. Those who are handling hazardous substances must take the responsibility and act to prevent, prepare for and respond to chemical emergencies. Information about hazards in a community will allow local emergency officials and the public to work with industry to prevent accidents.

Conclusion

The EPA will continue its efforts to help prevent chemical accidents and releases under the Risk Management Program. Strong chemical accident prevention, preparedness, and response programs rely upon effective partnerships with the public and all levels of government. We will continue our outreach efforts to stakeholders and work with our federal, state, and local partners to promote chemical safety, address chemical process safety issues, and explore opportunities for improving chemical safety.

Enclosure

U.S. EPA Responses to Questions for the Record
Senate Environment and Public Works Committee Hearing on "Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA"
June 27, 2013

Questions from Senator Boxer

1. **Mr. Breen, in 2012, labor, health, and environmental justice groups petitioned the Environmental Protection Agency to update its guidance on the Clean Air Act's "General Duty Clause," which the Agency issued in 2000, to enhance the use of inherently safer technologies.**

Please describe the status of the Environmental Protection Agency's:

a. **Review of this petition;**

b. **Timeline for initiating and completing actions to consider and respond to the petition; and**

c. **Actions, if any, to require the consideration and use, where feasible, of inherently safer technologies under the Agency's risk management program.**

Response: The EPA is evaluating the petition and is currently considering what actions, if any, are necessary. Executive Order 13650, "Improving Chemical Facility Safety and Security," issued August 1, 2013, requires federal agencies, including the EPA, to, among other things, "develop options for improved chemical facility safety and security that identifies improvements to existing risk management practices through agency programs, private sector initiatives, Government guidance, outreach, standards, and regulations." Within 90 days of developing the options above, the EO Working Group will engage key stakeholders to discuss the options and within 90 days of completing this outreach and consultation effort, will develop a plan for implementing the practical and effective improvements to chemical risk management.

The Order further requires the EPA and the Department of Labor to "review the chemical hazards covered by the Risk Management Program (RMP) and the Process Safety Management Standard (PSM) and determine if the RMP or PSM can and should be expanded to address additional regulated substances and types of hazards. In addition, the EPA and the Department of Labor shall develop a plan, including a timeline and resource requirements, to expand, implement, and enforce the RMP and PSM in a manner that addresses the additional regulated substances and types of hazards." The Order also requires agencies to "convene stakeholders, including chemical producers, chemical storage companies, agricultural supply companies, state and local regulators, chemical critical infrastructure owners and operators, first responders, labor organizations representing affected workers, environmental and community groups, and consensus standards organizations, in order to identify and share successes to date and best practices to reduce safety risks and security risks in the production and storage of potentially harmful chemicals, including through the use of safer alternatives, adoption of best practices, and potential public-private partnerships."

The EPA intends to address the issues of chemical facility safety and security raised by the petitioners within the context of the government's actions under the Executive Order. Plans for changes to regulations or guidance relative to chemical safety will be considered in accordance with the framework and timelines specified in that Order.

2. **Mr. Breen, in 2012, Environmental Protection Agency's National Environmental Justice Advisory Council wrote to EPA saying: "We have already witnessed in countless environmental justice communities what can, and has happened as chemical releases, explosions, fires, train derailments, and refinery releases have wreaked havoc upon local communities...." The Council recommended that EPA use its authorities under section 112(r) of the Clean Air Act to reduce or eliminate such catastrophic risks, where feasible.**

a. **Please describe the actions, if any, that the Environmental Protection Agency has taken in response to this recommendation?**

b. **Please describe the Environmental Protection Agency's timeline for initiating and completing actions to consider and respond to this recommendation.**

Response: Under the Clean Air Act Section 112(r), the EPA implements and enforces regulations at 40 CFR Part 68 (the RMP regulations) as well as the Clean Air Act Section 112(r)(1) General Duty Clause (GDC). Using these authorities, the EPA conducts approximately 450 facility inspections each year, with a priority given to inspecting "high risk" facilities.

When facilities are found to be out of compliance with regulatory or statutory requirements, the EPA may take an enforcement action. For example, a recent case involved a food processing facility in South San Francisco (U.S. v. Columbus Manufacturing). The EPA assessed a monetary penalty for violations of the CAA GDC of over $685,000, and required significant safety improvements at the facility, including upgrading the facility's refrigeration system to a safer design.

The National Environmental Justice Advisory Council's letter requests the EPA to take additional actions, including changes to regulations and guidance. The actions requested by the Council are consistent with those to be considered under the President's recent Executive Order. The EPA intends to consider these requests within the context of the government's actions under Executive Order 13650, and plans for changes to regulations or guidance relating to chemical safety will be considered in accordance with the framework and timelines specified in that Order.

3. **Mr. Breen, a 2002 Chemical Safety Board report, titled, "Improving Reactive Hazard Management" found an average of five fatalities a year in our nation related to incidents with reactive chemicals, and that more than 50% of these incidents involved chemicals that were not covered by the Environmental Protection Agency or Occupational Safety and Health Administration safeguards. Among other issues, the Chemical Safety Board recommended that Environmental Protection Agency's risk management program "explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public."**

a. **Please describe the actions, if any, that the Environmental Protection Agency has taken in response to this recommendation?**

b. **Please describe the Environmental Protection Agency's timeline for initiating and completing actions to consider and respond to this recommendation.**

Response: The agency has taken a number of actions to improve reactive chemical safety in response to the 2002 Chemical Safety Board recommendation. For example, the EPA worked with the American Institute for Chemical Engineers Center for Chemical Process Safety (CCPS) to develop guidance on the safe handling of reactive materials. CCPS issued a safety alert entitled *Reactive Material Hazards*, which describes what facilities should do to fully understand the reactive properties of chemicals. CCPS also published *Essential Practices for Managing Chemical Reactivity Hazards,* which provides guidance on management systems and hazard assessment protocols for reactive materials. EPA staff participated in both of these efforts and worked to make the guideline widely available to chemical facilities.

The EPA continues to work with the National Oceanic and Atmospheric Administration (NOAA) to produce the Chemical Reactivity Worksheet (CRW), a free software program that allows users to identify most chemical reactivity hazards associated with their chemical processing and support operations. A recently released update of the program was downloaded more than 30,000 times on the first day of release. The CRW is available at: http://response.restoration.noaa.gov/reactivityworksheet.

The EPA also collaborated with the Occupational Safety and Health Administration (OSHA) and various industry associations to form the Chemical Reactivity Hazards Management Alliance. The Alliance provided education and outreach materials and conducted safety workshops for reactive chemical users with the objective to improve the overall safety of reactive chemical hazards within U.S. industry. Our work with CCPS, NOAA, OSHA, and various industry groups has helped increase public knowledge of reactive hazards and the means to abate those hazards. These efforts promote the design and maintenance of safer facilities as addressed by the CAA GDC.

Executive Order 13650 requires the EPA to review the chemical hazards covered by the RMP and determine if the program should be expanded to address additional regulated substances and types of hazards. Therefore, any plans for actions to be taken by the agency to modify the RMP regulation will be considered in accordance with the framework and timelines specified in that Order.

4. **Mr. Breen, a 2011 Chemical Safety Board report, titled, "Public Safety at Oil and Gas Storage Facilities," investigated the safety of oil and gas storage tanks. This report found a lack of fencing, security, or other safety measures had contributed to 44 deaths and 25 injuries related to explosions at these sites (1983 to 2010). The Chemical Safety Board recommended Environmental Protection Agency use its general duty clause authority under the Clean Air Act to enhance safety, including by having owners or operators put signs warning of explosive hazards on or near tanks.**

a. **Please describe the actions, if any, that the Environmental Protection Agency has taken in response to this recommendation?**

b. **Please describe the Environmental Protection Agency's timeline for initiating and completing actions to consider and respond to this recommendation.**

Response: The Chemical Safety Board (CSB) recommended the EPA publish a safety alert directed to owners and operators of exploration and production facilities that have flammable material storage tanks, advising them of their general duty clause responsibilities for accident prevention under the Clean

Air Act. The EPA accepted the CSB's recommendation and plans to publish an alert by the end of calendar year 2013.

Questions from Senator Gillibrand:

1. **In my State, fire destroyed a Columbia County transformer recycling facility in August 2012. Thankfully, no one was killed or seriously injured in this fire, but the immediate aftermath lead to confusion and more questions than answers by local officials. Fire broke out in an area of this facility that had a high concentration of PCB-containing oils. There was presence of sodium and toxic chemicals in this facility. West, TX should be a lesson that the danger posed to first responders who respond to a fire call with no prior knowledge of the elements and compounds inside a facility risk life, property and threaten the environment. My concern remains as to what obligation these companies, handling elements like this, or transporting them to and from their facilities over our roads and rail, have to inform first responders to their presence?**

Response: The Emergency Planning and Community Right-to-Know Act (EPCRA) Sections 311 and 312 apply to facilities that are required to prepare or have available a material safety data sheet (MSDS) for hazardous chemicals defined under OSHA Hazard Communication Standard (HCS). A MSDS provides information on the hazards associated with the chemical and how to safety handle and manage the chemical. Section 311 requires the owner or operator of a facility to submit a MSDS for any hazardous chemical present at the facility above the reporting thresholds specified in the regulations, to the State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC) and the local fire department. Section 312 requires the owner or operator of the facility subject to Section 311 to submit a hazardous chemical inventory form (Tier II form) annually to the SERC, LEPC and the fire department on the hazards, amounts and locations of hazardous chemicals present at the facility above the reporting thresholds. Facilities are required to provide specific locations of hazardous chemicals at the facility. In addition, under Section 312(f) facilities are required to provide access to the fire department to conduct on-site inspections of facilities subject to Sections 311 and 312.

The information reported on the Tier II form includes information about hazardous chemicals present during the previous calendar year. Reporting thresholds are codified in 40 CFR part 370. Emergency planners and responders currently use the information reported on the Tier II form to develop or modify community emergency plans because the Tier II form contains information on extremely hazardous substances defined under EPCRA Section 302 and on other OSHA hazardous chemicals.

Only hazardous chemicals defined under the OSHA Hazard Communication Standard (HCS) are subject to EPCRA Sections 311 and 312 reporting requirements. Some chemicals are exempted from MSDS requirements under OSHA HCS and therefore exempted from EPCRA Sections 311 and 312. For example, hazardous waste regulated under the Solid Waste Disposal Act (as amended by the Resource Conservation and Recovery Act), drugs regulated under the Food, Drug and Cosmetic Act, articles, wood or wood products, etc. If any such chemicals are present at a facility, then these chemicals would not be reported under Sections 311 and 312. EPCRA does not give the EPA authority to require facilities to report non-OSHA hazardous chemicals on the Tier II form.

Under EPCRA section 302, facilities are required to provide notification to the SERC and the LEPC of the presence of EHS at or above its threshold planning quantity (TPQ). EHSs and TPQs are listed in 40 CFR part 355. LEPCs use this information to develop or modify the local emergency response plan. PCB-transformer oil is not an EHS, so notification is not required under Section 302. However, these types of facilities may have EHSs present which may require notification under Section 302. Even if there are no EHSs present at these types of facilities, Section 302(b)(2) authorizes the Governor or the

SERC to designate additional facilities which would be subject to emergency planning notification requirements, after public notice and comment. Once these facilities have been so designated, under Section 303, the LEPC may request the facility owner or operator to provide information necessary for developing and implementing the community emergency plan. The EPA continues to encourage SERCs and LEPCs to exercise their authorities to designate such facilities to be subject to emergency planning notification.

EPCRA Section 327 exempts substances in transportation or stored incident to transportation, except for Section 304 release notification requirements. Therefore, substances in transportation or stored incident to transportation would not be reported under Sections 302, 311 and 312. However, the provisions in Section 303 state that LEPCs should include in their local emergency response plan routes used for transporting EHSs in their district. LEPCs have the authority under Section 303 to request any information necessary, which may include transportation routes of EHSs for developing or modifying the community emergency plan.

Questions from Senator Vitter

1. **Under what authority is EPA relying to try and access CSB investigative materials?**

Response: The EPA exercises authority under the Clean Air Act (CAA) and other pollution control statutes when it seeks relevant information held by other federal, state, or local governmental entities. For example, 42 U.S.C. § 7412(r)(6)(Q) provides "any records reports or information obtained by the [Chemical Safety] Board shall be available to the Administrator."

2. **Do you agree with EPA's response to Senator Boxer's April 30th letter on the incident in West, TX, that ammonium nitrate fertilizer does not meet the criteria for regulating substances under the Clean Air Act RMP program?**

Response: Ammonium nitrate fertilizer is not currently regulated under the RMP provisions as it did not meet the listing criteria that the EPA used to establish the list of regulated substances. As explained more fully in the rulemaking notices establishing the list in 40 CFR 68.130, EPA's current criteria focus on acutely hazardous and highly flammable gases and liquids. See 59 FR 4478, 4493 (Jan. 31, 1994); 63 FR 640, 644 (Jan. 6, 1998). Ammonium nitrate meets neither set of criteria. Within certain constraints, the EPA has authority to add substances to the RMP list via notice and comment rulemaking. In listing substances, CAA Section 112(r)(4) requires the EPA to consider specific factors including the severity of any acute adverse health effects associated with accidental releases of the substance, the likelihood of accidental releases of the substance, and the potential magnitude of human exposure to accidental releases of the substance.

3. **Does EPA share information about regulated chemical facilities with other federal agencies responsible for oversight of activities at their sites? What is being done to identify other "outlier" facilities that have a poor compliance record?**

Response: The EPA shares information about regulated chemical facilities with other federal agencies responsible for oversight at the same sites. The EPA maintains a national database of risk management plans (RMPlans) submitted to the agency by regulated facilities, and makes those data available to other federal, state, and local agencies, as permitted by law. RMPlan data are shared with the Department of

Homeland Security (DHS) and its component agencies (e.g. the U.S. Coast Guard), the Department of Labor, the CSB, the Department of Justice, the Department of Defense, the Department of Transportation's Pipeline and Hazardous Materials Safety Administration and others. DHS recently conducted a crosswalk of RMPlan facilities and Chemical Facility Anti-Terrorism Standards (CFATS) facilities as part of ongoing federal chemical safety and security efforts.

The EPA performs periodic reviews to identify facilities that should have filed an RMPlan and implemented a risk management program by comparing the list of current RMP facilities against other available databases, such as Toxic Release Inventory (TRI) data collected under the Emergency Planning and Community Right-to-Know Act (EPCRA), state EPCRA Tier 2 chemical inventory databases where available, and other databases such as the DHS Chemical Facility Anti-Terrorism Standards Top-Screen database, which DHS has recently made available to the EPA. The EPA also conducts approximately 450 RMP facility inspections each year, focusing on high-risk chemical facilities. Where facilities are found to be out of compliance with regulatory or statutory requirements, the EPA may take an appropriate enforcement action.

4. **How does EPA work with local communities and first responders to ensure information the Agency has collected is not only readily available, but in a form easily used by first responders at the local level in response to chemical facility accidents?**

Response: The EPA works with local communities and first responders to provide chemical hazard information in various ways:

- The EPA makes the RMPlan database available to State Emergency Response Commissions (SERCs), Local Emergency Planning Committees (LEPCs), and other state and local authorities as requested. Authorized users may obtain these data either on a data DVD or through on-line access via EPA's Central Data Exchange.
- The EPA provides RMP inspector training to state and local agencies with delegated authority to implement the 40 CFR Part 68 RMP regulations, and as resources allow, the EPA also provides such training to non-delegated state and local agency representatives. The EPA frequently invites state and local agency officials and first responders to participate on RMP inspections. The agency is also developing on-line EPCRA training for SERCs and LEPCs and plans to deploy that training in FY 2014.
- The EPA and the National Oceanic and Atmospheric Administration (NOAA) developed the Computer-Aided Management of Emergency Operations (CAMEO) suite of software applications to provide local emergency planners and responders with a set of computer tools to assist them in planning for and managing hazardous chemical emergencies. CAMEO includes a chemical database containing comprehensive hazard information on over 6000 chemicals and allows users to store and manage information about chemicals in their communities. The software also includes an atmospheric dispersion modeling program to estimate the impact distances of toxic vapor clouds, fires and explosions, and a mapping application that people can use to quickly create, view, and modify maps containing chemical facilities along with additional mapping layers (e.g., schools, facilities, response assets).
- Via the RMP Reporting Center and EPA Call Center, the EPA provides ongoing support to state and local agencies and others to answer questions regarding implementation of the RMP and EPCRA, access to and use of the RMP National Database, and use of related EPA software tools such as CAMEO, EPCRA Tier II Submit, RMP*Comp, and others.
- Although the EPA does not collect the Section 312 EPCRA Emergency and Hazardous Chemical Inventory (Tier II) Forms, which provide information to state and locals on the amounts and locations of hazardous chemicals at a facility, on July 3, 2012, the EPA amended the required format for these forms

in response to stakeholders' requests. The changes make the forms more useful for state, local, and tribal agencies and reporting easier for facilities.

- The EPA frequently participates in SERC and LEPC conferences and workshops. The EPA also attends National Association of SARA Title III Program Officials (NASTTPO) conferences to provide regulatory and policy updates on EPCRA and other preparedness and prevention activities. NASTTPO members include SERCs, Tribal Emergency Response Commissions (TERCs), LEPCs and other emergency management and response officials. During these conferences, these entities suggest ways the EPA could provide more information from facilities that would be valuable for emergency planning and response.
- The EPA also manages a hotline to answer questions from the regulated community, SERCs, LEPCs, first responders and other emergency management officials on EPCRA and RMP.
- The EPA co-chairs thirteen Regional Response Teams (RRTs) in the U.S., each representing a particular geographic region (including the Caribbean and the Pacific Basin). RRTs are composed of representatives from field offices of the federal agencies that make up the National Response Team, as well as state representatives. RRTs provide a forum for federal agency field offices and state agencies to conduct response planning, training, and coordination for hazardous chemical incidents and major oil spills.
- U.S. EPA and DHS representatives as part of an interagency working group met with a group of firefighters in New Jersey on June 27, 2013 to engage them on emergency preparedness and response issues that they felt needed to be addressed to safely respond to chemical incidents at facilities in their communities. Information gathered from this dialogue will be used to develop a plan to support and further enable efforts by federal, state, and local authorities coordinating with chemical facilities to improve chemical facility safety and security as discussed in the Executive Order.
- The EPA is working to ensure wide distribution of the August 30, 2013, updated Ammonium Nitrate Advisory.

The issue of coordination and information sharing with local communities and first responders is one of the key issues to be addressed in Executive Order 13650 on "Improving Chemical Facility Safety and Security." The Order requires the EPA and other agencies to identify ways to improve coordination among the federal government, first responders, and state, local, and tribal entities, to identify opportunities and mechanisms to improve response procedures and enhance information sharing between chemical facilities, local authorities, and responders, and other actions. Therefore, the agency intends to address any plans for changes and improvements in its work with local communities and first responders within the framework and timelines specified in the Order.

5. **The "Information and Data Sharing" section of the Memorandum of Understanding ("MOU") between EPA and CSB states:**

"The CSB is an independent, non-enforcement agency. To ensure that during the conduct of an investigation the CSB is not perceived as an extension of a state or federal enforcement investigation, the CSB will not participate in compliance and enforcement activities conducted by other agencies. To avoid duplicative efforts, interviews of witnesses and requests for documents will be conducted or requested jointly as often as possible; the CSB, EPA, the company, or person(s) involved in the investigation may request to proceed separately." In your view, is this section of the MOU being properly adhered to?

Response: The EPA and the CSB share a mission to prevent harm to public health and the environment. The current MOU provides a framework by which these goals can be met, however, to help further support information sharing, on August 1, 2013, the White House issued Executive Order 13650 entitled "Improving Chemical Facility Safety and Security." The Order establishes a Working Group charged with enhancing coordination and information sharing regarding chemical safety between federal entities and between federal, state, and local governments. One charge is to consult with the CSB and determine what, if any changes are required to existing Memoranda of Understanding and processes between the CSB and various agencies (EPA, OSHA, and the Bureau of Alcohol, Tobacco and Firearms) "for timely and full disclosure of information." The group is consulting with CSB regarding Memoranda of Understanding and other processes to ensure timely and full disclosure of information needed by all agencies that share an environmental and public health protection mission.

6. **Does the EPA have any plans to issue a regulation to define the scope of the General Duty Clause, as well as a complete list of chemicals of which it covers?**

Response: The General Duty Clause (GDC) is a broad, performance-based, self-enabling requirement that appears to reflect the Congressional intent that the owners and operators of chemical handling facilities have and must take primary responsibility for the prevention of chemical accidents from recognized hazards, including hazards that may not be identified or substances that may not be listed, in 112(r) regulations. The EPA does not have plans to define the scope of the GDC by regulation, either by specifying a limited set of covered hazards or by identifying a limited number chemicals covered by the GDC through an implementing regulation. Such a regulation could limit the scope of the GDC and relieve facilities of that responsibility.

The statute itself and its legislative history help define the scope of the General Duty Clause and provide guidance to the EPA and all stakeholders on its implementation. Congress patterned the CAA GDC after the general duty clause of the Occupational Safety and Health (OSH) Act. The OSH Act general duty has been enforced to promote worker safety. As noted by the 101st Congress, the Occupational Safety and Health Administration cites the OSH Act general duty provision when there is no specific applicable OSHA regulation or standard and when an employer is aware that a hazard exists (Senate Environment and Public Works, Report 101-228, at 209 (1989)) "Senate Report." The CAA directly references the OSH Act general duty provision as informing the nature of the duty under the CAA GDC. Section 112(r)(1) provides that facilities have a general duty "in the same manner and to the same extent as" the general duty in the OSH Act.

In accordance with the general duty clause of the OSH Act, an employer must "(1)...render a workplace free of a hazard; (2) the hazard [must be] recognized either by the cited employer or generally within the employer's industry; (3) the hazard was causing or was likely to cause death or serious harm; and, (4) there was a feasible means by which the employer could have eliminated or materially reduced the hazard (Secretary of Labor v. Duriron Co., 11 OSHC (BNA) 1405, 1407 (OSHRC 1983) Senate Report at 209). For purposes of complying with the CAA GDC, these same responsibilities apply to owner/operators of stationary sources that have extremely hazardous substances under the CAA GDC. *Id.* Like the OSH Act general duty, the CAA GDC functions as a gap-filler when a serious hazard is recognized by a source or within the source's industry and there is not a specific regulation addressing that hazard. *See Id.* Therefore, issuing a regulation on the scope of the GDC would be contrary to the design of the statute.

Specifically with regard to the listing of chemicals, while Congress required EPA to issue a list of substances and thresholds to implement the risk management plan requirements of CAA 112(r)(7), it left the substances potentially covered by the CAA GDC open-ended. The guidance at the time of enactment was that "[e]xtremely hazardous substances would include, but are not limited to" the list of substances that covered in the risk management plan requirements, all extremely hazardous substances identified under the Emergency Planning and Community Right-to-Know Act, and "other agents which may or may not be listed or otherwise identified by any Government agency" that may cause death, injury, or serious property damage in an accidental release (Senate Report at 211). The Senate provided further guidance by saying that "the release of any substance which causes death or serious injury . . . or which causes substantial property damage . . . would create a presumption that such substance is extremely hazardous" (Id.). The EPA has implemented the GDC consistent with this intent and refrained from listing specific chemicals, since the earliest days after enactment of section 112(r) (59 Fed. Reg. 4478, 4481 (Jan. 31, 1994)). Consistent with the nature of the GDC described above, establishing a limited list of substances subject to the GDC by EPA would appear to be contrary to the design of the statute.

7. **What provisions of the CAA Risk Management Plans do you believe are missing or inadequate enough to result in the Agency applying the General Duty Clause?**

Response: The RMP and the GDC have distinct functions that serve to prevent chemical accidents. For sources covered by both, the RMP imposes greater and more specific obligations than the GDC. However, the Risk Management Program applies only to stationary sources holding within a process more than a threshold quantity of any of 140 listed substances, whereas the GDC is not limited to a specific list of substances (i.e., the GDC applies to all RMP substances and any other extremely hazardous substance) or threshold quantities.

As provided in the statute, the focus of the RMP is on substances that "pose the greatest risk of causing death, injury, or serious adverse effect on human health or the environment from accidental releases" (CAA 112(r)(3)), and on quantities known to cause the effects for which the substance was listed (CAA112(r)(5)).

The GDC, as described in the answer to question #6, is broader in its scope and is intended to include chemicals that, due to case specific factors, pose serious risks [(see 63 Fed. Reg. 640, 642 (January 6, 1998)) ("The general duty clause of section 112(r)(1) would apply when site-specific factors make an unlisted chemical extremely hazardous")]. This necessarily means that the GDC applies in situations where the RMP regulation does not apply, but does not demonstrate a deficiency in EPA's authority under the RMP program.

8. **Does EPA have any plans on issuing any guidance or proposing any rule that would mandate the use or consideration of Inherently Safer Technologies?**

Response: The EPA has received input from some stakeholders regarding this issue. In a petition dated July 25, 2012, various groups asked the EPA for a rulemaking and interim guidance on this issue. The EPA continues to evaluate this petition and is currently considering what actions to take.

Executive Order 13650, "Improving Chemical Facility Safety and Security," issued August 1, 2013, requires federal agencies, including the EPA, to among other things, "develop options for improved chemical facility safety and security that identifies improvements to existing risk management practices through agency programs, private sector initiatives, government guidance, outreach, standards, and regulations." Within 90 days of developing the options above, the EO Working Group will engage key stakeholders to discuss the options and within 90 days of completing this outreach and consultation effort, will develop a plan for implementing the practical and effective improvements to chemical risk management.

The Order further requires the EPA and the Department of Labor to, "review the chemical hazards covered by the Risk Management Program (RMP) and the Process Safety Management Standard (PSM) and determine if the RMP or PSM can and should be expanded to address additional regulated substances and types of hazards. In addition, the EPA and the Department of Labor shall develop a plan, including a timeline and resource requirements, to expand, implement, and enforce the RMP and PSM in a manner that addresses the additional regulated substances and types of hazards."

The Order also requires agencies to "convene stakeholders, including chemical producers, chemical storage companies, agricultural supply companies, State and local regulators, chemical critical infrastructure owners and operators, first responders, labor organizations representing affected workers, environmental and community groups, and consensus standards organizations, in order to identify and share successes to date and best practices to reduce safety risks and security risks in the production and storage of potentially harmful chemicals, including through the use of safer alternatives, adoption of best practices, and potential public-private partnerships." The EPA intends to consider the petitioners' requests within the context of the government's actions under the Executive Order.

Questions from Senator Crapo

1. **On Friday, February 8, 2013, the CSB's lead investigator in the August 6, 2012, fire at the Chevron refinery in Richmond, CA, was served with a federal grand jury subpoena that demanded his testimony as well as the production of "all notes, audio recordings, and transcripts of every interview conducted in furtherance of the U.S. Chemical Safety and Hazard Investigation Board's accident investigation." The subpoena is the result of an EPA criminal investigation overseen by Special Agent Amy Adair of the EPA's Criminal Investigation Division (CID) in San Francisco. What type of "chilling effect" will this have on the relationship between CSB and EPA?**

Response: The EPA and the CSB share a mission to prevent harm to public health and the environment and maintaining an effective working relationship between our agencies is important to the EPA. To help further support information sharing, on August 1, 2013, the White House issued Executive Order 13650 entitled "Improving Chemical Facility Safety and Security." The Executive Order establishes a Working Group charged with enhancing coordination and information sharing regarding chemical safety between federal entities and between federal, state, and local governments. One charge is to consult with the CSB and determine what, if any changes are required to the existing Memoranda of Understanding and processes between the CSB and various agencies (EPA, OSHA, and the Bureau of Alcohol, Tobacco and Firearms) "for timely and full disclosure of information." The group will be consulting with CSB regarding Memoranda of Understanding and other processes to ensure timely and full disclosure of information needed by all agencies that share an environmental protection mission.

2. **It is my understanding that the CSB relies on goodwill to obtain the bulk of its witness statements, which are conducted voluntarily. If witnesses are aware that their statements are easily obtained for criminal investigations, they will be very reluctant to voluntarily speak with our investigators.**

    a. **Would you agree or disagree with this statement?**

b. How are the goals of each agency (CSB & EPA) different?

Response: Many agencies conduct voluntary interviews. We understand that generally, agencies have been able to share information with criminal investigators without a material adverse impact on their ability to obtain witness information needed to accomplish their mission in a timely fashion. The EPA continues to work with the CSB recognizing the sensitivities surrounding this concern.

The goals of the CSB and the EPA are the same in that both agencies work to prevent harm to public health and the environment, however, the CSB and the EPA employ different methods to achieve these goals. The CSB conducts in-depth root cause investigations and issues public reports and recommendations on how to prevent such accidents in the future, while the EPA performs similar investigative and technical assistance functions with additional emphasis on civil and criminal enforcement actions to prevent and deter future violations and emergency preparedness activities to improve state and local response capabilities.

<u>Questions on first responders to accidents:</u>

3. What type of changes would EPA propose to get first responders hazard information that can help them perform their jobs?

Response: The EPA is working on this issue pursuant to the directives of Executive Order 13650 on Improving Chemical Facility Safety and Security. As part of this effort, the EPA is seeking input from State Emergency Response Commissions (SERCs), and Local Emergency Planning Committees (LEPCs), and local responders whether information currently available is sufficient and in the best form to support their work on emergency planning and response.

4. How does the public "right to know" conflict with important information given to first responders?

Response: It is unnecessary for the public "right to know" provisions under the Emergency Planning and Community Right-to-Know Act (EPCRA) to conflict with information given to first responders. EPCRA Sections 311 and 312 requires the owner or operator of a facility to submit information on the hazards, amounts and locations of OSHA hazardous chemicals at the facility to the SERC, LEPC, and the local fire department. The hazardous chemical inventory reporting under Section 312 is an annual requirement for facilities to these entities. Section 312(f) authorizes the fire department to conduct on-site inspection of facilities subject to Section 312. Under this provision, facilities are required to provide specific location information on hazardous chemicals at the facility during the inspection as well as on the Tier II form.

5. How do you incorporate first responder input? What emphasis do you suggest on building relationship between stakeholders instead of information data dumps?

Response: EPCRA authorizes LEPC's to develop emergency response plans as required under Section 303. LEPC membership could usefully consist of elected state and local officials, law enforcement, civil defense, firefighters, first aid, health, local environmental, hospital, transportation personnel, broadcast and print media, community groups and owners and operators of facilities subject to the emergency planning notification provisions of EPCRA. Under Section 303, facilities are required to provide the name of a representative, facility emergency coordinator, who will participate in the emergency planning process.

The statute allows facility owners or operators to be part of the LEPC which would involve participating in the development of emergency plans. The requirement under Section 303 also ensures that owners and operators of facilities are involved in preparing and informing the community as well as first responders of potential risks.

Facilities subject to the Clean Air Act 112(r)(7) provisions are also required to coordinate their emergency response actions with the local emergency planning and response organizations. This requirement assists in ensuring that the facility and community planning efforts are coordinated, which will improve both plans, thereby facilitating effective response actions when releases occur.

The EPA continues to provide technical assistance to facilities and state and local officials to comply with the provisions under EPCRA and RMP.

6. What educational outreach and training programs has EPA proposed to first responders and industry as a result of West and other industry accidents?

Response: The EPA, in cooperation with other federal agencies including OSHA and ATF, has updated and expanded its Chemical Safety Advisory for Ammonium Nitrate, which primarily focuses on safe handling, storing and management of solid ammonium nitrate. It can be found at: http://www.epa.gov/emergencies/content/rmp/index.htm. The advisory also provides links to many other safe practices that have been developed for various uses of ammonium nitrate by industry groups and standard setting organizations.

EPA's regional offices are in direct contact with SERCs and many LEPCs. The regions hold conferences and information sessions for LEPCs, other planners and responders as well as participate in the LEPC workshops and exercises.

The EPA publishes guidance and policy memos as well as frequently asked questions to assist planners and responders in becoming familiar with requirements under EPCRA. The EPA is also developing on-line training on EPCRA and its implementing regulations for planners and responders, which will be available by the end of 2013.

7. Has EPA talked to first responders as to their needs for reporting information, post the West, Texas accident?

Response: Yes, the EPA has conferred both by conference calls and in person. For example, the EPA and DHS representatives, as part of an interagency working group, met with a group of firefighters in New Jersey on June 27, 2013, to engage them on emergency preparedness and response issues that they felt needed to be addressed to safety respond to chemical incidents at facilities in their communities. Information gathered from this dialogue will be used to develop a plan to support and further enable efforts by federal, state, and local authorities coordinating with chemical facilities to improve chemical facility safety and security as discussed in Executive Order 13650.

In his testimony, Richard Webre the Director of OHSEP, proposes many changes to current EPCRA laws and enforcement.

8. Which recommendations do you support? (page 5 of Webre testimony)

Response: The EPA is evaluating the recommendations for improving emergency planning and response to chemical accidents. We hope for further discussion of his recommendations as part of Executive Order 13650's goal of improving operational coordination with state, local and tribal partners and enhancing information collection and sharing.

9. EPA has a robust enforcement agenda in protecting the environment, how much money is directed toward enforcement efforts? And how much is afforded for outreach efforts?

Response: The agency strives to balance our outreach and enforcement programs to ensure that SERCs, LEPCs and fire departments have the information they need to understand and address the chemical risks in their community while ensuring facilities are complying with the regulations and providing the information the local community needs.

10. Do you find, given this discrepancy, the stick is more effective than the carrot? How can EPA rectify this challenge?

Response: See response to Question 9 above.

11. Has EPA reached out to industry and first responder partners in outreach material? If not, why not? Do you have a timeline for action?

Response: Yes, the EPA has long-standing collaborative relationships with industry groups and our state and local first responder partners. We also work with the National Association of SARA Title III Program Officials (NASTTPO) and attend state and local conferences and workshops to identify stakeholder needs with regard to information, outreach materials and tools. Some examples of our working with our partners to develop and provide outreach material include:

- The EPA and the National Oceanic and Atmospheric Administration (NOAA) developed the Computer-Aided Management of Emergency Operations (CAMEO) suite of software applications to provide local emergency planners and responders with a set of computer tools to assist them in planning for and managing hazardous chemical emergencies. CAMEO includes a chemical database containing comprehensive hazard information on over 6000 chemicals and allows users to store and manage information about chemicals in their communities. The software also includes an atmospheric dispersion modeling program to estimate the impact distances of toxic vapor clouds, fires and explosions, and a mapping application that can be used to quickly create, view, and modify maps containing chemical facilities along with additional mapping layers (e.g., schools, facilities, response assets).
- The EPA has published numerous fact sheets and chemical safety alerts to inform industry, first responders, and other stakeholders about important chemical safety matters. For example, the EPA, OSHA and ATF recently collaborate to update and republish EPA's Chemical Safety Advisory for Ammonium Nitrate (see response to Question 6).

- The EPA maintains a website containing policy memos, frequently asked questions and answers, and a Hazardous Materials Planning Guide and Exercise Program developed by the National Response

Team (NRT) to assist state and local officials with the development of their state and local emergency response plans and to assist them with implementation of the EPCRA program.

- The EPA manages a hotline to answer questions on EPCRA and RMP and their implementing regulations from the regulated community, SERCs, LEPCs, planners and responders.

- The EPA worked with industry trade associations to develop risk management program guidance for various industry sectors regulated under the RMP rule, including chemical warehouses and distributors, ammonia refrigeration facilities, propane facilities, water and wastewater treatment plants, and agricultural retail facilities.

- The EPA participates in development of various consensus standards and guidelines relating to hazardous chemical safety. For example, EPA staff participate on the National Fire Protection Association (NFPA) Committee on Hazardous Materials (NFPA 400), the NFPA Committee on Liquefied Petroleum Gas (NFPA 58), and the American National Standards Institute/Compressed Gas Association Committee on Safety Requirements for the Storage and Handling of Anhydrous Ammonia (ANSI/CGA K-61.1), and have participated in the development of numerous chemical process safety guidelines developed by the American Institute of Chemical Engineers Center for Chemical Process Safety (AIChE/CCPS).

- The EPA is in the process of developing on-line training on EPCRA and its implementing regulations, which will provide LEPCs, SERCs, TERCs, and other stakeholders with easy access to comprehensive information on EPCRA. The EPA intends to make this training available in early 2014.

Outreach and information sharing with industry and first responders is one of the key issues to be addressed in the President's Executive Order 13650 on Improving Chemical Facility Safety and Security. The Order calls on the EPA and other agencies to convene stakeholders, including industry, first responders and others in order to improve collaboration, information sharing, and response procedures, and to identify best practices to reduce safety and security risks in the production and storage of potentially harmful chemicals. Therefore, the agency intends to address any plans for changes and improvements in its work with industry and first responders within the framework and timelines specified in the Order.

12. Are you aware of the Agriculture Retailers Association's Fertilizer Code of practice that is currently addressing the challenges faced with fertilizer storage and handling? How can government leverage this knowledge?

Response: Yes. The ARA Fertilizer Code of Practices could be leveraged to help facilities establish basic Environmental, Health and Safety and Security (EHS&S) performance practices. This management system is under development by ARA and to assist ARA. The EPA is providing ARA with educational and training materials and inspection/audit checklists used by EPA officials that would be applicable to fertilizer facilities storing and handling anhydrous ammonia and ammonium nitrate fertilizers. For example, the *my***RMP** suite of compliance assistance tools (https://www.asmark.org/myRMP/) was specifically developed by the Fertilizer Institute and Asmark Institute with the support of the EPA to provide retail agricultural facilities with industry-standard information to assist in the preparation and maintenance of the RMP for their facilities.

Best practices developed by trade associations can also be leveraged for use by having the EPA incorporate them into our Chemical Safety Alerts and Advisories. The EPA publicizes chemical alerts and advisories by placing them on our Website, emailing to other trade association groups, distributing via a listserv and to National Association of SARA Title III Program Officials. EPA regional offices also distribute the information in outreach and compliance seminars they conduct for industry, during visits to facilities and in local conferences organized for SERCs and LEPCs. The EPA will, as part of the working group established under Executive Order 13650 on "Improving Chemical Facility Safety and Security," be convening with other agencies and other stakeholders to identify and share best practices to reduce safety and security risks.

13. What progress have you made with other agencies like OSHA, DHS, CSB, DOT in outreach efforts? Is there a tangible product resulting from these talks? Is there a timeline?

Response: A joint federal Working Group was established under the President's Executive Order 13650. The Executive Order calls for developing a plan to support efforts by co-regulators and responders, chemical facility owners and communities to work together to improve chemical safety and security. The plan will address ways to improve coordination, improve access to information, integrate programs and collaborate, and improve response procedures.

The federal Working Group is tasked to produce the plan within 135 days or December 14, 2013. A multi-agency pilot is underway in New York and New Jersey. This pilot effort included a meeting with firefighters to engage them on emergency preparedness and response issues that they felt needed to be addressed to safety respond to chemical incidents at facilities in their communities.

14. Will there be more information sharing? How will this be achieved?

Response: Part of the efforts under Executive Order 13650 on Improving Chemical Safety and Security tasks the federal Working Group to enhance information sharing and collaborative planning between chemical facility operators, emergency planners and first responders, improving public access to information about chemical facility risks, and enhancing the collection, storage and use of facility information by agencies and sharing data between agencies.

Senator BOXER. Mr. Breen, I am going to ask you a series of questions. But that was the most vague testimony I have ever heard. You never talked about what happened in my State, you did not talk about what happened in West, you did not talk about happened in Louisiana and I do not sense in your voice any type of shock or desire to use your authority to move forward.

That is just a comment about the tone and lack of urgency that I heard in your voice. Now, maybe as I ask you questions, something else will come about. So, let me give you a minute to think about what I just said which, by the way, you do not have to agree with. It is one person's reaction after we have this tragic loss of life in two and, since 2012, in three States, including my own, including the Ranking Member's and, of course, West. So, if I am the relative sitting here, I am thinking OK, that is vague. What is your timeframe, what do you want to do?

I want to talk for a minute to the Chairman of the Chemical Safety Board, Chairman Moure-Eraso. Thank you for your testimony.

Now, my understanding is that about 30 percent of what you have recommended has not been adopted by any of the agencies. Would you be willing to sit down with my staff and go through those recommendations with them, in writing, and then if we need to talk with you, so we can get a sense of what is out there that has not been embraced by the agencies?

Mr. MOURE-ERASO. Thank you very much for the offer, Senator. I will be very, very glad to sit with my staff and your staff and look at what is still on, what we waiting for actions on our recommendations.

Senator BOXER. That would be very helpful to me because, again, as I said in my opening statement, some of these will need legislation but a lot of them can be done without legislation.

Mr. Breen, a 2002 Chemical Safety Board report found an average of five fatalities a year in our Nation related to incidents with reactive chemicals such as this ammonium nitrate and that more than 50 percent of these incidents involved chemicals that were not covered by EPA or OSHA safeguards.

Among other issues, CSB recommended that EPA's Risk Management Program "explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public." And I say it is not the potential. They have injured the public, they continue to injure the public and they are not handled in the way the CSB has recommended.

I do not know the extent of your authorities or who you have to check with, but I am asking you, is it time for the EPA to adopt this recommendation that was made in 2002 given the tragedies that have occurred since then?

Mr. BREEN. Thank you very much.

Senator BOXER. Yes.

Mr. BREEN. Thank you, Senator, and I think that point is worth some clarification. I saw in the Chairman's testimony the statement, let me pull it, it was in his testimony just now, that the 2002 recommendation was to list "reactive chemicals" on the RMP. I actually went back and looked at the 2002 recommendations and it says to revise the RMP program "to explicitly cover chemical reactive hazards". And then I went behind that recommendation into the report itself, which has that recommendation and makes the following observations.

I will start with one of the key findings. It is under "Conclusions." "Using lists of chemicals is an inadequate approach." The difference is between a "list of chemicals" and "reactive hazards," so the CSB report states on page 1 of the——

Senator BOXER. Mr. Breen.

Mr. BREEN. Yes, Madam.

Senator BOXER. Please. Are you questioning the fact that the CSB never said what Mr. Moure-Eraso said here today, that you ought to take a look at, and I will quote him, storing these reactive chemicals in non-combustible bins? Are you saying they never suggested anything like that, that you look at your Risk Management Plans and amend those so that the storage of these potentially explosive chemicals is changed? Are you suggesting they never said that?

Mr. BREEN. Thank you. So, let me at the outset be clear that this was a tragedy and more must be done——

Senator BOXER. I am asking a question.

Mr. BREEN. I understand, Senator.

Senator BOXER. Are you questioning what he told us today?

Mr. BREEN. Senator, let me turn to that in just a moment. But I wanted to be clear because of the point you made earlier about recognizing the tragedy. It is a tragedy and more must be done.

What the CSB said in 2002 is important. And what it said was that "reactivity," and I am reading, "is not necessarily an intrinsic property of a chemical substance." It is "related to process specific factors." And so, it went on to conclude that "lists of chemicals is an inadequate approach" and specifically questioned, for example, several lists that were extant at the time.

So, the actual recommendation I did not read as including the idea of finding a list of reactive chemicals and adding them to the RMP, but instead to deal with reactive hazards.

Senator BOXER. Well, sir, I do not agree. And I would like to ask the Chairman of the Chemical Safety Board here, it sounds to me like EPA is kind of putting a slant on what your recommendation was. Could you tell us what your recommendation was on the way to store these potentially explosive chemicals?

Mr. MOURE-ERASO. Well, our idea was to address situations that could have a catastrophic effect in the community. That was the aim of it. And we were looking at reactive chemicals as a not addressed situation on both an OSHA PSM and on EPA RMP. The idea was the concept of reactive chemicals, and specific reactive chemicals that were known to cause catastrophic effects, will be included in these recommendations.

I would like to review with you, as you said, specifically this recommendation that you said you wanted to look at with us because this is still open with us and EPA, to clarify specifically what will help to try to prevent what happened here in West.

Senator BOXER. The bottom line is, as I read it, and I have got your report here, I am going to put it into the record, to EPA you say revise the accidental release prevention requirements to explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public including those resulting from self-reactive chemicals and a combination of chemicals and process specific conditions. So, we will put that in the record and that stands in stark contrast to what you said, Mr. Breen.

[The referenced material follows:]

U.S. CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

HAZARD INVESTIGATION

IMPROVING REACTIVE HAZARD MANAGEMENT

KEY ISSUES:

- REGULATORY COVERAGE
- NFPA HAZARD RATING SYSTEM
- MANAGEMENT SYSTEM GUIDANCE
- INDUSTRY INITIATIVES

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Figures

*These photographs are not available for website posting. They will be placed in the printed copy.

Tables

Acronyms and Abbreviations

ACC	American Chemistry Council
AFL-CIO	American Federation of Labor-Congress of Industrial Organizations
AIChE	American Institute of Chemical Engineers
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APELL	Awareness and Preparedness for Emergencies at Local Level (UNEP)
ARC	Accelerating rate calorimeter (Arthur D. Little, Inc.)
ARIP	Accidental Release Information Program (EPA)
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
BLS	U.S. Bureau of Labor Statistics
BPS	Bartlo Packaging, Inc.
°C	Degrees Celsius
CAAA	Clean Air Act Amendments of 1990
CAER	Community awareness and emergency response (ACC Responsible Care)
cal/g	Calorie per gram
CCPS	Center for Chemical Process Safety
CDCIR	The Community Documentation Centre on Industrial Risk (MAHB)
CFR	Code of Federal Regulations
CHETAH	Chemical Thermodynamic and Energy Release Evaluation (ASTM)
CHRIS	Chemical Hazards Response Information System (USCG)
CIMAH	Control of Industrial Major Accident Hazards (U.K.)
CIRC	Chemical Incident Reports Center (CSB)

Acronyms and Abbreviations (cont'd)

COMAH	Control of Major Accident Hazards Involving Dangerous Substances (U.K., replaced CIMAH in 1999)
CSB	U.S. Chemical Safety and Hazard Investigation Board
CSI	Concept Sciences, Inc.
DOE	U.S. Department of Energy
DSC	Differential scanning calorimetry
DTA	Differential thermal analysis
EC	European Community
EHS	Environmental health and safety
EHS	Extremely hazardous substance
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EU	European Union
°F	Degrees Fahrenheit
FMEA	Failure modes and effects analysis
GDC	General Duty Clause (OSHA)
HA	Hydroxylamine
HarsNet	Hazard Assessment of Highly Reactive Systems Thematic Network
HASTE	The European Health and Safety Database
HAZOP	Hazard and operability
HSE	Health and Safety Executive (U.K.)
HSEES	Hazardous Substances Emergency Events Surveillance (MAHB)
IAFF	International Association of Fire Fighters

Acronyms and Abbreviations (cont'd)

IChemE	Institution of Chemical Engineers (U.K.)
ICWU	International Chemical Workers Union (now part of UFCW)
IMIS	Integrated Management Information System (OSHA)
IPD	Instantaneous power density
ISA	Instrumentation, Systems, and Automation Society
MAHB	Major Accident Hazard Bureau (European Communities)
MARS	Major Accident Reporting System (MAHB)
MHIDAS	Major Hazard Incident Data Service (HSE)
MOC	Management of change
MSDS	Material safety data sheet
MSV	Management systems verification
NACD	National Association of Chemical Distributors
NAICS	North American Industry Classification System
NFIRS	National Fire Incident Reporting System
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NRC	National Response Center (USCG)
NTSB	National Transportation Safety Board
OCAW	Oil, Chemical, and Atomic Workers (now part of PACE)
OSHA	Occupational Safety and Health Administration
PACE	Paper, Allied-Industrial, Chemical & Energy Workers International Union
PHA	Process hazard analysis
PSCMS	Process Safety Code Measurement System (ACC)

Acronyms and Abbreviations (cont'd)

psi	Pound per square inch
PSI	Process safety information
PSM	Process safety management (OSHA)
QA	Quality assurance
R&D	Research and development
RDP	Responsible Distribution Process (NACD)
redox	Oxidation-reduction
RMP	Risk management program (EPA)
SIC	Standard industrial classification
SOCMA	Synthetic Organic Chemical Manufacturers Association
SOP	Standard operating procedure
TCDD	Dioxin
TCP	2,4,5-Tricholorophenol
TCPA	Toxic Catastrophe Prevention Act (New Jersey)
TGA	Thermogravimetric analysis
TNO	Netherlands Organisation for Applied Scientific Research
UFCW	United Food and Commercial Workers International Union
UNEP	United Nations Environmental Programme
UNITE	Union of Needletrades, Industrial, and Textile Employees
USCG	U.S. Coast Guard
USWA	United Steelworkers of America
VSP	Vent size packaging
W/mL	Watt per milliliter

Executive Summary

ES.1 Introduction

The capability of chemical substances to undergo reactions, or transformations in their structure, is central to the chemical processing industry. Chemical reactions allow for a diversity of manufactured products. However, chemical reactivity can lead to significant hazards if not properly understood and controlled.

Reactivity[1] is not necessarily an intrinsic property of a chemical substance. The hazards associated with reactivity are related to process-specific factors, such as operating temperatures, pressures, quantities handled, concentrations, the presence of other substances, and impurities with catalytic effects.

Safely conducting chemical reactions is a core competency of the chemical manufacturing industry. However, chemical reactions can rapidly release large quantities of heat, energy, and gaseous byproducts. Uncontrolled reactions have led to serious explosions, fires, and toxic emissions. The impacts may be severe in terms of death and injury to people, damage to physical property, and effects on the environment. In particular, incidents at Napp Technologies in 1995 and Morton International in 1998 raised concerns about reactive hazards to a national level. These and other incidents across the United States[2] underscore the need to improve the management of reactive hazards.

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[1] See Appendix A, Glossary, for a definition of "reactivity" and numerous other technical terms.
[2] For example: BPS, Inc., West Helena, Arkansas (1997), with three fatalities; Condea Vista, Baltimore, Maryland (1998), with five injured; Whitehall Leather Company, Whitehall, Michigan (1999), with one fatality; and Concept Sciences, Inc., Allentown, Pennsylvania (1999), with five fatalities and 14 injured.

A variety of legal requirements and regulations govern the hazards associated with highly hazardous chemicals (including reactive chemicals), among which are regulations of the Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA).

OSHA develops and enforces standards to protect employees from workplace hazards. In the aftermath of the reactive incident that caused the Bhopal tragedy,[3] OSHA was concerned about the possibility of a catastrophe at chemical plants in the United States. Its own investigations in the mid-1980s indicated a need to look beyond existing standards.

Bhopal and a series of other major incidents underscored the need for increased attention to process safety management; OSHA began to develop a standard that would incorporate these principles. A proposed standard was published in 1990. Additionally, the Clean Air Act Amendments (CAAA) of 1990 required OSHA to promulgate a standard to protect employees from the hazards associated with releases of highly hazardous chemicals, including reactive chemicals.

In 1992, OSHA promulgated its Process Safety Management (PSM) Standard (29 CFR 1910.119). The standard covers processes containing individually listed chemicals that present a range of hazards, including reactivity, as well as a class of flammable chemicals. Reactive chemicals were selected from an existing list of chemicals identified and rated by the National Fire Protection Association (NFPA) because of their instability rating of "3" or "4" (on a scale of 0 to 4).[4,5]

CAAA also required EPA to develop regulations to prevent the accidental release of substances, including reactives, that could have serious effects on the public or the environment. In 1996, EPA

[3] On December 4, 1984, approximately 40 metric tons of methyl isocyanate was accidentally released in Bhopal India. The incident resulted in an estimated 2,000 deaths within a short period (Lees, 1996; App. 5).
[4] OSHA used the 1975 version of NFPA 49, Hazardous Chemicals Data.
[5] An NFPA instability rating of "4" means that materials in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. A rating of "3" means that materials in themselves are capable of detonation or explosive decomposition or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation.

promulgated its Accidental Release Prevention Requirements: Risk Management Programs (RMP; 40 CFR 68) in response to the congressional mandate. Although this standard established new measures with regard to public notification, emergency response, and accident reporting, its requirements for managing process safety are similar to those of the OSHA PSM Standard. For purposes of this regulation, EPA identified covered substances based on toxicity and flammability–but not chemical reactivity.

Professional and trade associations such as the American Institute of Chemical Engineers (AIChE), the American Chemistry Council (ACC), the Synthetic Organic Chemical Manufacturers Association (SOCMA), and the National Association of Chemical Distributors (NACD) provide voluntary chemical process safety guidance to their members.

In 1985, AIChE established the Center for Chemical Process Safety (CCPS) in response to the Bhopal tragedy. Manufacturers, government, and scientific research groups sponsor CCPS, which has published extensive industry guidance in the area of process safety technology and management. CCPS recently produced a safety alert on reactive hazards, and a more comprehensive product is under development.

ACC and SOCMA each have programs to promote good practices among member companies in the area of chemical process safety. Similarly, NACD promotes good distribution practices and dissemination of information to end-use customers on the proper handling of chemical products.

This report, *Hazard Investigation: Improving Reactive Hazard Management*, by the U.S. Chemical Safety and Hazard Investigation Board (CSB), examines chemical process safety in the United States–specifically, hazardous chemical reactivity. Its objectives are to:

- Determine the impacts of reactive chemical incidents.

- Examine how industry, OSHA, and EPA currently address reactive chemical hazards.

- Determine the differences, if any, between small, medium, and large companies with regard to reactive chemical policies, practices, in-house reactivity research, testing, and process engineering.
- Analyze the appropriateness of, and consider alternatives to, industry and OSHA use of the NFPA instability rating system for process safety management.
- Develop recommendations for reducing the number and severity of reactive chemical incidents.

ES.2 Investigative Process

CSB completed the following tasks:

- Analyzed reactive incidents by collecting and reviewing available data.
- Surveyed current reactive hazard management practices in industry.
- Visited companies to observe reactive hazard management practices.
- Analyzed regulatory coverage of reactive hazards.
- Met with stakeholders to discuss the problem and approaches to improve the management of reactive hazards.
- Conducted a public hearing at which further stakeholder inputs were solicited on key findings and preliminary conclusions from the hazard investigation.

The data analysis included evaluating the number, impact, profile, and causes of reactive incidents. CSB examined more than 40 data sources (e.g., industry and governmental databases and guidance documents; safety/loss prevention texts and journals; and industry association, professional society, insurance, and academic newsletters), focusing on incidents where the primary cause was related to chemical reactivity.

For the purposes of this investigation, an "incident" is defined as a sudden event involving an uncontrolled chemical reaction–with significant increases in temperature, pressure, and/or gas evolution–that has caused, or has the potential to cause, serious harm to people, property, or the environment.

Through a survey of select small, medium, and large companies, information was gathered about good practices for reactive hazard management within the chemical industry. CSB also visited chemical industry facilities that have implemented programs for managing reactive hazards.

ES.3 Key Findings

1. The limited data analyzed by CSB include 167 serious incidents in the United States involving uncontrolled chemical reactivity from January 1980 to June 2001. Forty-eight of these incidents resulted in a total of 108 fatalities. The data include an average of six injury-related incidents per year, resulting in an average of five fatalities annually.

2. Nearly 50 of the 167 incidents affected the public.[6]

3. Over 50 percent of the 167 incidents involved chemicals not covered by existing OSHA or EPA process safety regulations.[7]

[6] "Public impact" is defined as known injury, offsite evacuation, or shelter-in-place.
[7] OSHA PSM Standard (29 CFR 1910.119) and EPA Accidental Release Prevention Requirements: Risk Management Programs (RMP) Under the Clean Air Act, Section 112(r)(7) (40 CFR 68).

4. Approximately 60 percent of the 167 incidents involved chemicals that either are not rated by NFPA or have "no special hazard" (NFPA "0").[8] Only 10 percent of the 167 incidents involved chemicals with NFPA published ratings of "3" or "4."

5. For the purpose of the OSHA PSM Standard, NFPA instability ratings have the following limitations with respect to identifying reactive hazards:

   - They were originally designed for initial emergency response purposes, not for application to chemical process safety.

   - They address inherent instability only, not reactivity with other chemical substances (with the exception of water) or chemical behavior under nonambient conditions.

   - NFPA Standard 49[9]–on which the OSHA PSM-listed highly reactive chemicals are based–covers only 325 chemical substances, a very small percentage of the chemicals used in industry.[10]

   - The OSHA PSM Standard lists 137 highly hazardous chemicals–only 38 of which are considered highly reactive based on NFPA instability ratings of "3" or "4."

   - The NFPA ratings were established by a system that relies, in part, on subjective criteria and judgment.

[8] An NFPA instability rating of "0" means that materials in themselves are normally stable, even under "fire" conditions.
[9] NFPA 49, Hazardous Chemicals Data (1975 Edition).
[10] The Chemical Abstracts Service maintains data on over 200,000 chemicals that are listed under national and international regulations.

6. As a result of the joint OSHA-EPA chemical accident investigation of the Napp Technologies incident in April 1995, a recommendation was made by EPA and OSHA to consider adding more reactive chemicals to their respective lists of chemicals covered by process safety regulations. To date, neither OSHA nor EPA process safety regulations have been modified to better cover reactive hazards.

7. Reactive hazards are diverse. The reactive incident data analyzed by CSB included:

   - Over 40 different chemical classes (i.e., acids, bases, monomers, oxidizers, etc.), with no single dominating class.

   - Several types of hazardous chemical reactivity, with 36 percent attributed to chemical incompatibility, 35 percent to runaway reactions, and 10 percent to impact-sensitive or thermally sensitive materials.

   - A diverse range of chemical process equipment–including reaction vessels, storage tanks, separation equipment, and transfer equipment. Storage and process equipment (excluding chemical reaction vessels) account for over 65 percent of the equipment involved; chemical reaction vessels account for only 25 percent.

   Reactive incidents can result in a variety of consequences, including fire and explosions (42 percent of incidents) as well as toxic gas emissions (37 percent).

8. No one comprehensive data source contains the data needed to adequately understand root causes and lessons learned from reactive incidents or other process safety incidents.

9. Incident data collected by OSHA and EPA provide no functional capability to track reactive incidents so as to analyze incident trends and develop preventive actions at a national level.

10. Causes and lessons learned are reported in only 20 percent of the 167 incidents. (Industry associations, government agencies, and academia typically do not collect this information.) However, more than 60 percent of the incidents for which some causal information was available involved inadequate practices for identifying hazards or conducting process hazard evaluations; nearly 50 percent involved inadequate procedures for storage, handling, or processing of chemicals.[11]

11. Over 90 percent of the incidents analyzed by CSB involved reactive hazards that are documented in publicly available literature accessible to the chemical processing and handling industry.[12]

12. Although several computerized tools[13] and literature resources are available to identify reactive hazards, surveyed companies do not generally use them. In some cases, these tools provide an efficient means of identifying reactive hazards without the need for chemical testing.

13. Surveyed companies share chemical data of a general nature for most chemicals (e.g., material safety data sheets [MSDS]) and good handling practices for some. However, detailed reactive chemical test data, such as thermal stability data–which can be valuable in identifying reactive hazards–are not typically shared.

14. Approximately 70 percent of the 167 incidents occurred in the chemical manufacturing industry. Thirty percent involved a variety of other industrial sectors that store, handle, or use chemicals in bulk quantities.

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[11]The summation of causal factor statistics exceeds 100 percent because each major incident can, and often does, have more than one cause.
[12] See Section 6.1 for a list of selected literature.
[13]National Oceanic and Atmospheric Administration's (NOAA) The Chemical Reactivity Worksheet, American Society for Testing and Materials' (ASTM) CHETAH, and Bretherick's Database of Reactive Chemical Hazards.

15. Only limited guidance on the management of reactive hazards throughout the life cycle of a chemical manufacturing process[14] is currently available to industry through professional societies, standards organizations, government agencies, or trade associations. There are significant gaps in the following:

- Unique aspects of reactive hazards that should be examined during process hazard analysis (PHA), such as the need for reactive chemical test data, and methods to identify and evaluate worst case scenarios involving uncontrolled reactivity.

- Integration of reactive hazard information into process safety information, operating procedures, training, and communication practices.

- Review of the impact on reactive hazards due to proposed changes in chemical processes.

- Concise guidance targeted at companies engaged primarily in the bulk storage, handling, and use of chemicals to prevent inadvertent mixing of incompatible substances.

16. Several voluntary industry initiatives, such as ACC's Responsible Care and NACD's Responsible Distribution Process (RDP), provide guidance on process safety management for chemical manufacturers and distributors. However, no voluntary industry initiatives list specific codes or requirements for reactive hazard management.

17. The EPA RMP regulation and the European Community's Seveso II directive both exempt covered processes from some regulatory provisions, if the facility documents the absence of catastrophic damage from process accidents under reasonable worst case conditions. The

[14] A recently initiated CCPS project, Managing Reactive Chemical Hazards, may address this gap in industry guidance.

State of New Jersey is also considering similar action in its proposed revisions of the Toxic Catastrophe Prevention Act (TCPA) regulations.

ES.4 Conclusions

1. Reactive incidents are a significant chemical safety problem.

2. The OSHA PSM Standard has significant gaps in coverage of reactive hazards because it is based on a limited list of individual chemicals with inherently reactive properties.

3. NFPA instability ratings are insufficient as the sole basis for determining coverage of reactive hazards in the OSHA PSM Standard.

4. The EPA Accidental Release Prevention Requirements (40 CFR 68) have significant gaps in coverage of reactive hazards.

5. Using lists of chemicals is an inadequate approach for regulatory coverage of reactive hazards. Improving reactive hazard management requires that both regulators and industry address the hazards from combinations of chemicals and process-specific conditions rather than focus exclusively on the inherent properties of individual chemicals.

6. Reactive incidents are not unique to the chemical manufacturing industry. They also occur in many other industries where chemicals are stored, handled, or used.

7. Existing sources of incident data are not adequate to identify the number, severity, and causes of reactive incidents or to analyze incident frequency trends.

8. There is no publicly available database for sharing lessons learned from reactive incidents.

9. Neither the OSHA PSM Standard nor the EPA RMP regulation explicitly requires specific hazards, such as reactive hazards, to be examined when performing a process hazard analysis.

Given that reactive incidents are often caused by inadequate recognition and evaluation of reactive hazards, improving reactive hazard management involves defining and requiring relevant factors (e.g., rate and quantity of heat and gas generated) to be examined within a process hazard analysis.

10. The OSHA PSM Standard and the EPA RMP regulation do not explicitly require the use of multiple sources when compiling process safety information.

11. Publicly available resources[15] are not always used by industry to assist in identifying reactive hazards.

12. There is no publicly available database to share reactive chemical test information.

13. Current good practice guidelines on how to effectively manage reactive hazards throughout the life cycle[16] of a chemical manufacturing process are neither complete nor sufficiently explicit.

14. Given the impact and diversity of reactive hazards, optimum progress in the prevention of reactive incidents requires both enhanced regulatory and nonregulatory programs.

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[15] NOAA's The Chemical Reactivity Worksheet, ASTM's CHETAH, and Bretherick's Database of Reactive Chemical Hazards.

[16] "Life cycle" refers to all phases of a chemical manufacturing process–from conceptualization, process research and development (R&D), engineering design, construction, commissioning, commercial operation, and major modification to decommissioning.

ES.5 Recommendations

Occupational Safety and Health Administration (OSHA)

1. Amend the Process Safety Management (PSM) Standard, 29 CFR 1910.119, to achieve more comprehensive control of reactive hazards that could have catastrophic consequences.

   - Broaden the application to cover reactive hazards resulting from process-specific conditions and combinations of chemicals. Additionally, broaden coverage of hazards from self-reactive chemicals. In expanding PSM coverage, use objective criteria. Consider criteria such as the North American Industry Classification System (NAICS), a reactive hazard classification system (e.g., based on heat of reaction or toxic gas evolution), incident history, or catastrophic potential.

   - In the compilation of process safety information, require that multiple sources of information be sufficiently consulted to understand and control potential reactive hazards. Useful sources include:

     - Literature surveys (e.g., *Bretherick's Handbook of Reactive Chemical Hazards*, *Sax's Dangerous Properties of Industrial Materials*).

     - Information developed from computerized tools (e.g., ASTM's CHETAH, NOAA's The Chemical Reactivity Worksheet).

     - Chemical reactivity test data produced by employers or obtained from other sources (e.g., differential scanning calorimetry, thermogravimetric analysis, accelerating rate calorimetry).

     - Relevant incident reports from the plant, the corporation, industry, and government.

     - Chemical Abstracts Service.

- Augment the process hazard analysis (PHA) element to explicitly require an evaluation of reactive hazards. In revising this element, evaluate the need to consider relevant factors, such as:
  - Rate and quantity of heat or gas generated.
  - Maximum operating temperature to avoid decomposition.
  - Thermal stability of reactants, reaction mixtures, byproducts, waste streams, and products.
  - Effect of variables such as charging rates, catalyst addition, and possible contaminants.
  - Understanding the consequences of runaway reactions or toxic gas evolution.

2. Implement a program to define and record information on reactive incidents that OSHA investigates or requires to be investigated under OSHA regulations. Structure the collected information so that it can be used to measure progress in the prevention of reactive incidents that give rise to catastrophic releases.

U.S. Environmental Protection Agency (EPA)

1. Revise the Accidental Release Prevention Requirements, 40 CFR 68 (RMP), to explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public, including those resulting from self-reactive chemicals and combinations of chemicals and process-specific conditions. Take into account the recommendations of this report to OSHA on reactive hazard coverage. Seek congressional authority if necessary to amend the regulation.

2. Modify the accident reporting requirements in RMP*Info to define and record reactive incidents. Consider adding the term "reactive incident" to the four existing "release events" in EPA's current 5-year accident reporting requirements (Gas Release, Liquid Spill/Evaporation, Fire, and Explosion). Structure this information collection to allow EPA and its stakeholders to identify and focus resources on industry sectors that experienced the incidents; chemicals and processes involved; and impact on the public, the workforce, and the environment.

National Institute of Standards and Technology (NIST)

Develop and implement a publicly available database for reactive hazard test information. Structure the system to encourage submission of data by individual companies and academic and government institutions that perform chemical testing.

Center for Chemical Process Safety (CCPS)

1. Publish comprehensive guidance on model reactive hazard management systems. At a minimum, ensure that these guidelines cover:

    - For companies engaged in chemical manufacturing: reactive hazard management, including hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

    - For companies engaged primarily in the bulk storage, handling, and use of chemicals: identification and prevention of reactive hazards, including the inadvertent mixing of incompatible substances.

2. Communicate the findings and recommendations of this report to your membership.

American Chemistry Council (ACC)

1. Expand the Responsible Care Process Safety Code to emphasize the need for managing reactive hazards. Ensure that:

   - Member companies are required to have programs to manage reactive hazards that address, at a minimum, hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

   - There is a program to communicate to your membership the availability of existing tools, guidance, and initiatives to aid in identifying and evaluating reactive hazards.

2. Develop and implement a program for reporting reactive incidents that includes the sharing of relevant safety knowledge and lessons learned with your membership, the public, and government to improve safety system performance and prevent future incidents.

3. Work with NIST in developing and implementing a publicly available database for reactive hazard test information. Promote submissions of data by your membership.

4. Communicate the findings and recommendations of this report to your membership.

Synthetic Organic Chemical Manufacturers Association (SOCMA)

1. Expand the Responsible Care Process Safety Code to emphasize the need for managing reactive hazards. Ensure that:

   - Member companies are required to have programs to manage reactive hazards that address, at a minimum, hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

- There is a program to communicate to your membership the availability of existing tools, guidance, and initiatives to aid in identifying and evaluating reactive hazards.

2. Develop and implement a program for reporting reactive incidents that includes the sharing of relevant safety knowledge and lessons learned with your membership, the public, and government to improve safety system performance and prevent future incidents.

3. Work with NIST in developing and implementing a publicly available database for reactive hazard test information. Promote submissions of data by your membership.

4. Communicate the findings and recommendations of this report to your membership.

National Association of Chemical Distributors (NACD)

1. Expand the existing Responsible Distribution Process to include reactive hazard management as an area of emphasis. At a minimum, ensure that the revisions address storage and handling, including the hazards of inadvertent mixing of incompatible chemicals.

2. Communicate the findings and recommendations of this report to your membership.

International Association of Firefighters

Paper, Allied-Industrial, Chemical & Energy Workers International Union (PACE)

The United Steelworkers of America

Union of Needletrades, Industrial, and Textile Employees (UNITE)

United Food and Commercial Workers International Union

American Society of Safety Engineers (ASSE)

American Industrial Hygiene Association (AIHA)

Communicate the findings and recommendations of this report to your membership.

1.0 Introduction

Safely conducting chemical reactions is a core competency of the chemical industry.[17] However, chemical reactions can become uncontrolled, rapidly releasing large quantities of heat, energy, and gaseous byproducts. As highlighted below, uncontrolled reactions have led to serious explosions, fires, and toxic emissions.

In April 1995, an explosion and fire at Napp Technologies, in Lodi, New Jersey, killed five employees, injured several others, destroyed a majority of the facility, significantly damaged nearby businesses, and resulted in the evacuation of 300 residents from their homes and a school (USEPA-OSHA, 1997). Additionally, firefighting generated chemically contaminated water that ran off into a river. The property damage exceeded $20 million.

Two years later, an explosion and fire at Bartlo Packaging (BPS, Inc.), in West Helena, Arkansas, killed three firefighters and seriously injured another. Hundreds of residents, including patients at a local hospital, were either evacuated or sheltered-in-place (USEPA-OSHA, 1999). Property damage was extensive. Major roads were closed; and Mississippi River was traffic halted for nearly 12 hours.

An incident on April 8, 1998, at Morton International, Inc., in Paterson, New Jersey, resulted in nine injuries. Residents in a 10- by 10-block area around the plant sheltered-in-place for up to 3 hours, and an estimated 10,000 gallons of contaminated water ran off into a nearby river (USCSB, 2000). Six months later, an explosion and fire at Condea Vista, in Baltimore, Maryland, injured five and caused $14 million in damages (USCSB, 2001). In February 1999, an explosion at Concept Sciences, Inc. (CSI), in Allentown, Pennsylvania, killed five persons, including one worker at an adjacent business (USCSB, 2002a). Fourteen persons, including six firefighters, were injured. The facility

[17] See Appendix A, Glossary, for definition of technical terms.

was completely destroyed, and several other businesses in the vicinity suffered significant property damage. The blast also shattered windows of homes in a nearby residential area. In June 1999, a toxic release at Whitehall Leather in Whitehall, Michigan, killed one employee (NTSB, 2000).

Each of these incidents involved an uncontrolled chemical reaction. They vividly illustrate the tragic potential of reactive hazards and offer compelling reasons to improve reactive hazard management.

1.1 Objectives

The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted this investigation of reactive hazard management in the United States to:

- Determine the impacts of reactive chemical incidents.
- Examine how industry, the Occupational Safety and Health Administration (OSHA), and the U.S. Environmental Protection Agency (EPA) currently address reactive chemical hazards.
- Determine the differences, if any, between small, medium, and large companies with regard to reactive chemical policies, practices, in-house reactivity research, testing, and process engineering.
- Analyze the appropriateness of, and consider alternatives to, industry and OSHA use of the National Fire Protection Association (NFPA) instability rating system for process safety management.
- Develop recommendations for reducing the number and severity of reactive chemical incidents.

This report, *Improving Reactive Hazard Management*, supports the CSB goal of increasing awareness of reactive hazards and reducing the occurrence of reactive incidents.

1.2 Scope

In addressing reactive hazard management in the United States, this investigation focuses on:

- Chemical manufacturing–from raw material storage through chemical processing to product storage.
- Other industrial activities involving bulk chemicals, such as storage/distribution, waste processing, and petroleum refining.

Industrial activities involving transportation, pipelines, laboratories, minerals extraction, mining, explosives manufacturing, pyrotechnic manufacturing, or military uses are not considered.

1.3 Investigative Process

The chemical industry evaluates the reactivity of a substance in a variety of ways. With input from key stakeholders, CSB developed the following definition of a reactive incident (synonymous with "reactive chemical incident"):

> A sudden event involving an uncontrolled chemical reaction–with significant increases in temperature, pressure, or gas evolution–that has caused, or has the potential to cause, serious harm to people, property, or the environment.[18]

[18] The use of the term "sudden" is intended to imply that reactive incidents–though they may be slow to develop because of reactive chemistry effects over an extended time–have sudden consequences.

Using this definition, CSB analyzed data to attempt to determine the number, impact, profile, and causes of reactive incidents.

Hazards arising from reactive chemicals are covered by a variety of legal requirements and regulations, including regulations of OSHA and EPA. CSB examined these authorities and regulations to determine how reactive hazards are currently addressed.

Through site visits and a survey of select small, medium, and large companies (Appendices B and C)–and literature reviews of industry guidance documents–CSB gathered information on the strengths and limitations of reactive hazard management practices within the chemical industry. Industry facilities with programs for managing reactive hazards were selected for site visits.

1.4 Background

On April 8, 1998, a runaway reaction during the production of Automate Yellow 96 dye initiated a sequence of events that led to an explosion and fire at the Morton International, Inc., plant in Paterson, New Jersey. On the day of the incident, flammable materials were released as the result of an uncontrolled rapid temperature and pressure rise in a 2,000-gallon kettle in which *ortho*-nitrochlorobenzene and 2-ethylhexylamine were being reacted. Nine employees were injured in the explosion and fire, including two seriously. Potentially hazardous materials were released into the community, and the physical plant was extensively damaged.

The CSB Morton investigation showed that inadequate evaluation and communication of reactive hazards was one important factor in the root and contributing causes of the incident (USCSB, 2000). During the course of the investigation, stakeholders raised concerns and requested further investigation into reactive hazards–particularly in light of similar incidents since 1995.

Occasionally, in the course of conducting incident investigations, CSB is alerted to significant safety problems that are beyond the scope of any one particular incident investigation. The Morton investigation validated stakeholder concerns that reactive hazards merited a more systemic analysis. Therefore, CSB recommended in its report that a hazard investigation be conducted to study issues associated with the management of reactive hazards. A CSB hazard investigation examines numerous incidents to better understand the nature and causes of a generic safety problem.

1.5 Stakeholder Involvement

CSB sought input from various stakeholders to gain insight into differing approaches on how to improve reactive hazard management. CSB staff met with industry, regulatory agencies, professional safety organizations, trade associations, trade unions, and public advocacy groups.

The following stakeholders contributed to this investigation:

- American Chemistry Council (ACC).
- Center for Chemical Process Safety (CCPS).
- Environmental Defense.
- U.S. Environmental Protection Agency (EPA).
- International Association of Firefighters.
- National Association of Chemical Distributors (NACD).
- National Fire Protection Association (NFPA).
- Occupational Safety and Health Administration (OSHA).
- Paper, Allied-Industrial, Chemical & Energy Workers International Union (PACE).
- Synthetic Organic Chemical Manufacturers Association (SOCMA).

- The Chlorine Institute, Inc.
- The United Steelworkers of America.
- Union of Needletrades, Industrial, and Textile Employees (UNITE).
- United Food and Commercial Workers International Union (UFCW).
- Working Group on Community Right-to-Know.

1.6 Public Hearing

A public hearing was held on May 30, 2002, at the Paterson, New Jersey, City Hall to communicate findings and conclusions from this hazard investigation and to gather input from interested parties prior to making final recommendations and issuing a final report.

The following questions were published in the *Federal Register* and were the main focus of the public hearing:

- Is there a need to improve coverage of potentially catastrophic reactive hazards under the OSHA Process Safety Management (PSM) Standard? If so, what approaches should be pursued?
  - What criteria could be used in the context of process safety regulations to classify chemical mixtures as "highly hazardous" due to chemical reactivity?
  - Should there be a minimum regulatory requirement for reactive hazard identification and evaluation that apples to all facilities engaged in chemical manufacturing?
  - What are alternative regulatory approaches?

- For processes already covered under the OSHA PSM Standard, do the safety management requirements of the standard adequately address reactive hazards? If not, what should be added or changed?

- Does the EPA Risk Management Program (RMP) regulation provide sufficient coverage to protect the public and the environment from the hazards of reactive chemicals? If not, what should be added or changed?

- What nonregulatory actions should OSHA and EPA take to reduce the number and severity of reactive chemical incidents?

Additional issues:

- Suggested improvements to industry guidance or initiatives (e.g., Responsible Care [ACC], Responsible Distribution Process [RDP; NACD]) to reduce the number and severity of reactive chemical incidents.

- Suggested improvements for sharing reactive chemical test data, incident data, and lessons learned.

- Other nonregulatory initiatives that would help prevent reactive incidents.

CSB staff presented the investigation findings and preliminary conclusions to the Board. The public hearing agenda also included panels representing industry, labor, the State of New Jersey, and technical experts in the field of chemical process safety. In addition, the hearing included eyewitness testimony from victims of reactive chemical incidents. Former Senator Frank Lautenberg (D-NJ) and Senator Jon Corzine (D-NJ) gave statements of support for the hazard investigation. Representatives from OSHA and EPA declined an invitation to participate.

Following the hearing, a 30-day period was opened to receive written public comments. All information gathered at the hearing and written public comments were carefully considered before the final report was approved by the Board.

2.0 Understanding Reactive Hazards

Reactive hazards are briefly defined and characterized below. However, neither Section 2.0 nor this report in its entirety is intended to substitute for any of the more extensive guides and references on this topic or to eliminate the need for expert analysis in dealing with reactive hazards.

2.1 Definition

Process safety management of reactive hazards involves the systematic identification, evaluation, and control of hazardous chemical reactivity at all phases of the process life cycle–from research and development (R&D) to pilot plant, commercial operation, change management, and decommissioning. It encompasses many types of industrial chemical operations–from storage and handling to chemical manufacturing and waste processing.

CCPS (1989) defines a "hazard" as a chemical or physical condition that has the potential to cause harm to human life, property, or the environment. A "reactive hazard" has the potential to lead to a reactive incident (Section 1.3).

There are several types of hazardous chemical reactivity. A reactive hazard may involve:

- ***Impact-sensitive or thermally sensitive materials*** (i.e., self-reactive chemicals)–When subjected to heat or impact, these chemicals may rapidly decompose, resulting in a potentially explosive release of energy.

- ***Runaway reactions*** (i.e., self-reactive chemicals or mixtures)–In an out-of-control reaction involving a chemical or chemical mixture, the rate at which heat is generated exceeds the rate at which it is removed through cooling media and surroundings.

- ***Chemical incompatibility between two or more substances***–These hazards occur when a chemical is suddenly mixed or comes into contact with another chemical, resulting in a violent reaction.

Among governmental regulations, voluntary guidelines, or trade association codes of practice, there is no standard approach to classifying hazardous chemical reactivity. A variety of methods are used to address self-reactivity (e.g., decomposition reactions and some polymerization reactions) and chemical incompatibility.

For the purposes of this investigation–rather than adopting any single definition of a "reactive chemical"–CSB focuses on the broadest range of practices to identify reactive hazards and to manage the risk of reactive incidents. A reactive chemical may include any pure substance or mixture that has the capability to create a reactive incident. CSB defines a reactive incident as a sudden event involving an uncontrolled chemical reaction–with significant increases in temperature, pressure, or gas evolution–that has caused, or has the potential to cause, serious harm to people, property, or the environment.

2.2 Characterization of Reactive Hazards

A reactive hazard exists when changes in chemical structure have the potential to generate heat, energy, and gaseous byproducts beyond that which can be safely absorbed by the immediate surroundings (Bretherick, 1999). If the rate of energy release is rapid enough and not adequately controlled, the consequences may be severe and include fires, explosions, or toxic emissions.

Numerous types of chemical reactions pose potential hazards. Literature and incident data highlight the hazards of common industrial reactions, such as polymerization, decomposition, acid-base, oxidation-reduction (redox), and reactions with water. Polymerization and decomposition can be classified as "self-reactions" because they often involve just one chemical substance. However, other substances acting unexpectedly–such as catalysts or contaminants–are often required to promote even these reactions. "Chemical incompatibility" requires that two or more substances come into contact. A reactive hazard may involve further, more complicated behavior when an intended chemical reaction releases enough heat and energy to initiate a second unintended reaction, usually a chemical decomposition.

Therefore, chemical reactivity is not necessarily an intrinsic property of a single chemical substance. The severity of reactive hazards is influenced by process-specific factors, such as operating temperatures, pressures, quantities handled, chemical concentrations, impurities with catalytic effects, and compatibility with other chemicals onsite.

Section 6.0 and Appendix D discuss good practices and guidelines for reactive hazard management.

3.0 Profile and Causes of Reactive Incidents

The purpose of the CSB data search and analysis was to better understand the impact of reactive incidents by evaluating their number, severity, and causes. Five recent reactive incidents–which illustrate the diversity of reactive hazards–are highlighted throughout this section.

Napp Technologies

On April 21, 1995, an explosion and fire at Napp Technologies in Lodi, New Jersey, killed five employees and destroyed the facility (Figure 1).[19] The plant was conducting a toll blending operation to produce a commercial gold precipitation agent. The chemicals involved were water reactive (i.e., aluminum powder, a combustible metal in the form of finely divided particles; and sodium hydrosulfite, a combustible solid).

During the process operation, water was introduced into the blender, probably as a result of a mechanical failure. Operators noticed the production of heat and the release of foul-smelling gas. During an emergency operation to offload the blender of its reacting contents, the material ignited and a deflagration occurred. The most likely cause of this incident was the inadvertent introduction of water into water-reactive materials (USEPA-OSHA, 1997).

NFPA rates aluminum powder as "1" and sodium hydrosulfite as "2" for reactivity. Therefore, these chemicals are not included on the OSHA PSM list and are not regulated under that standard. The product of the mixture of aluminum powder and sodium hydrosulfite–a gold precipitation agent–is not rated by NFPA. However, a material safety data sheet (MSDS) on the chemical from the company contracting with Napp to produce the material gave it an NFPA rating of "3."

[19] Photograph not available for website posting; it will appear in the printed copy.

The Napp incident raises questions regarding use of the NFPA rating system as the sole basis for regulating reactive hazards (see Section 5.1.3).

Bartlo Packaging, Inc.

This incident occurred on May 8, 1997 (Figure 2).[20] BPS–a bulk storage and distribution facility in West Helena, Arkansas–was repackaging an organic pesticide, AZM50W. As it was being offloaded into a warehouse, employees noticed smoke coming from the building. City emergency response personnel were notified. A team of four West Helena firefighters was attempting to locate the source of the smoke when an explosion occurred. A collapsing cinderblock wall killed three of the firefighters, and one was injured.

The most likely cause of the incident was the decomposition of bulk sacks of the pesticide, which had been placed too close to a hot compressor discharge pipe, and the release of flammable vapors (USEPA-OSHA, 1999). This case history illustrates that severe reactive incidents can occur even at companies engaged in the simple storage and handling of chemicals. The facility was not covered by OSHA PSM, and AZM50W does not have an NFPA rating.

3.1 Data Sources and Methods

CSB searched over 40 data sources for incidents that met its definition of a reactive incident (Section 2.1). The data search focused on recent incidents (since 1980) where the primary cause was related to chemical reactivity; however, the 1980 cutoff is not intended to diminish the important lessons learned from prior incidents. The search covered both chemical manufacturing (i.e., raw material storage, chemical processing, and product storage) and other industrial activities involving bulk chemicals, such as

[20] Photograph not available for website posting; it will appear in the printed copy.

storage/distribution, waste processing, and petroleum refining.[21] For purposes of this incident search, only reactive incidents that caused serious consequences[22] were examined.

Sources of incident data include a variety of public-domain databases, technical literature, and news accounts (Appendix E). Sources are categorized in Appendix E as "reviewed only" if incident data did not meet the CSB definition of "reactive chemical incident" (Section 1.3).

3.2 Data Limitations

Although the statistics provided in Section 3.3 concerning the number and severity of reactive incidents are grave, existing sources of incident data are inadequate to identify the number, severity, frequency, and causes of reactive incidents. The following limitations affected CSB analysis of incident data:

- No single data source provides a comprehensive collection of chemical incidents from which to retrieve or track reactive incident data.
- Incident data collected by OSHA and EPA provide no functional capability to track the occurrence of reactive incidents with serious worker or public impacts;[23] such data are a valuable resource for analyzing incident trends and developing prevention actions at a national level.

[21] Incidents involving transportation, pipelines, laboratories, minerals extraction, mining, explosives manufacturing, pyrotechnic manufacturing, or military uses are beyond the scope of this investigation, in addition to events involving simple combustion (i.e., rapid reaction of fuel [liquid, vapor, or dust] with oxygen in air).
[22] Serious consequences are injuries or fatalities, significant property damage, environmental contamination, and offsite evacuation or shelter-in-place.
[23] Research indicates that the OSHA Integrated Management Information System (IMIS) identified 70 percent of the reactive incidents in Section 3.3, but none were tracked as "reactive incidents." Only 25 percent of the reactive incidents that occurred from June 1994 through June 1999 were reported to EPA. These reports are contained in the RMP 5-year accident histories sent to EPA prior to the June 1999 deadline for initial submissions.

- No one comprehensive data source contains the data needed to adequately understand root causes and lessons learned from reactive incidents or other process safety incidents.[24] Table 1 lists the limitations of some public databases.

- It is difficult to identify causes and lessons learned in existing sources of process safety incident data because industry associations, government agencies, and academia generally do not collect this information.

- Data sources contained incomplete and sometimes inaccurate incident information–for example, on numbers of injuries and community impacts. Descriptions of incidents and causal information were sometimes vague and incomplete.

- There are limited Federal or state requirements to report incidents unless they involve specific consequences.

The results of the CSB incident data analysis are acknowledged as representing only a sampling of recent reactive incident data. This limitation precludes CSB from drawing statistical conclusions on incidence rates or inferring trends in the number or severity of incidents. However, despite these limitations, the data can be used to illustrate the profile and causes of reactive incidents.

[24] Only one publicly available database is designed to provide such information. The Accident Database from the Institution of Chemical Engineers (IChemE) contains lessons learned for one-fourth of the 12,000 incidents in the database.

Table 1

Limitations of Common Public Databases

Data Source (a)	Description	Years Searched	Strengths	Limitations
USCG NRC	Data on release notifications of oil and hazardous substance reports to NRC or EPA regional offices	1982-Present	Extensive range of incidents, including those resulting in a chemical release from a reactive incident All states and localities included	Knowledge of incident limited at time of notification, leading to possible inaccuracies No requirement to follow up on reports to improve data quality Relies on company compliance to notify (or third party) Notification requirement is driven by release of specified chemical above reportable quantity **Not designed to be a lessons-learned database**
OSHA IMIS	Records of workplace inspections, including those prompted by accidents where a worker is injured	1984-Present	Information from OSHA field inspections, a third party More accurate description of impacts on employees and contractors Keyword indexing allows for easy search and retrieval	Not comprehensive, limited to incidents selected by OSHA Inspections without abstracts cannot be keyword searched; causal information unavailable Designed to assist compliance enforcement, not to report on incident causes Limited information from "State-Plan" states **Not designed to be a lessons-learned database**
EPA ARIP	Responses to questionnaires sent by EPA from facilities that have had significant releases; purpose is to learn about causes and consequences of hazardous material incidents	1986-Present	Supplements NRC reports for more significant events Additional information on causal factors, consequences, and company safety programs Data are easily analyzed for common causes Includes all states and localities	Survey relies on voluntary compliance Not comprehensive; limited to select cases Checklist approach limits value of information to understand root cause **Not designed to be a lessons-learned database**

EPA RMP*Info	Data about chemical releases resulting in specific impacts covered under RMP regulation (40 CFR 68)	1994-Present	Provides further information about major events involving specific listed chemicals More accurate data on impacts, causal factors, and corrective actions Includes all states and localities	Not comprehensive, limited to events resulting in major harm for a select group of chemicals None of selected chemicals were listed due to reactivity No requirements to include extensive description of incidents, including causes and lessons learned Checklist approach limits respondent's choices (no indicator for incidents resulting from reactive hazards) **Not designed to be a lessons-learned database**
IChemE Accident Database	Reports about chemical incidents around the world from official government sources, the news media, and company reports	1980 - Present	Scope is beyond incidents reported to or investigated by regulatory agencies or first responders Contains lessons learned from 3,000 incidents	Only one-fourth of the 12,000 incidents in the database contain lessons-learned information
HSE MHIDAS	Information taken from public domain sources worldwide; however, majority of the 7,000 incidents occurred either in UK or US	1985 - Present	Scope is beyond incidents reported to or investigated by regulatory agencies or first responders	No extensive description of incidents, including causes and lessons learned
U.S. Fire Administration NFIRS	Response data submitted by local fire departments	1980-Present	Includes fire and explosion incidents with no/little release, incidents resulting in property damage only, and near-misses if fire department was called	Limited state participation Represents limited information available to fire department at time of response Checklist approach limits respondent choices **Not designed to be a lessons-learned database**
CSB CIRC	Initial reports about chemical incidents around the world from official government sources, news media, and eyewitnesses	1998-Present	Scope is beyond incidents reported to or investigated by regulatory agencies or first responders Includes domestic and international incidents	Not comprehensive, only select incidents included Limited time span Frequent reliance on media accounts limits the depth of initial reports **Not designed to be a lessons-learned database**

(a) ARIP = Accidental Release Information Program; CIRC = Chemical Incident Reports Center; HSE = Health and Safety Executive, United Kingdom; IChemE = Institution of Chemical Engineers; IMIS = Integrated Management Information System; MHIDAS = Major Hazard Incident Data Service; NFIRS = National Fire Incident Reporting System; NRC = National Response Center; RMP = Risk Management Program.

3.3 Assessment of Reactive Incidents

Reactive incidents can severely affect workers and the public, as well as cause major economic losses and environmental damage. The limited data available to CSB includes 167 incidents over nearly 22 years, as summarized in Figure 3.

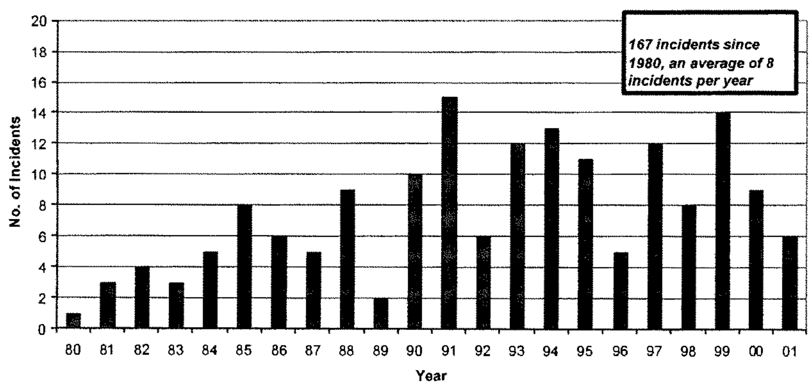

Figure 3. Total incidents by year, 1980–2001.

3.3.1 Injuries and Fatalities

Of the 167 reactive incidents, 48 caused a total of 108 fatalities. Since 1980, CSB data show an average of six injury-related incidents per year, resulting in an average of five fatalities per year. Table 2 provides data on 12 incidents with three or more fatalities (see also Figures 4 and 5).[25] Appendix F presents a 5-year summary of U.S. Bureau of Labor Statistics data on occupational fatalities.

[25] Photographs not available for website posting; they will appear in the printed copy.

Table 2

Incidents With Three or More Fatalities

Location	Date	Fatalities
ARCO Chemical Channelview, TX (a)	07/05/90	17
Albright and Wilson Charleston, SC	06/17/91	9
IMC Fertilizer/Angus Chemical Sterlington, LA	05/01/91	8
NAPP Technologies Lodi, NJ	04/21/95	5
Concept Sciences Hanover Township, PA	02/19/99	5
Terra Industries Port Neal, IA	12/13/94	4
Bastian Plating Auburn, IN	06/28/88	4
Plastifax Gulfport, MS	06/02/82	3
Merck Barceloneta, Puerto Rico	06/12/86	3
Shell Chemical Belpre, OH	05/27/94	3
BPS Inc. West Helena, AR	05/08/97	3
BP Amoco Augusta, GA	03/13/01	3

(a) Although this incident involved combustion, an *uncontrolled peroxide decomposition reaction* created an oxygen-enriched atmosphere in a tank containing flammable liquids. This incident does not meet the "simple combustion" exclusion in the CSB reactive incident definition because it involved combustion in an oxygen-enriched atmosphere rather than oxygen in air.

3.3.2 Consequences

In addition to causing injuries and fatalities to plant personnel and the public, reactive incidents can also result in environmental harm and equipment damage. These impacts may be due to fires, explosions, hazardous liquid spills, toxic gas releases, or any combination of such (Figure 6). Fires and explosions are the most frequent occurrence in CSB data, followed by toxic gas releases.

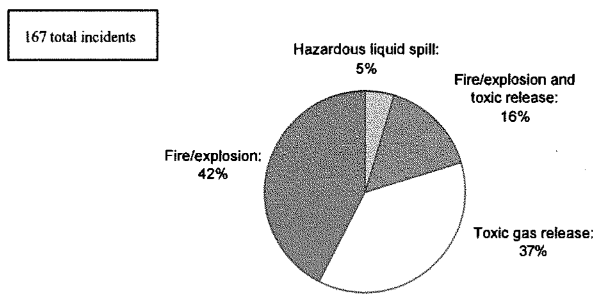

Figure 6. Categorization of consequences of incidents.

Whitehall Leather Company

On June 4, 1999, the inadvertent mixing of two incompatible chemicals caused a toxic gas release at Whitehall Leather Company in Whitehall, Michigan (Figure 7).[26] One person was killed, and another was injured.

A truck driver arrived at the facility to deliver a load of sodium hydrosulfide solution. The delivery took place on the night shift. During prior deliveries on this shift, the shift supervisor had received only "pickle acid." (The material commonly known onsite as pickle acid was actually ferrous sulfate.) He assumed that the sodium hydrosulfide was pickle acid and directed the truck driver to unload at the facility's pickle acid tank. Hydrogen sulfide gas was produced when the sodium hydrosulfide solution was unloaded into the ferrous sulfate tank. The truck driver was exposed to the gas and died; one Whitehall Leather employee was injured (NTSB, 2000).

The Whitehall Leather case demonstrates that reactive hazards other than thermal runaways in reactors–such as inadvertent mixing of incompatible materials–can cause severe reactive incidents. Neither ferrous sulfate nor sodium hydrosulfide is rated by NFPA, and neither compound is an OSHA PSM-listed chemical.

[26] Photograph not available for website posting; it will appear in the printed copy.

3.3.3 Property Damage

At least a dozen incidents in the CSB data resulted in property damage alone exceeding $10 million, with three cases in which loss exceeded $100 million (Figure 8).[27] These numbers do not include further financial losses due to business interruption or lost market share.

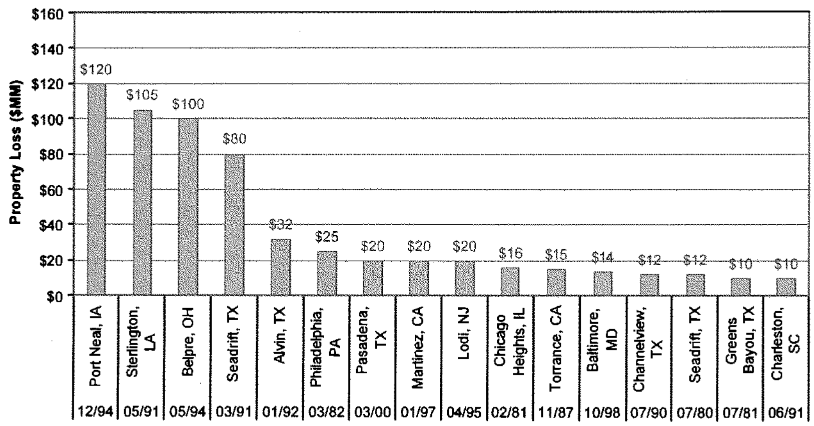

Figure 8. Incidents resulting in large property losses.

[27] Property loss figures are quoted for the year in which they were incurred. The numbers in Figure 8 are not scaled to represent constant dollar valuation of loss.

Concept Sciences, Inc.

An explosion that occurred during the distillation of a solution of aqueous hydroxylamine (HA) and potassium sulfate killed four CSI employees and an employee of an adjacent business on February 19, 1999 (Figure 9;[28] USCSB, 2002a). Fourteen people were injured. The CSI facility, in Hanover Township, Pennsylvania, was completely destroyed. Several local buildings in the industrial park were damaged, and windows were broken in nearby residences.

On the day of the incident, CSI was in the process of producing its first full-scale batch of 50 wt-percent HA. After the distillation process was shut down, the HA contained in one of the process tanks explosively decomposed. The last recorded concentration of the HA solution in the tank was 86 wt-percent. HA has been shown to explosively decompose at high concentrations (i.e., 85 wt-percent; Koseki and Iwata, 2001).

The CSB investigation determined that CSI did not adequately evaluate the hazards of HA during process development. The explosive decomposition hazard of HA was not adequately translated into CSI's process design, operating procedures, mitigation measures, or precautionary instructions for operators. This incident demonstrates the need for effective reactive hazard management throughout the many phases of the process life cycle–including development, design, construction, and startup. Furthermore, the offsite fatality dramatically illustrates that reactive incidents can affect the public.HA is not a listed chemical under the EPA RMP regulation. It is an OSHA PSM-listed chemical and has an NFPA rating of "3."

[28] Photograph not available for website posting; it will appear in the printed copy.

3.3.4 Public Impact

Reactive incidents primarily cause onsite impacts, such as worker fatalities and injuries–and severe business impacts, including lost production and property damage. However, a significant number of incidents have led to public impacts,[29] which include public harm (injury or fatality), offsite evacuation, or shelter-in-place. Nearly 50 of the 167 incidents in the CSB data affected the public. At least eight of the 12 reactive incidents listed in Table 2 had public impacts. One of these incidents (CSI) resulted in a public fatality.

3.4 Profile of Affected Industries

Analysis of CSB data shows that reactive incidents are not unique to the chemical manufacturing industry (Figure 10). Although about 70 percent of the 167 incidents occurred in the chemical industry, the remaining 30 percent occurred in other industries that use bulk quantities of chemicals–such as waste processing and petroleum refining.

The BPS incident is an example of a severe reactive incident at a nonchemical manufacturing site. The fire and explosion at Chief Supply Corporation also occurred at a nonchemical manufacturing facility (Figure 11).[30]

[29] The definition of public impact is based on the criteria for reporting offsite incidents in the EPA RMP regulation (40 CFR 68.42a). "Public" includes anyone except employees or contractors at the facility.
[30] Photograph not available for website posting; it will appear in the printed copy.

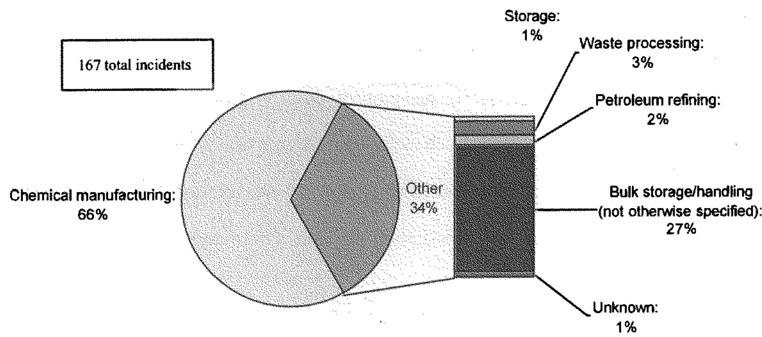

Figure 10. Industry profile, 1980–2001.

3.5 Profile of Reactive Incidents

3.5.1 Chemical Classes

The CSB data analysis shows that reactive incidents are not limited to any one chemical or to a few classes of chemicals. Table 3 lists common chemical classes involved in the 167 incidents. None of these classes represent a majority of incidents in the CSB data.

Table 3

Common Classes of Chemicals Involved in Reactive Incidents

Chemical Class	No. of Incidents (a)
Acid	38
Oxidizer	20
Monomer	15
Water	14
Base	12
Organic peroxide	12
Hypochlorite	10
Alcohol	8
Hydrocarbon	7
Inorganic/metal	6
Hydrosulfite	6
Other classes	79

(a) Some incidents involved more than one class of chemicals.

3.5.2 Type of Reactions

A range of chemical reactions can cause reactive incidents. Over 90 percent of the 167 incidents analyzed by CSB involved reactive hazards that are documented in literature available to the chemical processing industry (see Section 7.1). The various types of reactions indicate the diversity of chemistry involved; for example, an explosion at a Georgia Pacific resin factory–involving formaldehyde, phenol, and sulfuric acid–was caused by an exothermic runaway reaction (Figure 12).[31]. Nearly 75 percent of the incidents from the CSB data were caused by one of the following types of reactions:

- Decomposition (26 percent)
- Acid/base (11 percent)
- Water reactive (10 percent)
- Polymerization (10 percent)
- Oxidation (6 percent)
- Decomposition initiated by another reaction (5 percent)
- Oxidation-reduction (4 percent)
- Chlorination, catalytic cracking, halogenation, hydrolysis, and nitration (each 1 percent).

Information was insufficient to determine type of reaction for the remaining 23 percent of incidents.

3.5.3 Type of Equipment

A reactive incident can occur in most equipment used to store, handle, manufacture, and transport chemicals. The CSB data show that incidents occur in a variety of chemical processing and storage equipment–including reactors, storage tanks, and bulk storage drums (Figure 13). Twenty-five percent of the incidents involved reactor vessels; 22 percent, storage equipment (e.g., tanks, rail cars, and designated storage areas); 22 percent, other process equipment (e.g., holding tanks, mixers, and dryers); 13 percent,

[31] Photograph not available for website posting; it will appear in the printed copy.

waste, separation, and transfer equipment; and 10 percent, bulk storage drums. No particular equipment accounted for 8 percent of the data.

These data contradict a common assumption that a majority of reactive incidents involve chemical reactor vessels. Chemical processing and storage equipment (excluding reactors) and bulk storage drums account for over 65 percent of the equipment involved in reactive incidents. The case histories highlighted throughout Section 3.0 are examples of reactive incidents that did not occur in reaction vessels.

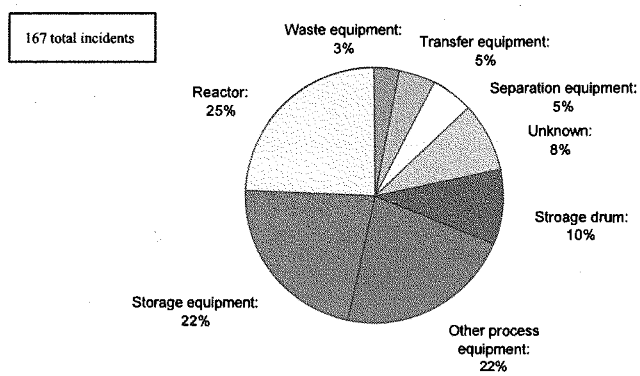

Figure 13. Equipment involved in incidents, 1980–2001.

BP Amoco Polymers, Inc.

On March 13, 2001, three people were killed as the result of a vessel failure and fire at the BP Amoco Polymers plant in Augusta, Georgia (Figure 14,[32] USCSB, 2002b). The facility produces plastics. Startup operations in a process to produce Amodel–a nylon-family polymer–were suspended due to problems with equipment in a finishing line. During the aborted startup attempt, polymer was discarded into the polymer catch tank, a waste collection vessel. Cooling effects created a layer of hardened plastic 3 to 5 inches thick along the entire inner wall of the vessel, blocking all normal and emergency vents. However, the material in the core of the vessel remained hot and molten. It continued to react and decompose, generating gas that could not escape. Over several hours, the catch tank became pressurized. The failure occurred as workers attempted to open a cover on the vessel.

The CSB investigation determined that BP Amoco was unaware of the hazardous reaction chemistry of the polymer because of inadequate hazard identification during process development. This lack of awareness is a commonly cited cause of reactive incidents within the CSB data. The BP Amoco incident also involved an endothermic (or heat consuming) reaction rather than the more commonly recognized exothermic (or heat producing) runaway chemical reaction.

[32] Photograph not available for website posting; it will appear in the printed copy.

3.6 Common Reactive Hazards and Causal Information

Identifying common types of associated hazards and causes is an essential element of understanding the reactive incident problem.

3.6.1 Reactive Hazards

A common perception is that reactive incidents are primarily the result of runaway reactions. In fact, analysis of data from the 167 incidents suggests that other types of reactive hazards should also be of concern. CSB data analysis identified three common types of reactive hazards (see Appendix A for definitions):

- Chemical incompatibility
- Runaway reaction
- Impact or thermally sensitive materials.

Of the 167 incidents, 36 percent are attributed to chemical incompatibility, 35 percent to runaway reactions, and 10 percent to impact or thermally sensitive materials. The hazard is unknown for 19 percent of the incidents.

3.6.2 Causal Information

Causal[33] data are reported for only 37 of the 167 incidents. Analysis of this limited set of data revealed a variety of causes (Table 4). More than 60 percent of reactive incidents for which some causal information was available involved inadequate management systems for identifying or evaluating hazards. In the CSI

[33] The term "cause" within this section refers to inadequate process safety management practices. The causal information presented is not intended to be considered as root causes; no consistent root cause analysis methods were identified within the data.

incident, even though the reactive hazard was known, an inadequate hazard evaluation was performed. Nearly 50 percent of the causal data also point to inadequate procedures for the safe storage, handling, or processing of chemicals (e.g., Whitehall Leather and BPS).

Table 4

Analysis of Causal Information

Causes	Frequency of Attribution	
	No. of Incidents	Incidents With Causal Information (%) (a) (b)
Inadequate hazard identification	9	24
Inadequate hazard evaluation	16	43
Inadequate procedures for storage/handling of reactive chemicals	17	46
Inadequate training for storage/handling of reactive chemicals	10	27
Inadequate management of change (MOC) system to identify/evaluate reactivity hazards	6	16
Inadequate process design for reactive hazards	6	16
Inadequate design to prevent human error	9	24
Inadequate company-wide communication of hazards	5	14
Inadequate emergency relief system design	3	8
Inadequate safe operating limits	3	8
Inadequate near miss/incident investigation	2	5
Inadequate inspection/maintenance/monitoring of safety critical devices in reactive chemical service	2	5
Previously unknown reactive hazards	1	3

(a) Causal data are reported for 37 of the 167 incidents.
(b) Total greater than 100 percent because each incident may have more than one cause.

4.0 NFPA Hazard Rating System

CSB analyzed incident data in terms of the chemicals published in NFPA Standards 49 and 325. The data show that only about 10 percent of the 167 known incidents involved chemicals that were rated NFPA "3" or "4" (Figure 15). NFPA "not rated" or "0" accounts for nearly 60 percent of the data.. (Both the BPS and the Morton incidents involved chemicals that were not rated by NFPA.)

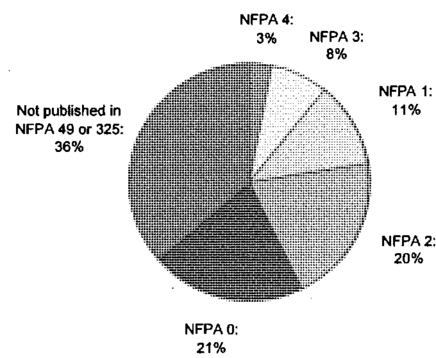

Figure 15. NFPA instability rating analysis (*formerly reactivity rating*) of incident data, 1980–2001.

The OSHA PSM Standard lists 137 highly hazardous chemicals–only 38 of which are considered highly reactive based on NFPA ratings "3" or "4"[34] (as defined in NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response).

Public and labor union concerns as the result of a number of reactive incidents have caused OSHA to consider PSM revisions. One alternative OSHA identified through a petition from unions (Section 5.1.3) is to add the remaining NFPA "3" and "4" chemicals and all NFPA "1" and "2" chemicals to the PSM list. However, this approach would address less than half of the chemicals involved in the 167 incidents examined by CSB.

NFPA developed Standard 704 as a tool for identification and evaluation of potential hazards during emergency response, not for application to chemical process safety. The instability rating is a part of this standard. It was not intended to be used to measure reactivity, but rather to measure the "inherent" instability of a pure substance or product under conditions expected for product storage. The instability rating does not measure the tendency of a substance or compound to react with other substances or any other process-specific factors, such as operating temperature, pressure, quantity handled, chemical concentration, impurities with catalytic effects, and compatibility with other chemicals onsite.

NFPA 704 is a voluntary standard. Table 5 lists the five degrees of hazard defined in NFPA 704. The NFPA hazard rating system primarily relies on qualitative criteria and judgment to assign chemical

[34] The PSM chemical list is based on ratings in NFPA 49 (1975). Six of the 137 PSM chemicals are listed twice. An NFPA instability rating of "4" means that materials in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures (13 of 131 PSM-listed chemicals have an NFPA "4" reactivity). A rating of "3" means that materials in themselves are capable of detonation or explosive decomposition or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation (25 of 131 PSM-listed chemicals have an NFPA "3" reactivity).

instability ratings, which may vary considerably from company-to-company. The instability rating system was so named in 1996 to clarify its intent; it was formerly known as the reactiv ity rating system. NFPA 49 lists the ratings for 325 chemicals–representing only a very small percentage of the chemicals used in industry.[35]

Table 5

NFPA-Defined Degrees of Instability Hazards

NFPA Instability No.	Stability Criteria	Typically Includes	Water Reactivity Criteria (a)	Instantaneous Power Density Criteria (b)
4	Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures	Materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures	Not applicable	Greater than 1,000 W/mL
3	Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation	Materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures	Materials that react explosively with water without heat or confinement; heat of mixing greater than 600 cal/g	Less than 1,000 but greater than 100 W/mL
2	Materials that readily undergo violent chemical change at elevated temperatures and pressures	Materials that exhibit an exotherm at temperatures less than 200°C and materials that polymerize vigorously and evolve heat	Materials that react violently with water or form potentially explosive mixtures with water; heat of mixing less than 600 but greater than 100 cal/g	Less than 100 but greater than 10 W/mL

[35] The Chemical Abstracts Service maintains data on over 200,000 chemicals that are listed under national and international regulations.

1	Materials that in themselves are normally stable, but can become unstable at elevated temperatures and pressures	Materials that exhibit an exotherm at temperatures greater than 200°C but less than 500°C	Materials that react vigorously with water, but not violently; heat of mixing less than 100 but greater than 30 cal/g	Less than 10 but greater than 0.01 W/mL
0	Materials that in themselves are normally stable, even under fire conditions	Materials that exhibit an exotherm at temperatures greater than 500°C when tested by differential scanning calorimetry (DSC)	Materials that do not react with water; heat of mixing less than 30 cal/g	Less than 0.01 W/mL

Source: NFPA 704.

(a) cal/g = calories per gram.

(b) W/mL = watts per milliliter.

The more recent editions of NFPA 704 provide some objective criteria (Table 5) for assignment of ratings. The degree of instability hazard is ranked based on "ease, rate, and quantity of energy release" of the substance (NFPA, 1996). Onset temperature, instantaneous power density (IPD; Hofelich et al., 1997),[36] and–in the case of water-reactive substances–the energy of reaction upon mixing are the parameters considered. Onset temperature was added in the 1990 edition of the standard, and the latter two criteria were added in 1996. These criteria are not intended to replace the primarily qualitative nature of the rating system, but to be used as a hazard recognition aid. Where data are available, NFPA currently prefers ratings based on IPD.

[36] IPD is calculated as the mathematical product of the energy of decomposition/reaction and the initial rate of reaction, determined at 482 degrees Fahrenheit (°F; 250 degrees Celsius [°C]).

NFPA 49 is no longer issued in the NFPA Fire Code set, and the standard is no longer updated;[37] however, Standard 704 was updated in 2001. NFPA 49 information is available in the *Fire Protection Guide to Hazardous Materials* (NFPA, 1997).

NFPA confirmed the intent of NFPA 704 and the instability rating system through correspondence with CSB staff. The committee clarified that the rating system is insufficient for use as the sole basis of determining reactivity for regulatory lists because it considers only one facet of chemical reactivity. NFPA staff reiterated this position in testimony given at the CSB public hearing on reactive chemical safety on May 30, 2002.

[37] Revision of NFPA 49 was withdrawn as a committee project in 1998.

5.0 Regulatory Analysis

5.1 OSHA

5.1.1 Overview

CSB found significant gaps in OSHA process safety regulations designed to protect workers from highly hazardous chemicals, including reactive hazards. OSHA standards cover the hazards of some classes of substances, such as flammable and combustible liquids; however, no OSHA standard specifically addresses reactive hazards.

There are OSHA standards designed to protect employees from acute chemical hazards resulting from reactive incidents–including fires, explosions, and toxic releases. The Hazard Communication Standard (29 CFR 1910.1200) requires chemical manufacturers to evaluate chemicals produced or handled in their workplace and to communicate the hazards associated with the products they produce via labels and MSDSs. The standard also requires all employers to provide information to employees about the hazardous chemicals to which they could be exposed. The PSM Standard (29 CFR 1910.119) requires employers to prevent or minimize the consequences of catastrophic releases of highly hazardous chemicals, including highly reactive chemicals.

Numerous other OSHA regulations apply to the chemical industry in general, but are not specific to reactive hazards. Where no specific OSHA standards apply, the OSHA General Duty Clause (GDC; Section 5(a)(1) of the 1970 Occupational Safety and Health Act) creates a legal obligation for an employer to address a known hazard, including a reactive hazard.

5.1.2 Process Safety Management

The CSB incident data were analyzed to determine whether the chemicals involved were considered "highly hazardous" under the OSHA PSM Standard. For the purposes of analyzing the data, CSB determined if a chemical was covered by OSHA PSM by identifying whether it was listed in PSM or was covered as a flammable chemical by OSHA definition.[38]

All 167 incidents were included in the analysis, even if the incident predated the promulgation of PSM:

- In 30 percent of the incidents, the chemicals were covered under PSM.
- In 50 percent of the incidents, the chemicals were not PSM covered.
- In 20 percent of the incidents, it could not be determined whether PSM-covered chemicals were involved.

CSB was unable to determine from the incident data if a process was PSM covered.[39]

5.1.2.1 Development of PSM Standard

Following a series of very serious chemical accidents in the 1980s, OSHA began to develop the PSM Standard. The proposed standard was published in 1990, the same year that Congress enacted the Clean Air Act Amendments (CAAA). Section 304 of CAAA required OSHA to promulgate a chemical process safety standard to protect employees from hazards associated with accidental releases of highly hazardous chemicals in the workplace. It further required that OSHA develop and apply the standard to a list of

[38] Processes that are covered by the OSHA PSM Standard due to the presence of flammable substances may, in fact, have significant reactive hazards as well. An example is a polymerization reaction involving the flammable chemical 1,3-butadiene. Such processes are required to address all chemical hazards, including reactive hazards.
[39] The CSB analysis is limited by incomplete knowledge of chemical concentrations, quantities, or other covered chemicals in the same process–all of which are relevant in determining whether a process is regulated under the PSM Standard.

highly hazardous chemicals. Congress specified that highly hazardous chemicals included "toxic, flammable, highly reactive, and explosive substances."

OSHA relied on several established lists–including the New Jersey Toxic Catastrophe Prevention Act (TCPA), the Delaware Extremely Hazardous Substances Risk Management Act, the European Communities Seveso Directive (82/501/EEC), and NFPA Hazardous Chemicals Data (NFPA 49)–to develop its list of highly hazardous chemicals. OSHA chose to list the chemicals classified as reactive category "3" or "4" in NFPA 49 (1975 edition).

The OSHA PSM Standard lists 131 distinct chemicals with toxic or reactive properties.[40] It includes 25 chemicals with an NFPA rating of "3" and 13 chemicals with an NFPA rating of "4." PSM applies to processes that involve listed chemicals at or above threshold quantities and to processes with flammable liquids or gases onsite in one location, in quantities of 10,000 pounds or more. Companies that manufacture explosives and pyrotechnics are also required to comply with the standard.

The OSHA list has not been updated since the promulgation of PSM in 1992. It does not reflect changes in the list of chemicals and their ratings made by NFPA in 1991 and 1994.

5.1.2.2 Process Safety Information and Process Hazard Analysis

The PSM Standard is a performance-oriented standard that requires the employer to prevent catastrophic releases from covered processes by executing a 14-element safety program. All processes with highly hazardous chemicals are required to have a management system that addresses each element of the standard.

As supported by the CSB incident data, two elements are particularly relevant to reactive hazards–Process Safety Information (PSI; 29 CFR 1910.119 [d]) and Process Hazard Analysis (PHA; 29 CFR 1910.119

[40] Six of the 137 chemicals on the PSM list are not distinct (i.e., are listed under a synonym).

[e]). Two commonly cited causes of reactive incidents, as shown by the data, are inadequate understanding of reactive chemistry or inadequate hazard evaluation (Section 3.0; Table 4).

The PSM Standard requires that the following information be contained within the PSI element–physical data, reactivity data, corrosivity data, thermal and chemical stability data, and hazardous effects of potential inadvertent mixing of different materials. The standard does not specifically define what is to be included in any of these data categories, the level of detail required, or the method of compilation.[41] It does, however, stipulate that an MSDS can be used to compile the data to the extent that it contains the information required. In 1996, OSHA issued a Hazard Information Bulletin cautioning that MSDSs do not always contain information about hazards from mixing or blending chemicals (OSHA, 1996).

Another requirement of the PSM Standard is that the employer conduct process hazard analysis, which OSHA defines as "an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of highly hazardous chemicals." The analysis must identify the hazards of the process and necessary safeguards; however, the standard does not explicitly define requirements for addressing reactive hazards.

It is evident that the PSM Standard has significant gaps in coverage of reactive hazards because it is based on a limited list of individual chemicals with inherently reactive properties.

[41] Incident data in Section 3.0 illustrate that reactive hazards are broader than the "hazardous effects of potential inadvertent mixing of different materials."

5.1.3 General Duty Clause

The OSHA GDC states, "Each employer shall furnish to each of his [sic] employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his [sic] employees." In the event that there is no OSHA standard to address a hazard, OSHA may use the GDC to enforce a legally binding requirement on an employer or impose a fine. To substantiate a GDC violation, several criteria must be met,[42] including:

- A condition or activity in the employer's workplace presents a hazard to employees.
- The cited employee or the employer's industry recognizes the hazard.
- The hazard is likely to cause death or serious physical harm.
- There is a feasible means of eliminating or materially reducing the hazard.

To support a GDC citation, OSHA must establish employer or industry recognition of a hazard. Among other forms of evidence, industry recognition may be demonstrated by a consensus standard (NFPA, American National Standards Institute [ANSI], American Petroleum Institute [API], American Society for Testing and Materials [ASTM], etc.). Industry standards may also be used to identify feasible means of reducing the hazard. However, no industry consensus standard has been identified for the management of reactive hazards in support of a GDC citation.[43]

5.1.4 Other PSM Initiatives

As a result of the joint OSHA-EPA chemical accident investigation of the Napp Technologies incident in April 1995, a recommendation was made by both agencies to consider adding more reactive chemicals to

[42] OSHA response to CSB interrogatory for the reactive chemical hazard investigation, June 6, 2001.
[43] OSHA response to CSB interrogatory for the reactive chemical hazard investigation, June 6, 2001.

their respective lists of chemicals covered by process safety regulations. To date, however, neither OSHA nor EPA has modified process safety regulations to better cover reactive hazards.

Following the Napp incident, six labor unions[44] petitioned OSHA for emergency revision of the PSM Standard, stating that it failed to cover reactive chemicals. In a followup letter, the labor unions asked OSHA to consider the following issues in any revision of the standard:

- Addition of NFPA category "1" and "2" reactives to the list of highly hazardous chemicals.
- Hazard evaluation, including the conditions for use of highly hazardous chemicals.
- Adequacy of the NFPA ratings process.
- Synchronization of the OSHA PSM and the EPA RMP lists; and expansion of worker/union involvement.

In February 1996, the Chemical Manufacturers Association (now ACC) and API submitted a letter to OSHA responding to issues raised by the labor unions. The letter indicated ACC support of PSM as an effective standard. It also reflected the opinion that expanding PSM in the ways proposed would greatly increase compliance costs without substantial benefits and that a large amount of the additional cost would fall on small businesses. ACC and API identified several alternatives for regulating reactives, but concluded that each presented technical difficulties, significant cost, and minimal benefit. For these reasons, both trade groups opposed any revisions to the PSM Standard.

[44] Union of Needletrades, Industrial, and Textile Employees (UNITE); United Steelworkers of America (USWA); Oil, Chemical, and Atomic Workers (OCAW); American Federation of Labor-Congress of Industrial Organizations (AFL-CIO); International Association of Fire Fighters (IAFF); and International Chemical Workers Union (ICWU). In 1999, OCAW merged with the United Paperworkers International Union to form the Paper, Allied-Industrial, Chemical & Energy Workers International Union (PACE). In 1996, ICWU merged with the United Food and Commercial Workers International Union (UFCW).

OSHA did not undertake an emergency revision of the PSM Standard in response to the labor unions' petition. In October 1997, OSHA and EPA issued a joint chemical accident investigation report on the Napp Technologies incident. Among the recommendations was that OSHA and EPA review the lists of substances subject to the PSM Standard and RMP regulation (40 CFR 68) to determine whether reactive substances should be added.

The OSHA regulatory agenda published on May 14, 2001, indicated that it intended to reconsider the reactives issue that year. However, in the regulatory agenda published on December 3, 2001, OSHA withdrew from consideration changes to the PSM Standard. A May 21, 2002, letter from John Henshaw, Assistant Secretary of Labor for OSHA, to CSB stated that issues related to reactives–though dropped from the current regulatory agenda–would be reconsidered and possibly raised in future regulatory agendas.

5.2 EPA

5.2.1 Overview

Similar to OSHA, EPA has no regulations specifically targeted to reactive hazard management. However, some legal requirements cover limited aspects of reactivity. The EPA RMP and GDC are two such requirements, as discussed in more detail below. EPA has made no decision on how to address reactivity because it has not yet identified a technically sound method for determining reactive substances.[45]

CSB incident data were analyzed with respect to coverage under the EPA RMP regulation:

- In 20 percent of the incidents, the chemicals were covered under RMP.

[45] EPA response to CSB interrogatory for the reactive chemical hazard investigation, May 31, 2001.

- In 60 percent of the incidents, the chemicals were not RMP listed.
- In 20 percent of the incidents, it could not be determined whether RMP-listed chemicals were involved.

The 1990 CAAA required EPA to promulgate regulations to prevent the accidental release of substances that could cause death, injury, or serious adverse effects to human health or the environment. Congress directed EPA to regulate at least 100 substances and to take into account several factors when developing a chemical list, including "toxicity, reactivity, volatility, dispersibility, combustibility, or flammability of the substance, and amount of the substance."

5.2.2 Accidental Release Prevention Requirements (40 CFR 68)

EPA promulgated the Accidental Release Prevention Requirements (40 CFR 68), which contain the list of regulated chemicals and requirements for facilities possessing more than a threshold quantity of a listed chemical in an individual process. Covered facilities are required to implement a risk management program and submit a risk management plan to EPA.

When developing the list of substances, EPA considered only the inherent characteristics of a chemical that indicate a severe threat due to exposure. Well-defined criteria were used for toxicity and flammability. However, because of the complexities of site-specific factors and process conditions, EPA was unable to determine any inherent characteristic as an indicator of reactivity. EPA concluded that there was "insufficient technical information for developing criteria for identifying reactive substances."[46] Consequently, the January 1994 RMP list of 130 chemicals does not contain any substances listed due to reactive hazards.

[46] EPA Response to CSB interrogatory for the reactive chemical hazard investigation, May 31, 2001.

Unlike OSHA's use of criteria for covering classes of chemicals, such as the criterion for flammable substances as a class, EPA has used only chemical lists for the RMP regulation. The authority provided by Congress in the CAAA for EPA to develop the Accidental Release Prevention Requirements is explicit on the use of a "List of Substances" (Section 112[r][3]) to identify the covered chemicals.

The list of RMP-regulated chemicals has not been revised since the October 1997 recommendation by the OSHA-EPA joint chemical accident investigation team to review the lists of substances subject to the PSM Standard and RMP regulation to determine whether reactive chemicals should be added.

RMP requires covered processes to have a hazard assessment, a prevention program, and an emergency response program. The hazard assessment must evaluate the accidental release of regulated substances, including the worst case scenario. RMP contains requirements for prevention of accidental releases, which include the same basic elements as the OSHA PSM Standard. Therefore, the limitations described in Section 5.1.2.2 with respect to process safety information and process hazard analysis also apply to RMP.

It is evident that the EPA RMP has significant gaps in coverage of reactive hazards.

5.2.3 General Duty Clause

The EPA GDC is a statutory requirement found in Section 112(r)(1) of the 1990 CAAA. It reads as follows:

> The owners and operators of stationary sources producing, processing, handling or storing [a chemical in 40 CFR 68 or any other EHS] have a general duty [in the same manner and to the same extent as the OSHA GDC] to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases

which do occur.

GDC applies to all stationary sources (fixed facilities) that handle, produce, process, or store regulated substances or extremely hazardous substances (EHS)[47]. It obligates facilities to identify and safely manage all hazards, including reactive hazards. Similar to OSHA, EPA can use its GDC enforcement authority to create legally binding requirements or enforce actions for hazards that have not been properly identified or managed.

The EPA GDC is not limited solely to hazards addressed by industry standards; however, there are no standards for management of reactive hazards that can be used to enforce a general duty on industry.

The EPA GDC enforcement authority can be used in either a proactive (before an incident) or a reactive (after an incident) manner. EPA can use its order authority (CAA Section 112[r][9]) to enforce GDC in a case where it finds the possibility of imminent and substantial endangerment. EPA has used GDC order authority in only one situation for reactive hazards.

[47] The Senate Report on the 1990 CAAA stated that EHS includes substances specifically listed under EPA's Accidental Release Prevention Requirements (40 CFR 68) and substances listed under Section 302 of the Emergency Planning and Community Right-to-Know Act (EPCRA). The definition also includes substances not necessarily listed that–due to their toxicity, reactivity, flammability, volatility, or corrosivity–may cause death, injury, or property damage as a result of short-term exposure upon release to the air.

6.0 Management System Guidance

Inadequate process safety management practices are often cited as the cause of reactive incidents, as discussed in Section 3.0 (Table 4). Incident data underscore the critical importance of successfully implementing the following key elements throughout the life cycle[48] of a manufacturing process:

- ***Hazard identification***–structured approach to identifying and understanding the reactive hazards of chemicals used alone or in combination.
- ***Hazard evaluation***–system for investigating reactive hazards, assessing the potential consequences of uncontrolled reactions, and establishing a safe design and operating basis.
- ***Management of change (MOC)***–procedure to re-evaluate reactive hazards when changes occur throughout the life cycle of a chemical process.
- ***Personnel training and procedures***–program that includes written operating procedures and consideration of the potential for human error in reactive systems.

CSB staff found a considerable amount of technical guidance for chemists and process engineers on how to identify reactive hazards during the R&D and design phases. This guidance covers chemical manufacturing processes and storage/handling situations.

[48] "Life cycle" refers to all phases of a chemical manufacturing process–from conceptualization, process R&D, engineering design, construction, commissioning, commercial operation, and major modification to decommissioning.

However, only limited guidance is available on the following aspects of reactive hazards management:

- Use of reactive test data, including data from the reactive hazard evaluation.
- Use of a protocol to identify reactive hazards (e.g., checklist or specific guidewords).
- Application of a chemical interaction matrix.
- Identification and evaluation of worst case scenarios involving uncontrolled reactivity.
- Integration of reactive hazard information into process safety information, operating procedures, training, and communication practices.
- Evaluation of reactive hazards during MOC procedures.

Companies engaged primarily in the bulk storage, handling, and use of chemicals are particularly in need of concise guidance on preventing the inadvertent mixing of incompatible substances.

Additionally, as discussed earlier, though several computerized tools and literature resources are available to identify reactive hazards, the surveyed companies generally do not use them. Also, they typically do not share detailed reactive chemical test data.

6.1 Hazard Identification

Understanding and identifying reactive hazards is a key component of process knowledge. It is often the first activity in managing reactive hazards and may occur early in product research or in process development. Ineffective hazard identification is commonly cited as a cause of reactive incidents. Where some causal information is available from CSB's data search,[49] about 25 percent of incidents are attributed to this factor.

The identification of reactive hazards is a prerequisite to conducting a hazard evaluation and developing safe design, operation, and maintenance practices (CCPS, 1992; pp. 9, 12). A variety of reactive hazard identification methods are currently used, including literature searches and screening tests (CCPS, 1995a, 1995b; HSE, 2000; Barton and Rogers, 1997). No one technique is appropriate for all circumstances.

6.1.1 Existing Sources of Data

Relevant sources of information for reactive hazard data include the following, as noted throughout this report and listed in Section 11.0:

- *Bretherick's Handbook of Reactive Chemical Hazards.*
- U.S. Coast Guard (USCG) Chemical Hazard Response Information System (CHRIS) Database.
- NFPA 49, Hazardous Chemicals Data.
- NFPA *Fire Protection Guide to Hazardous Materials.*
- *Sax's Dangerous Properties of Industrial Materials.*
- National Oceanic and Atmospheric Administration (NOAA) The Chemical Reactivity Worksheet.

[49] Causal information is available in approximately 20 percent of the incidents identified by CSB.

- *Rapid Guide to Chemical Incompatibilities.*

- ASTM Chemical Thermodynamic and Energy Release Program (CHETAH).

Responses to the CSB industry survey[50] indicate that most companies consult a variety of information sources as a first step in compiling data on reactive hazards. However, respondents prefer literature sources and expert opinion over computerized tools such as CHETAH, The Chemical Reactivity Worksheet, or Bretherick's Database of Reactive Chemical Hazards. Such programs can be used to predict the thermal stability of compounds, reaction mixtures, or potential chemical incompatibilities. In some cases, they provide an efficient means of identifying reactive hazards without having to conduct chemical testing. Survey responses showed that five of nine companies consider computer-based tools "not valuable." Only two of the surveyed companies use The Chemical Reactivity Worksheet.[51]

CSB data show that hazard information was available in existing literature for over 90 percent of the reactive incidents.

6.1.2 Chemical Incompatibility

Approximately 36 percent of incidents in the CSB data are related to chemical incompatibility. CCPS provides information on managing chemical incompatibility hazards in guidelines for chemical reactivity. It emphasizes the need to systematically examine possible chemical incompatibilities and describes the use of interaction matrices (CCPS, 1995a, p. 7; 1995b, p. 108).[52], [53] This guidance applies to chemical manufacturers as well as to other industries.

[50] Appendix B describes the CSB industry survey.
[51] The survey did not seek to determine whether the participants had used the tools and concluded that they were of little value, or whether they had only a limited understanding of the potential benefits.
[52] An interaction matrix indicates whether the combination of two or more materials yields an undesired consequence (see ASTM E2012-99, Standard Guide for Preparation of Binary Chemical Compatibility Chart).
[53] Section 6.1.1 lists data sources for developing an interaction matrix.

In many cases, it is not possible to identify hazards through intrinsic chemical properties because they may be caused by the interaction of process chemicals, either inadvertent or intentional. Such hazards are commonly encountered at facilities primarily engaged in the bulk storage, handling, and use of chemicals. There is limited guidance on segregation and isolation of incompatible substances, handling water- or air-reactive chemicals, training, and MOC.

Seven of nine respondents use chemical interaction matrices to identify potential chemical incompatibilities. Most use a binary matrix (i.e., the mixing of only two chemical components at a time). Respondents indicated that literature or expert opinion are important sources of data for the matrix.

Five of the seven respondents who use a matrix also use chemical testing results as a data source. A similar number review the matrix during qualitative hazard evaluation studies (i.e., hazard and operability [HAZOP] studies, "what-if," checklist, etc.).

CCPS (1995a; pp. 46-49) provides only limited discussion on when to conduct an incompatibility study or how to apply the results during a hazard evaluation. It suggests that the PHA team review the interaction matrix, but does not provide detailed guidance on this subject (CCPS, 1995b; p. 111).

6.1.3 Thermal Hazards

From the data collected by CSB, 35 percent of the 167 incidents are attributed to runaway reaction hazards. CCPS (1995a, Ch. 2; 1995b, Ch. 3), HSE (2000; pp. 15-28), and IChemE (Barton and Rogers, 1997; pp. 20-45) offer guidance on methods for identifying thermal hazards such as runaway reactions. In *Guidelines for Safe Storage and Handling of Reactive Materials*, CCPS (1995b; p. 58) outlines a materials assessment strategy for hazard identification that applies various recognition aids along with expert judgment and experience. The guidelines suggest evaluation of each substance stored or handled onsite.

6.1.4 Chemical Reactivity Testing

When there are gaps in literature or expert knowledge of reactive hazards, industry good practice guidelines (e.g., CCPS, 1995a; p. 13) recommend chemical testing prior to scaleup of a chemical manufacturing process. Chemical reactivity testing can be used either to aid in hazard identification during product research or to evaluate hazards during capital projects. Most survey participants view chemical testing as a valuable part of the hazard identification process. Appendix G presents more detailed information on testing.

The survey participants were asked about their reactivity testing programs. Three of five companies visited by CSB use expert opinion to examine the need for testing. Seven of nine use a mix of in-house and contracted testing capabilities. Two respondents rely on literature surveys and expert opinion instead of chemical testing. Only two of 10 respondents to a recent SOCMA survey[54] use reactive chemical test data to identify hazards. (SOCMA membership includes many small- and medium-sized companies.)

Guidance on when to conduct testing is not consistent. When designing processes for conducting chemical reactions, CCPS (1995a; p. 13) suggests that all materials be subject to screening tests, even if no reactivity concerns are identified in the literature search and expert judgment. In other guidance, CCPS (1995b; p. 85) states that in designing storage and handling systems for reactive materials, prior experience, theoretical evaluations, and expert opinion may be used to determine the need for screening tests.

[54] SOCMA conducted a survey of reactive hazard management practices among its 300 member companies during the April 2001 Responsible Care conference. The survey consisted of a two-page questionnaire distributed at a working session on reactive chemical safety. Ten companies responded. A copy of the survey report was provided to CSB.

6.1.5 Accessibility of Chemical Reactivity Test Data

Although no dedicated data repository for reactive chemical test results is generally available to industry or the public, a substantial amount of test data have been generated by the chemical industry. One company visited by CSB had compiled a database of over 60,000 reactive chemical test results. Survey participants were asked if such data are shared with other companies.

CSB investigators determined that the surveyed companies share data of a general nature for most chemicals (i.e., data typically found on an MSDS) and good handling practices for some. This typically does not include reactive chemical test data. Several reasons were given for the absence of substantial data sharing, including:

- Potential liability concerns
- Need for expert interpretation of reactivity data
- Reluctance to share trade secrets or confidential business information.

Currently, there is no mechanism to effectively share reactive chemical test data throughout industry. The feasibility of a publicly available test database has not yet been studied by industry or government. Reactive chemical experts at one company visited by CSB expressed an interest in working with the National Institute of Standards and Technology (NIST) to develop such a database.

6.2 Hazard Evaluation

More than 40 percent of the 167 incidents from the CSB data search, where some causal information is available,[55] are attributed to inadequate hazard evaluation. In several cases, the hazard was known, but its

[55] Causal information is available in approximately 20 percent of the incidents identified by CSB.

potential magnitude was not–nor was the potential severity of the consequence. In other cases, the hazard evaluation did not properly identify initiating events.

IChemE acknowledges that "there is no standard procedure for evaluating chemical reaction hazards" (Barton and Rogers, 1997; p. 120). The CSB survey further highlights the variety of approaches to reactive hazard evaluation; companies rely to varying degrees on quantitative and qualitative evaluation methods.

6.2.1 Quantitative Methods

A prerequisite to any process hazard evaluation is adequate knowledge of the chemistry. Prior to specifying safe design and operating requirements, identified hazards must be evaluated to understand what can go wrong and the potential consequences. CCPS (1995a, p. 17; 1995b, p. 94) and IChemE (Barton and Rogers, 1997; p. 28) provide guidance on parameters for reactive hazard evaluation. Quantitative modeling techniques and calorimetry data are sometimes required along with extensive process-specific information.[56]

Both HSE (2000; p. 34) and IChemE (Barton and Rogers, 1997; p. 107) emphasize the need to identify a worst case scenario involving uncontrolled reaction to ensure that safety systems are designed and maintained to provide adequate protection under all postulated circumstances. When identifying the worst case, IChemE provides a general recommendation to evaluate any scenario not protected by high

[56] Good practice guidelines illustrate how these parameters are typically examined for both normal and postulated abnormal conditions, such as variations in reactant quantity, concentration, agitation, sequence, time, failure of utilities, and instrumentation. Qualitative hazard evaluation protocols are not well suited for such complex chemical phenomena (e.g., the severity of an uncontrolled reaction under a loss of electrical power may not be apparent without sufficient test data).

integrity shutdown systems.[57] However, there is little guidance on how to systematically identify and evaluate a worst case scenario involving uncontrolled reaction.

6.2.2 Qualitative Methods

Chemical reactivity information is gathered from data searches, calculations, and reactivity testing. Qualitative hazard evaluation is one commonly used approach to assessing process hazards, including reactive hazards (CCPS, 1992).

Several qualitative approaches can be used to identify hazardous reaction scenarios, including process hazard analysis, checklists, chemical interaction matrices, and an experience-based review. CCPS (1995a; p. 176) describes nine hazard evaluation procedures that can be used to identify hazardous reaction scenarios–checklists, Dow fire and explosion indices, preliminary hazard analysis, "what-if" analysis, failure modes and effects analysis (FMEA), HAZOP study, fault tree analysis, human error analysis, and quantitative risk analysis.

Although each of these methods can be useful in identifying reactive scenarios, none are designed specifically to address the reactive hazard. Existing good practice guidelines from CCPS (1992), HSE (2000), and IChemE (Barton and Rogers, 1997) do not adequately address how to manage the unique aspects of reactive hazards while performing hazard evaluations.

The CSB survey identified examples of modified or hybrid techniques to identify reactive hazard scenarios and ensure the implementation of adequate safeguards. For example, companies conducting reactions in batch chemical reactors often conduct HAZOP studies by evaluating deviations from

[57] Instrumentation, Systems, and Automation Society (ISA) Standard 84, Application of Safety Instrumented Systems for the Process Industries, outlines the principles of high integrity shutdown systems.

procedural steps as opposed to deviations from intended equipment design. One company uses a "what-if" PHA protocol specifically designed to address reactivity hazards.

Most survey respondents indicated that they perform reactive hazard evaluation studies during specific life-cycle phases of a process or product. These phases include process development, commercial process design, periodic re-evaluation, and before proposed modifications. The protocol for hazard evaluation of reactive systems varies from company-to-company. At a minimum, all surveyed companies employ qualitative hazard evaluations.[58]

Industry guidance from CCPS (1995a; 1995b), HSE (2000), and IChemE (Barton and Rogers, 1997) contains little information on how and when to apply reactive chemical test data during a process hazard analysis. During site visits, CSB investigators encountered PHA teams that use test data to evaluate reactive hazards. In combination with input on reactive chemistry, the test data are used to assist in evaluating appropriate safe operating limits and potential consequences of an uncontrolled reaction.

This practice supports the CSB observation that effective process hazard analysis for a reactive system is essentially more "data driven" than conventional process hazard analysis given the technical complexity of the reactive hazard. Three of the five visited companies use reactivity test data when conducting process hazard analysis; two use qualitative hazard evaluation methods only.

6.3 Management of Change

MOC is a systematic procedure for reviewing potential hazards of proposed changes to facilities. It applies to all hazardous materials regardless of reactivity; however, there are specific considerations for

[58] Qualitative hazard evaluation is commonly referred to as "process hazards analysis," or PHA, which is used in OSHA PSM.

reactive hazards. Inadequate MOC procedures are a contributing cause of several reactive incidents described in Section 3.0.

For reactive processes, MOC applies to increases or decreases in process temperature, changes in raw material specifications, concentration changes, process time changes, and changes in materials of construction (HSE, 2000; p. 41). CCPS (1995a, p. 6; 1995b, p. 197) explains that chemical testing may be required to identify and evaluate new hazards from process changes.

Overall, there is a lack of specific guidance on how to evaluate reactive hazards during the MOC procedure. Existing guidelines from CCPS (1995a; 1995b), IChemE (Barton and Rogers, 1997), and HSE (2000) do not address how to maintain and update reactive hazard evaluation as part of the change approval procedure–nor do they address what type of change to process chemistry or product formulation necessitates a review and possible update of the reactive hazard evaluation.

6.4 Personnel Training and Procedures

Personnel training and performance–as a management systems element–focuses on development of process knowledge and documentation, including clearly defined technical information and operating procedures (CCPS, 1989).

Incident data in Section 3.0 show that more than half of the reactive incidents, where some causal information is available, are attributed to inadequate operating procedures and training. These data illustrate the challenge of effectively communicating a practical, working knowledge of an often complex array of chemical and process information.

Personnel who work with reactive chemicals must understand the hazards they face and take precautions to ensure safety (HSE, 2000; p. 42). Training is required for both technical personnel (e.g., process engineers, chemists) and operators and maintenance personnel. In the Morton case, plant personnel did not have a proper understanding of reactive hazards and were unaware of the potential for a runaway reaction. The Morton case and others described in Section 3.0 show that reactive hazard management requires a working knowledge of the complex intersection of chemical properties and process-specific conditions.

Both IChemE (Barton and Rogers, 1997; p. 137) and HSE (2000; p. 42) briefly address operator training in systems that involve reactive hazards. None of the guidelines, however, address the transfer and communication of this information to technical personnel. There is little guidance on integrating reactive hazard information into operating procedures, training, and communication practices.

At one company visited by CSB, newly appointed production managers are required to demonstrate their knowledge of reactive hazards before a review committee. The basis for technical and managerial training is an established "operating discipline," an up-to-date reference of process knowledge containing technical details, operational details, and process hazard information. This approach to ensuring technical and management personnel training is unique among survey participants.

6.5 Summary

Guidance on safety management throughout the life cycle of a process is limited. CCPS (1989; 1994) provides a framework for a systems-based approach to managing chemical process safety. No organization provides comprehensive guidance on technical and management practices for reactive hazards that applies to all phases of the process life cycle, though CCPS (1995b; pp. 193-202) briefly describes how these management principles apply to reactive hazards.

Good management practices include not only hazard identification and evaluation early in R&D, but also issues such as MOC throughout the life of the chemical manufacturing process. The existing body of knowledge is largely focused on technical topics, such as calorimetry testing, engineering design, scaleup, and emergency venting. CCPS currently has a project underway that addresses technical and management practices for reactive hazards.

7.0 Industry Initiatives

Voluntary industry initiatives supplement regulatory requirements. The chemical industry has voluntarily undertaken several initiatives to provide guidance on chemical process safety, including processes involving reactive hazards. However, at present, no industry initiatives list specific codes or requirements for reactive hazard management.

7.1 Responsible Care Process Safety Code

Approximately 70 percent of incidents in CSB data occurred in the chemical manufacturing industry. Both ACC and SOCMA have programs to promote good practices among their member companies in the area of chemical process safety.[59] In 1989, ACC developed the Responsible Care Process Safety Code[60] to prevent fires, explosions, and accidental chemical releases. The code and its accompanying resource guidelines include a series of recommended management practices.

Responsible Care is intended to apply throughout the life cycle of a process–from conception and design through construction and startup, and continuing with long-term operation of the facility. The safety practices are divided into four areas, as listed in Table 6. Although many practices are similar to requirements of the OSHA PSM Standard, the Responsible Care Process Safety Code includes such additional elements as accountability, multiple safeguards, and performance measurement. The ACC and SOCMA bylaws obligate member companies to participate in Responsible Care, which includes making good faith efforts to implement the program elements. Companies are required to undergo a self-evaluation process; a third-party management systems verification (MSV) audit is optional.

[59] Currently, ACC has approximately 190 member and partner companies, representing 1,700 facilities. SOCMA–with 300 member companies, representing 2,000 facilities–has been a Responsible Care Partner Association since 1990.

[60] Approximately 30 chemical industry associations are Responsible Care Partner Associations.

Table 6

ACC Responsible Care Safety Management Practices

Management Leadership in Process Safety
1 – Commitment
2 – Accountability
3 – Performance Measurement
4 – Incident Investigation
5 – Information Sharing
6 – Community Awareness and Emergency Response (CAER) Integration

Process Safety Management of Technology
7 – Design Documentation
8 – Process Hazards Information
9 – Process Hazard Analys is
10 – Management of Change

Process Safety Management of Facilities
11 – Siting
12 – Codes and Standards
13 – Safety Reviews
14 – Maintenance and Inspection
15 – Multiple Safeguards
16 – Emergency Management

Managing Personnel for Process Safety
17 – Job Skills
18 – Safe Work Practices
19 – Initial Training
20 – Employee Proficiency
21 – Fitness for Duty
22 – Contractors

7.1.1 Guidance on Implementation

ACC has published a resource guide to aid member companies in implementing the Responsible Care Process Safety Code (ACC, 1989). Although the guide provides suggestions on how to continually improve process safety, it does not prescribe how to comply with the code. It does not list specific requirements for reactive hazard management, but does require management systems to be developed–several of which could apply to reactive hazards as determined by each member company.

Currently, ACC highlights reactive hazard management only in the following areas:

- Management Practice 7, Design Documentation, which emphasizes the need to develop and retain process description, chemistry, and "reaction data."
- Management Practice 8, Process Hazards Information, which describes the need to maintain current, accessible information on material characteristics, including "reactivity."

Management Practice 12, Codes and Standards, discusses the need to identify, use, and comply with voluntary and consensus standards where applicable.

ACC member companies are required to establish company-specific goals against which progress is measured toward the common vision of no accidents, injuries, or harm to the environment. An example of one such goal is to limit the annual number of process safety incidents below a target level.

Member companies submit to ACC annual reports on process safety incidents that meet specific criteria.[61] The ACC Process Safety Code Measurement System (PSCMS), established in 1996, contains data on

[61] The criteria include any fire or explosion causing more than $25,000 in property damage; an episodic loss of containment incident of a chemical in excess of the threshold quantities listed in 40 CFR 355.40, Appendix A; an episodic loss of containment incident involving more than 5,000 pounds of a flammable substance; or any fire, explosion, or chemical release that involves one or more fatalities or serious injuries.

type of incident (i.e., fire, explosion, toxic gas), number of injuries, etc., for 1,500 facilities–but no data on causes of incidents or lessons learned.

PSCMS is primarily designed as a metric for tracking industry performance on process safety incidents; it is not intended to be a lessons-learned database. However, if expanded to include causes and lessons learned and if more widely distributed, the data could be useful in preventing similar incidents.

7.1.2 SOCMA Guidance on Implementation

The *Guide to Process Safety* is designed to help with implementation of the Responsible Care Process Safety Code (SOCMA, 1999). The guide presents voluntary, proactive initiatives for the continuous improvement of process safety performance.

The SOCMA process safety committee informally shares information on incidents at member facilities, but it does not offer a formal incident reporting mechanism such as the ACC PSCMS.

7.2 NACD Responsible Distribution Process

Reactive incidents are not unique to the chemical manufacturing industry. Approximately 30 percent of incidents in CSB data occurred at industrial facilities that use or consume chemicals in bulk quantities.

NACD is an association of chemical distributor companies that purchase and take title of chemical products from manufacturers.[62] Member companies process, formulate, blend, repackage, warehouse, transport, and market chemical products to industrial customers. NACD has developed the Responsible Distribution Process (RDP), which is similar in concept to the ACC Responsible Care code.

[62] NACD has approximately 300 member companies and distributes to 750,000 industrial customers.

As a condition of NACD membership, each chemical distribution company is required have an active safety management program designed to continuously improve safety and reduce incidents. The RDP code has been in place since 1991 and includes risk management, compliance review and training, carrier selection, handling and storage, job procedures and training, waste management, emergency response and public preparedness, community outreach, and product stewardship.

NACD (1997) has published an RDP implementation guide to assist member companies in developing programs. A self-evaluation and a third-party onsite MSV audit are required. In the last 3 years, NACD has expelled 20 companies because of noncompliance.

RDP does not contain explicit requirements for reactive hazard management, though several elements may apply. For example, the handling and storage element requires;

> . . . procedures for loading and unloading chemicals at the member company's facilities that result in protection of personnel, a reduction in emissions to the environment, and ensures that chemicals are loaded and unloaded into and out of proper storage facilities.

This element implicitly applies to reactive hazards in terms of inadvertent mixing of incompatible materials.

The RDP handling and storage element also requires "a program for providing manufacturer guidance and information to customers, warehouses, terminals and carriers on procedures for loading, unloading, and storing chemicals." Again, this element implicitly applies to the communication of good practices for reactive hazards–from the manufacturer to the end use customer. The product stewardship element of RDP includes similar requirements.

8.0 Alternatives for Improving Regulatory Coverage

There is considerable debate over the need to extend regulatory coverage of reactive hazards. Testimony provided at the CSB public hearing on May 30, 2002, and elsewhere indicates a general consensus that there are concerns with the number and range (i.e., addressing reactive mixtures of substances as well as single substances) of reactive hazards covered under the OSHA PSM Standard and EPA RMP regulation. However, there is no consensus on how the problems should be addressed–for example, by regulatory means, by voluntary efforts such as ACC's Responsible Care program, or by a combination of approaches.

There are significant differences in the laws authorizing the OSHA PSM Standard and the EPA RMP regulation. Because EPA specifically lists substances covered under RMP and does not establish classes of substances, this report separately discusses alternatives for OSHA (Section 8.1) and EPA (Section 8.2). (Section 8.3 briefly discusses regulatory relief absent catastrophic consequences, and Section 8.4 suggests improvements within the requirements of the existing PSM Standard and RMP regulation to enhance hazard identification and hazard evaluation.)

8.1 Improved Coverage Under OSHA PSM

8.1.1 Highly Reactive Substance Classification

One approach to improve management of reactive hazards is to extend OSHA PSM coverage to a class of "highly reactive substances," similar to the way the existing standard defines a class of "flammable liquids or gases." "Highly reactive substances" would include single components as well as multicomponent substances; coverage would apply to all chemical processes (as defined by OSHA PSM). For example, a criterion based on the heat of reaction would specify coverage if the quantity exceeded a certain level (e.g., 100 cal/g). Alternatively, multiple criteria such as heat of reaction and total pressure may be a better indicator of reactivity.

With relevant criteria, the highly reactive substance classification would cover the most likely process deviations and inadvertent mixing scenarios leading to injury; however, it may not take into account all process-specific conditions, such as inadvertent mixing of unexpected chemicals or addition of an unexpected catalyzing agent.

Highly reactive substance classification could also include regulatory relief, as discussed in Section 8.3.

8.1.2 Coverage Based on Hazard Evaluations

A performance-based system–rather than a list of "reactive chemicals"–is suggested as another alternative for extending regulatory coverage of reactive hazards. Such a system would consider the risk of reactive chemicals, site-specific (extrinsic) factors such as siting and proximity, and conditions that create potentially reactive situations. Objective criteria such as the North American Industry Classification System (NAICS) codes, accident history, or number of employees could be used to establish coverage.

The process hazard analysis required by OSHA PSM is an example of a performance-based approach; it allows for a variety of hazard analysis methodologies. A performance-based system requires experts to identify and evaluate all relevant reactive hazards of a process and to determine the complexity of the hazards analysis. If the hazard evaluation demonstrates the possibility of a catastrophic consequence, the process has regulatory coverage. This approach to hazard evaluation allows for both a comprehensive analysis and flexibility in implementation; however, if applied to reactive hazards, it requires expertise for implementation and regulatory evaluation.

8.1.3 "Safety Case"

A safety case approach along the lines of the Seveso[63] requirements is another possible alternative for determining regulatory coverage. The safety case requires a detailed explanation of why a process is safe to operate. Again, objective criteria such as NAICS codes, thermodynamic properties, or some combination of those criteria previously discussed are used to establish coverage.

The concept of a safety case comes from the requirements of the European Union/European Community (EU/EC) Seveso Directive (82/501/EC) and, in particular, regulations that the United Kingdom and other member states used to implement that directive. United Kingdom regulations (Control of Industrial Major Accident Hazards [CIMAH], 1984; replaced by Control of Major Accident Hazards Involving Dangerous Substances [COMAH] in 1999) require that major hazardous facilities produce a safety report or safety case.[64] The requirement for a safety case is initiated by a list of chemicals and a class of flammables. Like the hazard analysis approach (Section 8.1.2), experts identify the reactive hazards of the process; if analysis shows that the proposed process is safe, it may be excluded from additional regulatory requirements.

The objective of a safety case is to demonstrate to the regulatory authority that a company is fully aware of the hazards associated with its operations and that they are conducted in a safe manner, such that employees and the public are not exposed to undue risks. The regulatory authority must examine the safety case and communicate the results of its examination to the facility, usually within a "reasonable period of time."

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[63] On July 9, 1976, in Meda, Italy, near Seveso, a chemical reactor incident caused a release of dioxin (TCDD), which is a highly toxic chemical. The regulatory requirements developed as a result of this incident are referred to as the Seveso Directive.

[64] The concept of a safety case exists within the context of a licensing regime. Licensing mechanisms exist in the United States, but compliance with workplace safety requirements is not a prerequisite for license.

The safety case may be prescriptive or performance based. Although this approach is comprehensive, if applied to reactive hazards, it requires that regulatory agencies have expertise to assess the adequacy of the analysis.

8.2 Improved Coverage Under EPA RMP

Significant differences in the laws authorizing the OSHA PSM Standard and the EPA RMP regulation may affect the means by which EPA can revise coverage of processes containing reactive hazards. EPA maintains that it is required to specifically list substances covered under RMP and cannot establish classes of substances. For this reason, EPA individually lists flammables, rather than adopting the "class" approach to flammables used by OSHA.

Two states have successfully implemented or are considering a list-based approach to address coverage of reactive hazards that affect the public. Delaware uses the same overpressurization criterion as OSHA for determining the quantity of a listed substance that is covered. New Jersey is expected to include the criterion in its revision of the Toxic Catastrophe Prevention Act (TCPA).

To most effectively improve reactive hazard management, coverage under the OSHA PSM Standard and the EPA RMP regulation should be more compatible. EPA should seek the authority needed to allow it to address reactive hazard coverage in a manner compatible with any revised OSHA approach.

8.3 Regulatory Relief Absent Catastrophic Consequences

Physical processing conditions and even small amounts of extraneous materials (contaminants) that may have catalytic properties affect both the rate at which energy is released from an "intended reaction" and the potential damage. For this reason, many processes–which could be otherwise covered–may not present a catastrophic risk to workers under reasonable worst case scenarios. Moreover, even if the reaction "runs away," there may be no catastrophic injury to workers because the process is designed to handle reasonable worst case scenarios or offers effective passive mitigation measures, such as containment, diking, blast walls, and adequate emergency relief systems.

Regulations could encourage inherently safer design and mitigation by granting exemptions where such measures are proven to prevent catastrophic incidents.

8.4 Improvements in OSHA PSM and EPA RMP Requirements

8.4.1 Improved Process Safety Information

The PSI element of both the OSHA PSM Standard and the EPA RMP regulation can be improved by requiring the inclusion of all existing information on chemical reactivity. Examples of such information are chemical reactivity test data, such as DSC, thermogravimetric analysis (TGA), or accelerating rate calorimetry; and relevant incident reports from the plant, the corporation, industry, and government. OSHA and EPA should require the facility to consult such resources as *Bretherick's Handbook of Reactive Chemical Hazards*, *Sax's Dangerous Properties of Industrial Materials*, and computerized tools (e.g., CHETAH, The Chemical Reactivity Work Sheet).

8.4.2 Improved Process Hazard Analysis

In both the OSHA PSM Standard and the EPA RMP regulation, the PHA element does not currently specify the factors that must be considered to effectively manage reactive hazards. Present requirements should be augmented to explicitly require an evaluation of such factors as rate and quantity of heat generated; maximum operating temperature to avoid decomposition; thermostability of reactants, reaction mixtures, byproduct waste streams, and products; effect of charging rates, catalyst addition, and possible contaminants; and understanding the consequences of runaway reactions or toxic gas evolution.

8.4.3 Improved Reporting Requirements

OSHA PSM-covered facilities are required to investigate "each incident which resulted in, or could reasonably have resulted in a catastrophic release of a highly hazardous chemical in the workplace" (29 CFR 1910.119 [m] [1]). At the conclusion of an incident investigation, the company is required to prepare a report on the factors that contributed to the incident. At present, OSHA does not require submittal of these incident reports. However, mandatory submission of the reports would increase available data and thus improve the capability of identifying or tracking reactive incidents.

8.5 Regulatory Initiatives Under Review by New Jersey

The New Jersey Department of Environmental Protection and Energy is presently considering amendment of its TCPA to establish coverage of reactive hazards that might affect the public. The State has asked for stakeholder input on the following proposition (paraphrased):

> Processes having a reactive hazard with a heat of reaction of 100 calories per gram will be regulated under the NJ TCPA when the quantity of reactive hazard contained in the process equals or exceeds the threshold quantity calculated to result in a 2.3 psi overpressure wave endpoint at a distance of 100 meters or a lesser distance to the source boundary.

New Jersey is also considering whether it should have varying compliance requirements for covered processes. Less stringent requirements are proposed for covered processes where the reactive hazard substance is only stored in shipping containers and handled, with no emptying or filling. The State is proposing that a covered process could escape regulation under TCPA if the facility provides evidence that the reactive hazard substance is not capable of producing an explosion or deflagration overpressure.

9.0 Conclusions

1. Reactive incidents are a significant chemical safety problem.

2 The OSHA PSM Standard has significant gaps in coverage of reactive hazards because it is based on a limited list of individual chemicals with inherently reactive properties.

3. NFPA instability ratings are insufficient as the sole basis for determining coverage of reactive hazards in the OSHA PSM Standard.

4. The EPA Accidental Release Prevention Regulations (40 CFR 68) have significant gaps in coverage of reactive hazards.

5. Using lists of chemicals is an inadequate approach for regulatory coverage of reactive hazards. Improving reactive hazard management requires that both regulators and industry address the hazards from combinations of chemicals and process-specific conditions rather than focus exclusively on the inherent properties of individual chemicals.

6. Reactive incidents are not unique to the chemical manufacturing industry. They also occur in many other industries where chemicals are stored, handled, or used.

7. Existing sources of incident data are not adequate to identify the number, severity, and causes of reactive incidents or to analyze incident frequency trends.

8. There is no publicly available database for sharing lessons learned from reactive incidents.

9. Neither the OSHA PSM Standard nor the EPA RMP regulation explicitly requires specific hazards, such as reactive hazards, to be examined when performing a process hazard analysis. Given that reactive incidents are often caused by inadequate recognition and evaluation of

reactive hazards, improving reactive hazard management involves defining and requiring relevant factors (e.g., rate and quantity of heat and gas generated) to be examined within a process hazard analysis.

10. The OSHA PSM Standard and the EPA RMP regulation do not require the use of multiple sources when compiling process safety information.

11. Publicly available resources[65] are not always used by industry to assist in identifying reactive hazards.

12. There is no publicly available database to share reactive chemical test information.

13. Current good practice guidelines on how to effectively manage reactive hazards throughout the life cycle[66] of a chemical manufacturing process are neither complete nor sufficiently explicit.

14. Given the impact and diversity of reactive hazards, optimum progress in the prevention of reactive incidents requires both enhanced regulatory and nonregulatory programs.

[65] NOAA's The Chemical Reactivity Worksheet, ASTM's CHETAH, and Bretherick's Database of Reactive Chemical Hazards.
[66] " Life cycle" refers to all phases of a chemical manufacturing process–from conceptualization, process R&D, engineering design, construction, commissioning, commercial operation, and major modification to decommissioning.

10.0 Recommendations

Occupational Safety and Health Administration (OSHA)

1. Amend the Process Safety Management Standard (PSM), 29 CFR 1910.119, to achieve more comprehensive control of reactive hazards that could have catastrophic consequences. (2001-01-H-R1)

   - Broaden the application to cover reactive hazards resulting from process-specific conditions and combinations of chemicals. Additionally, broaden coverage of hazards from self-reactive chemicals. In expanding PSM coverage, use objective criteria. Consider criteria such as the North American Industry Classification System (NAICS), a reactive hazard classification system (e.g., based on heat of reaction or toxic gas evolution), incident history, or catastrophic potential.

   - In the compilation of process safety information, require that multiple sources of information be sufficiently consulted to understand and control potential reactive hazards. Useful sources include:

     - Literature surveys (e.g., *Bretherick's Handbook of Reactive Chemical Hazards, Sax's Dangerous Properties of Industrial Materials*).

     - Information developed from computerized tools (e.g., ASTM's CHETAH, NOAA's The Chemical Reactivity Worksheet).

- Chemical reactivity test data produced by employers or obtained from other sources (e.g., differential scanning calorimetry, thermogravimetric analysis, accelerating rate calorimetry).

- Relevant incident reports from the plant, the corporation, industry, and government.

- Chemical Abstracts Service.

- Augment the process hazard analysis (PHA) element to explicitly require an evaluation of reactive hazards. In revising this element, evaluate the need to consider relevant factors, such as:

  - Rate and quantity of heat or gas generated.

  - Maximum operating temperature to avoid decomposition.

  - Thermal stability of reactants, reaction mixtures, byproducts, waste streams, and products.

  - Effect of variables such as charging rates, catalyst addition, and possible contaminants.

  - Understanding the consequences of runaway reactions or toxic gas evolution.

2. Implement a program to define and record information on reactive incidents that OSHA investigates or requires to be investigated under OSHA regulations. Structure the collected information so that it can be used to measure progress in the prevention of reactive incidents that give rise to catastrophic releases. (2001-01-H-R2)

U.S. Environmental Protection Agency (EPA)

1. Revise the Accidental Release Prevention Requirements, 40 CFR 68, to explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public, including those resulting from self-reactive chemicals and combinations of chemicals and process-specific conditions. Take into account the recommendations of this report to OSHA on reactive hazard coverage. Seek congressional authority if necessary to amend the regulation. (2001-01-H-R3)

2. Modify the accident reporting requirements in RMP* Info to define and record reactive incidents. Consider adding the term "reactive incident" to the four existing "release events" in EPA's current 5-year accident reporting requirements (Gas Release, Liquid Spill/Evaporation, Fire, and Explosion). Structure this information collection to allow EPA and its stakeholders to identify and focus resources on industry sectors that experienced the incidents; chemicals and processes involved; and impact on the public, the workforce, and the environment. (2001-01-H-R4)

National Institute of Standards and Technology (NIST)

Develop and implement a publicly available database for reactive hazard test information. Structure the system to encourage submission of data by individual companies and academic and government institutions that perform chemical testing. (2001-01-H-R5)

Center for Chemical Process Safety (CCPS)

1. Publish comprehensive guidance on model reactive hazard management systems. (2001-01-H-R6) At a minimum, ensure that these guidelines cover:

- For companies engaged in chemical manufacturing: reactive hazard management, including hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

- For companies engaged primarily in the bulk storage, handling, and use of chemicals: identification and prevention of reactive hazards, including the inadvertent mixing of incompatible substances.

2. Communicate the findings and recommendations of this report to your membership. (2001-01-H-R7)

American Chemistry Council (ACC)

1. Expand the Responsible Care Process Safety Code to emphasize the need for managing reactive hazards. (2001-01-H-R8) Ensure that:

   - Member companies are required to have programs to manage reactive hazards that address, at a minimum, hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

   - There is a program to communicate to your membership the availability of existing tools, guidance, and initiatives to aid in identifying and evaluating reactive hazards.

2. Develop and implement a program for reporting reactive incidents that includes the sharing of relevant safety knowledge and lessons learned with your membership, the public, and government to improve safety system performance and prevent future incidents. (2001-01-H-R9)

3. Work with NIST in developing and implementing a publicly available database for reactive hazard test information. Promote submissions of data by your membership. (2001-01-H-R10)

4. Communicate the findings and recommendations of this report to your membership. (2001-01-H-R11)

Synthetic Organic Chemical Manufacturers Association (SOCMA)

1. Expand the Responsible Care Process Safety Code to emphasize the need for managing reactive hazards. (2001-01-H-R12) Ensure that:

   - Member companies are required to have programs to manage reactive hazards that address, at a minimum, hazard identification, hazard evaluation, management of change, inherently safer design, and adequate procedures and training.

   - There is a program to communicate to your membership the availability of existing tools, guidance, and initiatives to aid in identifying and evaluating reactive hazards.

2. Develop and implement a program for reporting reactive incidents that includes the sharing of relevant safety knowledge and lessons learned with your membership, the public, and government to improve safety system performance and prevent future incidents. (2001-01-H-R13)

3. Work with NIST in developing and implementing a publicly available database for reactive hazard test information. Promote submissions of data by your membership. (2001-01-H-R14)

4. Communicate the findings and recommendations of this report to your membership. (2001-01-H-R15)

National Association of Chemical Distributors (NACD)

1. Expand the existing Responsible Distribution Process to include reactive hazard management as an area of emphasis. At a minimum, ensure that the revisions address storage and handling, including the hazards of inadvertent mixing of incompatible chemicals. (2001-01-H-R16)

2. Communicate the findings and recommendations of this report to your membership. (2001-01-H-R17)

International Association of Firefighters

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R18)

Paper, Allied-Industrial, Chemical & Energy Workers International Union (PACE)

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R19)

The United Steelworkers of America

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R20)

Union of Needletrades, Industrial, and Textile Employees (UNITE)

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R21)

United Food and Commercial Workers International Union

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R22)

American Society of Safety Engineers (ASSE)

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R23)

American Industrial Hygiene Association (AIHA)

Communicate the findings and recommendations of this report to your membership. (2001-01-H-R24)

By the

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APPENDIX A: Glossary

Adiabatic calorimetry: Chemical testing technique that determines the self-heating rate and pressure data of a chemical under near-adiabatic conditions. ("Adiabatic" refers to any change in which there is no gain or loss of heat.) This measurement technique conservatively estimates the conditions for, and consequences of, a runaway reaction.

Acid-base reaction: Chemical reaction involving the transfer of a hydrogen ion from an acidic substance to a basic substance.

Blast: Potentially damaging pressure or shock wave produced by an explosion.

Catalyst: Substance that usually increases the rate of a chemical reaction without changing its own composition.

***Chemical incompatibility*:** Type of reactive hazard that occurs when a chemical is mixed or comes in contact with other chemicals, or process materials, resulting in an uncontrolled and often violent reaction.

Chemical reaction: Interaction of substances in which they undergo change of composition and properties due to changes in molecular structure of the constituent atoms or molecular fragments.

Chlorination: Reaction of substances with chlorine whereby chlorine atoms are chemically integrated into the original chemical molecule.

Contaminant: Any substance that enters a process where it is not normally found.

Decomposition: Chemical reaction that leads to the breakdown or decomposition of a chemical into smaller molecules or elements, often with the liberation of energy and product gases.

Differential scanning calorimetry (DSC): Chemical testing technique that is used to establish approximate temperature ranges in which a substance undergoes an exothermic decomposition and to determine the energy output of those reactions; may also be used to study endothermic processes, such as melting. DCS data provide very simple and approximate reaction kinetics.

Differential thermal analysis (DTA): Chemical testing technique that produces similar data to DSC. DTA uses temperature differences to generate test results; DSC has largely replaced the DTA technique as a screening tool for obtaining chemical hazard test data.

Endothermic reaction: Chemical reaction that absorbs heat.

Explosion: Sudden release of energy that causes a blast or shock wave; may lead to personal injury or structural damage.

Exothermic reaction: Chemical reaction that liberates heat.

Halogenation: Chemical reaction of substances with a halogen–typically, fluorine, chlorine, and bromine. See "chlorination."

Hazard: Chemical or physical condition that has the potential to cause harm to human life, property, or the environment.

Hazard evaluation: Systematic process to investigate hazards, assess potential consequences, and establish a design and operating basis for safety.

Hazard and operability analysis (HAZOP): A qualitative hazard analysis technique to identify and evaluate process hazards and potential operating problems; focuses on a detailed and systematic examination of process deviations and their consequences.

Human factors: Discipline concerned with designing machines, operations, and work environment to match human capacities and limitations.

Hydrolysis: Chemical reaction of a substance with water; may lead to undesired runaway reactions and generation of gaseous molecules, such as hydrogen, hydrogen chloride, and alkanes.

Impact or thermally sensitive material: Material that decomposes rapidly when subjected to heat or impact, resulting in a potentially explosive release of energy.

Layers of protection: Multiple, redundant, or diverse safeguards to prevent an incident from occurring regardless of the initiating event or the performance of any single safeguard.

Management system: Structured, systematic method to implement an identified set of activities with assigned responsibilities and accountability.

Mixing calorimetry: Technique used to measure heat evolved upon instantaneous mixing of two or more chemicals; usually designed to be rapid (15 to 45 minutes), operating over the range of -50 to 200 degrees Celsius (°C).

Monomers: Chemicals that are the simple starting units from which polymers are made; they are reactive and sometimes unstable under ambient conditions.

Nitration: Chemical reaction of a substance in which the nitro group ($-NO_2$) is introduced into the molecule; often accomplished under highly reactive conditions using mixtures of nitric and sulfuric acids at high temperatures. Byproducts of the reaction may have explosive properties; if reaction control is lost, may lead to vigorous and strongly exothermic runaway reactions due to oxidation of the reactants.

Oxidation: Chemical reaction in which the oxidation state of a molecule increases due to the abstraction of electrons; often occurs when oxygen or other oxidizing material combines with the reacting substance.

Oxidation-reduction (REDOX): Chemical reaction in which an element loses (oxidation) or gains (reduction) an electron.

Oxidizer: Material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion.

Polymer: Large chemical molecule made up of repeating smaller units (e.g., polyethylene is a synthetic polymer made up of repeating ethylene units).

Polymerization: Chemical reaction in which one or more relatively simple molecules (monomers) combine to form a more complex compound (polymer).

Process hazard analysis: Organized effort to identify and evaluate hazards associated with chemical processes; normally involves the use of qualitative techniques to identify and assess the significance of hazards.

Process-specific factors: Conditions such as temperature, pressure, quantities handled, chemical concentrations, catalytic effects, and addition rates.

Process life cycle: All phases of a process from its conception through chemical and process research and development (R&D), engineering design, construction, commissioning, commercial operation, major modification, and decommissioning.

Public: Any person other than employees or contractors at or near a facility.

Public impact: Known injury to the public, offsite evacuation, or shelter-in-place.

Reactive incident: Sudden event involving an uncontrolled chemical reaction–with significant increases in temperature, pressure, or gas evolution–that has caused, or has the potential to cause, serious harm to people, property, or the environment.

Reactive chemical process safety: Systematic identification, evaluation, and control of reactive hazards at all phases of the production life cycle–from R&D to pilot plant, change management, and decommissioning; and for all types of operations–from storage or manufacturing to packaging or waste processing.

Reactive hazard: Reactive properties and physical conditions of a single chemical or mixture that have the potential to generate heat, energy, and gaseous byproducts that have the potential to do harm.

Reactivity: Tendency of substances to undergo chemical change.

Reaction calorimetry: Chemical testing technique that determines thermodynamic and kinetic information on a desired reaction under conditions closely similar to those of a larger-scale plant; measures heat flow (production of desired process) and product generation (without knowledge of heat of reaction), and facilitates isothermal and temperature-ramped experiments.

Root cause: Primary reason why an incident occurred, developed through systematic analyses.

Runaway reaction: Reaction that is out of control because the heat generation rate exceeds the rate at which heat is removed to cooling media and surroundings.

Self-reactivity: Chemical reaction that involves only one chemical substance.

Thermal gravitational analysis (TGA): Chemical testing technique that precisely measures weight loss (due to gas forming reactions) as a function of temperature and time.

Toll manufacturer: Facility that blends, mixes, processes, or packages chemicals.

Worst case scenario: The most severe postulated scenario involving an uncontrolled reaction.

Water reactive: Substance that reacts with water, often producing a vigorous exothermic reaction.

APPENDIX B: Surveys

B.1 Industry Survey

The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted a survey of companies that store, handle, and process chemicals. The objective of the survey was to examine current management practices with regard to reactive hazard management. Survey responses served primarily to highlight good practices, but also to point out areas for potential improvement. The survey questionnaire is posted on the CSB website at http://www.chemsafety.gov/info/Reactives.Survey.Final.pdf.

The survey was designed, administered, and analyzed by CSB staff with the support of EQE International, a consulting company with expertise in chemical process safety. Questions focused on the application of systematic programs, procedures, and practices for reactive chemicals management at the site level. Respondents were asked to provide details about good management practices in all phases of the manufacturing life cycle, including research and development (R&D), engineering, capital projects, commissioning, plant operations, and management of change (MOC). Where possible, respondents were asked to provide information about actual, routine practices.

The nine surveyed companies volunteered to participate. Industry trade associations (American Chemistry Council [ACC], National Association of Chemical Distributors [NACD], Synthetic Organic Chemical Manufacturers Association [SOCMA]) and professional societies (Center for Chemical Process Safety [CCPS]) were asked to identify possible survey candidates–small, medium, and large sites or companies with reactive chemical hazard management programs or practices in place. As such, the survey was not intended to represent the practices of the chemical industry as a whole; in fact, the survey respondents more likely represent the "upper tier" of companies/facilities handling reactive chemicals and managing the related hazards.

To supplement the industry survey, CSB staff conducted five selected site visits at industry facilities that have implemented programs for managing reactive hazards. The first-hand information gathered in these visits provided an understanding of the challenges involved in developing a systematic management program for reactive hazards.

All nine survey participants were primarily engaged in chemical manufacturing, representing synthetic organic chemicals, pharmaceuticals, specialty chemicals, fine organics, polymers, agrochemicals, and contract manufacturing. Most considered their site to use many reactive chemicals and highly reactive chemicals. Interpretation of the term "highly reactive" was left to the participant. Seven of the nine survey respondents were member companies of ACC; four of nine were member companies of SOCMA; and five of nine were CCPS sponsors.

Considering the limitations of the industry survey–including the small number of respondents–it is important to correspondingly recognize that the conclusions are also limited. Although representative small, medium, and large companies and sites were surveyed, the conclusions of this investigation do not support a differentiation among the practices of small versus large companies.

B.2 SOCMA Survey

SOCMA conducted a survey of members during its April 2001 Responsible Care Conference on Managing Reactive Chemicals. However, eight of the 10 respondents represented facilities with less than 100 employees.

APPENDIX C: Site Visits

C.1 Company Profiles

Company A is a major pharmaceutical manufacturer with worldwide operations. The U.S. Chemical Safety and Hazard Investigation Board (CSB) staff visited a site with both pilot-plant facilities and pharmaceutical manufacturing operations. The company is continually developing new and innovative chemistry, which results in frequent changes in the chemicals handled and manufacturing techniques used.

Company B is a diversified chemical manufacturing company with worldwide operations. CSB staff visited the corporate headquarters, which also houses extensive chemical manufacturing operations. The site also has an extensive thermal hazards testing capability. CSB met with corporate staff, site manufacturing personnel, and thermal hazards chemists. The Company B testing laboratory evaluates a range of chemicals.

Company C is a small custom chemical manufacturer. Contract manufacturing accounts for its entire business. CSB staff visited a small manufacturing site with several batch chemical manufacturing operations. The nature of custom chemical manufacturing translates into very frequent changes in chemicals handled and processed.

Company D is a large pharmaceutical manufacturer with worldwide operations. CSB staff visited a pilot-plant facility and thermal hazards laboratory. Pilot-plant operations included the use of several batch chemical reactors. Like Company A, this company also frequently changes chemicals handled and manufacturing techniques.

Company E is a large chemical manufacturer with worldwide operations. CSB staff visited a medium-sized manufacturing site. Operations included storage and handling/processing of monomers, as well as extensive batch polymerization. The site uses standardized manufacturing methods and typically handles a specific set of chemicals.

C.2 Analysis of Practices for Reactive Chemical Hazard Management

C.2.1 Company A (Major Pharmaceutical Manfacturer)

C.2.1.1 Program Philosophy

- Reactive chemical hazard management is one element of an overall process safety program, but is emphasized through thermal hazards analysis.
- Capabilities and practices are driven by the business need for rapid scaleup and high product quality.
- The corporate environmental health and safety (EHS) group provides technical resources (including expertise in reactive chemicals).
- The corporate research and development (R&D) facility has sophisticated thermal hazards capability/expertise.

C.2.1.2 Hazard Identification and Testing Program

- The company employs a phased approach to identify hazards, as outlined below:

Company A, Hazard Identification

Stage	Activity
Research	Literature search
Pilot plant (process development)	Screening test prior to pilot plant
Production	Additional tests as indicated by process hazard analysis (PHA)

- Scaleup to pilot plant is the key step in identifying and controlling reactivity hazards.
- A checklist approach is used to gather process safety information (PSI) prior to scaleup to pilot plant.
  - *Basic process/chemical data*–material safety data sheet (MSDS), special handling requirements, pressure, temperature, gaseous byproducts, and waste streams; includes a list of potentially hazardous chemical interactions.
  - *Reaction safety*–thermal test data, hazardous bond groups, and exothermic reactions.
  - *Powder handling/milling*–dust explosion issues.
- The company is beginning to use chemical interaction matrices as an input to PHA review.
- The company has a well-equipped laboratory for thermal hazards screening and sophisticated reaction calorimetry.

- Small quantities and the high cost of making the product limit the amount of material available for R&D testing.

- Differential scanning calorimetry (DSC) and dust explosion tests are usually conducted before a new chemical goes into the pilot-plant phase.

- Thermal hazards data are accessible through the company intranet.

C.2.1.3 Hazard Evaluation

- The company conducts process hazards evaluation of all new or modified products/processes.

- PHA techniques involve a combination of "what if" for unit operations and hazard and operability (HAZOP) for both equipment- and procedural-based deviations.

- Thermal hazards testing staff play a key role on the PHA team.

- The thermal hazards laboratory, in consultation with pilot-plant engineering, typically assess emergency venting scenarios and requirements for runaway reaction hazards.

- Over 1,300 equipment configuration changes per year account for extensive use of management of change (MOC).

C.2.1.4 Risk Reduction/Controls

- PHA forms the basis for identifying needed controls.

- Small-scale batch equipment is typically "over designed" for multipurpose use.

- The company has in place numerous checks and balances to prevent human error; quality assurance (QA)-driven processes require validation (secondary checks/rechecks) of operator actions, sampling/analysis, etc.

C.2.1.5 Communications and Training

- The pharmaceutical industry has no official EHS trade group that develops codes of practice equivalent to Responsible Care.

- The company recognizes the need for better and more formal sharing of lessons learned and for support of an improved industry incident database.

C.2.2 Company B (Diversified Chemical Manufacturer)

C.2.2.1 Program Philosophy

- The reactives program focuses on preventing uncontrolled chemical reactions that have the potential to cause loss or injury or environmental harm.

- Reactive hazards are addressed separately and uniquely from other process safety factors.

- The reactives program involves the interaction of several diverse technical experts to study the chemistry and process, looking for risk reduction opportunities; in-house expertise is available to handle reactive chemical issues.

- The company perceives its reactives program as adding value rather than being regulatory driven.

- Value is defined as having a competitive advantage; reducing damage to the facility, property, and equipment; reducing injuries; and being accepted as a good member of the community.

- The company advocates an outside-in approach, using reviewers from outside the technology or business to help identify hazards that may have been overlooked.

- Program philosophy focuses on identifying potential accident scenarios.

- The reactives program emphasizes both self-reactivity (instability) and binary reactivity.

- The company strongly supports owner responsibility on the part of the production leader–knowing reactive chemicals and their process hazards, participating in the establishment and maintenance of corporate memory, and demonstrating a fundamental understanding of reactive chemical hazards within the facility within 90 days of any new assignment.

- Corporate guidelines require that individuals develop an understanding of reactive hazards based on data collection, hazard evaluation, training, etc.

- Corporate standards, approved by the EHS board, are established for audit/review; performance-based training; MOC, which is approved by the area production leader; and training, which addresses worst case scenarios, cardinal rules, and lines of defense.

- There are corporate guidelines for application of the reactive chemicals program, formation of a reactive chemicals team, project reviews, and chemicals testing.

- Key deliverables are capital project reviews; new production leader reviews; existing facility hazard reviews on a 3- to 5-year cycle; research facility reviews; and a formal training and awareness program.
- The company offers as key resources a global standard, how-to guidelines, testing laboratories/expertise, and computerized tools for review.
- The company offers multidisciplinary support through research, manufacturing, 27 technology centers, and EHS.
- Technology centers provide critical functions in establishing corporate memory, documenting findings and implementing preventive measures, submitting data to CCPS, sharing operating knowledge across the company, and establishing effective process technologies.

C.2.2.2 Hazard Identification and Testing Program

- Key elements of reactive hazard identification are owner-initiated review, chemistry review, review of unit operations, review of scenarios, definition of required testing, records testing, and interpretation of results for owner.
- Testing centers are geographically distributed and include contractor support.
- Testing includes screening (e.g., literature research, mixing calorimetry, thermodynamic calculations, estimation of heats of reaction, DSC, flash point calculations), quantitative assessment (e.g., accelerated rate calorimetry, specialized calorimetry), and scaleup (vent size packaging [VSP], modeling, reaction calorimetry).

- The program focuses on binary and higher levels of reactivity in addition to self-reactivity (instability).
- An incompatibility-mixing chart facilitates the prediction of reactive mixing hazards.
- The reactive testing laboratories cover fire, dust, kinetics, high energy, and thermodynamics.

C.2.2.3 Hazard Evaluation

- The company hazard review process was revised in June 1997 to combine reactive chemicals, loss prevention, distribution risk review, EHS review for safety and loss, project risk review, and technology center review.
- Each major company site has a hazard review committee to administer the standard and guideline. The committee includes representatives from process safety, chemistry, reactive chemistry, manufacturing, process engineering, pilot-plant operations, and the technology center.
- The outside-in approach brings people without specific knowledge of a process into reviews.
- Flowcharts are used for process overview; analysis of causes and consequences, lines of defense, and testing data requirements; and review of hazard checklist, schedule, and followup on recommendations.
- Review of work progress includes scenarios for inadvertent mixing, reaction loss-of-control, and instability of materials.

C.2.2.4 Risk Reduction/Controls

- The need for additional controls is identified through design standards, reactive chemicals process hazard analysis, and technology centers.

C.2.2.5 Communications and Training

- The communications/training challenge is to retain learning from incidents in corporate memory to prevent recurrence.
- The key premises of corporate memory are to never have to pay for an incident more than once, to learn from history and leverage across all plants and technologies, and to derive benefit from the experience of other companies.
- Eighty percent of incidents are due to known chemistry hazards; it has been 6 years since the company's last "unknown" chemistry incident.
- Technical centers provide small sites access to data and technical expertise for reactive chemicals.
- The company maintains global databases for 60,000+ tests, prior incident data for 22 years, and databases of all credible reactive chemical scenarios with key lines of defense for all technologies.
- Small sites generally have little/no capability in R&D, process engineering, reactive chemical testing, and chemistry.
- A global reactive chemical newsletter is published regularly and read by over 4,000 employees worldwide.

C.2.3 Company C (Custom Chemical Manufacturer)

C.2.3.1 Program Philosophy

- Management considers reactive hazard management as a subset of process safety management.
- The company has specific procedures for reactive chemicals hazard management.
- Management takes a proactive approach in terms of Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) requirements. The company applies the PSM Standard and the Risk Management Program (RMP) regulation to processes that normally do not require coverage (under threshold quantities) because it makes good business sense.
- Management focuses on safety-oriented programs to prevent business interruptions.
- Reactive hazards play a significant role in deciding whether to manufacture new chemicals onsite.
- Although the company has very limited safety resources onsite, management perceives safety as added value and hires individuals from organizations with a good safety culture. The management commitment to safety is clearly evident in each aspect of the safety program.
- When a customer requests production of a chemical, the steering committee reviews the inquiry and determines the initial feasibility of production; within 1 to 2 weeks, the committee renders a go-no go decision to the customer. Process safety plays a significant role in the decision process.

C.2.3.2 Hazard Identification and Testing Programs

- The customer requesting production of a chemical provides reactive hazard information (literature reviews, thermal test data, etc.).

- If the information is insufficient to assess reactive hazards, additional data are requested, such as thermal screening test data.

- When considering development of a new process for a customer, a team is formed to assess potential hazards (including reactive) and to determine the technically feasibility of production.

- Potential hazards (flammability, corrosivity, etc.) are reviewed to identify concerns regarding the storage and handling of reactive chemicals, and information is obtained from raw material suppliers (e.g., technical bulletins). Flashpoint, DSC, or differential thermal analysis (DTA) testing is typically done by the customer.

- If potential reactive hazards are identified within a proposed process, the customer is asked to provide additional test data. The company only occasionally contracts testing services.

C.2.3.3 Hazard Evaluation

- Expert opinion is essential in the hazard evaluation process.

- A hazard evaluation is performed before assessing the technical feasibility of a new process. Chemical handling/storage criteria, critical process conditions, quality measurements, thermal hazards, and post-campaign cleanup are considered in the introduction of any new process/product.

- Once a new process is identified as feasible, it goes through a process hazard analysis (usually HAZOP) to evaluate issues such as reactive chemistry.

- Hazard evaluations are conducted in a team environment that typically includes a process engineer, EHS staff, a chemist, maintenance, a production operator, and the customer.

- Design reviews are conducted to refine requirements. Hazards are introduced to plant operators following laboratory work, EHS review, capital requirements review, and process hazard analysis. Reactivity is addressed during process hazard analysis and the initial review.

- A HAZOP is performed on all new chemicals following process review, preliminary equipment review, and development of preliminary standard operating procedures (SOP). "What-if" and checklists are typically used to review a process without process design and chemistry changes.

- Process chemistry changes are evaluated for quality and EHS impacts.

- MOC and SOPs are vehicles for approving and communicating change.

C.2.3.4 Risk Reduction/Controls

- Process hazard analysis leads to risk reduction/control recommendations.

- Risk reduction/control is primarily accomplished through design measures, SOPs, and training.

C.2.3.5 Communication and Training

- Once a new chemical is introduced into the plant, employees receive on-the-job training on the new production process, which covers safe operating limits, process controls, emergency situations, etc.

- Operators have levels of expertise. The most experienced operators (level 3) generally perform the majority of the process-related functions. Entry-level operators are not assigned this work, and level 2 operators perform these functions with supervision.

C.2.4 Company D (Large Pharmaceutical Manufacturer)

C.2.4.1 Program Philosophy

- Reactive chemical hazard management is one element of an overall process safety program and is emphasized through thermal hazards evaluation.

- The program is driven by previous incidents, concern for the community, and business factors.

C.2.4.2 Hazard Identification and Testing

- Hazard identification is built into the design process.

- Testing is conducted regardless of supplier information.

- The program includes a preliminary screening test, team-based screening, reactive evaluation, and process hazard analysis.

- The reactive hazard evaluation protocol is nonprescriptive; the type and quantity of testing is based on judgment.

- National Fire Protection Association (NFPA) ratings are used for original screening; no chemicals with NFPA ratings of 3 or 4 are used at the site.
- The company has a full range of reactive chemical test equipment onsite.

C.2.4.3 Hazard Evaluation

- A complete evaluation is conducted during process development, including testing and system evaluation of process aberrations.
- A multidisciplinary team approach is used during all phases of evaluation.
- A binary interaction matrix is developed for all materials in the process, including air and rust.
- The PHA method is case dependent, focused on procedure, and required for every pilot-plant run.
- Process hazard analysis considers equipment failure, human factors–including errors of omission and commission, and previous incidents.

C.2.4.4 Risk Reduction and Controls

- Risk is identified at various stages in the process.
- Special setups are used to control risk.
- The process hazard analysis identifies operator training needs.

- Risk assessment is qualitative.

C.2.4.5 Communications and Training

- Incident data are kept in a local database and shared both site- and company-wide.
- There is no formal pharmaceutical industry trade group that dicusses safety issues.

C.2.5 Company E (Large Chemical Manufacturer)

C.2.5.1 Program Philosophy

- Reactive chemicals hazard management is part of the overall process safety program, which is applied regardless of regulatory coverage.
- Codes of practice developed at the corporate level promote standardization throughout the company.

C.2.5.2 Hazard Identification and Testing

- Reactive chemical testing is done at the corporate level.
- The company maintains a list of chemicals that are considered to be highly hazardous based on such characteristics as flash point (less than 100°F), self reactivity, water reactivity, boiling point, and toxicity.

C.2.5.3 Hazard Evaluation

- Plants are periodically audited against rigid corporate guidelines for safe operation.
- Multidisciplinary teams conduct process hazard analyses.

- Exceptions to corporate guidelines are made by committee.

- Process hazard analyses are conducted in accordance with formal procedure, with piping and instrumentation diagrams for reference.

C.2.5.4 Risk Reduction and Controls

- The company generates a standard MSDS for all raw materials and products.

- Corporate guidelines dictate procedures for safe limits of operation and response to a runaway reaction.

- Color-coded buckets and storage locations protect against inadvertent mixing of incompatible chemicals.

- An interaction matrix is available on the intranet.

C.2.5.5 Communications and Training

- The company offers comprehensive training on plant safety policies.

APPENDIX D: Resources

D.1 Guidelines

There are extensive writings on reactive hazard management. The term "guidelines" is used herein to refer to good practices that are nonmandatory and are developed through industry consortia, committees, professional societies, and other bodies.

CSB analysis included guidelines that focus primarily on the process safety of reactive chemicals; other good practices that might include some elements of reactive process safety were not included.

D.1.1 CCPS Guidelines Series

In 1985, the American Institute of Chemical Engineers (AIChE) established the Center for Chemical Process Safety (CCPS) to aid in the prevention or mitigation of catastrophic chemical accidents. CCPS publishes a series of Guidelines books and bulletins on good management and engineering practices, including the following on reactive hazard management:

- *Guidelines for Chemical Reactivity Evaluation and Application to Process Design*, 1995

  This publication describes the principles for evaluating chemical reactivity as an element of chemical process design. It outlines methods for identifying reaction hazards and establishing safe operating conditions. Special emphasis is placed on state-of-the-art theory and testing methods, as well as inherent safety principles. The intended audience is those involved in R&D, pilot-plant, process design, and (to a lesser degree) commercial plant operations. The guidelines focus on technical issues; they are not intended to be a manager's guide to reactive hazard management.

- *Guidelines for Safe Storage and Handling of Reactive Materials,* 1995

  This book summarizes current industry practices for design and operation of reactive chemical storage and handling systems. Special emphasis is placed on the engineering design of storage and handling systems. The intended audience is primarily process engineers or others with technical responsibility–not managers. The guidelines do not cover chemical reactions, mixing, or blending.

- *Safety Alert, Reactive Material Hazards,* 2001

  This 10-page bulletin offers an introduction to reactive material hazards. It is organized around four key questions: Do you handle reactive materials? Can you have reactive interaction? What data do you need to control these hazards? What safeguards do you need to control these hazards?

D.1.2 Other Guidance

Other international publications offer guidance on the topic of reactive hazard management, such as:

- *Chemical Reaction Hazards, A Guide to Safety,* 1997

  The purpose of this guidebook, written by Barton and Rogers for the Institution of Chemical Engineers (IChemE), is to provide a basis for good practice in assessing reactive hazards. It is written for those responsible for design and operation of chemical plants. It addresses hazards from uncontrolled exothermic activity in batch and semibatch chemical reaction systems as well as associated process equipment.

- *Designing and Operating Safe Chemical Reaction Processes*, 2000

  The intent of this book, published by the Health and Safety Executive (HSE) of the United Kingdom, is to guide programs for small- and medium-sized chemical manufacturing companies using batch and semibatch manufacturing processes. Its intended audience is those directly responsible for the development, design, and operation of chemical plants and processes, particularly process chemists and process engineers. The objectives of the HSE guidance are to:

  - Increase awareness of potential reactive hazards.
  - Assist in the assessment of risks.
  - Provide a systematic approach for the design, operation, and control of chemical reactions in batch and semibatch processes.
  - Advise on safe management procedures.
  - Advise on maintenance, training, and information needs to prevent and control reactive hazards.

D.2 Future Guidance

At least two efforts are currently underway to develop additional guidance in the area of reactive hazard management:

- CCPS project on the management of reactive chemical hazards

  As the result of a number of recent incidents caused by inappropriate handling of reactive chemicals, CCPS initiated a project in 2001 to develop additional management guidelines for reactive hazards. A CCPS technical steering committee documented the urgent need for comprehensive "best practice" guidelines.

The audience is expected to be process safety professionals, engineers, chemists, and other technical personnel who generate data and design processes that involve reactive chemicals. Manufacturing personnel who operate such facilities are also expected to benefit through improved understanding of risks.

- Hazard Assessment of Highly Reactive Systems Thematic Network (HarsNet).

HarsNet is a thematic network project sponsored by the European Commission's Industrial and Materials Technologies Program. It is coordinated through the Instituto Químico de Sarrià, with participation by government organizations, universities, major companies (e.g., Dow, BASF, and CIBA), and private testing services.

The objectives of HarsNet are to:

- Analyze existing methodologies for thermal hazard assessment and prevention.
- Prepare guidelines for thermal hazard assessment and prevention.
- Disseminate knowledge and methodologies to small- and medium-sized enterprises.
- Provide technical support to small- and medium-sized enterprises.

HarsNet maintains that reactive chemical testing and analysis is too complex for most small- and medium-sized companies because of the wide spectrum of processes and equipment involved. The project seeks to provide an industry guide for estimating the thermal hazard of a chemical synthesis without sophisticated testing and analysis.

D.3 ASTM Codes and Standards

The American Society for Testing and Materials (ASTM) is a not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services.[67] One ASTM committee (E27) develops standardized physical and chemical test methods on the hazard potential of chemicals, including but not limited to reactive hazards. The committee has developed standard analytical methods for calorimetry studies in addition to a standard guide for determining binary chemical compatibility (ASTM, 2000).

ASTM also distributes the computer program CHETAH (Chemical Thermodynamic and Energy Release Evaluation), a tool for predicting both thermodynamic properties and certain reactive hazards associated with a pure chemical, a mixture of chemicals, or a chemical reaction.

D.4 Select Resources on Reactive Hazards

A variety of tools and resources are available to aid in the recognition of reactive hazards. Table D-1 provides a list and brief description of selected literature resources and computerized tools.

[67] ASTM standards are developed voluntarily and used voluntarily. They become legally binding only when a government body makes them so or when they are cited in a contract

Table D-1

Select Resources on Reactive Hazards

Title	Contents	Source
Bretherick's Handbook of Reactive Chemicals	Summaries of reactivity, incompatibility, and other dangerous properties of individual substances either alone or in combination; case histories	Butterworth-Heinemann
Sax's Dangerous Properties of Industrial Materials	Summaries of reactivity, incompatibility, and other dangerous properties; applicable standards and recommendations; hazard rating	VanNostrand Reinhold (Lewis)
Rapid Guide to Chemical Incompatibilities	Summaries of known effects of dangerously reactive substances	Wiley and Sons (Pohanish and Greene)
The Chemical Reactivity Worksheet	Database of reactivity information for more than 4,000 common chemicals; includes information on special hazards of each chemical and whether a chemical reacts with air, water, or other materials; predicts the reactivity between two chemicals	National Oceanic and Atmospheric Administration (NOAA)
CASREACT	Database of abstracts related to reaction chemistry, including hazard/safety information	American Chemical Society (Chemical Abstract Service)
Chemical Hazards Response Information System (CHRIS)	Database on chemical and physical properties; guides to compatibility of chemicals	U.S. Coast Guard (USCG)
Material Safety Data Sheets (MSDS)	Data on chemical and physical properties, and other dangerous properties	Chemical manufacturer
Guidelines for Chemical Reactivity Evaluation and Application to Process Design	Fundamentals for identification and evaluation of reactive hazards	CCPS
Guidelines for Safe Storage and Handling of Reactive Materials	Design of storage and handling systems for reactive chemicals	CCPS
Reactive Material Hazards, What You Need to Know	Introduction to reactive issues	CCPS
Safety and Runaway Reactions	Articles on reactive hazards	Institute for Systems Informatics and Safety
Chemical Reaction Hazards, A Guide to Safety	Fundamentals of reactive hazards	IChemE (Barton and Rogers)
Designing and Operating Safe Chemical Reaction Processes	Safe design and operation of plants and processes for chemical reactions	HSE
Safety of Reactive Chemicals and	Evaluation of reactive hazards and	Elsevier (Yoshida, Wada, and

Title	Contents	Source
Pyrotechnics	case histories	Foster)
CRC Handbook of Chemistry and Physics	Data on chemical properties, especially thermochemistry, kinetics, and molecular structure	CRC Press (Lide)
Encyclopedia of Chemical Technology	Articles on chemical manufacturing of either single substances or groups of substances.	Wiley and Sons (Kirk-Othmer)
Chemistry of Hazardous Materials	Fundamentals of hazardous properties	Brady, Prentice-Hall (Meyer)
Ashford's Dictionary of Industrial Chemicals	Hazardous properties of particular chemicals	Wavelength Publications
A Comprehensive Guide to the Hazardous Properties of Chemical Substances	Correlates the chemical structure of compounds to their hazardous properties	Wiley and Sons (Patnaik)
Sittig's Handbook of Toxic and Hazardous Chemicals and Carcinogens	Data on chemical properties and chemical incompatibility	William Andrew Publishing
Hazardous Chemicals Desk Reference	Chemical property data on safe handling and storage, applicable standards and recommendations, hazard rating	Wiley and Sons (Lewis)
NFPA 491M Manual of Hazardous Chemical Reactions	Data on hazardous chemical reactions	National Fire Protection Association (NFPA)
NFPA 43 B Storage of Organic Peroxide Formulations	Hazards of peroxides	NFPA
NFPA 49 Hazardous Chemicals Data	Chemical hazard information, including reactivity data	NFPA
NFPA 325 Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids	Chemical hazard information, including reactivity ratings	NFPA
NFPA 430 Storage of Liquid and Solid Oxidizers	Hazards of oxidizers	NFPA

Appendix E: Hazard Investigation Data Sources

Title	Source	CSB Action
Process Safety Incident Database	Center for Chemical Process Safety (CCPS)/American Institute of Chemical Engineers (AIChE)	Proprietary - unavailable
National Response Center (NRC) Data	U.S. Coast Guard (USCG)	Retrieved information
Integrated Management Information System (IMIS)	Occupational Safety and Health Administration (OSHA)	Retrieved information
The Accident Database	Institution of Chemical Engineers (IChemE)	Retrieved information
Accidental Release Information Program (ARIP)	U.S. Environmental Protection Agency (EPA)	Retrieved information
RMP*Info (Five-Year Accident History Data)	EPA	Retrieved information
Major Hazard Incident Data Service (MHIDAS)	Health and Safety Executive, United Kingdom (HSE)	Retrieved information
Chemical Incident Reports Center (CIRC)	U.S. Chemical Safety and Hazard Investigation Board (CSB)	Retrieved information
Fire Incident Data Organization Database	National Fire Protection Association (NFPA)	Retrieved information
Reports of Chemical Safety Occurrences at U.S. Department of Energy (DOE) facilities	DOE	Retrieved information
Process Safety Code Measurement System	American Chemistry Council (ACC)	Reviewed only
National Fire Incident Reporting System	U.S. Fire Administration	Reviewed only
TNO Process Safety and Dangerous Goods (FACTS)	Netherlands Organisation for Applied Scientific Research	Reviewed only
Major Accident Reporting System (MARS)	European Communities Major Accident Hazard Bureau (MAHB)	Reviewed only
Mary Kay O'Connor Process Safety Center Database	Texas A&M University	Reviewed only
Hazardous Substances Emergency Events Surveillance (HSEES)	MAHB	Reviewed only

Title	Source	CSB Action
The Community Documentation Centre on Industrial Risk (CDCIR)	MAHB	Reviewed only
Awareness and Preparedness for Emergencies at Local Level (APELL)	United Nations Environmental Programme (UNEP)	Reviewed only
Acute Hazardous Events Database	EPA	Reviewed only
Census of Fatal Occupational Injuries (CFOI)	U.S. Bureau of Labor Statistics	Reviewed only
Process Safety Database	American Petroleum Institute (API)	Reviewed only
The European Health and Safety Database (HASTE)	European Foundation for the Improvement of Living and Working Conditions	Reviewed only
Various Chlorine Related Incident Reports	Chlorine Institute	Retrieved information
Hazardous Materials Incident Reports	National Transportation Safety Board (NTSB)	Retrieved information
Fire Incident Reports	NFPA	Retrieved information
Annual Loss Prevention Symposium (CD ROM)	CCPS	Retrieved information
Bretherick's Handbook of Reactive Chemical Hazards, 6th Ed.	Butterworth-Heinemann	Retrieved information
Loss Prevention in the Process Industries	F. P. Lees	Retrieved information
Large Property Damage Losses in the Hydrocarbon Chemical Industries, A Thirty-Year Review, 18th Ed.	Marsh and McLennan	Retrieved information
NAPP Technologies Chemical Accident Investigation Report	EPA/OSHA	Retrieved information
Prevention of Reactive Chemical Explosions	EPA	Retrieved information
How to Prevent Runaway Reactions	EPA	Retrieved information
Tosco Avon Refinery Chemical Accident Investigation Report	EPA	Retrieved information
Surpass Chemical Company Chemical Accident Investigation Report	EPA	Retrieved information
Incidents in the Chemical Industry Due to Thermal Runaway Reactions	Barton and Nolan	Retrieved information

Title	Source	CSB Action
Lessons From Disaster	T. Kletz	Reviewed only
What Went Wrong?	T. Kletz	Reviewed only
Chemical Process Safety, Lessons Learned from Case Histories	R. Sanders	Reviewed only
Explosions in the Process Industries	IChemE	Reviewed only
Chemical Reaction Hazards, A Guide to Safety, 2nd Ed.	IChemE	Reviewed only
NFPA 491 Guide for Hazardous Chemical Reactions	NFPA	Reviewed only
Proceedings of the 2nd International Symposium on Runaway Reactions, Pressure Relief Design, and Effluent Handling	CCPS	Reviewed only
Occurrence and Impact of Unwanted Chemical Reactions, Journal of Loss Prevention in the Process Industries I	B. Rasmussen	Reviewed only
Origins of Unwanted Reactions, Report M-2631	B. Rasmussen	Reviewed only
Unwanted Chemical Reactions in the Chemical Process Industry	B. Rasmussen	Reviewed only
Intl. Conference and Workshop on Process Industry Incidents	CCPS	Reviewed only
Chemical Reaction Hazards and the Risk of Thermal Runaway	HSE	Reviewed only
Safety of Reactive Chemicals and Pyrotechnics, Industrial Safety Series, Volume 5	Yoshida, et al.	Reviewed only
Safety and Runaway Reactions	Mitchison and Snyeder	Reviewed only
Safety of Chemical Batch Reactors and Storage Tanks	Benuzzi and Zaldivar	Reviewed only

APPENDIX F: Statistical Review of Occupational Fatalities

The U.S. Chemical Safety and Hazard Investigation Board (CSB) reviewed Bureau of Labor Statistics (BLS) data (1996–2000) on occupational fatalities to determine the significance of the reactive incident problem in the context of chemical process safety.[68] Table F-1 summarizes this information.

Table F-1

Review of Occupational Fatalities

Year	1996	1997	1998	1999	2000	Total
Total occupational fatalities	6,112	6,218	6,026	6,023	5,915	30,294
Fatalities in the chemical manufacturing industry (a)	40	62	91	78	41	272
Fatalities in the chemical manufacturing industry due to fire, explosion, and toxic substances (b)	16	23	46	46	16	147
Fatalities from reactive incidents in data collected by CSB	2	8	0	10	1	21
Fatalities from reactive incidents in the chemical manufacturing industry in data collected by CSB	0	3	0	7 (c)	1	11

(a) Chemical manufacturing industry (SIC Division D Group 28).
(b) Incidents that resulted in fires, explosions, and toxic releases are assumed to be process safety incidents.
(c) In addition to occupational fatalities, there was also one public fatality from a reactive incident during 1999.

[68] It is important to note that CSB analyzed BLS fatality data only within SIC Division D Group 28 (chemical manufacturing and allied products). Thus, the data presented in table F-1 is conservative in that it does not include fatalities that occurred to contractors or to personnel in other industries, such as petroleum refining, rubber products, paper products. Contractor fatalities are documented within BLS according to the services the contract company provides. For example, in the ARCO incidents there were 17 fatalities, 5 ARCO employees (a chemical manufacturer under SIC Group 28) and 12 contractors (who had been working at the facility for several years). The fatalities to the ARCO employees were recorded under SIC Division D Group 28. However, the 12 contractor fatalities were not attributed to the chemical manufacturing industry rather they were grouped under the construction SIC. Thus, these 12 contractor fatalities would not have been included in our analysis of BLS data.

As described in Section 3.1, CSB data represent only a sampling of reactive incidents and should not be directly compared to BLS data, which offer a more complete accounting of occupational fatalities. Nonetheless, CSB data provide an indication that a significant number of fatalities from process safety incidents involve reactive hazards.

APPENDIX G: Identifying Hazards Using Chemical Reactivity Testing

This appendix, which briefly illustrates how testing can be an integral part of a reactive hazard management system, is provided to facilitate the discussion of alternative criteria for improving regulatory coverage in Section 8.0. It does not describe in detail testing methods, theory, or practical application. Further information on these topics is provided in Grewer (1994), CCPS (1995a; 1995b), IChemE (Barton and Rogers, 1997), and HSE (2000). The Glossary (Appendix A) briefly defines each analytical test.

Screening is typically used to indicate when more detailed testing is necessary. The Center for Chemical Process Safety (CCPS, 1995b; p. 90) explains that the objective of thermal stability screening is to obtain data on the possibility of exothermic (heat generating) reaction for mixtures or self-reaction for single substances. Screening calorimeters measure the energy produced by a reaction and the temperature at which energy is liberated. Differential screening calorimetry (DSC) is considered to be the primary screening test, though differential thermal analysis (DTA) is also used. Thermogravimetric analysis (TGA) can also be used to screen for stability at high temperature through precise weight loss measurements.

Screening techniques are relatively cost-effective and require only a small chemical sample; however, they do not measure gas evolution or maximum pressure rise. A material is generally considered to be thermally stable if the temperature at which energy from reaction is first observed is at least 100 degrees Celsius (°C) above the maximum operating temperature of a process event under upset conditions (CCPS; 1995b; p. 93).

CCPS (1995b; p. 94) recommends more sensitive and sophisticated methods if screening calorimetry shows thermal instability at or near the temperature range of large-scale storage or processing. The next logical choice is adiabatic calorimetry,[69] which uses a larger sample and more advanced technology. This technique is more sensitive to detecting the onset temperature[70] for exothermic reactions, adiabatic temperature rise, and rate of reaction; it also can measure pressure rise in a closed vessel, an important parameter in reaction scaleup. Compared to screening calorimetery, this sophisticated technique more accurately measures the overall energy of reaction, though the tests tend to be more costly and time intensive.

A common theme of industry guidelines is that every test result must be individually interpreted because of limitations and variations in conditions, and the complexity of the instrument. Factors such as sample size, container material, and heating rate can greatly affect results. Therefore, personnel with appropriate training and experience should be consulted both before testing and for interpretation of results.

CCPS offers guidance on when to conduct testing for hazard identification. CCPS (1995a; p. 13) suggests that when designing processes for conducting chemical reactions, all materials should be subject to screening tests even if no reactivity concerns are identified in the literature search or by expert judgment. In other guidance, CCPS (1995b; p. 85) states that that prior experience, theoretical evaluations, and expert opinion may be used to determine whether screening tests are necessary in designing storage and handling systems for reactive materials.

One of the factors that may be important in this determination is the possible rate of reaction. Theoretical evaluations can determine a large potential energy of reaction, but they do not determine how fast or slow that energy can be released. The rate of reaction can be the critical factor in determining the severity of

[69] In this context, the term "adiabatic" refers to calorimetry conducted under conditions that minimize heat losses to the surrounding environment to better simulate conditions in the plant, where bulk quantities of stored or processed material tend to minimize cooling effects. This class of calorimetry includes the accelerating rate calorimeter (ARC), from Arthur D. Little, Inc., and PHI-TEC from Hazard Evaluation Laboratory Ltd.

[70] Onset temperature is the lowest temperature at which the test first observes an exothermic (heat liberating) reaction.

the reactive hazard (CCPS, 1995b; p. 86). When such uncertainties arise, an expert opinion may be needed to determine whether chemical testing is necessary.

Five of nine respondents to the CSB survey frequently use both screening and more sophisticated approaches, including adiabatic calorimetry, to determine the thermal stability or compatibility of process materials. Seven of nine respondents use screening alone for chemical reactiv ity testing. The most often used testing objectives are:

- To determine the onset temperature of a runaway reaction using calorimetry.
- To determine thermal stability using screening tests.
- To determine gas evolution and maximum pressure rise.

Senator BOXER. Now, Mr. Breen, if you do not want to listen to the Chemical Safety Board, what about this? What about the fact that in 2012, labor, health and environmental justice groups petitioned EPA to use the Clean Air Act Section 112 rulemaking authority and the General Duty Clause to require facilities that handle dangerous chemicals to use safer technologies to prevent or eliminate threats from uncontrolled chemical releases wherever feasible?

What is the status of EPA's review of this petition and for requiring the use of inherently safer technologies where feasible under the Risk Management Program?

Mr. BREEN. Thank you, Senator. And thank you for entering the 2002 full report into the record as well. We are grateful for that.

So, we have the petition from the groups from July 2012. The petition calls on us to adopt regulations under 112(r) of the Clean Air Act to require, where feasible, inherently safer technology. This is a different matter than what would be under the RMP program.

Senator BOXER. I understand. I am asking you the second, there are two things here. The way you store these chemicals or making sure we get the opportunity to look at safer alternatives where feasible. I understand that. How are you responding? You did not much say how you are responding to the first. But now the second, how are you responding to this petition?

Mr. BREEN. Thank you. So, again in the theme that more must be done, we are looking at a number of potential policy options in addressing this tragedy. One idea is that put forward by the petition to use provisions of 112(r)(7), they suggest, to write regulations and 112(r)(1) to write guidance, the General Duty Clause. Separately, we have had recommendations, not in the form of a formal petition but nonetheless important recommendations, to use the General Duty Clause, 112(r)(1) to write regulations.

Senator BOXER. Well, I am asking you, what is the status of these recommendations? What are you doing? What is your time line? When will we know what your recommendations are?

Mr. BREEN. Thank you. So, inherently safer technology has some attraction. And it has worked at site-specific ways with important results. And the Chemical Safety Board has helped in that respect.

The Chemical Safety Board's Strategic Plan for 2012 through 2016 identifies inherently safer technology as an issue of concern, one of four issues of concern, and their letter to you of May 17th indicates they are looking into it quite seriously and that will be quite helpful. We are looking into it as well.

At the same time, the petition importantly asks us to require it, where feasible. And the literature on this issue indicates that——

Senator BOXER. What is your timeframe?

Mr. BREEN. Let me just address——

Senator BOXER. Sir, I do not have enough time to hear your entire biography. Just tell me. Please answer the question. What is your timeframe on responding to this petition?

Mr. BREEN. Senator, thank you. What I wanted to mention is that the Congressional Research——

Senator BOXER. What is your timeframe?

Mr. BREEN [continuing]. Service points out that in order to establish that timeframe, we need to understand the issue better. So, that is what we are doing now.

Senator BOXER. All right. Here is the situation. I am sympathetic to the fact that there is work to be done. I am unsympathetic to the attitude that I hear, which is the lack of urgency, because lives are being lost and recommendations were made a long time ago and nothing is happening.

Now, there is another, there is another correspondence to you, this is your own National Environmental Justice Advisory Council. Your own, from EPA says "We have already witnessed in countless environmental justice communities what can and has happened is chemical releases, explosions, fires, train derailments and refinery releases have wreaked havoc upon local communities." The Council, your own Council, recommended that EPA use its authorities to eliminate the risks.

So, again, what are you doing about this communication? So, now you have outside groups, inside groups, the Chemical Safety Board, everyone is saying to you do something. So, how are you responding to your own Council?

Mr. BREEN. Yes. And I need to find a way to convey to you that we share your sense of urgency.

Senator BOXER. Good. Convey it. Say it. It is good.

Mr. BREEN. Thank you. We share it. More must be done and this was a tragic loss. I share in that. We all do, of course. The important thing is to get it right in addition to getting it fast. With regard to the National Environment Justice Advisory Committee——

Senator BOXER. Fast? It goes back to 2002. Please. The Chemical Safety Board talked about this in 2002. Am I right? So, do not say fast to me because this was before EPA, and I do not know if you were there, I am not blaming you personally, I do not know if you were there in 2002. Were you there in 2002?

Mr. BREEN. Yes.

Senator BOXER. Yes. OK, so they called this out in 2002. And now you are telling me fast? How many more of these do we have to have? So, let me just cut to the chase because others want to ask questions.

I understand that should you decide, in your wisdom, which I hope you have, that these kinds of potentially explosive materials should be stored in ways that people are saying would be far safer, segregated, not near wooden bins and so on. If you did that, I understand that is a regulation and it would take about 18 months to get it done.

But I also understand that under EPA's rules you could issue an alert, a guidance. What are you thinking about issuing an alert or a guidance? How many more accidents does it take before you issue an alert or a guidance on storage?

Mr. BREEN. Thank you, Senator. I am showing now the "Explosion Hazard from Ammonium Nitrate" alert that EPA issued and in which it warns that a fire involving ammonium nitrate in an enclosed place could lead to an explosion.

Senator BOXER. When did you do that?

Mr. BREEN. December 1997.

Senator BOXER. OK. You have not issued an alert since 1997. Do you not think it would be a good thing since we have now seen what has happened? This adds even more impact to the fact that you have done nothing in terms of your Risk Management Plan if you knew it, way back then, even before 2002.

So, you are reading to me, and taking credit for, something that happened in the last century? We are in this century. I would like to see a new alert, a new guidance. Is that something you will look at, Mr. Breen, and report back to me on?

Mr. BREEN. Senator, naturally we would like to keep you up to date on all of this——

Senator BOXER. No, no. I am not asking up to date. Would you consider issuing an updated alert since that one is from the last century and we have had many accidents since then, a new alert and a new guidance, a guidance, and then potentially a rule?

Mr. BREEN. Senator, I do not want to leave you with a misimpression. This alert is posted on our website——

Senator BOXER. I understand.

Mr. BREEN [continuing]. And continues to be vital.

Senator BOXER. And you think it is adequate what is, all these years, my staff says it is inadequate.

Mr. BREEN. What we would like to do then is better understand the ways in which it is inadequate and as part of a panoply of making sure events——

Senator BOXER. So, you have an alert. You are taking credit for having an alert that goes back to 1996. Now, one would think technologies have changed just a bit since then. And there are other ways that we can guide people on how best to avert these disasters before there is a rule change.

So, I am going to stop now. But I wanted to say, express my clear disappointment in your defensive testimony. You are looking back. You are not looking forward. You are defending non-action and some alert that was put up in 1996. And I feel that EPA has to step up to the plate here and do a lot more. And I will talk to my Ranking Member after this hearing. He may not agree with me on this. He may. But I do plan to oversee what you are going to do and that means alert guidance rulemaking.

And I will turn to my colleague.

Senator VITTER. Thank you, Madam Chair.

Mr. Chairman, following the tragic incident in Geismar, we talked on the phone and you were very gracious to act very, very quickly and have had folks on the scene. Can you give me a quick update on that particular investigation?

Mr. MOURE-ERASO. Yes, Senator. We have deployed with an investigating team there. We have engaged a number of consultants, especially structural engineers. We have concerns about the safety of the people that have to enter to look at the specific site of the explosion. We customarily do not enter until the structural engineer tells us it is safe because there is still hanging debris in the place in there.

In the meantime, we are taking views with a, you know, we are taking photographs, aerial photographs, of the site. We have interviewed close to 14 people that have been witnesses, direct witnesses of what happened, and we are preparing to enter into the place immediately that our safety engineer tells us that we will be safe to do it.

But we are at this time mostly engaged on interviewing people on the site.

Mr. VITTER. OK, thank you, Mr. Chairman. Now, it has also come to my attention that EPA has recently tried to subpoena information from CSB and even CSB investigators themselves in order to help EPA in their enforcement actions.

Now, I am concerned about this because Congress from the get go has separated those two roles and I am concerned about it because you basically, CSB basically relies on cooperation with the site in question, the company in question. And if EPA is going to subpoena everything you get, I am guessing you are going to get less cooperation, you are going to get less documents and information and that is going to hamper your doing your job.

Can you elaborate on your concerns about this attempt by EPA?

Mr. MOURE-ERASO. Yes, Senator. We, normally in these catastrophes we conduct parallel investigations with our sister agencies in the Federal Government and the local government. For the issue of our witnesses, we base our work mostly in what a witness will tell us in good faith that was their experience before the accident.

But we believe very strongly that workers and managers should be allowed to tell the truth to the CSB on these accidents without fear of retaliation or prosecution. We are focusing on conducting a safety investigation, that is to find out the hows and the whys of why something happened. And we want that to be a focus that is what we consider just as important as the other focus that other agencies are investigating. I mean, their goals are different than our goals but we believe that both goals of finding out law enforcement, and our goal of finding out the root causes of the accidents, are just as important and we should be able to work together to obtain this information.

Senator VITTER. Thank you, Mr. Chairman.

Mr. Breen, let me turn to you with the same question. And this really does concern me because I think it fundamentally threatens CSB's ability to do its job and thereby prevent future accidents.

In his February letter, Chairman Moure-Eraso wrote "It is our belief that EPA should use its own staff resources and authorities in conducting civil and criminal investigations rather than to seek the wholesale repurposing of the CSB investigative record." And he went on to cite that EPA "has more than 400 times as many employees and more than 750 times the budget of the Chemical Safety Board." Can you respond to these concerns?

Mr. BREEN. Only partially, Senator. The Department of Justice would have an important role in any response and I cannot represent what the Criminal Division or other parts of the Department of Justice would say to these issues. The Bureau of Alcohol, Tobacco and Firearms is part of the Department of Justice as well.

I can share with you, Senator, that——

Senator VITTER. If I can just interrupt and I will certainly let you finish however you want. But the Department of Justice would not be trying to subpoena CSB stuff on behalf of EPA unless EPA was asking them to do that. So, sort of pointing to your lawyer is an evasion. Why is it EPA's policy to try to subpoena CSB's documents and investigators when that is a different type of investigation fundamentally and also when it depends on cooperation which, in my opinion, these actions are going to shut down?

Mr. BREEN. Senator, cooperation is important in this regard. And there are important civil as well as important criminal needs to be met in the investigation. Perhaps there is more than ought to be said in an open hearing, and if you would like we can ask representatives of the criminal program to come and brief you or your staff.

Senator VITTER. Well, I would like that, No. 1. No. 2, I see no reason why we cannot talk about it in public. And No. 3, I am not trying to prevent you from slowing down any, in terms of any enforcement action, or justice, including a criminal action if it is appropriate. But that has to be separate. And once you start subpoenaing CSB's information and documents and witnesses, they depend on cooperation. That is 95 percent of their ability to do their job. You are going to shut it down.

Mr. BREEN. Thank you, Senator. Again, cooperation and a dual approach are important and we would be happy to fill you in more fully when we are able to.

Senator VITTER. I will certainly follow up on that. I do not understand why you are not able to this morning.

That is all I have.

Senator BOXER. Senator Fischer.

Senator FISCHER. Thank you, Senator Boxer.

Mr. Chairman, in your testimony you mentioned that recent investigations have "further taxed the CSB's already overstretched staffing and resources" and that you are facing a backlog of cases to investigate. Can you tell me how you prioritize your work and what can be done to ensure that the use of CSB's limited resources result in maximum safety improvements?

Mr. MOURE-ERASO. Thank you, Senator. When I started my job at the CSB as the Chair in 2010, I was faced with a backlog of 22 investigations that were already in the pipeline. We have added at least five new major ones during my estate, and we have finished with nine and currently our backlog is 15 investigations.

Congress frequently calls on the CSB to investigate root causes of some of the most complex tragic industrial accidents in the U.S. For example, the Water Horizon is in the pipeline, Chevron that we finished the preliminary report, and, you know, in the last 2 months we have gotten requests to deploy at West and at Williams Olefins.

That has a really ripple effect on all of our investigations. We have to move the teams that are currently working on and finished a report to deploy in the field to start a new one. We believe that the situation is that I must tell this Committee that when the next serious accident comes along in the near future in the petrochemical industry, and believe me, they are coming, we will not be able to have the researchers to deploy.

Senator FISCHER. Can you tell me how you prioritize? Do you take it by the dates that they occur, by the chemicals that are involved, by the number of fatalities, the destruction that takes place? How do you prioritize which accident you are going to move to though?

Mr. MOURE-ERASO. Yes. We have a department that takes care of evaluating the incidents that are constantly being monitored on a daily basis. They have the relevant algorithm by which you determine, based on the consequences of the accident, we can classify them as major, medium or minor.

What concerns us is basically whether a statute has called us do to, that is to look at accidents that cause fatalities, that cause people to go to hospital, that cause destruction in the environment and in the communities, and that will be applicable and could be able to generalize to a sector so we can learn something out of them so that we can develop recommendations for prevention of further accidents to happen this way.

So, once we gather all of this information on a particular incident, we meet in our headquarters with all of the department heads, get all of the inputs, look at the algorithm, look at how it is being classified, and then we make a decision of deployment.

Senator FISCHER. On all of your investigations, do you make recommendations on safety improvements?

Mr. MOURE-ERASO. Yes, we make recommendations to a number of stakeholders. We make recommendations to the company itself, to the sector which that company belongs to. We make recommendations also to the regulatory agencies when we feel that the particular regulations have not been enough to prevent what has happened. We make recommendations especially to OSHA and to EPA.

We also make recommendations to the private organizations that establish guidelines for safety like the National Fire Protection Association, the American Petroleum Institute and other organizations like that.

Senator FISCHER. And these are just recommendations and guidelines? Are there any teeth in them?

Mr. MOURE-ERASO. We believe they do have some teeth. We have established in our organization a recommendations department and their job is not only to formulate these recommendations but to follow up with a very specific system that we have to find out what is the action that is being taken.

We send 180-day letters in which we ask the stakeholders, the people that we make the recommendations to, saying what is the recommendation and asking them what specific actions are going to be taken in that period. These are public letters, public information, and we use that information basically to be sure that our recommendations that are public are also answered in public by the receivers of our recommendations.

And, as you can see, we have a very good, our tracking record tells us that over 70 percent of what we have recommended has been acted upon in a way that we are have declared the recommendations closed and acceptable.

Senator FISCHER. Also, Mr. Chairman, in your written testimony you state that "The CSB has had a number of discussions with fertilizer industry representatives since April 17th, including officials from the Fertilizer Institute and the Agriculture Retailers Association. We believe the industry has a strong and sincere interest in learning from the tragedy in West and taking steps to prevent future incidents involving ammonium nitrate including the development of new audit tools and product stewardship programs."

Can you please elaborate on this part of your statement and what role do you see industry-led initiatives have in advancing chemical safety?

Mr. MOURE-ERASO. We have had conversations with the Fertilizer Institute and the Agriculture Retailers Association on this issue. Normally, these organizations are the ones that are going to determine for their affiliates what is the state-of-the-art for issues of safety. And we have learned that they, for the prevention of future accidents, it is very useful that they be, that they understand and that they embrace the issue of safety. And we find out that the Fertilizer Institute and the Agriculture Retailers Association do have programs and of course they are similarly interested on the particular situation to prevent this from happening.

I would like to add that this complements the effort that should be done at the level of the Federal Government and the State organizations because even though this is, we applaud their programs, voluntary programs by themselves are not substitutes for eventually having regulations.

Senator FISCHER. Do you feel that you have a good working relationship, though, with the private industry and trying to reach better safety requirements?

Mr. MOURE-ERASO. I believe we do. I believe we do. We have discussions with the Fertilizer Institute in which they have described to us the programs that they have and we are encouraging them, they have, they want very much to see the results of our investigation and they are very positive about supporting the work that we are doing. So yes, we have very good relationship with them.

Senator FISCHER. OK, thank you. Also in your testimony regarding West Fertilizer, you state that no manufacturing occurred in the site, only blending of fertilizers for retail customers. Can you tell us, maybe better explain what the difference is between manufacturing and blending of fertilizer?

Mr. MOURE-ERASO. Yes. Manufacturing of a chemical is done in a chemical plant in which you have reactors and you have a system by which you use raw materials to come out with a product at the end, a chemical product, like in this case it would be ammonium nitrate. You have to use ammonia as a raw materials, you have to you nitric acid, and there is a whole, it is a chemical process.

That is not what was happening in West. They would receive the finalized product that had already been classified as a fertilizer. They were receiving it by train and they would store it in a storage place and from that storage place, in bulk form was the storage, it was sold to farmers from the region that come to get the amounts that they need for planting.

So, basically what the operation was is a distribution center of an already finalized product. It was a retail operation.

Senator FISCHER. I would assume you would have different recommendations for regulations on the chemical process and the storage process. Is that correct?

Mr. MOURE-ERASO. Yes, it is correct. When you store substantial amounts of a particular chemical that is a strong oxidizer like ammonium nitrate, there are specific recommendations of how it should be done safely. The key issue is that you have to avoid a fire hazard by all possible means because fire is one of the components that could make the chemical detonate, not by fire itself.

Senator BOXER. Sorry. I am sorry. Because we are running out of time, we do not want to short the other panel, I am going to have to stop the questioning of this panel——

Senator FISCHER. OK. Thank you so much.

Senator BOXER. We are going to move forward. Senator Barrasso, we have run out of time here, so can I have you lead off the questioning of the next panel? Is that all right with you? Unless you would like to make a 5-minute statement now.

Senator BARRASSO. Madam Chairman, I could limit myself to the 5 minutes.

Senator BOXER. OK. Go right ahead.

Senator BARRASSO. Thank you, Madam Chairman. And I am pleased that you are having this hearing to discuss the issues surrounding chemical safety and learn more about the tragic events that occurred in Texas and Louisiana.

I would like to say that my home State of Wyoming is the largest consumer in the U.S. of ammonium nitrate, a chemical oxidizer that was implicated in the West, Texas accident. Mining companies in Wyoming use 1.5 billion pounds of ammonium nitrate each year in places like Powder River Basin to extract coal.

At these mining sites, ammonium nitrate is mixed with fuel oil, pumped and poured into the blast hole which is fitted with an initiation system. The subsequent explosion gets rock out of the way so that we can get to coal. Through this process, Wyoming and other States can provide essential building materials and affordable energy for families and small businesses across the Country.

Now, ammonium nitrate was not always the chemical used to do this work. In the past, nitroglycerin-based explosives were used which were less safe and led to accidents and cost lives.

And, Madam Chairman, I would recommend to you a book Senator Mansfield, Mike Mansfield, we go to the Mansfield Room for our leadership lunches, he was the leader and a Democrat in the Senate and had a history as a miner. And as you go through this, he talked about working with nitroglycerin. And through his entire career they would always say to Mike, tap it light because you do not want to tap it too hard and cause the explosion that causes these kinds of significant injuries.

And the transition to ammonium nitrate from nitroglycerin has produced inherently safer products. Today, ammonium nitrate comprises at least 90 percent of all the commercial explosive material and the use of ammonium nitrate is so pervasive that there is no viable substitute for the chemical explosives industry.

So, I do have a couple of questions. I see I have some time left. The first to Mr. Moure-Eraso.

You referenced a series of past events where ammonium nitrate was involved in the explosions in Texas as well as in France in 2001. Is it not true that the type of ammonium nitrate involved in the 1947 Texas City tragedy that you talk about is vastly different than the type manufactured today? Simply yes or no.

Mr. MOURE-ERASO. I concluded, I do not have the data about what was exactly the chemical composition of the Texas City and we are waiting for the data on West.

Senator BARRASSO. Well, with regard to the one in France, is it not true that the ammonium nitrate involved in that explosion was contaminated?

Mr. MOURE-ERASO. I could not tell you. I am sorry, Senator.

Senator BARRASSO. OK. Now in the 1974 ruling, OSHA ruled to ensure the safe handling and storage of ammonium nitrate. Are there any examples of accidental detonations of ammonium nitrate where ammonium nitrate was handled and stored in compliance with the rules, if they actually did it properly within the rules?

Mr. MOURE-ERASO. I am not aware of them, Senator.

Senator BARRASSO. Mr. Breen, does the EPA have enough personnel and inspectors to police the facilities like the West Fertilizer Company if ammonium nitrate was included under a Risk Management Plan as some have advocated? When you take a look at some of these reports, it sounds like there are about 12,800 different facilities which might then be covered if we went and expanded this and right now I think you are looking at about 500 a year. I do not know how many more facilities you would have to inspect each year and do you have the personnel to do that? What would the cost be?

Mr. BREEN. Senator, the President's Fiscal Year Budget asks for additional funding for this program and that would allow for additional inspectors as well.

Senator BARRASSO. And how many more do you think you would have to go, from 500 a year to——

Mr. BREEN. The number of inspections, Senator?

Senator BARRASSO. Yes.

Mr. BREEN. I do not have an answer for that.

Senator BARRASSO. OK. Thank you.

Thank you, Madam Chairman.

Senator BOXER. Senator, thank you.

What we are talking about is the way to safely store AN. I mean, that is my perspective here. So, we want to thank the panel.

I just want to say to the EPA, I am going to be working with you much more than you would like. We need to do better than point to an alert that was written in 1997. I have looked up, many States have moved beyond that type of an alert. Many States have guidance. Many other countries have guidance.

And I would like to put in the record a June 2014 editorial in the Nebraska Journal Star that calls on EPA to update your Risk Management Plans to ensure that this type of potential explosive is stored safely.

This does not seem to me to be an unsolvable problem. We have seen what happens when it is not stored correctly. Let us fix it. And you have the tools, sir, and we are going to work with you and if we have to against you. I mean I do not want to, but if we cannot work with you we are going to have to, you know, make sure this happens. We are going to make sure that this alert is updated, that this guidance is updated, and that you have perhaps a rules change so that what Senator Barrasso says is accurate, that this is used but it is used safely.

Thank you very much.
[The referenced article follows:]

JournalStar.com

Bloomberg View:Texas explosion reveals hole in chemical regulation

TEXAS EXPLOSION REVEALS HOLE IN CHEMICAL REGULATION
JUNE 02, 2013 11:50 PM

The following editorial appears on Bloomberg View:

Six weeks after a fertilizer center near West, Texas, blew up, killing 15 people, it has become clear none of the half-dozen state and federal agencies overseeing the place regulated the safe storage of the chemical that exploded.

Investigators have concluded that a fire at West Fertilizer Co. -- perhaps caused by arson, an electrical short or a spark from a golf cart -- detonated large stores of ammonium nitrate, a chemical compound used as both a fertilizer and a commercial explosive. The blast devastated a 37-block area.

None of the regulatory agencies focuses on the specific hazard of fire plus an explosive compound, existing in the midst of schools, a nursing home and scores of residences. Given that at least 2,400 businesses in the United States store ammonium nitrate, the lack of regulation is a national issue.

Texas sets no standards for the fire-safe storage of ammonium nitrate. The state Commission on Environmental Quality policed West Fertilizer Co. only in regard to air quality and pollution. The Office of the Texas State Chemist inspected the center yearly to ensure compliance with a state requirement that it enclose and lock its ammonium nitrate stores to keep them from being stolen by terrorists.

Federal oversight also missed the problem. The U.S. Pipeline and Hazardous Materials Safety Administration regulated only the transportation of chemicals in and out of the facility. The Labor Department's Occupational Safety and Health Administration conceivably could have noticed any faulty wiring at the business, but OSHA last inspected the place in 1985. With just 2,000 inspectors for the nation's 8 million workplaces, the agency can't police the chemical industry.

That is more the writ of the Environmental Protection Agency, whose mission includes protecting people and the environment from the risks of toxic chemicals. The EPA required that West Fertilizer provide a risk-management plan for its handling of another fertilizer, anhydrous ammonia, which is toxic and stored under high pressure. Yet the EPA doesn't mandate risk-management plans for ammonium nitrate, despite the evident dangers.

Originally, the agency required such plans for some explosives, but in response to a lawsuit from the Institute of Makers of Explosives, it delisted the category altogether in 1988, saying the Bureau of Alcohol, Tobacco and Firearms had them covered. The ATF, however, regulates only explosives more powerful than ammonium nitrate.

Only tough local zoning laws might protect against building high schools and nursing homes next to ammonium nitrate stores. West didn't have such restrictions, and the fertilizer distributor stood outside the city limits anyway.

In any case, local authorities may not be well equipped to gauge the risks in chemical storage, and business-hungry state officials may be inclined to discount them. That's why it should be a federal agency that regulates the storage of ammonium nitrate.

The EPA is a good choice because it already possesses considerable authority to manage risks such as those that led to the catastrophe in West. For example, the agency requires that state and local officials have emergency-response plans for dealing with a list of chemicals. It can, and should, add ammonium nitrate to that list. Under EPA rules, West Fertilizer was required only to inform state and local officials, including the fire department, that it had ammonium nitrate on site.

The EPA also should require risk-management plans of ammonium nitrate distributors. Specifically, the agency should insist they maintain their electrical systems, keep fire hazards away from the chemical compound and separate bins to prevent secondary explosions.

The EPA should demand that all new distributors of ammonium nitrate have buffer zones separating their stockpiles from inhabited areas. Congress should offer existing distributors tax incentives to relocate their supplies.

There's a precedent for this: The agricultural chemicals security credit, which expired Jan. 1, offered sellers of agricultural chemicals 30 percent federal income tax credits to offset the costs of securing dangerous substances against theft by terrorists or other criminals.

The last time a fertilizer facility containing ammonium nitrate blew up -- in 2001, in Toulouse, France, killing 30 people and damaging 30,000 buildings -- investigators never determined the cause. Authorities may never know exactly what occurred in West either. But they can act now to minimize chances it will happen again.

Senator BOXER. We will call up our next panel. We are sorry it took so long to get you up here but we are going to give you each 5 minutes and then I will turn to Senator Vitter first to question because he had the tragedy most recently in his State.

So Mr. Randall Sawyer, Dr. Rick Webre, Mr. Paul Orum, Dr. Sam Mannan, Mr. Kim Nibarger. And I think we are going to try to, if you can cut down to 4 minutes that would be far better because then we will have some time to question.

So, let us get started. As you are seating, I am going to have to just move forward.

Mr. Randall Sawyer, I am so honored you are here. You are the Chief Environmental Health and HazMat Officer in Contra Costa County, a large county in California and one that has some of these companies in it. So, I am very pleased you are here. Please go ahead.

STATEMENT OF RANDALL SAWYER, CHIEF ENVIRONMENTAL HEALTH AND HAZARDOUS MATERIALS OFFICER, CONTRA COSTA HEALTH SERVICES

Mr. SAWYER. Thank you, Chairman Boxer, Ranking Member Vitter. Thank you for inviting me to participate in today's hearing.

As you know, my name is Randy Sawyer and I am the Contra Costa Health Services Chief Environmental Health and Hazardous Materials Officer.

Contra Costa County is a safer place to work and live because of the actions taken by the citizens of the county, the county's Board of Supervisors, United Steelworkers local unions, the Hazardous Materials Program staff and the regulated industry. The safety culture of the petroleum refineries and chemical facilities have dramatically improved over the last 15 years.

Contra Costa County is located on the San Francisco Bay Estuary. It is home to four petroleum refineries and several small to medium chemical facilities. In the 1990s, there were many chemical accidents and releases, some of which caused the death and injury of workers and impacted communities, causing the public to seek medical attention.

As a result, two actions were taken to address the accidents and concerns raised by the community and the county's Board of Supervisors. First was installation of the most integrated community warning system in the Country and the second was implementation of the most encompassing accidental release prevention program in the Country.

The Industrial Safety Ordinance was adopted by the county and the city of Richmond. The Industrial Safety Ordinance requirements go beyond those required by the U.S. EPA Risk Management and Federal OSH Process Safety Management Programs. The Industrial Safety Ordinance requires regulated stationary sources to consider inherently safer alternatives, perform root cause analysis as part of their accident incident investigation programs, perform human factors analysis and perform a safety culture assessment at least once every 5 years.

The Contra Costa Health Services Hazardous Materials Program engineers have industrial experience and perform in-depth audits of the regulated sources at least once every 3 years. These audits may take five engineers 4 weeks to perform and may be the most thorough audits in the Country.

The results of these actions is a change in the way industry does business in Contra Costa County. In addition to putting safeguards in place, they are also looking at how to avoid hazards all together. As a result, from May 1999 to August 2012, there was not an accidental release from a regulated source that had a major impact on the surrounding community or caused serious injury or death of a regulated sources worker.

On October 6, 2012, the Chevron Richmond Refinery had a major release and fire and more than 15,000 sought medical attention. Five different investigations were performed, Cal OSHA issued 25 citations with 11 being willful, 12 being serious and fines totaling $963,200. Chevron issued their investigation report on April 12th, U.S. EPA and Bay Area Air Quality Management District investigations are ongoing.

The Chemical Safety and Hazard Investigation Board issued its interim report on April 19th with recommendations to Chevron, the city of Richmond, Contra Costa County, the State of California and the U.S. EPA. Contra Costa County and the city of Richmond are working together to address these recommendations and is in the process of modifying the Industrial Safety Ordinance. The Chemical Safety and Hazard Investigation Board plans to have a final report issued by the end of this year with additional recommendations.

Contra Costa Health Services is hiring a third party to perform a safety evaluation of the refinery. The selection of the third party will occur next week and it is expected the work will begin in August. Governor Brown has established a task force to look at the refinery's safety and the task force is planning to issue a report in July.

The Community Warning System and the Industrial Safety Ordinance has made a dramatic positive impact on refinery and the chemical facility safety in Contra Costa County that has resulted in reduced accidents. Last year's incident at Chevron Richmond underscores the need for continued vigilance around these efforts to prevent such occurrence and continue the overall trend toward a safer worker environment for the employees of the petroleum refineries and the chemical plants and a safer community for our citizens to live.

Thank you.

[The prepared statement of Mr. Sawyer follows:]

Written Testimony of Randall L. Sawyer
Chief Environmental Health and Hazardous Materials Officer – Contra Costa Health Services
Hearing on "Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading up to the Explosions in West, TX and Geismar, LA"
Before the Committee on Environment and Public Works
United States Senate
June 27, 2013

Chairman Boxer, Ranking Member Vitter, and Honorable Members of the Committee:

Thank you for inviting me to participate in today's hearing. My name is Randy Sawyer.

Contra Costa County is located on the San Francisco Bay estuary. Contra Costa County is the home to four petroleum refineries and many small to medium chemical facilities. Many accidental releases, spills and fires from these facilities impacted the employees of these facilities and the surrounding communities during the 1990s. There was an average of one accident a year that resulted in a release or fire that caused the death of workers or had a major impact to the community. Members of the community, labor unions and the County's Board of Supervisors looked for solutions to this problem. Two major changes to how the County, the City of Richmond, and industry operated occurred during this time. First was installation of the most integrated warning system in the Country and the second was implementation of the most encompassing accidental release prevention program in the Country.

History

Major Chemical Accidents and Releases

Below is a listing of major accidents and releases that occurred in the County during the 1990s.

- May 1992 lube spent acid was released and ignited and one worker died and another was seriously injured and there was a major impact from the smoke and gas cloud that was formed.
- August 1993 four to eight tons of sulfur trioxide was released that reacted with the water in the air to produce a sulfuric acid cloud and more than 20,000 people sought medical attention.
- September 1994 there was a release that occurred over 16 days that impacted the workers at the refinery and the surrounding community where more than 1,200 people sought medical attention at a special clinic established as a result of this release.
- June 1995 there was a crude unit fire where the refinery established alternative housing at a motel during and after the fire for more than 100 families.

- April 1996 there was a major release and fire at a catalytic gas unit that caused millions of dollars of damage at the facility and impact to the surrounding community from the fire smoke.
- May 1996 there was an accidental release of hot coke[1] that ignited and caused millions of dollars of damage at the facility.
- January 1997 there was a runaway reaction at a hydrocracker unit, which caused increased temperatures and pressures and the outlet piping from the hydrocracker failed, killing one worker and injuring 46 contractor employees.
- February 1999 there was a flash fire at a crude unit where four employees died and one was seriously injured.
- March 1999 a six-inch valve failed at a gasoline process unit and a gas release occurred that exploded and ignited, causing millions of dollars of damage to the facility and smoke impacting the surrounding community.

There was an accident that occurred at a non-chemical or petroleum refinery in which there was a dust explosion, resulting in the death of a worker and major damage at the facility.

Community Warning System

The County looked at how to alert and notify the surrounding community around an industrial site if there was a release or fire from the site that could impact the community. The original concept was to develop local Traveler Information System radio stations, which could broadcast local emergency information; a telephone emergency notification system, which would call people with land lines downwind of a release; work with a local radio station to broadcast emergency information within Contra Costa County; and consider adding sirens in the industrial area of the County. After the 1993 release of sulfur trioxide, when more than 20,000 people sought medical attention, a committee was formed including eight community members, four industrial representatives, and three representatives from law enforcement, fire and health services to determine the best means available to alert and notify the community during an incident. The committee visited industrial sites in Texas and Louisiana and met with warning system consultants to determine the best means to alert and notify the community as quickly and thoroughly as possible. The committee developed a report that looked at an "All Hazard" warning system, which they submitted to the County's Board of Supervisors in December 1993. The County accepted the report and created a Community Notification Advisory Board.

The Community Notification Advisory Board worked with the Contra Costa County Community Awareness and Emergency Response (CAER) Group to design and find funding for the final project. The Community Notification Advisory Board developed a means for funding to be paid for from the industries that handled acutely hazardous

[1] Coke is a petroleum byproduct of some refineries. Coke is similar to coal. A delayed coker is one type of equipment that is used to produce this coke. The coke is formed in a delayed coker at high temperatures and then cooled. When the coke is cooled it is then dropped from the coker to a containment area below the delayed coker. This accident occurred when the coke was dropped before it was cooled properly, which caused a major fire.

materials. A project manager was hired by CAER to oversee the project to completion. The final system includes activation computer terminals at the four refineries and two chemical facilities. The system can be activated with a push button from these six industrial sites that will sound sirens in the surrounding community, notify emergency response agencies, alert the surrounding community by broadcasting over the National Weather Service, activate the Emergency Alert System, send messages to the media using the California Emergency Digital Information System and Twitter accounts and call the community within 1,000 yards of the boundary of the community. The telephone area is modified, if needed, when the wind direction is known and people who have registered their cell phones are called and/or receive a text message and/or an e-mail message. Now virtually all smart cell phones in the County will be alerted by a text messages when there is an incident. The message will state where the incident is occurring and what protective actions are being given. County staff can activate different scenarios throughout the County anywhere they have computer access to the internet. There are also four locations where scenarios are programmed into dedicated terminals at the Contra Costa Health Services Hazardous Materials Programs, the Office of the Sheriff's Dispatch Center, the Office of the Sheriff's Community Warning System Offices, and the Contra Costa County Fire Protection District Dispatch Center. There are also terminals that can receive information automatically at four other City Police Departments Dispatch Centers, the California Highway Patrol Bay Area Dispatch Center, the Bay Area Air Quality Management District's offices, and the San Ramon Valley Fire Protection District Dispatch Center. There is also a public website that the public can access to find out information on the incident, including the area that we are asking people to shelter in place. The original system was paid for by industry and given to the County in June 2001. There are three other notification levels that were developed and are detailed in the County's Hazardous Materials Incident Notification Policy that can be found at the following web address: http://www.cchealth.org/groups/hazmat/pdf/incident_notification_policy.pdf. The Notification Policy describes the Community Warning System and when and at what level to notify the Contra Costa Health Services Hazardous Materials Programs.

Accident Prevention Programs

California passed one of the first accidental release prevention programs in the United Sates in 1986, which was called the Risk Management and Prevention Program. Contra Costa County started implementing this program in 1989. This program was a predecessor to the U. S. EPA Risk Management, OSHA's Process Safety Management, and the California Accidental Release Prevention Programs. If a facility handled some of the more toxic chemicals, which were called acutely hazardous materials, above a threshold they were required to develop and implement a Risk Management and Prevention Plan. In Contra Costa County, there was a 46% decrease in the highest amount of acutely hazardous materials that was handled between 1990 and 1994 to the amount of acutely hazardous materials that were handled at the end 1994 if sulfuric acid was not included. There were three chemical engineers with industrial experience who worked implementing this program in 1992 when Contra Costa County began auditing the regulated businesses for compliance with the law.

On January 1, 1997 California adopted the U.S. EPA's Risk Management Program and made it more stringent by adopting some of the requirements of the Risk Management and Prevention Program. The regulated communities that were required to submit a Risk Management Plan to the U.S. EPA by June 1999 were also required to submit a Risk Management Plan to the local Unified Program Agency. There were additional California-only regulated sources that were required to submit Risk Management Plans three years after the local Unified Program Agency requested them.

Because of the accidents that occurred in Contra Costa County during the 1990s, the community and the County's Board of Supervisors wanted a more stringent accidental release prevention program than California's, U.S. EPA or the Federal OSHA accidental release prevention programs. The County originally adopted what was called the "Good Neighbor" ordinance. This ordinance had some major faults and some of the petroleum refineries filed a lawsuit to stop its implementation. While the lawsuit was going through the court system, industry, the Paper, Allied Chemical, and Energy labor Union, and the County worked at finding an alternative to the "Good Neighbor" ordinance.

Industrial Safety Ordinance

In December 1998, the County replaced the "Good Neighbor" ordinance with the Industrial Safety Ordinance for facilities in the unincorporated areas of the County that became effective on January 15, 1999. Two years later, the City of Richmond adopted this ordinance for facilities in that City.

The Board of Supervisors passed the Industrial Safety Ordinance because of accidents that occurred at the oil refineries and chemical plants in Contra Costa County. The ordinance applies to oil refineries and chemical plants with specified North American Industry Classification System (NAICS) codes that were required to submit a Risk Management Plan to the U.S. EPA and are program level 3 stationary sources as defined by the California Accidental Release Prevention (CalARP) Program. The ordinance specifies the following:

- Stationary sources had one year to submit a Safety Plan to Contra Costa Health Services stating how the stationary source is complying with the ordinance, except the Human Factors portion.
- Contra Costa Health Services develop a Human Factors Guidance Document (completed January 15, 2000).
- Stationary sources had one year to comply with the requirements of the Human Factor Guidance Document that was developed by Contra Costa Health Services.
- For major chemical accidents or releases, the stationary sources are required to perform a root cause analysis as part of their incident investigations.
- Contra Costa Health Services may perform its own incident investigation, including a root cause analysis.
- All of the processes at the stationary source are covered under the Industrial Safety Ordinance requirements.
- The stationary sources are required to consider Inherently Safer Systems for new processes or facilities or for mitigations resulting from a process hazard analysis.

- Contra Costa Health Services will review all of the submitted Safety Plans and audit/inspect all of the stationary source's Safety Programs within one year of the receipt of the Safety Plans (completed January 15, 2001) and every three years after the initial audit/inspection.
- Contra Costa Health Services will give an annual performance review and evaluation report to the Board of Supervisors.

The 2006 amendments to the Industrial Safety Ordinance require or expand the following:
1. Expand the Human Factors to included Maintenance and all of Health and Safety
2. Require the stationary sources to perform Safety Culture Assessments one year after the Hazardous Materials Programs develops guidance on the performing a Safety Culture Assessment (Safety Culture Assessment Guidance was completed November 9, 2009)
3. Perform Security Vulnerability Analysis

The seven stationary sources now covered by the County's Industrial Safety Ordinance are:
1. Air Products at the Shell Martinez Refining Company
2. Air Products at the Tesoro Golden Eagle Refinery
3. Shell Martinez Refining Company
4. General Chemical West in Bay Point
5. Phillips 66 Rodeo Refinery
6. Tesoro Golden Eagle Refinery
7. Air Liquidé Large Industries

The City of Richmond Industrial Safety Ordinance became virtually identical to the County's Industrial Safety Ordinance when the City of Richmond adopted the County's 2006 amendments in February 2013. Two stationary sources are covered by the City of Richmond's Industrial Safety Ordinance:
1. Chevron Richmond Refinery
2. General Chemical West in Richmond

Human Factors Guidance

Regulated Sources are required to develop comprehensive human factors programs to include operations, Health & Safety, and maintenance departments. Comprehensive human factors programs must develop methods for evaluating and resolving active failures and latent conditions initiated within the following four dimensions or at the interfaces between the dimensions:

- Individuals (e.g., motivation, emotional states)
- The activity or task being conducted, including the procedures for the activity or task (e.g., routine, non-routine, written, practice, formal, informal)
- The physical environment (e.g., equipment) or workplace
- Management or organization (e.g., poor communication, reward and discipline system)

The goal of the guidance document is to develop the requirements from the Industrial Safety Ordinance to ensure that sources will evaluate and resolve failures and conditions initiated within the previous four dimensions. Stationary sources must identify potential unsafe acts or active failures occurring in hazardous circumstances. They must also assess the adequacy of their existing safeguards and incorporate improvements if necessary. Both of these requirements can be fulfilled by conducting traditional and possibly procedural process hazard analyses. When incidents and accidents do occur, sources must perform incident investigations to identify the active failures and existing latent conditions that contributed to the incident. The latent conditions[2] identified during the incident investigation must be incorporated into a program developed to manage and control latent conditions. Other programs must also be developed and implemented to manage and control latent conditions including a Management of Change[3] procedure to review staffing changes, a program for developing high quality procedures, and a program for developing a sound management system. Minimization of latent conditions should result in fewer unsafe acts or active failures or at least reduced risk from the unsafe acts and active failures that do occur.

Management of Organizational Change

The Human Factors section of the Industrial Safety Ordinance requires stationary sources to conduct a Management of Change prior to staffing changes that affect permanent staffing levels/reorganization in operations or emergency response. Employees and their representatives shall be consulted in the Management of Change. Stationary sources may elect to develop a separate Management of Change procedure for staffing changes. Primarily, the guidance document details requirements for identifying the technical basis for the organizational change and assessing the impact of the organizational change on safety and health. The requirements specified in the guidance document apply to:

- Reduction in the number of positions or number of personnel within those positions in operations, including engineers and supervisors with direct responsibilities in operations; positions with emergency response duties; and positions with safety responsibilities.
- Substantive increase in the duties in operations, including engineers and supervisors with direct responsibilities in operations; positions with emergency response duties; and positions with safety responsibilities (e.g., addition of equipment or instrumentation which significantly adds to the complexity of the system).

[2] Latent conditions are underlying conditions that can lead to an accident when an action combines with the underlying condition.
[3] Management of Change is a term that is used in the U. S. EPA Risk Management and Federal OSHA's Process Safety Management Programs referring how a facility manages change in the process units and in their processes safely programs and ensuring that affected personnel are trained on the change.

- Changes in the responsibilities of positions in operations, including engineers and supervisors with direct responsibilities in operations; positions with emergency response duties; and positions with safety responsibilities.

Each stationary source must develop criteria or guidance to assist appropriate personnel in determining "when" a Management of Change for an organizational change should be initiated.

Root Cause Analysis

The primary purpose of an incident investigation is to prevent reoccurrence through the identification and correction of the causal factors of the incident. The process of determining of the causal factors seeks to answer the basic questions about an incident:

- What happened?
- How did it happen?
- Why did it happen?

A root cause analysis is a systematic process that determines the causal factors, i.e., the events and conditions that are necessary to produce or contribute to an incident. The analysis develops what happened and how it happened, and then focuses on finding the underlying causes for why an incident happened by determining the causal factors of an incident. There are three types of causal factors:

- Direct cause
- Contributing causes
- Root causes

The direct cause of an incident is the immediate events or conditions that caused the incident. The direct cause addresses what happened. Contributing causes address how and why an incident happened. Contributing causes are causal factors that are events or conditions that collectively with other causes increase the likelihood of an incident but that individually did not cause the incident. The identification of root causes answers the question of why an incident happened. Root causes are the causal factors that if corrected, would prevent recurrence of the incident. Root causes can include system deficiencies, management failures, inadequate competencies, performance errors, omissions, non-adherence to procedures and inadequate organizational communication. Root causes are generally the result of a management system failure. Root causes can be found at more than one level of an organization from management down through the first-line supervisors.

Root causes may be found at the worker level. However, Contra Costa Health Services agrees with the guideline set forth in the Department of Energy Accident Investigation Workbook that a root cause of an accident can be found at the worker level if, and only if, the following conditions are found to exist:

- Management systems were in place and functioning, and provided management with feedback on system implementation and performance

- Management took appropriate actions based on the feedback
- Management, including supervision, could not reasonably have been expected to take additional actions based on their responsibilities and authorities.

Inherently Safer Systems

The intent of the Inherently Safer Systems requirements is that each stationary source, using good engineering practices and sound engineering judgment will incorporate the highest level of reliable hazard reduction to the greatest extent feasible, to prevent Major Chemical Accidents and Releases[4].

"Inherently Safer Systems (ISS) means Inherently Safer Design Strategies as discussed in the 2008 Center for Chemical Process Safety Publication "Inherently Safer Chemical Processes" and means feasible alternative equipment, processes, materials, lay-outs, and procedures meant to eliminate, minimize, or reduce the risk of a Major Chemical Accident or Release by modifying a process rather than adding external layers of protection. Examples include, but are not limited to, substitution of materials with lower vapor pressure, lower flammability, or lower toxicity; isolation of hazardous processes; and use of processes which operate at lower temperatures and/or pressures."[5] "For all covered processes, the stationary source shall consider the use of inherently safer systems in the development and analysis of mitigation items resulting from a process hazard analysis and in the design and review of new processes and facilities."[6] The term inherently safer implies that the process is safer because of its very nature and not because equipment has been added to make it safer.[7]

2008 Center for Chemical Process Safety Publication Inherently Safer Chemical Processes has defined four categories for risk reduction:

- Inherent - Eliminating the hazard by using materials and process conditions which are nonhazardous; e.g., substituting water for a flammable solvent.
- Passive - Minimizing the hazard by process and equipment design features that reduce either the frequency or consequence of the hazard without the active functioning of any device; e.g., the use of equipment rated for higher pressure.

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[4] County Ordinance Code Section 450-8014(h) Major Chemical Accident or Release means an incident that meets the definition of a Level 3 or Level 2 incident in the Community Warning System incident level classification system defined in the Hazardous Materials Incident Notification Policy, as determined by Contra Costa Health Services; or results in the release of a regulated substance and meets one or more of the following criteria:

- Results in one or more fatalities
- Results in greater than 24 hours of hospital treatment of three or more persons
- Causes on- and/or off-site property damage (including cleanup and restoration activities) initially estimated at $500,000 or more. On-site estimates shall be performed by the regulated stationary source. Off-site estimates shall be performed by appropriate agencies and compiled by Health Service
- Results in a vapor cloud of flammables and/or combustibles that is more than 5,000 pounds

[5] County Ordinance Code Chapter 450-8, §450-8.014(g)

[6] County Ordinance Code Section 450-8.016(D)(3)

[7] Process Plants: A Handbook for Safer Design, 1998, Trevor Kletz

- Active – Using controls, safety interlocks and emergency shutdown systems to detect and correct process deviations; e.g., a pump that is shut off by a high-level switch in the downstream tank when the tank is 90% full. These systems are commonly referred to as engineering controls.
- Procedural – Using operating procedures, administrative checks, emergency response and other management approaches to prevent incidents or to minimize the effects of an incident; e.g., hot-work procedures and permits. These approaches are commonly referred to as administrative controls.

"Risk control strategies in the first two categories, inherent and passive, are more reliable because they depend on the physical and chemical properties of the system rather than the successful operation of instruments, devices, procedures, and people." The inherent and passive categories should be implemented when feasible for new processes and facilities and used during the review of Inherently Safer Systems for existing processes if these processes could cause incidents that that could result in a Major Chemical Accident or Release. The final two categories do require the successful operation of instruments, devices, procedures, and people. The concepts that are discussed in the CCPS book, Inherently Safer Chemical Processes, A Life Cycle Approach, for looking at active and procedural applications of risk reduction, should be used in developing recommendations and mitigations from process hazard analyses along with the inherent and passive categories. This is good risk reduction. These concepts should also be used in the review and application of human factors in the process hazard analysis of new and existing processes.

Approaches to consider Inherently Safer Systems include the following[8]:

- Minimization – Use smaller quantities of hazardous substances (also called Intensification).
- Substitute – Replace a material with a less hazardous substance.
- Moderate – Use less hazardous conditions, a less hazardous form of a material, or facilities that minimize the impact of release of hazardous material or energy (also called Attenuation or Limitation of Effects).
- Simplify– Design facilities that eliminate unnecessary complexity and make operating errors less likely, and that are forgiving of errors that are made (also called Error Tolerance).

The County's guidance on the review of Inherently Safer Systems is broken down into seven separate sections. The first section addresses new covered processes; the second section addresses existing processes; the third section addresses mitigations resulting from Process Hazard Analysis (PHA); the fourth section defines feasibility; the fifth section addresses recommendations from process hazard analyses; the sixth section addresses Inherently Safer System Reports; and the seventh section contains

[8] CCPS, Inherently Safer Chemical Processes, A Life Cycle Approach, 1996

definitions. The ISS analyses must be performed for situations where a major chemical accident or release could reasonably occur.[9]

Safety Culture Assessment
Merriam-Webster defines "culture" as "the set of shared attitudes, values, goals and practices that characterizes an institution or organization." Safety culture is a measure of the importance that individuals and organizations exhibit towards working safely. It is the summation of attitudes and actions workers do at 2 a.m. on a Sunday night when no one is watching. An organization can influence employees to embrace positive shared safety values with consistent policies and practices and by leading through example.

History is filled with tragic life-altering and -ending events that can be traced back to phrases like, "we've been doing it this way for years" or "this way is good enough." This guidance document was prepared to help stationary sources identify pervasive attitudes or beliefs regarding risk tolerance in the work place. There is a correlation between improving safety culture and decreasing the number and severity of accidents.

Although stationary sources subject to Contra Costa County's or the City of Richmond's Industrial Safety Ordinances already frequently evaluate situations for "hidden" problems or latent conditions, safety culture is subtler and even more difficult to assess. A Safety Culture Assessment will enable a facility to understand where they are in terms of risk acceptance. Additional benefits of performing a Safety Culture Assessment include:

- Identify positive as well as negative aspects of the onsite health and safety program.
- Assist in identifying opportunities for improving health and safety.
- Another tool to improve facility personnel's awareness and participation in health and safety.
- Identify perception gaps between managers, supervisors, and the workforce.
- Assist to demonstrate management's commitment to safety by performing the assessment and visibly addressing the results.

Every company has a culture. Sometimes certain aspects of safety culture are more evident (e.g., using the proper personal protective equipment) and sometimes it is more of an undercurrent of how things are done (e.g., recommended hearing protection is absent when the 'boss' is not around). There will always be some element of risk in the workplace and in the work that is performed, but being cavalier about safety could lead to major problems beyond serious personal injury. Large facilities may have different cultures across departments, process units or even between shifts in the same process unit. Finding whether these differences exist is one of the challenges of the assessment.

[9] Process Hazard Analysis methods determine the risk of a deviation or potential incident. The risk determination is based on a combination of the hazard (severity) of the potential incident and likelihood (probability) of an incident occurring. If the potential hazard (severity) of consequence of a deviation meets the definition of a Major Chemical Accident or Release an ISS Analysis should be done for those that could reasonably occur.

In general, the larger and more broad the population being assessed, the less evident these differences in perception may appear. For example, 10 similar perceptions from one workgroup may not be noticeable in a facility-wide survey of hundreds; whereas these same 10 perceptions out of a total work group size of 30 would stand out. Depending on the size of the facility, the following work groups should be assessed: management, supervisors, operators, maintenance, engineering, health and safety personnel and resident and applicable transient contractors. To better understand potential differences in behavior and develop improvement strategies, facilities should consider identifying sub-work groups for the assessment between processing areas, shifts, crews, maintenance crafts or levels of management.

Performing an initial Safety Culture Assessment will give a company a baseline from which they can compare future assessments. Any Safety Culture Assessment represents only a snapshot in time. Since the safety culture of a company will change over time, only by performing multiple assessments can a company discover if the steps that were taken to improve safety are actually improving safety. If not, the company may need to adjust and focus future improvement topics.

The primary goal of a Safety Culture Assessment is to assess individual and group values towards safety and risk tolerance. An ultimate goal for each facility should be to assess values toward safety and risk tolerance associated with each work group. One objective of the Safety Culture Assessment is to gauge the commitment and effectiveness of an organization's health and safety management program by evaluating attitudes, perceptions, competencies and patterns of behavior. Once these issues are known, a facility can direct the design, execution, evaluation and continuous improvement in the work environment to affect changes to safety-related behaviors and attitudes that ultimately minimize accidents.

More information on Contra Costa County's Safety Ordinance, including the Industrial Safety Ordinance Guidance Document can be found at the following web page: http://cchealth.org/hazmat/iso/.

Auditing Regulated Stationary Sources

Contra Costa Health Services has five engineers with one vacant position with industrial experience dedicated to the California Accidental Release Prevention Program and the Industrial Safety Ordinance. When an audit occurs at a petroleum refinery, it can take five engineers four weeks to complete the audit. The audit includes a review of the policies and procedures establishing the prevention elements that are required, review of the documents ensuring that the policies and procedures are being implemented as designed, interviewing operators and maintenance personnel to see if what is on paper is what is occurring in the plants, and to perform field evaluations. The purpose of the audits is to ensure that the programs in place meet the requirements of the California Accidental Release Prevention Program and the Industrial Safety Ordinance.

The audit includes 430 questions, the findings from the audit team, determination if the facility is in compliance with the requirement, actions to come into compliance, if out of compliance, proposed remedy, and a schedule to meet compliance. The proposed remedies and schedule are developed by the regulated stationary source and reviewed by the lead auditor. The regulated stationary source has ninety days to come up with a plan of action that is agreed upon by the auditing team. Follow-up on the actions being taken by the regulated source is reviewed during the next audit or during unannounced inspections. Table I shows an example of one of the questions with the proposed remedies from the regulated source.

Results

From May 1999 to August 2012 there was not a Major Chemical Accident or Release Severity Level 3 incident that occurred at a regulated stationary source[10]. Contra Costa Health Services staff has analyzed the Major Chemical Accidents or Releases (MCAR) that have occurred since the implementation of the Industrial Safety Ordinance. The analysis includes the number of MCARs and the severity of the MCARs. Three different levels of severity were assigned:

- Severity Level III – A fatality, serious injuries, or major onsite and/or offsite damage occurred[11]
- Severity Level II – An impact to the community occurred, or if the situation was slightly different the accident may have been considered major, or there is a recurring type of incident at that facility
- Severity Level I – A release where there was no or minor injuries, the release had no or slight impact to the community, or there was no or minor onsite damage

Figure 1 is a chart showing the number of MCARs from January 1999 through December 31, 2012 for the regulated Industrial Safety Ordinances facilities. The MCARs that have occurred at the County's Industrial Safety Ordinance stationary sources and a chart showing the MCARs that have occurred at the County and the City of Richmond's Industrial Safety Ordinance stationary sources. The chart also shows the number of Severity I, II, and III MCARs for this period.

A weighted score has been developed giving more weight to the higher severity incidents and a lower weight to the less severe incidents. The purpose is to develop a metric of the overall process safety of facilities in the County, the facilities that are covered by the County and the City of Richmond Industrial Safety Ordinances, and the facilities that are covered by the County's Industrial Safety Ordinance. A Severity Level III incident is given 9 points, Severity Level II 3 points, and Severity Level I 1 point. Figure 2 is a graph of this weighted scoring.

[10] On August 6, 2012 there was a major fire with major damage on site and a significant impact offsite.
[11] All the accidents that were listed during the 1990's were a Severity Level III MCAR

Table I

Number	Question ID#	Question	Findings	Answer	Actions	Proposed Remedy	Due Date	CCHS Comments
3	A12-08	Do the Process Hazard Analyses (PHA) address the identification of any previous incident, which had a likely potential for catastrophic consequences? [T19 CCR §2760.2©(2) & Section 450-8.016(d)(1)]	The PHA revalidation methodology includes a review of previous incidents. Tab 4 or 5 in the PHA binder is the listing of Chevron Incident investigation summary report reviewed by the PHA team. Per interview with personnel that participated in PHAs, incidents were reviewed and the likelihood of the event was adjusted to reflect incidents reviewed. The incidents discussed included Chevron events and incidents in other refineries/plants. These additional incidents discussed are not included in the PHA binder. CCHS reviewed T–C - (2/7/2008), there is an incident findings learning "solicit the team members to identify specialty or unique equipment whose failure could result in a loss of containment. This will be documented as either 'No specialty equipment discovered' 'or 'Specialty equipment discovered.' The PHA database has been updated to include this as a standard deviation.' Based on CCHS review of PHAs, the PHA data have not been modified to capture this learning/requirement.	P	Ensure the PHA database is modified accordingly when changes to the PHA process occur.	Chevron will include at least the list of incidents reviewed during PHA's and will include the review and analysis of specialty equipment (if any are identified) as a core deviation in each PHA.	12/15/08	None

Figure 1

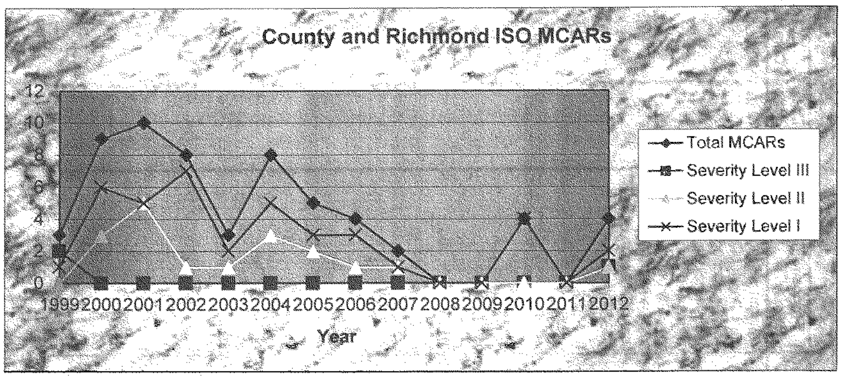
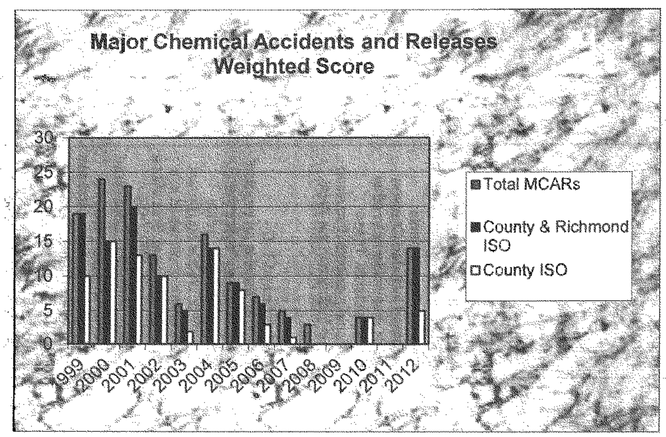


Figure 2



August 6, 2012 Chevron Fire

On August 6, 2012, a major fire occurred at the Chevron Richmond Refinery. The fire was caused by a failure of a pipe coming from a side cut of the atmospheric column in the crude unit. Six Chevron emergency responders received minor injuries as a result of the fire and over 15,000 people sought medical attention from August 6 through August 24, 2012. Five incident investigations (U. S. Chemical Safety and Hazard Investigation Board (CSB), U. S. EPA, Cal/OSHA, Bay Area Air Quality Management District, and Chevron) were started.

On January 30, 2012, Cal/OSHA issued 25 citations with 11being willful/serious, 12 serious, and 2 general. The total fine levied is $963,200. Chevron has appealed the citations through the Cal/OSHA appeal process. On April 19, 2013, the CSB issued an interim report with recommendations to Chevron, the City of Richmond, Contra Costa County, California, and the U. S. EPA. Use the following link to see a copy of the interim report: http://www.csb.gov/assets/1/19/Chevron_Interim_Report_Final_2013-04-17.pdf. Chevron issued their final root cause analysis of the incident on April 12, 2013. A copy of the Chevron root cause analysis can be found using the following link: http://cchealth.org/hazmat/pdf/2012_0806_chevron_30day_report_7th_Apr12.pdf. The U. S. EPA and the Bay Area Air Quality Management District incident investigations are ongoing.

The findings from the CSB interim report and the Cal/OSHA citations show that the pipe that failed had severe corrosion from high temperature sulfidation such that the wall of the pipe was less than a sixteenth of an inch thick. Inspections as far back as 2002 indicated that the pipe that failed had accelerated corrosion and should be monitored closely. Chevron was aware of high temperature sulfidation corrosion and that low silicon carbon steel pipe will have accelerated corrosion. Chevron's policy states that each component of piping that could see high temperature sulfidation corrosion should be inspected, at least, during maintenance turnarounds. Cal/OSHA and the CSB found that Chevron did not follow their own policy and that this component was not inspected. CSB and Cal/OSHA also questioned Chevron's decision not to shut down the crude unit when the leak occurred and that nineteen people were in the area of the pipe when the pipe failed and was engulfed in a vapor cloud.

The CSB is planning to issue a final report on the causes of the fire with their recommendations by the end of this year. The CSB is continuing to investigate issues including but not limited to: implementing a safety case regulatory regime in California; Chevron safety culture; indicator data collection and reporting; emergency response; off-site notification; stop work authority; and gaps in American Petroleum Institute recommended practices and standards.

Contra Costa Hazardous Materials Programs is hiring a third-party consultant to perform a safety evaluation of the refinery. The purpose of the safety inspection/audit is to review the safety culture, process safety management systems, and human factors associated with the operation of the refinery. Safety culture is a measure of the importance that individuals and organizations exhibit towards working safely. Process safety management system is a means to show management's commitment to process safety at the refinery. Human Factors is defined as: "A discipline concerned with designing machines, operations, and work environments so that they match human capabilities, limitations, and needs"[12]. Human Factors can be further referred to as: "...environmental, organizational, and job factors, and human and individual

[12] American Chemistry Council, formerly called the Chemical Manufacturers Association or CMA, (1990) A Manager's Guide to Reducing Human Errors

characteristics which influence behavior at work in a way which can affect health and safety."[13]

To assist in the safety inspection/audit, Contra Costa Health Services has established an oversight committee made up of four community members, representatives of the USW Local 5, Contra Costa Building Trades Council, a Contra Costa Health Services staff representative, two people with refinery technical experience, and two City of Richmond staff. The oversight committee has reviewed and approved: 1) the scope of work of the safety inspection/audit, and 2) the request for proposal for an outside consultant to work with Contra Costa Health Services in performing the safety inspection/audit. The oversight committee will select the outside consultant in early July and oversee the progress of the consultant during the evaluation and follow-up evaluation.

The safety inspection/audit will include public meetings; the onsite work of the consultant that will include interviews of Chevron personnel, review of documents, review of policies and procedures, inspection records, and other documents that assist in achieving the purpose of the safety evaluation; the preparation of a draft report; the preparation of a final report; and the presentation of the final report to the Richmond City Council and the Contra Costa County Board of Supervisors. A follow-up evaluation will occur six to twelve months after the initial evaluation to determine the progress that Chevron is making to address the findings and recommendations from the initial evaluation. The costs for the third-party safety evaluation will be paid for by Chevron.

Contra Costa County and the City of Richmond are in the process of revising the County's and the City of Richmond's Industrial Safety Ordinances to address the CSB recommendations. A committee that will include representatives from industry, United Steel Workers, Contra Costa Building Trades Council, community members, and the City of Richmond staff will work with Contra Costa Health Services staff to develop language for the revision to the Industrial Safety Ordinances. These revisions to the ordinances will then be presented to the Contra Costa County Board of Supervisors and the Richmond City Council for approval and adoption of the revisions.

The Bay Area Air Quality Management District is developing a Refinery Emission Tracking Rule that includes air monitoring around the refineries. The District is looking at what is in place and what additional air monitoring that would be beneficial during a chemical release or during a fire, including real-time particulate measurements.

Governor Brown has developed a working group on refinery safety. The Governor's working group has met with stakeholders that include community groups, regulators that have accident prevention oversight over the refineries, emergency responders, and industry representatives. The Governor's Task Force is planning to issue a report on proposed changes and actions that will address refinery safety in July 2013.

[13] Reducing Error and Influencing Behavior, HSG48, United Kingdom Health and Safety Executive (1999)

Fees

The maintenance, operations, training, and the continuous improvement of the Community Waming System are paid for by fees from regulated businesses that handle more than 500,000 pounds of hazardous materials.

The Industrial Safety Ordinance is paid for by fees based on the potential hazard that the facility poses. The potential hazard is assessed taking into consideration the following factors:

- The toxicity or flammability of the chemical.
- The quantity of the chemical stored in the largest vessel.
- The distance the largest vessel is from the fenceline of the regulated business.
- The volatility of the chemical.

An equation is used to determine the chemical potential hazard factor using the above four factors. Each chemical potential hazard factor is calculated. This factor is then multiplied by a factor based on the complexity of the regulated business and a factor based on the recent accidental history of the regulated business to give the regulated business potential hazard factor and then all of the chemical potential hazard factors are added together to get an overall factor for the chemicals handled by the regulated business. The percentage of the regulated business potential hazard factor to the sum of all the regulated businesses potential hazard factors is multiplied by the total overall expenses to implement the Industrial Safety Ordinance to determine the fee for that regulated business.

Conclusions

The Contra Costa County Board of Supervisors and the Richmond City Council adopted the Industrial Safety Ordinances and industry paid for and gifted the Community Warning System to Contra Costa County as a result of the major chemical accidents and releases that occurred in Contra Costa County during the 1990s and the outcry from the community. Today, there is a marked change in the way the petroleum refineries and chemicals operate. What was acceptable in the 1990s is not acceptable today. The industry is now held to higher standard than anywhere else in the Country through the County's and City's Industrial Safety Ordinances and the way that alert and notifications were required to be performed through the Community Waming System. The thorough auditing and the follow-up by the Accidental Release Prevention Program Engineers sets a high standard that is most cases is being met by the regulated sources. The result is the number and severity of accidents that have occurred within the County have declined dramatically.

Environment and Public Works Committee Hearing

June 27, 2013

Follow-up Questions for Written Submissions

Questions for Sawyer

Questions from:

Senator Barbara Boxer

1. Can you please describe the importance that Contra Costa County places on facilities that handle dangerous chemicals using inherently safer systems and developing a strong safety culture to enhance the safety for workers and people in the community near such facilities?

   Response: Contra Costa County personnel believe that a good safety culture and implementing inherently safer systems is very important. Contra Costa County has adopted the Industrial Safety Ordinance that requires chemical facilities or petroleum refineries to perform inherently safer system analysis for all of the processes at their facilities. Inherently safer systems assessment looks at means to reduce or eliminate the hazard and not relying on layers of protection to reduce the potential for an event to occur. As part of an annual report, the facilities list the changes that they have made based on their inherently safer system analysis during that year. Contra Costa County has hired either chemical or mechanical engineers to audit the regulated facilities at least once every three years. As part of the audit process, the engineers determine if the regulated facilities are implementing inherently safer systems to the greatest extent feasible.

   A facility may have the best programs in place to prevent accidental releases but without a good safety culture those programs will not succeed. Safety programs are only as good as the people that are implementing the programs and their vigilance in making sure that every precaution has been taken in the actions of every person operating at the facility. The County's Industrial Safety Ordinance requires the regulated facilities to perform a safety culture assessment at least once every five years. The City of Richmond adopted this requirement for their regulated facilities in February 2013. The engineers that audit these facilities review the safety culture assessments to determine if the facilities are following the requirements of the ordinance. The engineers determine that the safety culture assessment includes employee participation and is thorough and complete.

2. Can you please describe the three things that you believe are most important for enhancing safety at industrial facilities that handle dangerous chemicals?

   Response: a. A good safety culture at a facility will determine how well a facility can carry out safety systems to prevent accidents from occurring. Without a good safety culture a facility may have good programs on paper and in place but the implementation of these programs will likely be poor and ineffective.

   b. The root causes of accidents can always be traced back to a failure of management systems. It is highly important that facilities that handle hazardous materials have good management systems in place to understand proper process safety programs and prevent accidents from occurring. A facility that has a good safety culture will have good management systems in place.

   c. Performing inherently safer systems assessment is a different way of thinking for engineers and chemical facilities and petroleum refinery personnel to look at how to reduce the risk of an accident. Historically chemical facilities and petroleum refineries have been designed and re-designed to be efficient with the least amount of interruptions. In the process of doing this, their designs may have increased the size of equipment and piping or added equipment. Then to reduce additional risk that this may create extra instrumentation or other safeguards are added resulting in complex systems and confusing control schemes. Looking at how to reduce the overall hazard and to continue to run the facilities efficiently with the least amount of interruptions is a different way of thinking when designing and operating a facility. Performing or thinking inherently safer when designing and operating a facility, in many cases, will not only reduce the hazard but will reduce the overall costs. The costs may include the costs of oversizing equipment and piping and needing additional safeguards such as additional instrumentation. Through an inherently safer systems assessment, a facility can either eliminate or minimize the hazard where addition of safeguards will not be necessary.

Senator BOXER. Thank you so much. And thank you for taking action to protect my constituents. And clearly you just cannot sit back and wait for EPA. That is obvious. So thank you.

Mr. SAWYER. You are welcome.

Senator BOXER. Mr. Rick Webre. And would you like to introduce him, David?

Senator VITTER. Sure. I began to, in my opening. Rick Webre is Director of the Ascension Parish Office of Homeland Security and Emergency Preparedness. If there is any good news about the two incidents there it is that the response after the horrible accidents seemed to go very well, be very, very well coordinated. That is not by accident. It is because of a lot of work and practice.

And so, Mr. Webre, thanks for your service and welcome. Thank you for being here.

STATEMENT OF RICK WEBRE, DIRECTOR, ASCENSION PARISH OFFICE OF HOMELAND SECURITY AND EMERGENCY PREPAREDNESS

Mr. WEBRE. Madam Chairman, Senator Vitter, I appreciate the opportunity to testify.

I understand that the purpose of this hearing is to conduct oversight of Federal programs addressing chemical threats. My job is at the local level of government, so I will only provide insight from a local emergency management perspective.

Emergency managers perform the coordination efforts for all hazards within their jurisdiction. Petrochemical threats are only one of these hazards. They coordinate and plan through a Local Emergency Planning Committee, or LEPC, mandated by the Federal Emergency Planning and Community Right to Know Act of 1986.

A well-managed LEPC is one of the most critical functions that a community can form to prevent, mitigate, respond to and recover from an industrial incident. I cannot emphasize enough that all disasters are initially local.

Federal legislation governing chemical threats are unfunded mandates that are written at the strategic level of management, then interpreted operationally at the State level of government. Unfortunately, in many cases the tactical core at the local level of government is either overlooked or not well enforced. I believe that these Federal laws are not well enforced for the following reasons.

One is a lack of formal training and education for emergency managers in overseeing the LEPC. It is nearly nonexistent. Chairing the LEPC should be the responsibility of the duly appointed local emergency manager at the County level of government and should never be assigned to any other entity or the chemical industry.

There are no consequences should a State or local government choose not to enforce or poorly enforce the EPCRA mandates for an LEPC.

The Federal mandate to plan and coordinate with industry at the local level of government is unfunded. Funding that is available to local governments through Federal grants in many cases are retained at the State level of government. Chemical inventory filing fees that could assist in managing an Emergency Management Office and coordinating with industry are at times retained at the State level of government.

And metrics or standards do not exist in determining the performance level of an LEPC or SERC.

For over a decade, new Homeland Security doctrine has been drafted and significantly changed the emergency management environment in this Country. However, none of this superseded legislation from the U.S. Department of Transportation governing railway and pipeline incidents nor any element of the EPCRA law.

I believe that because of the new Federal doctrine, much less emphasis has been placed on EPCRA and the LEPC. However, I do not believe that more Federal legislation is required. I believe that the State and Federal legislation regarding chemical facilities, pipeline and railway incidents need to be compared, assessed and de-conflicted.

Instructions to first responders during a chemical incident must be predetermined and very simplistic. Complexity can result in poor performance on scene. My staff has developed very complex emergency operations plans which are excellent documents for training and planning and resourcing, but they are almost useless during an incident.

Creating one common operating picture between the chemical industry and the 911 center, the emergency operations center and the first responders on scene is absolutely critical. A simple few pages site-specific plan can contain the critical data that is needed.

And I cannot express how important the radio communications layer is during a petrochemical incident. There are 33 chemical facilities within our jurisdiction and each of them possesses a radio capable of communicating directly with the 911 center, the emergency operations center and the first responders on the ground. They communicate while referring to a site-specific plan that I mentioned earlier and this is what I referred to as one common operating picture.

None of this could have been accomplished without a having a strong LEPC in place. Our local chemical industry has been absolutely instrumental in coordinating with the LEPC as well as funding and managing the Ascension Parish Community Awareness Emergency Response Committee and the Geismar Area Mutual Aid Association. Between these two organizations, they fund and maintain the community siren system, defray the cost of our reverse 911 system, manage public outreach for the near-site population, provide mutual aid across a three-county jurisdiction, and manage the installation of our emergency radios.

I have been in my position for 7 years. Before June 2013, we experienced only two general emergencies resulting in zero fatalities and injuries. Now 2 weeks ago we experienced two general emergencies in 2 days resulting in three fatalities and over 100 injuries to chemical workers.

No other injuries were sustained by first responders or the general public and no damage was reported to adjacent critical infrastructure. I attribute this in large part to the ability of the first responder community and the chemical industry being able to operate effectively under a unified command.

I see that my time is up. My recommendations, Madam Chairman, were included in my written testimony.

[The prepared statement Mr. Webre follows:]

Parish of Ascension

OFFICE OF HOMELAND SECURITY &
EMERGENCY PREPAREDNESS

TOMMY MARTINEZ
Parish President

Richard A. Webre
Director

Jun 20, 2013

TO: The Honorable Barbara Boxer, Chairman
Senate Committee on Environment and Public Works

The Honorable David Vitter, Ranking Member
Senate Committee on Environment and Public Works

FROM: Richard Webre, Director, Ascension Parish Office of Homeland Security
828 South Irma BLVD, BLDG 3, Gonzales, LA 70737

SUBJECT: Hearing on Federal Risk Management Involving Chemical Threats.

Dear Madam Chairman,

I understand that the purpose of this hearing is to conduct over site of federal programs designed to prevent, mitigate, and address chemical threats, including risk management, emergency planning, and community right to know programs. I'm not a chemical or mechanical engineer; therefore, will not comment on technical prevention of industrial incidents, but I will provide insight from a local emergency management perspective. Emergency managers at the local level of government are tasked with the functions mentioned above as well as with coordination efforts for all hazards within their jurisdiction. Petro-chemical threats are only one of these hazards and are coordinated and planned within our jurisdiction through a Local Emergency Planning Committee (LEPC) that is mandated by the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. A well managed LEPC is the most critical function that a community can perform to prevent, mitigate, respond to and recover from an industrial incident.

I cannot emphasize enough that all disasters are initially local. Federal legislation governing local planning efforts for chemical threats at fixed facilities are unfunded mandates that are written at the strategic level of management. It is then interpreted operationally at the state level of government through a State Emergency Response Commission (SERC). Unfortunately, in many cases the tactical core that plans for and coordinates response to these incidents at the local level of government is at times either overlooked or not enforced. I believe that these federal laws are not enforced for several reasons:

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1. Formal training and education for emergency managers in overseeing an LEPC is nearly nonexistent. An LEPC hand book and the legislation itself is all that I ever had access to.
2. Chairing the LEPC should be the responsibility of the duly appointed local emergency manager at the county level of government and should never be assigned to another entity or chemical industry personnel.
3. There are no consequences should local or state governments choose not to enforce or poorly enforce the federal EPCRA mandate for an LEPC.
4. The federal mandate to plan and coordinate with industry at the local level of government is unfunded.
5. Funding that is available to local governments through federal grants (i.e. HMEP, EMPG) are in many cases retained at the state level of government.
6. TIER II filing fees that could assist in managing an emergency management office and coordinating with industry are at times retained at the state level of government.
7. Metrics do not exist in determining the performance level of an LEPC or SERC.

I'll be brief, but please allow me to elaborate on the history of the federal laws that we are discussing, which may illustrate why I believe that these mandates are not adequately enforced. In 1984 the Bhopal Disaster occurred, which was the world's worst industrial catastrophe. At a Union Carbide plant in Bhopal India forty metric tons of methyl isocyanine was accidentally released resulting in an immediate death toll of 2,259 Bhopal residents with an additional 3,900 receiving permanently disabling injuries.

In reaction the U.S. Congress passed an important piece of legislation, the Emergency Planning and Community Right to Know Act along with other legislation in 1986. This unfunded federal mandate with dual legislative purposes was the principle guiding doctrine of emergency managers for the next fifteen years in terms of petro-chemical emergency planning and public outreach. The office that I currently manage exits today because of this legislation.

In terms of emergency management September 11, 2001 changed our environment forever. To name only a few changes multiple Homeland Security Presidential Directives were issued, the Chemical Facility Anti-Terrorism Standards (CFATS) were developed and maritime security (MARSEC) standards for petro-chemical docks were enforced; however, none of this superseded legislation from the U.S. Department of Transportation governing railway and pipeline incidents, nor any element of the EPCRA law.

Then on August 23, 2005 hurricane Katrina occurred and the emergency management pendulum began to swing away from antiterrorism and back towards preparedness for natural disasters. Flooding events in the Midwest, tornados in Alabama and Oklahoma, and Super Storm Sandy reinforced this. Currently, with the incidents in West, Texas and Geismar, Louisiana we have come full circle.

I am the past president of the Louisiana Emergency Preparedness Association, and one of my responsibilities was oversight of the Louisiana Emergency Manager Certification and training program. I have traveled the state stressing the importance of maintaining a strong LEPC while

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trying to accomplish the tasks associated with recent state and federal emergency management doctrine.

I believe that because of new federal doctrine developed over the past thirteen years much less emphasis has been placed on EPCRA and the LEPC at the local level of government; however, I don't believe that more legislation is the answer. Again, let me reemphasize that all disasters are initially local, and I believe that state and federal legislation regarding chemical facility, pipeline, and railway incidents need to be compared, assessed and de-conflicted.

Each time that I assess the mandates from the state and federal government regarding chemical facilities, pipelines, railways, or natural disasters I refer to a quote over the door of the U.S. Army G-2 Section at the Pentagon: "Remember, at the end of every grandiose plan is an eighteen year old infantryman walking point." There may be a 21 year old young lady who is a 911 dispatcher that initiates all response to a major chemical related incident, or an 18 year old firefighter who is the first to arrive on scene. Instructions to them must be predetermined and simplistic. Complexity results in failure on scene.

My staff has developed complex emergency operations plans, hazardous material commodity flow studies, and risk-consequence assessments, all of which are excellent documents for performing long range planning, training and resourcing; however, they are useless during an incident. Creating one common operating picture between the chemical industry, the local 911 center, the Emergency Operations Center and the first responders on scene is absolutely critical. Simple, inexpensive, graphically displayed, two page standard operating procedures can accomplish this. EPCRA states that site specific plans should be developed for each facility in a jurisdiction. There is not a recommended format for this but these simple two page site specific plans can contain:

- Facility emergency points of contact.
- Half mile, one mile, and two mile radiuses around the core chemical processing units.
- One square mile emergency location grids.
- Adjacent facilities and critical infrastructure such as schools, businesses and residential areas that need to be protected, warned, evacuated, or sheltered in place.
- Predetermined road blocks to ensure that the public remains out of the hazard area.
- A brief list of extremely hazardous substances produced by the facility that allows fire chiefs to determine if an offensive attack is needed, or to move personnel to a safe location and allow the product to burn.
- Facility access gate locations.
- Siren identification numbers.
- Triage and command post locations.

No one appreciates technology more than I do; however, there is no app for this nor should there be. If industry is forced to comply with the installation of a mandated online reporting system the problem of triggering the system still exists. As an example, if an operator at a chemical facility experiences a catastrophic explosion and fire the last thing on his or her mind is logging onto a website, sitting behind a key board, and typing situational awareness information to government agencies echelons above their level; however, they can easily key up a radio and

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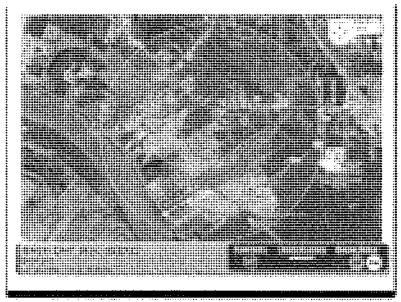
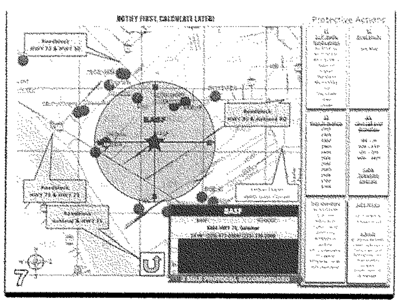
begin speaking to a 911 dispatcher reporting life-safety issues and requesting assistance. Additionally, government agencies that are echelons above their level do not have their fingers on the button that activate critical protective actions on scene. The 911 center usually does. The simple plans illustrated below are screen captures from plans in our jurisdiction similar to the one used during the recent incident in Geismar, LA.





I cannot express how important the radio communications layer is during a petro-chemical incident. There are 33 Tier II chemical facilities in our jurisdiction and all of them possess a P-25 compliant interoperable radio capable of communicating directly with the 911 center, the Emergency Operations Center, and the first responders on scene. They communicate while referring to the maps listed above. This is what I referred to as one common operating picture.

None of this could have been accomplished without having an extremely robust LEPC in place. There are no decisions that involve response to a chemical facility within our jurisdiction that are made in a vacuum. Local industry has been instrumental in coordinating with the LEPC as well

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as funding and managing the Ascension Parish Community Awareness Emergency Response (CAER) committee and the Geismar Area Mutual Aid Association (GAMA). The Ascension Parish CAER Committee funds and maintains the community siren system, defrays the cost of our reverse 911 system, and manages public outreach to the near site population. GAMA provides mutual aid across a three county jurisdiction for emergency response equipment and coordinates the installation of emergency radios for each facility.

I have been in my position for seven years. Before June 2013 we experienced only two general emergencies in the chemical industry resulting in zero fatalities or injuries. Two weeks ago we experienced two general emergencies in two days resulting in three fatalities and over one hundred injuries to chemical workers. No other injuries were sustained by first responders or the general public, and no damage was reported to adjacent critical infrastructure. I attribute this in large part to the ability of the first responder community and the chemical industry being able to operate effectively within a unified command. This could not have happened without prior planning, training and coordination. I believe that additional legislation and mandated IT platforms are not the answer. My recommendations are listed below:

1. De-conflict all federal legislation associated with chemical facilities as it applies to local government.
2. Modify EPCRA allowing strict enforcement of LEPC management.
3. Assign LEPC management to the duly appointed emergency manager at the county level of government.
4. LEPC meetings should be held at least quarterly.
5. Empower the LEPC with the ability to enforce EPCRA standards on chemical facilities that do not comply, not by contacting the EPA or a federal attorney, but within their own jurisdiction.
6. Provide funding directly to the emergency management office for LEPC management, but not without metrics to measure performance. Make this funding competitive if necessary for jurisdictions with a large petro-chemical presence.
7. Ensure that TIER II filing fees are shared with the LEPC or emergency management offices.
8. Ensure that emergency management grants and hazardous material grants are passed through to local government and that the assigned metrics are enforced.
9. Design and implement mandatory training for LEPC management.
10. Develop a simple standard for site specific response plans.
11. If anything is mandated to the petro-chemical industry, mandate that they possess a radio capable of communicating with the local 911 center, the EOC and first responders.

Sincerely,

RAWebre

Richard A. Webre
Director
Ascension Parish OHSEP

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Parish of Ascension

OFFICE OF HOMELAND SECURITY &
EMERGENCY PREPAREDNESS

TOMMY MARTINEZ
Parish President

Richard A. Webre
Director

August 19, 2013

TO: The Honorable David Vitter, Ranking Member
Senate Committee on Environment and Public Works

FROM: Richard Webre, Director, Ascension Parish Office of Homeland Security
828 South Irma BLVD, BLDG 3, Gonzales, LA 70737

SUBJECT: Follow Up Questions: Federal Risk Management Involving Chemical Threats.

Dear Senator Vitter,

Listed below are my responses to the follow up questions that I received from your office:

Q1: Could you please provide the Committee with the most up-to-date information on the tragic accidents in Geismar and Donaldsonville, LA.

Geismar, LA: After an initial investigation it was determined that instrumentation within in the control room at the Geismar facility was indicating a decrease in quench water flow through the re-boiler at the propylene fractionator. One of their employees went into the process unit to investigate. At some point thereafter, while inside the process unit, he radioed the control room and asked what the flow rate indicated. An operator in the control room replied that the flow rate had increased and asked what actions had the employee taken. His response over the radio was something to the effect of: Hold on, I'm on my way back to the control room, I'll tell you in a minute. Before he made it back to the control room, the explosion occurred. The primary cause of this incident is currently under investigation by federal and state agencies.

Donaldsonville, LA: The initial investigation indicates that nitrogen was being off-loaded from a tanker truck through a compressor rated at 15,000 psi into a small, temporary manifold rated at 6,000 psi. For unknown reasons it is believed that the output valves on the manifold was closed while the compressor was still in operation. Data obtained from the compressor indicates that the manifold experienced a catastrophic failure at approximately 9,000 psi. The mechanical failure of the manifold caused one fatality and multiple injuries.

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Q2: What is your view on the commitment of the chemical companies to operating their plants in a safe and secure environment? Is the process constantly improving?

This safety commitment from the local chemical companies is unwavering and is an integral part of their corporate culture. This commitment is instrumental in all planning processes of the Local Emergency Planning Committee (LEPC). Without the chemical industry commitment the LEPC would have very little value.

Yes, in our jurisdiction the process is constantly improving. All facilities within the parish have agreed to conduct a joint government-industry annual emergency communications audit. These audits are instrumental in process improvement over time. It allows my office to view any changes within the facility's contingency plan and allows the facility to become familiar with any new notification procedures from local government. Additionally, the quarterly LEPC meetings assist with process improvement.

Q3: Does your office do any joint emergency response training and exercises with the local chemical manufacturing companies, and can you elaborate on the usefulness of these exercises?

It's not only my office that participates with industry in joint training and exercises. Our local HAZMAT Team, fire departments, police departments and SWAT teams participate as well. Additionally, the Geismar Area Mutual Aid Association (GAMA), which is managed by industry, schedules and performs training events. GAMA manages the emergency radio system used by all of its chemical plant members to communicate with the 911 center and first responders. They also provide response equipment upon request from member companies during an incident.

An emergency manager never wants to meet a plant manager for the first time on the scene of an incident. Training and exercises are invaluable. It allows each of us to see the response from the other person's perspective.

Q4: What are the main "lessons learned" from your experiences that you feel would benefit other communities in the U.S.? How do other communities make their responses as good and effective as yours?

My only advice to appointed officials in other communities would be to find the best emergency managers and first responders in their state and hitch their wagon to them.

Sincerely,

Richard A. Webre
Director
Ascension Parish OHSEP

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Senator BOXER. Thank you so very much, Mr. Webre.

Mr. Paul Orum, Consultant, Coalition to Prevent Chemical Disasters. Welcome, sir.

STATEMENT OF PAUL ORUM, CONSULTANT, COALITION TO PREVENT CHEMICAL DISASTERS

Mr. ORUM. Good morning. My name is Paul Orum and I thank the Committee for the opportunity to present views important to a broad coalition of environmental health, labor, and community organizations. I have worked 25 years in government information policy on hazardous materials from the community perspective.

We all know what happened in Texas and that chemical plant incidents are common. I will depart from my written testimony just for three overall points. First, the explosion at West Fertilizer was preventable. Second, prevention is ultimately always more effective than response. And third, EPA should be using existing authorities to do more to prevent these incidents. I hope we can agree on the need for better public protections.

Returning to the specifics as listed in my written testimony, first, risk management planning should include reactive chemicals like the ammonium nitrate that detonated at West Fertilizer. Where there is serious potential harm to the public, reactive chemicals should be included in risk management planning which is, after all, the Clean Air Act program designed to cover such hazards. And, as has been noted, the Chemical Safety Board has in fact an open recommendation to EPA to do this.

Second, management systems and controls do fail. This seems mundane but we should plan on it. This goes to Senator Barrasso's point about rules and regulations. We should plan on failures. Chemical companies should be held responsible not only to understand their own hazards but also to understand less hazardous alternatives that are available in their industry.

Surveys show that risk management planning prompts some companies to remove avoidable hazards and there are examples in my written testimony. EPA should better incorporate methods that prevent potential consequences into risk management planning.

Third, the explosion in Texas illustrates the importance of the Clean Air Act's general duty to operate safely. West Fertilizer was subject to an incomplete patchwork of regulations. The general duty holds firms responsible for operating safely regardless of the completeness or incompleteness of Government actions. We would strongly oppose restricting the general duty in ways that could hamper enforcement or prevention.

Fourth, emergency planning notification is incomplete. The ammonium nitrate that exploded in Texas was not on the list of substances that require emergency planning notification. This is EPCRA 302. These notifications are only the starting point for emergency planning and do not guarantee follow up. Nonetheless, EPA should make sure that this list is more complete.

Fifth, EPCRA inventory reporting, this is Section 312, is valuable but insufficient. West Fertilizer did report ammonium nitrate to the State of Texas, a Tier II report. However, simple reporting on chemical inventories is not sufficient. We need to get from providing information to assuring communication. There should be fee-based programs to support prevention, pre-fire planning, inspections, drills and hazmat training for first responders.

Sixth, independent investigations are important. The Chemical Safety Board provides credible public information and focused recommendations for change. When we hear about barriers to investigations such as site access and preservation, we think they should be resolved.

A couple of quick issues beyond EPCRA and the Clean Air Act. Schools and nursing homes should not be in potential blast zones. State and local planners could benefit from Federal guidelines for safe setbacks. Site criteria for federally funded projects should take into account proximity to hazards.

And then, finally, hazardous chemical operations should not be underinsured.

In summary, sustained improvement is long term and involves a range of actions, not any one thing. But among immediate lessons from the recent explosions are the need for EPA to make sure that major recognized hazards first, are included in programs designed to address them, second, are subject to safer alternatives analysis by companies that hold them, and third, are covered by appropriate lists and thresholds and by the general duty to operate safely.

Thanks for the opportunity to testify. I would be glad to take any questions.

[The prepared statement of Mr. Orum follows:]

Testimony of Paul Orum

Consultant
Coalition to Prevent Chemical Disasters

Before the

Senate Environment and Public Works Committee

Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA

June 27, 2013

My name is Paul Orum. I thank the committee for the opportunity to present views important to a broad coalition of environmental health, labor, and community organizations known as the Coalition to Prevent Chemical Disasters. My background for 25 years is government information policy regarding hazardous materials.

Recent deadly explosions in West, Texas and Geismar, La., among others, remind us of the need for more effective public protections from industrial chemicals in populated areas.

- These recent incidents are hardly rare. The National Response Center recorded more than 11,000 oil and chemical spills in the last year alone.[1]

- The potential for large-scale incidents is ever present. A Congressional Research Service analysis indicates more than 470 facilities have vulnerability zones potentially affecting any of 100,000 or more people in the event of a worst-case toxic gas release.[2]

- Similar scenarios repeat. The fire and explosion at West Fertilizer is reminiscent of an event in Kansas City, Missouri, at which a construction facility storing ammonium nitrate first caught fire and then exploded killing six firefighters after they had responded to the fire. That was November 29, 1988.

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[1] On-line search of National Response Center conducted June 20, 2013. NRC is the national point of contact for reporting oil and chemical spills.
[2] Congressional Research Service memorandum to Senator Frank R. Lautenberg, *RMP Facilities in the United States,* November 16, 2012.

In general, the chemical safety landscape includes a lot of neglect, missed communication, static regulations, voluntary standards, and prosecution afterwards. There is not enough on prevention, technically competent inspections, community-wide awareness, producer responsibility, and safer alternatives. Regulations should not only control problems but also generate safer solutions. Accident prevention is ultimately more effective than response.

Risk management and emergency planning should be revised and updated in light of ongoing and recent plant explosions.

1] Risk management planning should include reactive chemicals like the ammonium nitrate that detonated at West Fertilizer. Where there is serious potential harm to the public, reactive chemical hazards should be included in Risk Management Plans (RMP) under the Clean Air Act, section 112(r). The Chemical Safety and Hazard Investigation Board has an open recommendation to EPA to this end:

> *Revise the Accidental Release Prevention Requirements, 40 CFR 68, to explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public, including those resulting from self-reactive chemicals and combinations of chemicals and process-specific conditions. (Recommendation No. 2001-1-I-H-R3)*

While the general duty clause of the clean air act presumably covers all facilities that hold extremely hazardous substances – including reactive substances that pose catastrophic hazards – the general duty does not explicitly cover important *proactive* elements of RMPs, such as the requirement to assess and communicate chemical hazards. Adding ammonium nitrate to the RMP program could have informed the owner of West Fertilizer, first responders, and the public about the magnitude of the danger, including off-site consequences, and might have prevented or reduced the tragic consequences of the explosion.

2] Management systems and controls do fail. Chemical facility owners and operators have a responsibility not only to understand their own chemical hazards, but also to understand less hazardous alternatives that are commercially available in their industry. EPA should require chemical facilities to review and include in RMPs available methods that prevent potential consequences of a worst-case incident. Such methods are often the most effective measures to protect workers at the site, emergency responders, and nearby populations.

Surveys show that the RMP process has prompted some companies to reduce or remove chemical hazards, one of the objectives of the program. The RMP process facilitates changes that companies may be considering for a variety of reasons, including safety, security, and other regulatory requirements.

- More than 554 drinking water and wastewater facilities converted from toxic inhalation hazard chemicals, removing dangers to more than 40 million Americans. (The 554 facilities are examples among other facilities that have converted to less hazardous operations.)[3]

- Facilities across some 20 industries already use options that do not pose the danger of a major toxic gas release, including bleach producers, water utilities, power plants, refineries, aluminum smelters, and many types of manufacturers.[4]

- Facilities that convert to safer operations may save money when all factors are considered, such as avoided costs of release control devices, liability insurance, regulatory compliance, personal protective equipment, site security, and emergency planning.[5]

These facilities typically substituted a less hazardous replacement chemical or process; used a chemical in a less hazardous form (such as less concentrated, or aqueous instead of gaseous); or adjusted the process design to minimize use or storage (such as generating the chemical on site as-needed without storage). These strategies are distinct from conventional risk management approaches such as containment, control, mitigation, or recovery of substances.

The House and Senate reports on the Clean Air Act Amendments of 1990 show that Congress viewed measures to remove avoidable chemical hazards as integral to the statutory goal of preventing accidental releases:

> *Measures which entirely eliminate the presence of potential hazards (through substitution of less harmful substances or by minimizing the quantity of an extremely hazardous substances present at any one time), as opposed to those which merely provide additional containment, are the most preferred.*[6]
>
> *Hazard assessments...include a review of the efficacy of various release prevention and control measures, including process changes or substitution of materials.* [7]

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[3] Center for American Progress, *Leading Water Utilities Secure Their Chemicals*, March 2010.
[4] Center for American Progress, *Chemical Security 101: What You Don't Have Can't Leak, or Be Blown Up by Terrorists*, November 2008.
[5] Center for American Progress, *Preventing Toxic Terrorism: How Some Chemical Facilities Are Removing Danger to American Communities*, April 2006.
[6] Senate Report on the Clean Air Act Amendments of 1990 Report # 101-228 (S-1630), page 209.
[7] House of Representatives, Clean Air Act of 1990: Conference Report to Accompany S-1630. Report #101-952 (October 26, 1990), page 349.

EPA took public comment on inherently safer approaches for facility design and operations when first implementing the RMP program.[8] Unfortunately the agency did not develop the approach at the time. As a result, covered facilities are not required to evaluate feasible chemical hazard reduction alternatives that may be the most effective safety measures. Basic prevention analysis elements such as the avoided costs and liabilities associated with alternate technologies are not standard elements of RMPs. Such elements are foundational to developing knowledge of solutions. They are among the elements that help make organizations intelligent about the advantages, costs, and feasibility of technology options.

In March 2012, EPA's National Environmental Justice Advisory Council urged the agency to prevent chemical disasters by more fully using its authorities to advance safer chemical processes under the Clean Air Act.[9] In July 2012, more than 50 organizations petitioned EPA to commence rulemaking under the Clean Air Act and to revise agency guidance for enforcement of the general duty clause.[10]

The EPA Administrator has authority under the Clean Air Act, section 112(r), to incorporate methods that prevent potential consequences into RMPs and should do so.

3] The explosion at West Fertilizer illustrates the importance of the Clean Air Act's general duty to operate safely. West Fertilizer was subject to an incomplete patchwork of chemical safety regulations regarding ammonium nitrate. The general duty clause holds firms responsible for understanding and managing their chemical hazards regardless of the completeness of government actions to regulate those hazards. For example, the ammonium nitrate at West Fertilizer was not on the RMP list of substances and thresholds. The general duty is an important tool for not only enforcement but also prevention. EPA's implementation guidance for the general duty clause recognizes that removing chemical hazards can be an effective safety measure, but EPA should further develop the concept in this guidance. We strongly oppose restricting the general duty clause in ways that could hamper enforcement or prevention. We also oppose arbitrarily fragmenting federal authorities between safety and security. By Presidential directive, the U.S. EPA is the lead agency to oversee security at drinking water and wastewater facilities.[11]

4] EPCRA emergency planning notification is incomplete. The ammonium nitrate that exploded at West Fertilizer was not on the EPCRA section 302 list of substances that require emergency planning notification. EPCRA section 302 requires facilities that hold threshold amounts of listed chemicals to notify their State Emergency Response Commission (SERC)

[8] 60 Federal Register 13526, March 13, 1995.
[9] National Environmental Justice Advisory Council letter to EPA Administrator Lisa P. Jackson, March 14, 2012.
[10] Petition to the Environmental Protection Agency to Exercise Authority Under Section 112(r) of the Clean Air Act to Prevent Chemical Facility Disasters Through the Use of Safer Chemical Processes, July 25, 2012.
[11] Homeland Security Presidential Directive/HSPD 7, *Critical Infrastructure Identification, Prioritization, and Protection*, December 17, 2003.

and designate a point of contact at the facility to participate in emergency planning. It should be acknowledged that local emergency response capacities are often starkly overmatched by the magnitude of chemical hazards, and that activity levels of Local Emergency Planning Committees (LEPC) vary widely. Too much is left to the mostly-volunteer LEPCs – states should have fee-based programs that support hazard reduction, inspections, and regular drills. Nonetheless, EPCRA 302 notifications are a starting point for local emergency planning. The EPA Administrator has responsibility to modify the EPCRA 302 list and should do so. While lists and thresholds will inevitably fall short – hence the need for a general duty to operate safely – EPA should revise the EPCRA 302 list to include common substances that are known emergency hazards. This process should include both proactive listing criteria and a review of substances involved in serious incidents reported to the National Response Center.

5] EPCRA inventory reporting is valuable but insufficient. Owners and operators of facilities that hold large amounts of hazardous chemicals have an obligation to clearly communicate chemical hazards to those who could be affected prior to an emergency. West Fertilizer did report ammonium nitrate to the Texas SERC under EPCRA section 312 (a Tier II report). Texas apparently maintains Tier II reports in an electronic format, which is important. EPA should continue to support and promote free electronic information management tools such as Tier II Submit, RMP*Comp, and CAMEO. The EPA should also develop routine electronic access to EPCRA 312 Tier II data from each state through memoranda of understanding or other means (as should OSHA and DHS). EPA should also promote awareness of reporting and planning obligations among regulated facilities. However, simple awareness of chemicals on-site is not sufficient. Local emergency planners and responders need not only chemical inventories but also worst-case and planning-case scenarios (which are included in RMPs but not EPCRA Tier II reports). They also need regular information about the number and type of high-hazard shipments in all modes of transportation. Fee-based programs should support prevention, pre-fire planning, technically competent inspections, drills, and NFPA-compliant hazmat training – including clear reminders that evacuating may be the most prudent course of action.

6] Independent investigations are important. The Chemical Safety and Hazard Investigation Board, also established by the Clean Air Act 112(r), produces root cause investigations and safety recommendations after the most serious chemical accidents. These activities are important to the public because they provide credible information and focused recommendations for change. Barriers to effective investigations, such as site access and preservation, should be resolved.

Issues beyond EPCRA and Clean Air Act, 112(r):

7] Schools and nursing homes shouldn't be in potential blast zones. It is not an easy problem. Communities may grow up around chemical facilities or vice versa, but they are too close together in many places. State and local planners could benefit from federal guidelines for substantial safe setback distances, based on a worst-case scenario, in order not to continue to compound the problem when siting new buildings. School buildings were badly damaged by the blast in West, Texas. School siting criteria should take into account proximity to hazardous chemical facilities. Recipients of federal construction funds for buildings that will be used by potentially vulnerable populations (such as head start schools, hospitals, or nursing homes) should be subject to oversight to prevent building in the near zone of potential harm. In addition, the agricultural chemicals security tax credit assists agricultural distributors with conventional security measures such as fences and lights; it should assist facilities that want to move locally to safer locations.

8] Hazardous chemical operations shouldn't be underinsured. West Fertilizer reportedly carried only $1 million in liability insurance, a fraction of the estimated $100 million in property damage alone. Companies that hold large amounts of extremely hazardous substances should be required to maintain sufficient liability insurance to cover a worst-case chemical release. Such a requirement would provide a reasonable cost incentive for companies to develop and use feasible alternatives. In addition, common carrier obligations encourage widespread overuse of railcars for shipping and storing extremely hazardous substances. Railroads have sought to have shippers share liability risks associated with extremely hazardous substances (which they are required to carry) and to have shippers develop safer substitutes.[12]

Sustained improvement in chemical hazard prevention, preparedness, and response is long term and involves a range of actions. Among the most immediate lessons from the West Fertilizer explosion are for EPA to make sure major recognized hazards are 1) included in the programs designed to address them, 2) subject to safer alternatives analysis by the companies that hold them, 3) covered by appropriate lists and thresholds, and by the general duty to operate safely.

Thank you again for the opportunity to testify. I would be glad to take any questions.

[12] Center for American Progress, *Toxic Trains and the Terrorist Threat: How Water Utilities Can Get Chlorine Gas Off the Rails and Out of American [illegible]*, April 2007.

Additional Testimony of Paul Orum
Consultant
Coalition to Prevent Chemical Disasters

In Response to
Questions from Senator Barbara Boxer
Concerning Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions at West, TX and Geismar, LA.

October 16, 2013

1. **Can you please provide me with a copy of the petition referred to in your testimony that a coalition of environmental, health, worker and community organizations submitted to Environmental Protection Agency that asked the agency to modernize its risk management program safeguards?**

A copy of this petition from July 25, 2012 is attached.

2. **Can you please submit a copy of the National Environmental Justice Advisory Council letter to the Environmental Protection Agency concerning the Agency's need to modernize its risk management program safeguards?**

A copy of this letter from March 14, 2012 is attached.

3. **Can you please provide me with a copy of the documents related to the 2002 draft proposal by former Environmental Protection Agency Administrator Whitman and former Director Ridge of the Office of Homeland Security to enhance safeguards at chemical facilities?**

Copies of these documents from June 2002 are attached.

4. **Is the enforcement of existing laws and the implementation of management strategies adequate to eliminate the threat of chemical disasters? Could a requirement to consider safer alternatives to toxic chemicals and dangerous industrial processes enhance safety for workers in facilities and people in communities located near such plants?**

Effective compliance enforcement is necessary, but insufficient. Providing additional resources to the three principal federal agencies involved in oversight of chemical safety and security (EPA, OSHA, and DHS) could improve compliance, but would not address fundamental shortcomings that limit these agencies' effectiveness.

Three factors illustrate why enforcement of existing laws and management strategies alone cannot eliminate the threat of chemical disasters.

First, the patchwork of existing chemical safety and security laws does not fully cover conditions of ammonium nitrate storage found at West Fertilizer and similar facilities. As noted in my testimony, there are shortcomings in existing laws covering risk management planning, emergency planning notification, local emergency preparedness, chemical inventory reporting, and incentives for change, among other areas. Further, neither the OSHA Explosives and Blasting Agents Standard (1910.109(i)) nor National Fire Protection Association codes prohibit relevant conditions found at West Fertilizer and many similar facilities. Among those conditions are flammable wooden storage bins, the lack of fire-suppression sprinkler systems, and the use of conventional detonable forms of ammonium nitrate. In addition, at current staffing levels, it would take federal OSHA 131 years to inspect each U.S. worksite just once.[1] OSHA had last inspected West Fertilizer in 1985.

Second, even vigorous enforcement of conventional regulations *could not be expected* to prevent all serious chemical emergencies. The concept of "normal accidents" is well known in the chemical industry. Where chemical processes are interactively complex and tightly coupled "normal accidents" are inevitable.[2] The interactive complexity of multiple small failures foils

[1] AFL-CIO, *Death on the Job: The Toll of Neglect*, April 2013.
[2] Charles Perrow, *Normal Accidents: Living With High Risk Technologies*, Princeton University Press, 1999.

even the most effective conventional safety arrangements. Relatively less complex operations also inevitably experience accidents if the process is widely enough used by varied individuals and organizations amid diverse requirements and situations. Control and management strategies that add safety features to existing hazards may reduce the frequency of serious accidents but not the inevitability of the underlying hazard.

Third, current regulations are based on strategies that control and manage chemical hazards much more than on strategies that prevent and avoid these hazards. Current regulations do not systematically develop the most effective solutions: the chemical hazard prevention strategies that reduce or remove potential catastrophic consequences.

As noted in my testimony, the Environmental Protection Agency (EPA) partially asserted its authority in this area by taking public comment (in 1995) on requiring chemical facilities to analyze technology options as part of Risk Management Plans (RMP). However, the agency did little to develop the approach. Nonetheless, the preference for primary prevention is embedded in the Clean Air Act, including the general duty clause and section 112(r)(7)(A).

There is little question that preventing the possibility of serious chemical emergencies through technological change can enhance the safety of workers and communities in and around high hazard chemical facilities. The surveys cited in my testimony identify alternatives that are already in use across some 20 industry sectors. Such changes can also be expected to reduce the number of facilities subject to oversight by federal agencies and hence the resources those agencies require to conduct enforcement. What is missing is systematic development of preventive approaches.

Submitted to the US Environmental Protection Agency:

July 25, 2012

PETITION TO THE ENVIRONMENTAL PROTECTION AGENCY TO EXERCISE ITS AUTHORITY UNDER SECTION 112(r) OF THE CLEAN AIR ACT TO PREVENT CHEMICAL FACILITY DISASTERS THROUGH THE USE OF SAFER CHEMICAL PROCESSES

Nearly thirty years after the disastrous release of methyl isocyanate from a chemical plant in Bhopal, India, and more than a decade after the attacks of September 11, 2001, brought home the vulnerability of U.S. chemical facilities to terrorist attacks that could cause similarly devastating releases of hazardous materials, many Americans remain at risk of death or injury from the unforeseen release of harmful chemicals from nearby industrial plants, water treatment facilities, and the like. To address this risk, the undersigned organizations and individuals hereby petition the Environmental Protection Agency (EPA), pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(e), and section 112(r)(7)(A) of the Clean Air Act, 42 U.S.C. § 7412(r)(7)(A), to commence a rulemaking to require the use of inherently safer technologies, where feasible, by facilities that use or store hazardous chemicals.

Petitioners also request that, pending completion of a rulemaking under section 112(r)(7)A), EPA revise its guidance concerning the enforcement of the Clean Air Act's general duty clause, section 112(r)(1), 42 U.S.C. § 7412(r)(1), to make clear that the duty to prevent releases of extremely hazardous substances includes the use, where feasible, of safer technologies to minimize the presence and possible release of hazardous chemicals.

I. THE NEED FOR ACTION

A. MILLIONS OF AMERICANS ARE THREATENED BY POSSIBLE ACCIDENTAL RELEASES OF HAZARDOUS CHEMICALS.

The Bhopal tragedy, which killed thousands and injured hundreds of thousands, alerted the world to the potential magnitude of the consequences of a major release of hazardous substances from a chemical facility. In 1990, as a partial response to this threat, Congress enacted section 112(r) of the Clean Air Act, 42 U.S.C. § 7412(r), which provided EPA with new powers to address possible releases of extremely hazardous substances. Two decades later, however, Americans remain vulnerable to the risk of catastrophic releases of such materials—a risk that, we are increasingly aware, is magnified by the possibility that chemical facilities may be targets of terrorist attacks that may result directly in the release of deadly chemicals.

The scope of these hazards is revealed by information submitted to EPA by operators of facilities that use hazardous chemicals. Under Clean Air Act section 112(r)(7)(B), 42 U.S.C.

§ 7412(7)(B), EPA has promulgated regulations requiring facilities that possess more than threshold amounts of designated hazardous substances to submit risk management plans (RMPs) to EPA. The RMP regulations require facilities to identify "worst-case scenarios" that indicate how many people would be at risk of exposure in the event of a release of the hazardous materials that are on-site.

In April 2011, the Congressional Research Service analyzed the most recent information from RMPs submitted to EPA and found that there were 94 facilities across the country where a release of hazardous substances *would potentially affect a population of 1 million people or more.* Another 398 facilities placed between 100,000 and 1 million people at risk; over 2,000 more threatened between 10,000 and 100,000 people, and more than 4,500 could affect 1,000 to 10,000 people.[1]

Another illustration of the extent of the potential exposure of the public to hazardous releases is the Department of Homeland Security's (DHS) designation of nearly 5,000 U.S. chemical facilities as presenting a high risk of vulnerability to releases of hazardous substances. DHS has promulgated "chemical facility anti-terrorism standards" (CFATS) pursuant to legislation giving it interim authority to impose security measures on facilities that have threshold amounts of 322 designated hazardous chemicals, depending on DHS's determination of whether those facilities present a high level of risk.[2] Under the CFATS regulations, DHS has divided high-risk facilities into four tiers. According to a January 2012 analysis by the Congressional Research Service, as of September 2011, 4,589 facilities had been finally or tentatively designated has high-risk, with 102 in the first tier representing the greatest threat, 539 in the second tier, 1,290 in the third tier, and 2,638 in the fourth tier.[3]

The DHS designations of high-risk facilities substantially understate the public threat posed by concentrations of dangerous chemicals because many chemical facilities are excluded from the purview of DHS's CFATS regulations. Most notably, the CFATS regulations do not cover water treatment facilities, many of which use and store significant quantities of chlorine gas, a potent poison that can threaten death or injury to large numbers of people if released into the atmosphere. As of March 2010, an estimated 2,600 water treatment facilities nationwide continued to use large quantities of chlorine gas.[4] Also exempt from CFATS regulations are an undetermined number of facilities, including most refineries, that are nominally regulated under the Maritime Transportation Security Act.

Such concentrations of hazardous chemicals pose significant threats of releases as a result of accidents during normal operations. Illustrative examples abound. In 2011, the Center for Public Integrity and ABC News reported that 16 million Americans live within range of potential releases of clouds of toxic hydrofluoric acid from gasoline refineries, including 550,000 near a single plant in Texas City, Texas, and 2.2 million near a refinery outside Minneapolis,

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[1] Congressional Research Service, *RMP Facilities in the United States as of April 2011* (April 12, 2011).

[2] *See* Pub. L. No. 109-295, § 550 (2006); 6 C.F.R. Part 27.

[3] Congressional Research Service, *Chemical Facility Security: Issues and Options for the 112th Congress*, at 5 (Jan. 13, 2012).

[4] Reece Rushing, Paul Orum, *Leading Water Utilities Secure Their Chemicals* (March 2, 2010), http://www.americanprogress.org/issues/2010/03/chemical_security.html/

Minnesota. [5] A 2009 explosion at a refinery in Corpus Christi, Texas, resulted in the release of more than a ton of the material, and a much larger release was only narrowly avoided.[6] Other examples include a 2008 explosion and fire at a Bayer facility in West Virginia, which narrowly missed causing a breach in piping on the top of an above-ground tank of methyl isocyanate, which in turn would have resulted in a deadly release of the same chemical responsible to the Bhopal disaster.[7] In 2007, an explosion and fire at a Texas refinery resulted in the release of nearly three tons of chlorine gas, with deaths and injuries avoided only by prompt evacuation of workers.[8] A 2007 release of 900 pounds of chlorine gas in Tacoma, Washington, required closure of the entire Port of Tacoma and resulted in 25 hospitalizations, and other releases of chlorine associated with railway accidents have resulted in numerous deaths in recent decades.[9]

Natural disasters such as hurricanes, floods, and earthquakes also create the potential for releases of hazardous chemicals. For example, numerous releases of potential toxins, including several thousand pounds of ammonia from a food-processing plant, resulted from the 1989 San Francisco earthquake.[10] Flooding in Brazil in 1995 resulted in a massive release of ammonia from a chemical plant requiring the mass evacuation of a nearby city and causing numerous injuries.[11] As extreme weather events proliferate in the wake of global warming, such disasters will become increasingly likely.

Concentrations of hazardous chemicals at industrial and other sites also present obvious targets for terrorists. Analyses by federal security agencies indicate that the targeting of concentrations of chlorine gas or other hazardous materials could easily cause tens of thousands of deaths and hundreds of thousands of injuries in downwind areas. The National Academies of Sciences summed up the point in a 2006 report: "it is easy to determine that a single chemical event could cause catastrophic casualties."[12] Moreover, the dispersed nature of facilities storing hazardous chemicals, their large number, and the shipment of chemicals between them render it exceedingly difficult to ensure that such an attack cannot occur or succeed, and the close proximity of major facilities to large populations of potential victims makes the evacuation in the event of a release problematic, to say the least.

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[5] J. Morris, et al., *Use of toxic acid puts millions at risk* (Feb. 24, 2011), http://www.iwatchnews.org/2011/02/24/2118/use-toxic-acid-puts-millions-risk.

[6] *Id.*

[7] *See* National Research Council, *The Use and Storage of Methyl Isocyanate (MIC) at Bayer CropScience* (2012).

[8] R. Moure-Eraso. *It's time for government and industry to adopt inherently safer technology*, Charleston Gazettte, June 23, 2012. http://wvgazette.com/Opinion/OpEdCommentaries/201206230057.

[9] R. Jones, et al., *Chlorine Gas: An Evolving Hazardous Material Threat and Unconventional Weapon*, 11 West J. Emerg. Med. 151 (2010). http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2908650/.

[10] S. Young, et al., *Natural and Technologic Hazardous Material Releases During and After Natural Disasters: A Review*, 322 Science of the Total Environment 3, 11 (2004).

[11] *Id.* at 5.

[12] National Research Council, *Terrorism and the Chemical Infrastructure: Protecting People and Reducing Vulnerabilities* 99 (2006).

B. USE OF INHERENTLY SAFER TECHNOLOGIES CAN HELP ENSURE PROTECTION OF THE PUBLIC.

Technologies and processes to reduce the likelihood that hazardous materials will be released, and actions to minimize or mitigate the consequences of releases, are of course essential parts of any strategy to protect the public against harmful chemical exposures. But as long as hazardous materials remain present in sufficient quantities to cause injury, such measures always leave some remaining degree of risk, and often substantial risk, particularly given the possibility of such unpredictable factors such as terrorism or natural disasters that may negate the effectiveness of protective measures. By contrast, if a hazardous material is not present at a site, or not present in a quantity capable of causing harm, there is no possibility of a catastrophic release.

This intuitively obvious proposition underlies the concept of using safer materials and processes to avoid chemical hazards — that is, taking steps to eliminate or minimize extremely hazardous materials where feasible. As the American Chemical Society has stated:

> Inherently safer industrial technologies for the production, transport, and use of industrial and agricultural chemicals, pharmaceuticals, and both commodity and advanced materials is a vital concept that is currently the focus of significant activity in a wide range of forums in the industrial, academic, and governmental arenas. While many industrial processes and sectors use various definitions of this term, collectively, they capture a group of processes and technologies that improve safety by greatly reducing or eliminating hazards through a permanent and inseparable element of the process. Thus, safety is built into the process, not added on, and hazards are reduced or eliminated, not simply controlled.
>
> Where feasible, inherently safer process technology can greatly reduce potential threats to public and worker safety, health, the environment and plant and public infrastructure from a variety of scenarios that might result in the release—fugitive or otherwise—of hazardous and toxic materials.
>
> Many organizations involved in the chemical, pharmaceutical, and related process industries have strongly advocated and advanced inherent safety, supporting the work of professional societies and academic institutions, utilizing the concept in training chemists and engineers, and incorporating it into internal process safety management programs. Inherent safety is a well recognized engineering process concept that is based on the belief that a hazard can be moderated or eliminated, thereby reducing risk and possibly removing the risk altogether. Certainly an inherently safer system or technology can make hazardous events less likely and less intense if there is an accident. [13]

These considerations led the National Research Council of the National Academy of Sciences, in its influential 2006 report, *Terrorism and the Chemical Infrastructure: Protecting People and Reducing Vulnerabilites*, to recommend that "[t]he most desirable solution to

[13] American Chemical Society, *Inherently Safer Technology for Chemical and Related Industrial Process Operations*, 2009-2012, http://portal.acs.org/portal/PublicWebSite/policy/publicpolicies/promote/ist/WPCP_011539.

preventing chemical releases is to reduce or eliminate the hazard where possible, not to control it. This can be achieved by modifying processes where possible to minimize the amount of hazardous material used, lower the temperatures and pressures required, replace a hazardous substance with a less hazardous substitute, or minimize the complexity of a chemical process."[14] More recently, in its report on the near-disaster at Bayer's West Virginia facility, the NAS has emphasized that the philosophy of inherently safer technology recognizes that "[i]t may not always be feasible to eliminate or reduce hazards, but ... this [must] be attempted before moving on to specification of risk management equipment and procedures."[15] Inherently safer technologies not only "have the potential to reduce the probability or likelihood that a worst-case accident occurs," but also "to provide assurance that, should a worst-case release occur (i.e., the entire chemical inventory under worst meteorological conditions), an absolute upper bound to the magnitude of an offsite release exists, and that this upper bound is less severe than the worst-case accident resulting from conventional passive, active, and procedural controls."[16]

The success of the inherently safer technology approach depends on the availability and feasibility of alternatives to the use and storage of dangerous quantities of extremely hazardous substances. Practical experience demonstrates that such alternatives are, in many cases, readily available. Clorox, for example, announced in 2009 that it would eliminate the use of bulk amounts of chlorine gas in its bleach-manufacturing process, eliminating the possibility of large-scale releases from its facilities.[17] Similarly, a survey in March 2010 found that 554 water treatment facilities had converted from reliance on chlorine gas and other extremely hazardous substances to alternative technologies, such as the use of liquid bleach and ultraviolet light as disinfectants, although nearly 2,600 water and wastewater facilities continued to rely on chemicals that would endanger the public in the event of an accidental release.[18] Similarly, alternatives to the use of hydrofluoric acid in gasoline refining are available, yet one third of the nation's refineries continue to rely on it.[19] These examples illustrate both the feasibility of using inherently safer technology and the continuing need for requiring its adoption in the face of the inertia that leads owners and operators of particular facilities to hold to outmoded and dangerous practices even in the face of recognition in their own industries that there are feasible and cost-effective alternatives. The scope of the potential application of safer technologies in the prevention of accidents is indicated by a recent analysis of Chemical Safety Board accident investigation reports finding that the Board has addressed the potential application of safer technology to avoid such accidents in 90 of the serious accidents it has investigated.[20]

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[14] National Research Council, *Terrorism and the Chemical Infrastructure: Protecting People and Reducing Vulnerabilities* 7 (2006)

[15] National Research Council, *The Use and Storage of Methyl Isocyanate (MIC) at Bayer CropScience*, at 4-53 (2012).

[16] *Id.* at 4-57.

[17] M. McCoy, *Clorox to Stop Using Chlorine*, Chemical & Engineering News, Nov. 9, 2009, http://pubs.acs.org/cen/news/87/i45/8745notw2.html

[18] Rushing & Orum, *supra*.

[19] J. Morris, et al., *Use of toxic acid puts millions at risk* (Feb. 24, 2011), http://www.iwatchnews.org/2011/02/24/2118/use-toxic-acid-puts-millions-risk.

[20] U.S. Chemical Safety Board, *Inherently Safer: The Future of Risk Reduction* (July 11, 2012) (video), http://www.csb.gov/videoroom/detail.aspx?VID=66.

As the Association of American Railroads has put it, "We can no longer continue to risk the lives of millions of Americans by using, transporting and storing highly toxic chemicals when there are safer alternatives commercially available. It is time for the nation's big chemical companies to stop making the dangerous chemicals that can be replaced by safer substitutes or new technologies currently in the marketplace."[21]

C. EXISTING REGULATIONS DO NOT REQUIRE USE OF SAFER TECHNOLOGIES EVEN WHERE READILY FEASIBLE.

Despite the clear benefits of using feasible technologies that do not result in concentrations of lethal chemicals that pose threats to the public, existing federal regulations governing chemical facilities fail to address the subject adequately. Although some states and local governments have attempted to step into this void, the issue is national in scope, and resource scarcity and competitive pressures may bar individual states from taking effective steps to protect their populations.

As noted above, EPA has invoked its authority under Clean Air Act section 112(r)(7)(B) to promulgate the RMP regulations, but those regulations are primarily procedural, requiring facilities to prepare and file planning documents with federal authorities; they do not impose substantive requirements to prevent chemical hazards through the use of safer technologies. Nor do the RMP regulations explicitly require facilities to systematically evaluate and document major technological options that can remove chemical hazards. Moreover, EPA's regulatory authority under section 112(r)(7)(B) does not reach all facilities that pose threats of release of hazardous chemicals, but only facilities that have more than threshold amounts of those chemicals that EPA has listed under section 112(r)(3).

EPA also has not, to date, broadly invoked the general duty clause in Clean Air Act section 112(r)(1), which requires owners and operators of chemical facilities to design and maintain safe facilities in such a manner as to prevent releases of hazardous chemicals, to require the use of available safer technologies and alternative materials and processes that would avoid risks to the public. EPA's existing guidance on the enforcement of the general duty clause does state that owners and operators of facilities "should try to substitute less hazardous substances for extremely hazardous substances or minimize inventories when possible" and recognizes that "[t]his is usually the most effective way to prevent accidents and should be the priority of a prevention program."[22] However, it does not appear that EPA has vigorously invoked the general duty clause to obligate facilities to recognize technological alternatives and to adopt feasible alternatives that *ensure* failsafe design and maintenance, or that industry recognizes this as a requirement under the general duty clause as currently enforced by EPA.

Nor do DHS's CFATS regulations address the use of inherently safer technology. DHS has authority to promulgate interim regulations applicable to chemical facilities, requiring them to implement performance-based site-security standards. *See* Pub. L. No. 109-295, § 550 (2006).

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[21] Association of American Railroads, *Homeland Security Committee urged to consider safer chemicals; Chemical companies should stop manufacturing extremely dangerous chemicals* (2008), http://www.greenpeace.org/usa/Global/usa/report/2008/2/railroads-in-favor-of-safer-te.pdf.

[22] EPA, Guidance for Implementation of the General Duty Clause Clean Air Act Section 112(r)(1), at 15 (2000).

Defending facilities as they currently exist against attack is not a substitute for designing them to be inherently safer. DHS has not required safer chemical processes that would prevent chemical releases that can occur not only as a result of security breaches, but also because of process accidents or natural disasters. Moreover, DHS is prohibited from requiring the use of any "particular security measure" in its CFATS regulations, *see id.* § 550(a), which would complicate any potential attempt to use DHS's authority to require use of specific safer processes and chemicals. Finally, DHS's authority does not extend to many facilities that use significant quantities of hazardous materials, most notably water treatment facilities, large numbers of which continue to rely on lethal chlorine gas. *See id.*

II. EPA Has Authority to Act Under Clean Air Act Section 112(r).

Despite the inadequacy of existing regulatory measures, EPA has legal authority under existing statutes to take actions requiring safer technologies to reduce the possibility of catastrophic releases. In particular, section 112(r) contains two sources of authority: (1) EPA's hitherto unused authority under section 112(r)(7)(A) "to promulgate release prevention, detection, and correction requirements which may include monitoring, record-keeping, reporting, training, vapor recovery, secondary containment, and other design, equipment, work practice, and operational requirements." 42 U.S.C. § 7412(r)(7)(A); and (2) the "general duty clause," section 112(r)(1), which imposes an obligation on all owners and operators of facilities that use extremely hazardous substances to "design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur," 42 U.S.C. § 7412(r)(1).

A. Section 112(r)(7)(A) Authorizes EPA to Impose Design and Operational Requirements to Prevent Releases.

EPA's regulatory authority under § 112(r)(7)(A) directly provides EPA with regulatory authority to require chemical facilities to avoid or mitigate releases through the use of safer technologies. Section 112(r)(7)(A) provides the agency broad authority (which it has apparently never exercised) to regulate chemical facilities in order to prevent accidental discharges:

> In order to prevent accidental releases of regulated substances, the Administrator is authorized to promulgate release prevention, detection, and correction requirements which may include monitoring, record-keeping, reporting, training, vapor recovery, secondary containment, and other design, equipment, work practice, and operational requirements. Regulations promulgated under this paragraph may make distinctions between various types, classes, and kinds of facilities, devices and systems taking into consideration factors including, but not limited to, the size, location, process, process controls, quantity of substances handled, potency of substances, and response capabilities present at any stationary source. Regulations promulgated pursuant to this subparagraph shall have an effective date, as determined by the Administrator, assuring compliance as expeditiously as practicable.

42 U.S.C. § 7412(r)(7)(A).

The authority conferred by § 112(r)(7)(A) clearly encompasses the power to require the use of safer technology to reduce or eliminate quantities of extremely hazardous substances. The provision specifically authorizes the imposition of "design" and "operational" requirements, and further authorizes EPA to make distinctions among facilities based on "process controls, quantity of substances handled, [and] potency of substances." This authority seems ideally suited to serve as the basis for regulations that require that facilities be designed and operated in such a manner as to minimize quantities of highly potent hazardous substances. And it permits regulation of any stationary source, thus permitting the agency to regulate without regard to whether "threshold" quantities of substances are present (as under regulations pursuant to § 112(r)(7)(B)) and without restrictions on the types of facilities subject to regulation (such as the limits imposed on DHS in establishing the CFATS regulations).

That EPA's authority under § 112(r) encompasses the power to require measures to prevent release through eliminating or minimizing the use of dangerous chemicals is fully consistent with the intent of the enacting Congress. As the Senate Report on the 1990 legislation that added § 112(r) to the Clean Air Act explains, such measures were viewed by Congress as the best way to achieve the statutory goal of preventing accidental releases:

> The objectives of the proposed section ... include both the prevention of accidental releases and the minimization of the consequences which may result. Systems and measures which are effective in preventing accidents are preferable to those which are intended to minimize the consequences of a release. *Measures which entirely eliminate the presence of potential hazards (through substitution of less harmful substances or by minimizing the quantity of an extremely hazardous substance present at any one time), as opposed to those which merely provide additional containment, are the most preferred.*

S. Rep. No. 101-228, at 209, 1990 U.S.C.C.A.N. 3385, 3594 (emphasis added).

EPA's regulatory authority under § 112(r)(7)(A) extends broadly to "accidental releases" of covered chemicals. Moreover, the statutory definition of "accidental releases" does not preclude the agency from requiring safer chemical technology simply because such measures would reduce the likelihood and possibility of releases caused by terrorist attacks as well as releases caused by other types of accidents. For purposes of § 112(r), an "accidental release" is defined as "an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source." 42 U.S.C. § 7412(r)(2)(A). Proponents of the view that EPA should not use its authorities under section 112(r) to require safer technologies have argued that this definition does not allow EPA to take action based on the possibility of releases caused by terrorism, because such releases are not "unanticipated" from the standpoint of the terrorists. The argument is incorrect for several reasons.

To begin with, although the use of safer technologies would be highly beneficial in reducing the likelihood and possibility of catastrophic releases caused by terrorism, it would be equally effective in preventing and mitigating the consequences of "traditional" accidents not caused by terrorism, such as the Bhopal release that was among the motivating factors in the enactment of § 112(r).[23] Thus, EPA's authority to use its section 112(r) powers for this purpose

[23] Indeed, the cause of the Bhopal disaster was a controversial issue, and at the time of the legislation Union Carbide had blamed sabotage, although the Indian government and independent experts disagreed. *See Theory of Bhopal Sabotage Is Offered*, N.Y. Times, June 23, 1987, http://www.nytimes.com/1987/06/23/world/theory-of-bhopal-sabotage-is-offered.html?pagewanted=all&src=pm; *Disaster in Bhopal Laid to Sabotage: Study Blames Worker at Carbide Facility*, L.A. Times, May 11, 1988, http://articles.latimes.com/1988-05-11/business/fi-

does not depend on whether releases resulting from terrorism are "accidental" within the meaning of the statute.

In any event, the argument that EPA may not consider the potential for releases caused by terrorism in using its authority to require prevention of "accidental releases" is not well-founded. The definition of "accidental releases" can easily be construed to encompass accidents that result from terrorism. In providing that an "accidental release" is one that is "unanticipated," the statute does not specify *by whom* it must be unanticipated. Given that the focus of the general duty clause is on owners and operators of facilities, however, the most natural reading of the clause would be that the definition is aimed at releases that are unanticipated *from the standpoint of facility owners and operators* (as opposed to releases that are a regular part of their operations, which are subject to CAA permitting requirements).

Such an interpretation would also be in accord with the way similar terms are treated in an analogous context in which legal consequences are attached to whether an event is "accidental": liability insurance, in which coverage typically is available unless an accident is "expected or intended from the standpoint of the insured."[24] By incorporating a similar concept of "accidental" in § 112(r), Congress likely intended to adopt a similar view of the standpoint from which whether an event was "unanticipated" should be determined.

At worst, the statute is ambiguous as to the standpoint from which an "accidental release" must be "unanticipated." In light of the possible ambiguity, an EPA determination that "unanticipated" means "unanticipated from the standpoint of the facility's owner or operator" would at least be entitled to deference under *Chevron U.S.A., Inc. v. NRDC*, 467 U.S. 837 (1984). In light of the statute's purposes of protecting the public against catastrophic releases, its delegation of broad authority to the agency, and its language, courts would be required to defer to EPA's assertion of such authority.

Moreover, confirmation that Congress anticipated and approved of the possibility that EPA's authority under §112(r) could protect the public against the effects of accidental releases resulting from terrorist attacks on chemical facilities as well as other types of accidental releases can be found in language added to the subsection by the Chemical Safety Information, Site Security and Fuels Regulatory Relief Act of 1999, Pub. L. No. 106-40, 113 Stat. 207. Among other things, that legislation added a new provision, § 112(r)(7)(H)(ix), requiring the Attorney General to "submit to Congress a report that describes the extent to which regulations promulgated under this paragraph have resulted in actions, including the design and maintenance of safe facilities, that are effective in detecting, preventing, and minimizing the consequences of releases of regulated substances that may be caused by criminal activity." 42 U.S.C. § 7412(r)(7)(H)(ix). The provision supplies express congressional recognition that EPA actions respecting "accidental releases" under the regulatory authority granted by § 112(r)(7) should be "effective" in addressing releases "caused by criminal activity" (including terrorism).[25] The

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2522_1_carbide-disaster-bhopal. It would be an odd reading of the statute to exclude from its coverage one of the possible causes of the exact type of accident that gave rise to its passage.

[24] *See* Jon Kalmuss-Katz, *Eco Anti-Terrorism: EPA's Role in Securing our Nation's Chemical Plants*, 18 N.Y.U. Envtl. L.J. 689, 709 & n.109 (2011).

[25] The reference to "this paragraph" in section 112(r)(7)(H)(ix) refers to paragraph (7) of subsection (r). Thus, the provision expressly refers to EPA's regulatory authority under § 112(r)(7).

provision offers strong support that EPA may consider the effectiveness of its actions to prevent such releases, as well as their impact on other types of accidental releases, when exercising its powers under § 112(r).

The use of EPA's regulatory authority under section 112(r)(7)(A) would be particularly appropriate in addressing the subject of inherently safer technology, because, by allowing the agency to "make distinctions between various types, classes, and kinds of facilities, devices and systems," that provision provides the agency with the needed flexibility to take into account the many considerations that are necessary to determine when the use of safer technology is appropriate (and when it should be mandated). Section 112(r)(7)(A) also provides the agency with the ability not only to announce a generally applicable standard, but also to issue specific rules applicable to specific types of facilities and chemicals that pose particular hazards and for which there are readily available safer technologies (e.g., water treatment facilities that use chlorine gas). Regulations under § 112(r)(7)(A) could also incorporate requirements that site owners and operators perform written assessments of the hazards posed by regulated substances used on-site, and the potential for their replacement or minimization through the use of feasible alternative materials and processes; in addition, regulations could authorize EPA to require use of such alternatives if, upon review of such an assessment, the agency found that such a change would have significant benefits for public health and safety and would be feasible and not unreasonably costly.[26] Use of the agency's regulatory authority to promulgate such requirements would provide site owners and operators with clear standards facilitating compliance and enforcement, and the notice-and-comment process leading to promulgation of regulations would allow all stakeholders and interested members of the public to have a voice in developing the standard that emerged.

B. The General Duty Clause Provides Additional Authority Allowing EPA to Take Action Now to Address Unsafe and Unnecessary Concentrations of Hazardous Chemicals.

As a complementary measure that could be implemented while the rulemaking process goes forward, or in the alternative to a rulemaking, petitioners request that EPA issue guidance making clear that the general duty clause of Clean Air Act section 112(r)(1) itself requires the use of inherently safer technology where it would be feasible and would reduce grave risks of accidental discharges resulting from process upsets, natural disasters, and terrorist attacks or other criminal acts.

The general duty clause imposes a requirement that all chemical facility owners and operators take measures to prevent "accidental releases" of extremely hazardous substances—including measures that relate to the design and maintenance of their facilities and that minimize the consequences of releases. The statutory provision itself creates a legally enforceable duty that is effective without implementing regulations. Because implementing regulations are not necessary under the general duty clause, EPA has provided direction to its enforcement personnel, and to facilities that must comply with the clause, through "guidance" that explain how it will enforce the clause.

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[26] One possible model for requirements that could be imposed through EPA's regulatory authority would be the provisions of § 2111 of H.R. 2868, the Chemical and Water Security Act of 2009, which passed the House of Representatives in 2009.

EPA's existing guidance does not clearly emphasize that the general duty clause requires use of safer technology, including less hazardous chemicals, that would prevent hazardous releases and mitigate their consequences by reducing the presence of hazardous materials, and neither EPA enforcement efforts nor industry practice have broadly recognized that the clause incorporates such a requirement. The language of the statute, however, readily encompasses, and even requires, a reading under which the general duty clause mandates the avoidance of releases through the recognition and use of reasonably available technology that would prevent them. The clause, on its face, requires that the "design" of facilities be such as to "prevent releases" and "minimize the consequences of accidental releases that do occur." Designs that prevent releases and minimize their consequences by using available technology to reduce or eliminate the use of extremely hazardous materials fall readily within the scope of that language.

The general duty clause further requires site owners and operators to use "appropriate hazard assessment techniques" to identify hazards posed by their facilities, and then take steps to address those identified hazards through the design of their facilities. This language is perfectly suited to convey a requirement that chemical facilities analyze the risks posed by the presence of concentrations of hazardous chemicals and consider, and, if appropriate, implement measures to reduce them through the use of feasible substitutes. Indeed, the Congress that enacted the general duty clause so recognized. The House Conference Report on the legislation expressly stated that hazard assessments required by § 112(r) "shall include ... a review of the efficacy of various release prevention and control measures, including process changes or substitution of materials." H.R. Conf. Rep. No. 101-952, at 349, 1990 U.S.C.C.A.N. 3867, 3872.

The general duty clause, like EPA's authority to regulate to prevent releases under section 112(r)(7), is applicable to "accidental releases." For the reasons stated above, the statutory definition of "accidental releases" does not in any way limit EPA's authority to use the general duty clause to require appropriate uses of safer technology to reduce the likelihood and mitigate the consequences of catastrophic releases, regardless of whether releases caused by terrorist attacks are among the releases EPA seeks to prevent. Any reliance on the general duty clause to impose such requirements must, of course, be consistent with other limitations on the scope of the general duty clause. Principal among those limitations is that the duty to identify and avoid hazards under §112(r)(1) is qualified by language incorporating standards applicable under the Occupation Safety and Health Act's general duty clause. That is, § 112(r)(1) provides that chemical facility owners and operators have a general duty to identify and address risks "in the same manner and to the same extent as section 654 of Title 29" (the OSH Act's general duty clause). 42 U.S.C. § 7412(r)(1).

The OSH Act's general duty clause has been construed to require employers to protect workers against hazards that are "recognized" within their industries. *Duriron Co. v. Sec. of Labor*, 750 F.2d 28 (6th Cir. 1984). Arguably, § 112(r)(1)'s statement that the general duty to avoid and mitigate accidental releases exists "in the same manner and to the same extent" as the general duty under the OSH Act indicates that a general duty clause violation would require that a chemical facility had disregarded a "recognized" hazard.

Assuming that reading of the statute is correct, it would not pose an obstacle to the use of the general duty clause to require appropriate uses of inherently safer technology to avoid or mitigate accidental releases by reducing or eliminating extremely hazardous substances. The hazards posed by unnecessary use and storage of large quantities of such substances are clearly "recognized," as actions by some facilities to eliminate unnecessary hazards (such as gaseous chlorine) demonstrate. The general duty clause requirement of recognition of feasible alternatives assuredly encompasses generally accepted industry practices, including the safer design practices of industry leaders as well as technologies that are widely commercially available. Moreover, EPA's listing of hazardous substances under Clean Air Act § 112(r)(3), and the regular reporting by facilities (pursuant to risk management plans required under regulations promulgated under § 112(r)(7)(B)) of worst-case scenarios for the release of such substances, also demonstrate that the hazards that EPA would be addressing under the general duty clause are widely recognized. Guidance on the use of safer technology to avoid or mitigate hazardous releases would easily comply with the limitation imposed by the incorporation of the OSH Act standard, as long as the agency's guidance addressed materials (and quantities of those materials) that are recognized to be hazardous.

Like regulations under section 112(r)(7), guidance implementing the general duty clause would be most helpful to site owners and operators who must comply with the general duty to avoid releases, as well as to EPA enforcement personnel and the general public, if it not only set forth a general standard for the use of inherently safer technology, but also addressed specific examples of facilities and substances that could trigger enforcement. Because the greatest risks to large numbers of members of the public appear to be posed by only a small number of hazardous substances, guidance could place a priority on addressing the use of those materials and outline specific circumstances where the general duty clause might require substitution of other materials or processes. Such guidance would also avoid anticipated criticism that the agency is imposing vague and open-ended requirements that could lead to arbitrary enforcement.

Finally, even after regulations under section 112(r)(7) are promulgated, the agency should recognize that the general duty clause has a continuing role to play. Unlike section 112(r)(7)(A), which provides regulatory authority only with respect to "regulated substances" (i.e., those designated under section 112(r)(3)), the general duty clause applies not only to substances listed under section 112(r)(3), but also to "any other extremely hazardous substance." 42 U.S.C. § 7412(r)(1). The general duty clause thus gives the agency flexibility to address dangers posed by newly developed chemicals as well as by existing hazardous chemicals that did not meet section 112(r)(3)'s criterion of "posing the greatest risk." 42 U.S.C. § 7412(r)(3). Reserving the ability to exercise its powers under the general duty clause would give EPA the ability to proceed against potential risks that might otherwise fall through the cracks in the agency's regulatory authority under § 112(r)(7).

CONCLUSION

In outlining the policies his Administration would implement if he were elected, President Obama stated that his Administration would "[s]ecure our chemical plants by setting a clear set of federal regulations that all plants must follow, including improving barriers, containment, mitigation, and safety training, and, where possible, using safer technology, such as less toxic chemicals."[27] The President, Vice President, and other Administration officials have repeatedly stated their support for inherently safer technology requirements. Former EPA Administrator Christine Todd Whitman has recently called upon EPA to exercise its powers under the section 112(r) to

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[27] *Change We Can Believe In: Barack Obama's Plan to Renew America's Promise*, at 116 (2008).

address chemical threats,[28] and Chemical Safety Board Chair Rafael Moure-Eraso has called upon EPA to make enforceable requirements for the use of safer chemicals and processes "a cornerstone of its accident prevention programs."[29] As elaborated above, such requirements are necessary to protect the public against possible chemical releases, including those that may be caused by terrorist attacks, and are well within EPA's existing authority under section 112(r) of the Clean Air Act.

For these reasons, petitioners respectfully request that EPA grant this petition, commence rulemaking proceedings under Clean Air Act section 112(r)(7), and take action to revise its guidance for enforcement of the general duty clause of Clean Air Act section 112(r)(1). Petitioners request that EPA, in compliance with its obligations under the Administrative Procedure Act,[30] proceed expeditiously to consider this petition within a reasonable time, considering the grave matters of public safety at stake.

Respectfully submitted,

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Kathy Curtis
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Gerald V. Poje, PhD
Founding Member, US Chemical Safety Board

[28] *See The Danger Downwind*, N.Y. Times, May 23, 2012, http://www.nytimes.com/2012/05/24/opinion/the-danger-downwind-of-chemical-plants.html.

[29] R. Moure-Eraso, *It's time for government and industry to adopt inherently safer technology*, Charleston Gazettte, June 23, 2012, http://wvgazette.com/Opinion/OpEdCommentaries/201206230057.

[30] See 5 U.S.C. §§ 555(b), 706(1).

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Cecil D. Corbin-Mack
WE ACT for Environmental Justice

Sean Moulton
OMB Watch

"PETITION TO THE ENVIRONMENTAL PROTECTION AGENCY TO EXERCISE ITS AUTHORITY UNDER SECTION 112(r) OF THE CLEAN AIR ACT TO PREVENT CHEMICAL FACILITY DISASTERS THROUGH THE USE OF SAFER CHEMICAL PROCESSES"

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NATIONAL ENVIRONMENTAL JUSTICE ADVISORY COUNCIL

March 14, 2012

Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Ave., NW
Washington, DC 20460

Dear Administrator Jackson:

During the October 2011 meeting of the National Environmental Justice Advisory Council (NEJAC) in Albuquerque, New Mexico, several advocates came from across the country to speak with us during the public comment session. They asked us to reach out to you about a critical matter. They presented us with a letter signed by many from across the country about the urgent need for EPA to act to prevent chemical disasters.

Their specific appeal to the NEJAC was that we support a request to you and to Assistant Administrator McCarthy that EPA would utilize its authority under the "General Duty Clause" of the 1990 Clean Air Act section 112(r) (also known as the Bhopal clause) to require covered chemical facilities to prevent, where feasible, catastrophic chemical releases. After hearing their sound arguments and reviewing the data they presented to us, the NEJAC concurred with their request and agreed to send this letter to you

Implementing the Clean Air Act's prevention authority will not only eliminate accidental hazards but also will address fatal flaws in the current chemical security law administered by the U.S. Department of Homeland Security (DHS). Presently, DHS is prohibited from requiring the use of safer chemical processes at facilities. These gaps are particularly threatening to low-income and tribal communities and communities of color because they frequently reside near waste water treatment plants, refineries, and port facilities which are exempted under a 2006 Congressional statute that allows thousands of potentially high-risk facilities such as these from being required to use safer chemicals.

We have already witnessed in countless environmental justice communities what can, and has happened as chemical releases, explosions, fires, train derailments, and refinery releases have wreaked havoc upon local communities, releasing life-threatening and dangerous chemicals upon the nearby populations. We have seen what has happened in Institute, West Virginia; Graniteville, South Carolina; Rubber town, Kentucky; Houston, Texas; Albuquerque, New Mexico; and Baton Rouge, Louisiana, to name but a few examples.

We know that in 2002, EPA made a proposal to implement the General Duty Clause for the first time to make chemical plants safer. According to the Agency's proposal, chemical plants would be made *"inherently safer by reducing quantities of hazardous chemicals handled or stored, substituting less hazardous chemical for extremely hazardous ones, or otherwise modifying the design of processes to reduce or eliminate chemical hazards."* Unfortunately, the Agency's efforts were scuttled and environmental justice communities, and indeed all communities, remain vulnerable to the dire threat of hazardous chemical releases, explosions, and spills.

In 2003, the Government Accountability Office (GAO) concluded that EPA could *"interpret the Clean Air Act's general duty clause to address chemical facility security... According to EPA, it would not have to make any regulatory changes as it currently implements the general duty clause through guidance..."* to address the specific threat of disastrous risks to vulnerable communities.

Recommendation: Therefore, we respectfully recommend that EPA use its authority under the 1990 Clean Air Act, Section 112 (r), to reduce or eliminate these catastrophic risks, where feasible, by issuing new rules and guidance to fully implement the General Duty Clause. This action would reduce the danger and imminent threat that chemical plants, chemical manufacturing, and the transport and storage of hazardous chemicals pose to environmental justice and all communities.

Once again, thank you for this opportunity to provide recommendations for enhancing environmental justice in EPA's programs.

Sincerely,

Elizabeth C. Yeampierre

Elizabeth C.Yeampierre
Chair

cc: NEJAC Members
Robert Perciasepe, Deputy Administrator
Gina McCarthy, Assistant Administrator for Air and Radiation (OAR)
Mathy Stanislaus, Assistant Administrator for Solid Waste and Emergency Response
Cynthia Giles, EPA Assistant Administrator for Enforcement and Compliance Assurance
Lisa Garcia, EPA Associate Assistant Administrator for Environmental Justice
Janet McCabe, Deputy Assistant Administrator, OAR
Victoria Robinson, NEJAC DFO, OEJ

Draft - Pre-decisional - Do Not Cite or Quote June 11, 2002

Rollout strategy for Chemical Facility Site Security

when: week of June 10-14 or week of June 17-21, 2002

who: EPA Administrator Christie Whitman
Governor Tom Ridge, Director, Office of Homeland Security
where: The White House Press Room

format: Remarks at the podium
Press release issued; Website live at same time w/current fact sheet;
Time for some questions by press

Announcement contents:
Principles for site security
acknowledgment to industry for their particular interest
acknowledgment to environmental groups for their particular interest
acknowledgment to ACC, Sandia National Lab, Center for Chemical Process Safety
general timeline to get principles distributed and for EPA visits to local sites
role of third party audit; role of enforcement and fines
decision to use guidance and Federal Register; future possibility of regulation;

Spokesperson: Bob Bostock (for press and public liaison); Ed Krenik (for congressional);

potential audiences: Members of Congress
Senate Environment and Public Works, Energy Committees
Any appropriations or other specific congressional committees (Michelle McKeever)
Industry: American Chemistry Council
If possible, contact companies that have already submitted RMPs
Center for Chemical Process Safety
Sandia National Laboratory
Other industry groups such as LEPC (Local Emergency Planning Committees)
State Environmental Directors
Governors
Local, state law enforcement organizations
EPA regions (RA, AA, Public Affairs Directors)
Environmental Groups (especially ones that provided input)

notification plan: 72 hours before: alert regions; provide fact sheet, Qs and As (& press help)
24 or less hours before announcement: Members of Congress
48 hours before announcement: specific industry liaison groups
Same day notification: Governors, State Environmental Directors

Message: currently being drafted

PRE-DECISIONAL DRAFT......DO NOT RELEASE, CITE OR QUOTE

United States
Environmental Protection Agency

Chemical Emergency Preparedness
and Prevention Office

EPA xxx-yyy-zzz
June 2002

Chemical Site Security: EPA's Strategy for Improving Security and Preventing Releases Caused by Criminal Attacks at Hazardous Chemical Facilities

The Environmental Protection Agency is announcing its strategy for improving security and preventing chemical releases resulting from terrorist attacks or other criminal activity at hazardous chemical facilities. The Clean Air Act (CAA) has long required facilities handling the most dangerous chemicals to operate safely in order to protect surrounding communities from unanticipated, potentially catastrophic releases. In the post 9/11 era, EPA believes that for a facility to be safe, it must also be secure. EPA intends to use its CAA authority to ensure that hazardous chemical facilities take reasonable precautions against terrorist or other criminal attack. EPA will soon issue guidance explaining that, with the increased threat of terrorism, facilities' duty under the CAA to operate safely includes an obligation to secure their sites. EPA will further explain that for facilities with the largest quantities of the most hazardous chemicals, the obligation is appropriately met by conducting a vulnerability assessment, addressing any vulnerabilities identified (including through hazard reduction), and consulting with local emergency planners and law enforcement. The public will have an opportunity to comment on the guidance before EPA enforces facilities' duty to take reasonable security precautions. EPA will also conduct site visits at selected high-priority hazardous chemical facilities to review their security plans, evaluate actions facilities may have taken since September 11, 2001 to improve security, and to discuss hazard reduction opportunities. Using what it learns from these site visits, EPA intends to initiate a notice and comment rulemaking to incorporate specific security requirements into the EPA Risk Management Program.

Overview

The federal government already implements programs for the prevention and mitigation of catastrophic chemical releases. Under current law, chemical facilities have a general duty to operate safely, and facilities handling the largest amounts of the most dangerous chemicals are subject to additional regulatory requirement

Since the 1990's, as the risk of terrorism has increased, the federal government has been focusing on the fact that for facilities to operate safely, they must also be secure. Congress recognized the potential vulnerability c chemical facilities to terrorist attack in enacting the Chemical Safety Information, Site Security, and Fuels Regulatory Relief Act in August 1999. In February 2000, EPA issued a site security alert to chemical facilitie to highlight security areas that companies should review to ensure that appropriate measures are being implemented.

In the wake of the terrorist attacks of September 11, 2001, there is heightened concern about the potential for terrorist attacks on facilities that manufacture, handle, store, or use dangerous chemicals. While components the chemical industry have initiated voluntary efforts to improve security, the federal government must also ac to ensure that facilities handling the most dangerous chemicals are taking appropriate measures to enhance security and that such measures will be sustained over the long-term.

General Duty

CAA section 112(r)(1) imposes an enforceable "general duty" on all chemical facilities handling extremely hazardous chemicals. The general duty clause addresses "accidental releases," which the CAA defines as " unanticipated releases." EPA believes that in light of the increased risk of terrorism, the 112(r)(1) general dut clause applies to unanticipated releases including releases caused by terrorists or other criminals. Accordingly the Agency believes that all hazardous chemical facilities have a general duty to identify hazards that may resu from releases caused by terrorist or other criminal activity using appropriate assessment techniques, to design and maintain a secure facility, and to minimize the consequences of such releases that do occur.

Under the general duty clause, chemical facilities with potential for the greatest harm to the public have a commensurately great duty to operate safely, including taking reasonable security precautions. For these facilities, EPA believes that the duty is appropriately met by undertaking comprehensive vulnerability assessments, taking appropriate hazard reduction measures, and enacting security measures in light of the assessment. Vulnerability assessment tools recently developed by the Sandia National Laboratories, the American Chemistry Council, and other organizations will assist facilities in meeting general duty obligations.

EPA intends to publish guidance to further elaborate on how facilities may meet general duty clause chemical security obligations in the post- 9/11 era. The guidance will be made available for public comment prior to final publication.

Regulations

EPA intends to propose regulations to incorporate security requirements into the EPA Risk Management Program. EPA anticipates that the regulations would require RMP facilities and any other facilities that may warrant specific security requirements to do the following:

Conduct initial vulnerability assessments (VAs). RMP facilities would be required to perform a systematic assessment of their vulnerability to chemical releases caused by criminal or terrorist attack. The regulations would not specify the use of any particular VA methodology, but would specify the fundamental components a VA (e.g., facility characterization, prioritization of assets, threat assessment, vulnerability analysis, and selection of countermeasures) and the facility characteristics to be assessed in the VA, as appropriate for the facility (e.g., physical security, process control, chemical storage and handling, cyber security, product stewardship, emergency response planning, personnel security). The regulations would specify that the threat assessment in the VA consider, as appropriate for the facility, the potential for an uncontrolled release from th facility, chemical theft or illegal purchase, and product tampering.

A vulnerability assessment conducted by a facility prior to publication of the regulations would satisfy this element to the extent the assessment addresses the specified VA provisions.

Document the results of the VA. Required documentation would include a description of the identified vulnerabilities and the implementation actions taken and planned to address those vulnerabilities. Facilities would be required to document reasonable schedules for any measures that cannot be immediately implemented. The documentation would be maintained on site and available for inspection by EPA or a state local government official who has been delegated responsibility for enforcing chemical security requirements.

Implement appropriate security and other measures to address identified vulnerabilities.
Facilities would be required to consider hazard reduction opportunities in the preparation of implementation plans and to implement appropriate hazard reduction measures.

Hazard reduction opportunities would include:

(1) Making chemical processes inherently safer by reducing quantities of hazardous chemicals handled or stored, substituting less hazardous chemicals for extremely hazardous ones, or otherwise modifying th design of processes to reduce or eliminate chemical hazards;
(2) Installing additional hazard mitigation devices or features;
(3) Implementing additional physical or procedural barriers against chemical releases, and;
(4) Other actions that reduce the likelihood and/or consequences of chemical releases.

Consult with Local Emergency Planning Committees (LEPCs) and local law enforcement agencies in up-front VA planning, and consult with law enforcement agencies in implementing security plans. Facilities would be required to share information needed by LEPCs and local law enforcement agencies to carry out their preparedness and response duties, but only law enforcement officials would receive access to specific facility vulnerability information.

Update VAs and implementation plans. Facilities would be required to review and, if warranted, update thei initial VAs and implementation plans at least every 2 years. Facilities would update their VA and plan at least every 5 years (where the biennial reviews did not result in an update) and at any other time a major change impacts a facility VA or implementation plan.

- During the biennial review, if a facility determined that no update was needed, the facility would document that the review was completed and maintain that documentation on site.

- VA updates would include the same consultation, hazard reduction, documentation, and access element as the initial VAs and implementation plans.

Site Visits

EPA intends to conduct site visits at selected high-priority hazardous chemical facilities to review their securit plans, evaluate actions facilities may have taken since September 11, 2001 to improve security, and to discuss hazard reduction opportunities. These visits will help ensure the security of selected facilities and provide EP with information helpful to implementation of the CAA general duty clause and development of proposed regulations for chemical site security.

Draft - Pre-Decisional - Do Not Cite or Quote June 11, 2002

Questions and Answers for Announcement on Chemical Site Security

1. I understand that EPA was developing legislative principles on chemical site security. Has EPA now decided that it will not pursue legislation, and if so, why?

EPA is not seeking legislation on chemical security at this time. Using existing authority under the Clean Air Act, we believe that the guidance and regulations I have announced today are the quickest paths to improving chemical facility security.

If we later find that there are legislative gaps, then we will consider seeking legislation.

2. Will EPA release a set of principles on chemical site security?

The draft guidance we will publish next month will describe the principles we believe constitute a sound approach to chemical facility security.

3. Isn't the Chemical Industry already taking action to improve security at chemical facilities? The American Chemistry Council recently adopted a new security code that is binding on its members. Why are guidance and regulations needed? And what will they accomplish that the industry isn't already doing?

There has been some very positive work in this area by chemical industry trade associations and individual chemical companies. EPA has worked with the chemical industry to support and assist in several of these efforts. However, we expect that the guidance and regulations that I announced today will advance security across a range of facilities that manage hazardous chemicals faster than would otherwise occur, and assure the public that action is taken. No one trade association can address the variety of different types of companies and facilities that manage hazardous chemicals.

4. What types of companies and facilities will be covered by EPA's guidance and regulations? Many communities include stores that sell relatively small quantities of flammable or toxic chemicals, such as pesticides or gasoline. Will these types of facilities be covered?

Our guidance and regulations will take a common sense approach to this question. If a facility manages one or more chemicals that can be dangerous, it only makes sense that they examine security concerns related to those chemicals and, at a minimum, apply accepted industry security practices. But our guidance and regulations will distinguish between facilities that manage large quantities of the most dangerous chemicals, regulated under EPA's Risk Management Program, and others that manage smaller quantities or less hazardous chemicals. For facilities that manage large quantities of particularly hazardous chemicals, our guidance and regulations will place specific requirements for these facilities to assess and address their security vulnerabilities. In addition, regulations would add a requirement for these higher priority facilities to certify to EPA that they have taken these steps. There are approximately 15,000 chemical facilities regulated by EPA's Risk Management Program, and approximately 500,000 facilities that are not regulated under that program, but still manage hazardous chemicals.

5. When does EPA expect to release this guidance and regulation?

We expect to have the draft guidance in the Federal Register for comment before the end of this July. Regulations will take longer to develop, but we will proceed at an expedited pace.

6. How many chemical facilities will EPA be visiting? And how will EPA choose the chemical facilities it visits? Will you publicly identify which facilities you visit?

We are initially focusing on facilities that we consider a higher priority. These are facilities that have large quantities of hazardous chemicals and are located near large populations. Our initial visits will include approximately 30 facilities.

We will not publicly identify the facilities we visit. Under the Chemical Safety Information, Site Security and Fuels Regulatory Relief Act, we are restricted from making that information publicly available.

7. Why is EPA visiting facilities before you have released either the guidance or your regulations? What can the visits hope to achieve?

Shortly after September 11, EPA disseminated safety advisories to trade associations in the chemical industry recommending that chemical facilities increase their vigilance and report any suspicious incidents to the FBI. Since that time we have worked with the chemical industry to encourage facilities to examine and address security concerns. These site visits represent a next step in our ongoing effort to advance chemical facility security, they are not dependent on guidance and regulations. They will provide us with a better understanding of security at high priority facilities and, where appropriate, allow us to encourage additional security considerations at these facilities.

8. When will EPA issue final guidance on the General Duty Clause as it applies to chemical facility security? And how long will facilities have to comply with specific security requirements?

As I explained earlier, we will publish draft guidance in the Federal Register by the end of next month (July 2002). We anticipate a 30 day comment period. We will move quickly to address comments and publish the final guidance after that 30 day period. Our current belief is that higher priority chemical facilities should be able to complete a vulnerability assessment and address security vulnerabilities as described in the guidance in 12-18 months.

9. If a chemical facility does not adequately address security under your new guidance, what penalties would apply?

The General Duty Clause of the Clean Air Act provides for penalties of up to $27,500 per violation per day.

10. Will the public or local community groups have access to information on the security of their local chemical facilities?

EPA's guidance will contain a provision directing Risk Management Program facilities to consult Local Emergency Planning Committees (LEPCs) and local law enforcement agencies in up-front vulnerability assessment planning, and consult with law enforcement agencies in implementing security plans. Facilities would be required to share information needed by LEPCs and local law enforcement agencies to carry out their preparedness and response duties, but only law enforcement officials would receive access to specific facility vulnerability information.

Pre-Decisional - Do Not Cite or Quote June 11, 2002

Draft Chemical Facility Security Announcement

I am pleased to join Governor Ridge today to announce a series of new initiatives by the Environmental Protection Agency to advance security at facilities that handle hazardous chemicals.

Since September 11, EPA has worked with the chemical industry to notify individual chemical facilities of the need to be vigilant regarding the security of the chemicals they manage. We have also worked and continue to work with the chemical industry and the Department of Justice to develop vulnerability assessment methodologies and security guidelines to assist individual facilities in their efforts to address security. This work is advancing and will produce valuable tools for facilities to apply to their individual security needs.

Today, I am announcing several new initiatives in the Agency's chemical security efforts. Starting in July, EPA representatives will begin visiting high priority chemical facilities to discuss their current and planned security efforts. These visits will allow EPA to survey security and, if appropriate, encourage security improvements at these facilities. Also, before the end of July, EPA will publish guidance in the Federal Register notifying all facilities that manage hazardous chemicals that they have a legal obligation to take security precautions related to these chemicals. In addition, EPA believes that it is appropriate that facilities that manage larger quantities of the most hazardous chemicals, currently regulated under EPA's Risk Management Program, take specific security steps. These security steps will be detailed in the guidance and will include direction for facilities to conduct vulnerability assessments, consider hazard reduction, address security vulnerabilities and consult with local law enforcement and emergency planners and responders. For all other facilities that manage hazardous chemicals, but are not regulated under EPA's Risk Management Program, the guidance will provide general information on fulfilling their security obligations. EPA will provide technical assistance and outreach materials tailored to security concerns at small businesses.

We believe that it is prudent to proceed with guidance at this time as it will provide rapid direction to all who manage hazardous chemicals. In the longer term, EPA will work to develop comprehensive chemical security regulations. These regulations will seek to further incorporate chemical facility security requirements into EPA's chemical safety program.

Senator BOXER. Thank you very much.

Next we go to Dr. M. Sam Mannan, Regents Professor and Director, Mary Kay O'Connor Process Safety Center, Texas A&M.

STATEMENT OF M. SAM MANNAN, PE, CSP, DHC, REGENTS PROFESSOR AND DIRECTOR, MARY KAY O'CONNOR PROCESS SAFETY CENTER, DEPARTMENT OF CHEMICAL ENGINEERING, TEXAS A&M UNIVERSITY SYSTEM

Mr. MANNAN. Good morning, Chairman Boxer, Ranking Member Vitter and other distinguished members of the Committee.

My name is Sam Mannan and I am Director of the Mary Kay O'Connor Process Safety Center, holder of the T. Michael O'Connor Chair I in Chemical Engineering, and Regents Professor at Texas A&M University. The center seeks to develop safer processes, equipment, procedures and management strategies that will minimize losses in the chemical process industries. The opinions presented during this hearing represent my personal position on these issues.

Risk management and emergency planning programs to prevent and address chemical threats are of extreme importance for the protection of the work force, public and the environment. These programs are also of great importance for the U.S. national economy and security.

So, what should we do in the aftermath of the incidents in West, Texas and Geismar, Louisiana? I believe that before we start looking at new regulations or revising regulations, we owe it to ourselves to determine if the existing regulations are being implemented and enforced in a comprehensive and universal manner. As I have elaborated in my written report, I do not think we are currently doing that, that is enforcing existing regulations through a comprehensive screen scheme and plan of inspections and audits.

I have made a total of nine recommendations in my written report but, in order to stay within the time allotted, I will address a few of those.

I sincerely believe that the establishment of a national chemical incident surveillance system for process safety incidents is essential. There is presently no reliable means for evaluating the performance of industry and limiting the number and severity of accidental chemical releases.

I strongly urge Congress to mandate a risk-based study to determine the hazards and risks and develop a regulatory map of hazardous materials oversight. This study should take into consideration types of facilities, their locations, chemicals involved and their quantities in order to determine what agencies do or do not regulate these facilities.

All Federal agencies with responsibility to regulate risk and associated issues should be required to conduct a comprehensive screening to determine their regulatory landscape, that is, create an exhaustive list of facilities covered by their respective regulations.

Once the regulatory landscape is determined, each Federal agency should be charged with developing a plan and schedule for ensuring compliance through regular inspections. Congress should consider directing Federal agencies to create verifiable and certifiable third party auditing and inspection systems. This approach has worked for ISO–9000 certifications and other programs. There are market-based approaches through which this regime can be implemented without causing a major burden on the regulatory authority or the regulated community.

I urge Congress to look into ways to utilize the local emergency planning committee framework in a much more effective manner. I urge Congress to look into ways to encourage States and local governments to improve and enforce risk-based zoning and land use planning.

In summary, I applaud Congress for providing leadership in this important area of risk management and emergency planning programs to prevent and address chemical threats. We have made a lot of progress in moving forward to overcome the challenges we face in using chemicals to improve our lives without hurting the industry employees, the public or the environment.

We all can agree that chemicals do improve our lives and we also can agree that they can hurt us, too. And I have often said, if we do not the right things, they can make us extinct as well.

This is a serious matter and I am pleased that people at the highest level of Government are involved in looking into this matter.

Thank you for inviting me to present my opinions and I would be happy to answer any questions.

[The prepared statement of Mr. Mannan follows:]

MARY KAY O'CONNOR PROCESS SAFETY CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

Submitted to the

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

Testimony of

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On

Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA

Thursday, June 27, 2013

Introduction

My name is M. Sam Mannan and I hold a BS, MS, and PhD in chemical engineering. I am a registered professional engineer in the states of Louisiana and Texas, and I am a certified safety professional. I am a Fellow of the American Institute of Chemical Engineers and a member of the American Society of Safety Engineers, the International Institute of Ammonia Refrigeration, and the National Fire Protection Association. I am Director of the Mary Kay O'Connor Process Safety Center, holder of the T. Michael O'Connor Chair I in Chemical Engineering, and Regents Professor of Chemical Engineering at Texas A&M University. The Center was established to memorialize Mary Kay O'Connor, a chemical engineer who, along with 22 others, died in a chemical plant explosion in 1989 in Houston, Texas. The Center mission is to lead the integration of process safety – through education, research, and service – into the education and practice of all individuals and organizations involved in chemical operations. The vision of the Center is to serve as the premier process safety resource for all stakeholders so that safety becomes second nature for managers, engineers, and workers as progress continues toward zero injuries and lost lives. The Center seeks to develop safer processes, equipment, procedures, and management strategies that will minimize losses in the process industry. My area of expertise within the chemical engineering discipline is process safety. I teach process safety engineering both at the undergraduate and graduate level. I also teach continuing education courses on process safety and other specialty process safety courses in the United States and overseas. My research and practice is primarily in the area of process safety and related subjects. The opinions presented in this document represent my personal position on these issues. These opinions are based on my education, experience, research and training.

Risk management and emergency planning programs to prevent and address chemical threats are of extreme importance for the protection of the workforce, public, and the environment. These programs are also of great importance for the US national economy and security. I applaud the US Congress for continuing to pay attention to such important issues, and I appreciate the opportunity to provide my opinions in this process.

Background

Chemicals play a key role in today's high-tech world. The chemical industry is linked to every technologically advanced industry. Only a handful of the goods and services we enjoy on a daily basis would exist without essential chemical products. Chemicals are also a big part of the economy in Texas and many other states. For example, the Texas chemical industry alone provides more than 100,000 jobs, and the state's chemical products are shipped worldwide at a value of more than $20 billion dollars annually.

But the use of chemicals is a two-edged sword. Safe use creates a healthier economy and a higher standard of living. Unsafe use threatens our lives, our businesses and our environment. As the industry's sophistication increases, so does the need to work and live safely with chemicals. In order to accomplish this, many stakeholders must work together diligently and with persistent determination. A common theme that also must be present is competence at all levels with regard to knowledge and execution of responsibilities.

Today's hearings are an appropriate congressional response to the recent events in West, Texas, and Geismar, Louisiana. Both these events were tragic and our heart goes out to the affected people, neighborhoods and cities, and the local authorities. We must as a nation and individuals explore and investigate these incidents and do our best to prevent the recurrence of such incidents. The hearings are focused on federal oversight programs, and I will limit majority of my testimony to that topic. However, because of the nature of accident prevention and role of all stakeholders, I will at times touch on those issues as well. Also, at the Center we had one PhD researcher working on ammonium nitrate before the West, Texas incident happened, and since the West, Texas incident, we have had a team of five PhD researchers working under my guidance on researching this whole issue and associated topics. Therefore, much of my testimony and opinions are derived from looking at the aftermath of the West incident. Wherever possible, I have tried to include information and knowledge derived from the Geismar, Louisiana, incident and its aftermath. I must also state that much is still unknown about these incidents and as the root causes are identified and more definitive information becomes available, some of these conclusions and opinions may have to be revisited.

The West, Texas, Incident

On Wednesday, April 18, 2013, an initial fire exacerbated into an explosion at West Fertilizer in West, Texas, causing the death of 15 people and injuring more than 200. The blast wave completely destroyed the facility and also caused varying levels of damage to many buildings, businesses, and homes at significantly long distances from the plant. More than 50 homes, a 50-unit apartment building, a nursing home and four schools were in the impact zone. Of the 15 people who died, 12 were emergency responders, who were responding to the initial fire and trying to control and extinguish the fire when the catastrophic explosion occurred.

The Geismar, Louisiana, Incident

On Thursday, June 13, 2013, an explosion occurred at Williams Olefins in Geismar, Louisiana, causing the death of two people and injuring more than 70.[1] Residents from a nearby community (St. Gabriel) were instructed to shelter in place.[2] This facility handles toxic chemicals and there was a concern about the air quality; therefore, the Louisiana Department of Environmental Quality (DEQ) checked the air quality during the subsequent days.[3] On the same day of the incident, the National Oceanic and Atmospheric Administration's (NOAA) Scientific Support Coordinator (SSC) was contacted by the US Coast Guard (USCG) regarding the plant fire and explosion at the Williams facility. Currently the USCG is requesting weather and plume modeling from NOAA.[4] An official report of total damages caused by the explosion is not available yet.

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[1] http://co.williams.com/williams/news-media/geismar-update/

[2] http://www.nola.com/traffic/baton-rouge/index.ssf/2013/06/explosion_at_williams_olefins.html

[3] http://www.deq.louisiana.gov/portal/WilliamsOlefins.aspx

[4] Emergency Response Division, Office of Response and Restoration, National Ocean Service, National Oceanic and Atmospheric Administration, US Department of Commerce. http://incidentnews.noaa.gov/incident/8613

Federal Oversight Programs for Risk Management and Emergency Planning and Lessons Learned from West, Texas, Incident

The West Fertilizer facility had a capacity to store 110,000 lbs of ammonia and 540,000 lbs of ammonium nitrate (Tier II reporting data from 2012). The discussion below provides a summary of different federal regulations the West facility was required to comply with and the known status of such compliance and the oversight role played by the respective federal agencies.

OSHA Regulations

The Occupational Safety and Health Administration (OSHA) has general and specific regulations that would apply to the use and possession of Ammonium Nitrate (AN). Appendix A provides a more detailed discussion on potential coverage/oversight of the West Fertilizer facility by OSHA regulations and the regulatory requirements.

The West facility was required to comply with specific OSHA regulations, including the *Hazard Communication Standard* (29 CFR 1910.1200) and *Explosives and Blasting Agents Standard* (29 CFR 1910.109). While it is not clear what the compliance status of the facility was at the time of the incident, it can be argued that compliance with these programs could have prevented or mitigated the incident.

Compliance with the *Explosives and Blasting Agents Standard* also has many measures that would have prevented or mitigated the incident. For example, the ammonium nitrate was stored in a warehouse, in very close proximity to the seed area. "Ammonium nitrate shall be in a separate building or shall be separated by approved type firewalls of not less than 1 hour fire-resistance rating from storage of organic..."[5] Seed is an organic and combustible material, which could propagate the fire to areas where ammonium nitrate was stored. Storage of ammonium nitrate at an adequate distance from the seed area might have helped in preventing the explosion. It is unknown – but unlikely – whether the warehouse had firewalls. Firewalls would have prevented ammonium nitrate from heating and reaching the onset temperature of decomposition. The warehouse construction material was wood, which is also a combustible material. Overall, from what is known, the storage of ammonium nitrate at West Fertilizer Company did not provide adequate measures to prevent overheating and propagation of fire, which eventually lead to the explosion. "Not more than 2,500 tons (2270 tonnes) of bagged ammonium nitrate shall be stored in a building or structure not equipped with an automatic sprinkler system."[6]

Proper training on the hazards of ammonium nitrate and knowledge about a potential violent decomposition might have allowed firefighters to take a different approach when responding to and fighting the initial fire.

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[5] 29 CFR 1910.109(i))
[6] Id.

General requirements include the "*General Duty Clause*" of the Occupational Safety and Health Act (P.L. 91-596, as amended) and an Emergency Action Plan (EAP) according to OSHA Standard 1910.38[7]. The "*General Duty Clause*" requires employers to provide employees with a workplace that is free from *"recognized hazards that are causing or are likely to cause death or serious physical harm"*[8].

The Risk Management Plan submitted by West Fertilizer Company to the US Environmental Protection Agency states that the company had an EAP[9]. However, the EAP is not publicly available.

The West facility was not covered by the Process Safety Management (PSM) standard (29 CFR 1910.119) even though it stored large quantities of anhydrous ammonia (a listed chemical under the PSM standard). OSHA proposed to exclude retail facilities, oil and gas well drilling and servicing operations and normally unmanned remote facilities from the [PSM] standard.[10] A brief summary of the PSM standard is provided in Appendix A. It should be noted that hazard analyses done under the PSM standard would have likely suggested prevention and mitigation measures similar to those provided under OSHA 1910.109 and NFPA 400.

The most recent known OSHA inspection of the West site was conducted in 1985. A fine of $30 was levied attributed to inadequate anhydrous ammonia storage and failures in Personal Protective Equipment (PPE).

EPA Regulations

Similar to OSHA, EPA also has a general duty clause and specific regulations that apply to the West Fertilizer facility. Appendix B provides a more detailed discussion on potential coverage/oversight of West Fertilizer by EPA regulations and the regulatory requirements.

Under the Clean Air Act Section 112(r)(1), the *General Duty Clause* states: *"The owners and operators of stationary sources producing, processing, handling or storing such substances [i.e., a chemical in 40 CFR 68 or any other extremely hazardous substance] have a general duty [in the same manner and to the same extent as the general duty clause in the Occupational Safety and Health Act (OSHA)] to identify hazards which may result from (such) releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."*

The *General Duty Clause* applies to any stationary source producing, processing, handling, or storing regulated substances or other extremely hazardous substances. "Other extremely

[7] Shea, D.A., Schierow, L.J., Szymendera, S. (2013) Congressional Research Service. *Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia.*
[8] 29 U.S.C. §654(a). http://www.gpo.gov/fdsys/pkg/USCODE-2010-title29/pdf/USCODE-2010-title29-chap15-sec654.pdf
[9] West Fertilizer Company Risk Management Plan, http://www.rtknet.org/db/rmp/rmp.php?facility_id=100000135597&datype=T&reptype=f&detail=4&submit=GO
[10] *Fed. Reg. 6355, 6363 (Feb. 24, 1992)*

hazardous substances" are any chemicals listed in 40 CFR 68, or any other chemicals, which may be considered extremely hazardous. Thus, it would seem the EPA has wide-ranging authority under the *General Duty Clause* to regulate West Fertilizer or other such facilities.

In addition to the EPA *General Duty Clause*, the following specific EPA regulations also apply to West Fertilizer:

- EPA's Risk Management Program (RMP) Rule (40 CFR 68) is intended to prevent and mitigate accidental releases of listed toxic and flammable substances. Requirements under the RMP rule include development of a hazard assessment, a prevention program, and an emergency response program. West Fertilizer would be regulated under the Program 2 requirements of the RMP rule because of the storage quantities of ammonia. Ammonium nitrate in not a listed substance under this rule.

- A separate EPA program, known as Tier II, requires reporting of hazardous chemicals (ammonium nitrate is included) stored above certain quantities. Tier II reports are submitted to local fire departments and emergency planning and response groups to help them plan for and respond to chemical disasters. In Texas, the reports are collected by the Department of State Health Services. As mentioned earlier, 2012 Tier II reporting data indicate that West Fertilizer filed a Tier II report stating that it had a capacity to store 540,000 lbs of ammonium nitrate at the facility.[11]

It could be argued that if the West Fertilizer facility had been regulated under Section 311 and 312 of EPCRA, the employees, fire responders and the community would have been more aware of the hazards of ammonium nitrate and consequences thereof. However, that argument is contingent on other factors including the fact that there is an operational and effective local emergency planning committee (LEPC) and other federal, state, and local government coordination.

The West Fertilizer facility last submitted a Risk Management Plan under the EPA Risk Management rule in June 30, 2011. In 2006, the EPA fined West Fertilizer Company with $2,300 for not having a risk-management plan that was up to federal standards.[12] [13]

DHS Regulations

Within DHS, two regulations apply to the West Fertilizer facility. Appendix C provides a more detailed discussion on potential coverage/oversight of West Fertilizer by DHS regulations and the regulatory requirements.

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[11] http://www.chicagotribune.com/news/sns-rt-us-usa-explosion-regulationbre93k09h-20130421,0,7972342.story?page=2

[12] http://www.wfaa.com/news/texas-news/Documents-show-West--203543061.html
http://www.washingtonpost.com/blogs/wonkblog/wp/2013/04/18/the-texas-fertilizer-plant-explosion-is-horrific-but-how-common-is-this/

[13] http://keranews.org/post/epa-fined-west-fertilizer-plant-2006

One of the DHS regulations that may have applied to West Fertilizer has not been finalized yet and comes under the congressional statute, ***Section 563, Subtitle J, Secure Handling of Ammonium Nitrate Public Law 110-161***. As implied, this regulation primarily deals with the control of purchase and sales of ammonium nitrate. The other DHS regulation that applies to West Fertilizer is the Chemical Facility Anti-Terrorism Standard (CFATS).

It has been widely reported that West Fertilizer did not file a Top Screen report with DHS as required under the CFATS regulation. The facility was not inspected by DHS for compliance with the CFATS requirements, given its anticipated tier that may not have happened as of today.

DOT Regulations

West Fertilizer was covered by DOT regulations. Please see Appendix D for more details on the regulatory requirements for DOT.

All DOT requirements for ammonium nitrate are with regard to safe transportation. The last known inspection of the West Fertilizer site was conducted by DOT on September 23, 2011. The inspection resulted in a fine of $5,250 with a total of 2 violations; illegible data on ASME placards and/or missing flammable gas placards (front and/or rear) and no security plan.[14 15 16] All the penalties/fines were with regard to anhydrous ammonia.

ATF Regulations

Appendix E provides a more detailed description of the ATF regulatory requirements pertaining to ammonium nitrate. In summary, ATF regulations do not apply to ammonium nitrate used as fertilizer. However, ATF has embarked on several collaborative programs with industry organizations to improve security and safety at all ammonium nitrate facilities.

Conclusions and Recommendations

The incidents at West, Texas, and Geismar, Louisiana, are tragedies that could and should have been avoided. However, as I have stated before, this requires continued and committed efforts by all stakeholders. We in the academic community have embarked on some ground-breaking initiatives, but I will be the first one to admit that we have not done enough and we need to do more. So, with that caveat, please understand that when I criticize other stakeholders, I am happy to take criticism myself as well.

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[14] Inspection / Investigation Report No. 1220047.
http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Press%20Releases/west_fertilizer_rpt_redact.pdf

[15] Compromise order.
http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Hazmat/Enforcement/West%20Fertilizer%20Comp%20Order%20Jun%202012.pdf

[16] Notice of Probable Violation.
http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Hazmat/Enforcement/West%20Fertilizer%20NOPV%20Jan2012.pdf

So, what should we do in the aftermath of the incidents in West, Texas, and Geismar, Louisiana? Clearly, as I have stated before, all stakeholders need to look at what they can do. However, this hearing is about the federal oversight programs on risk management and emergency planning. So, my conclusions and recommendations are primarily focused on that aspect.

1. Establishment of a national chemical incident surveillance system for process safety incidents. There is presently no reliable means for evaluating the performance of industry in limiting the number and severity of accidental chemical releases. There is also limited data with which to prioritize efforts to reduce the risks associated with such releases. Without this information, there are no means to measure the effectiveness of present programs or to guide future efforts.

2. Development of incident databases and lessons learned. This knowledge base could then be used to improve planning, response capability, and infrastructure changes. Recent experience in this regard is the improvement in planning and response for hurricane Rita from lessons learned from hurricane Katrina.

3. As a nation, we need to understand if regulations are doing what we intend them to do. To do that, we must understand the issues and to what agency to turn to find a solution. I strongly urge the US Congress to mandate a risk-based study to determine the hazards/risks and develop a regulatory map of hazardous materials oversight. This study should take into consideration types of facilities, their locations, chemicals involved and their quantities in order to determine what agencies do or do not regulate these facilities.

4. All federal agencies with responsibility to regulate safety/risk and associated issues should be required to conduct a primary screening to determine their regulatory landscape. Inter-agency training and briefings with regard to what each agency is covering and how they are enforced would also be beneficial.

5. Once the regulatory landscape is determined in item (4) above, each federal agency should be charged with developing a plan and schedule for ensuring compliance through regular inspections.

6. Inspections can only yield positive results when an adequate number of qualified, trained and competent inspectors is available. Clearly, in these days of budget restrictions, hiring and training hundreds or thousands more inspectors is going to be a challenge at least and at worst impossible. A cost-effective and viable alternative is third-party certified audits and inspections mentioned in item (7) below.

7. Congress should consider directing federal agencies to create verifiable and certified third-party auditing and inspection systems. This approach has worked for ISO-9000 certifications and other programs. There are market-based approaches through which this regime can be implemented without causing a major burden on the regulatory authority or the regulated community. For example, refer to the studies done by the University of Pennsylvania's Risk Management and Decision Processes Center regarding third-party

audits and inspections for EPA's Risk Management Program[17] and Environmental Programs[18].

8. I believe that EPCRA Sections 301-303 provide a systematic framework for coordination of hazard information, prevention programs, and emergency planning and response involving the federal government, state emergency response commissions (SERC) and the local emergency planning committees (LEPC). However, because of a lack of systematic funding and operational capability, most LEPC's are dysfunctional or exist in name only. Some further examination into better communication between the federal and state partners is needed. I urge Congress to look into ways to solve this problem and utilize the LEPC framework in an effective manner.

9. The fact that a nursing home, schools, residential neighborhoods, and other public facilities were so near the blast zone in the West Fertilizer incident raises questions about zoning and land-use planning. I urge the US Congress to look into ways to encourage states and local governments to improve and enforce risk-based zoning and land-use planning.

Summary

I applaud the US Congress for providing leadership in this important area of risk management and emergency planning programs to prevent and address chemical threats. We have made a lot of progress in moving forward to overcome the challenges we face in using chemicals to improve our lives without hurting the industry employees, the public, and the environment. We all can agree that chemicals do improve our lives but we also can agree that they can hurt us too and I as have often said, if we do not do the right things, they can make us extinct as well. This is a serious matter and I am pleased that people at the highest level of government are involved at looking at this matter.

I am encouraged by the leadership of Congress and by continued efforts to seek expertise and opinion from all stakeholders.

[17] http://opim.wharton.upenn.edu/risk/library/2001_JCB_3rdPartyAudits.pdf
[18] http://opim.wharton.upenn.edu/risk/downloads/archive/arch272.pdf

APPENDIX A
Potential Coverage/Oversight of West Fertilizer by OSHA Regulations

The Occupational Safety and Health Administration (OSHA) has general and specific regulations that would apply to the use and possession of Ammonium Nitrate (AN). General requirements include the "General Duty Clause" of the Occupational Safety and Health Act (P.L. 91-596, as amended) and an Emergency Action Plan (EAP) according to OSHA Standard 1910.38[19]. The "General Duty Clause" requires employers to provide employees with a workplace that is free from *"recognized hazards that are causing or are likely to cause death or serious physical harm"*[20]. The Emergency Action Plan must have, at minimum, the following elements[21]:

- procedures for reporting a fire or other emergency;
- procedures for evacuation;
- procedures to be followed by employees who remain to operate parts of the facilities before evacuating;
- procedures to account for all employees after evacuation;
- procedures for employees performing rescue or medical duties; and
- names and job titles of persons who may be contacted by employees to provide information to employees about the EAP

The Risk Management Plan submitted by West Fertilizer Company to the US Environmental Protection Agency states that the company had an EAP[22]. However, the EAP is not publicly available.

Other specific regulations from OSHA that might potentially cover operations at the West, Texas facility include the following:

29 CFR 1910.109: Explosives and Blasting Agents[23]

Brief summary of regulation
This standard regulates the storage, use and transportation of explosives and blasting agents, including mixtures of fuel and oxidizers, *e.g.*, mixtures that might contain ammonium nitrate. Following is the definition of a blasting agent, according to OSHA Standard 1910.109:

[19] Shea, D.A., Schierow, L.J., Szymendera, S. (2013) Congressional Research Service. *Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia.*
[20] 29 U.S.C. §654(a). Available at: http://www.gpo.gov/fdsys/pkg/USCODE-2010-title29/pdf/USCODE-2010-title29-chap15-sec654.pdf
[21] 29 C.F.R. §1910.38(c). Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9726&p_table=STANDARDS
[22] West Fertilizer Company Risk Management Plan, available at http://www.rtknet.org/db/rmp/rmp.php?facility_id=100000135597&datype=T&reptype=f&detail=4&submit=GO
[23] 29 C.F.R. §1910.109. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9755&p_table=STANDARDS

1910.109(a)(1) – "*Blasting agent - any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive and in which none of the ingredients are classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.*"

Section **1910.109(g)**, which addresses "blasting agents", specifically makes reference to ammonium nitrate handling in mixing facilities, and it provides recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

In addition, section **1910.109(i)** provides specific requirements for the storage of ammonium nitrate – but does not apply to transportation. The following paragraphs are taken from OSHA Standard 1910.109:

1910.109(i)(1)(i)(a) – "*Except as provided in paragraph (i)(1)(i)(d) of this paragraph applies to the storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more ammonium nitrate by weight but does not apply to blasting agents.*"

1910.109(i)(1)(ii)(b) – "*The standards for ammonium nitrate (nitrous oxide grade) are those found in the "Specifications, Properties, and Recommendations for Packaging, Transportation, Storage, and Use of Ammonium Nitrate", available from the Compressed Gas Association, Inc., which is incorporated by reference as specified in Sec. 1910.6*".

Compliance Requirements

1910.109(i)(2)(i) – "*This paragraph applies to all persons storing, having, or keeping ammonium nitrate, and to the owner or lessee of any building, premises, or structure in which ammonium nitrate is stored in quantities of 1,000 pounds or more.*"

1910.109(i)(2)(ii) – "*Approval of large quantity storage shall be subject to due consideration of the fire and explosion hazards, including exposure to toxic vapors from burning or decomposing ammonium nitrate.*"

Some of the specific requirements for the storage of ammonium nitrate, among others, which West Fertilizer Company should have complied with are the following:

1910.109(i)(2)(iii)(a) – "*... Storage buildings shall not be over one story in height.*"

1910.109(i)(2)(iii)(b) – "*Storage buildings shall have adequate ventilation or be of a construction that will be self-ventilating in the event of fire.*"

1910.109(i)(2)(iii)(c) – *"The wall on the exposed side of a storage building within 50 feet of a combustible building, forest, piles of combustible materials and similar exposure hazards shall be of fire-resistive construction…"*

1910.109(i)(2)(iii)(e) – *"The continued use of an existing storage building or structure not in strict conformity with this paragraph may be approved in cases where such continued use will not constitute a hazard to life."*

1910.109(i)(2)(iii)(f) – *"Buildings and structures shall be dry and free from water seepage through the roof, walls, and floors."*

1910.109(i)(4)(i)(a) – *"Warehouses shall have adequate ventilation or be capable of adequate ventilation in case of fire."*

1910.109(i)(7)(ii)(b) – *"Water supplies and fire hydrants shall be available in accordance with recognized good practices."*

Some of the requirements are summarized in the following table:

Description	**OSHA 1910.109 Requirement**
Piles size	H: 20 ft (6.1 m) W: 20 ft (6.1 m) L: 50 ft (15.2 m)
Piles – walls distance	30 inches (0.762 m)
Pile – roof distance	36 inches (0.91 m)
Pile – pile distance	3 ft (0.91 m)
Storage buildings requirements	The **wall** on the exposed side of a storage building within 50 ft of a combustible building = **fire resistant**
Contaminants	Include, but it is not limited to animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap or cotton bags, caustic soda, coal, coke, charcoal, cork, camphor, excelsior, fibers of any kind, fish oils, fish meal, foam rubber, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, oakum, oiled clothing, oiled paper, oiled textiles, paint, straw, sawdust, wood shavings, or vegetable oils.

Standard 1910.1200: Hazard Communication[24]

Brief summary of regulation
The goal of this standard is to ensure that employers provide employees adequate information about the hazards of all substances handled at the facility. West Fertilizer Company was covered under this regulation, according to the following paragraph taken from the standard:

> ***1910.1200(b)(2)*** – *"This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency."*

Compliance requirements
The West facility was required to comply with the following requirements (among others) under OSHA's hazard communication standard:

> ***1910.1200(a)(2)*** – *"Classifying the potential hazards of chemicals and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for*
>
> - *developing and maintaining a written hazard communication program for the workplace,*
> - *including lists of hazardous chemicals present;*
> - *labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces;*
> - *preparation and distribution of safety data sheets to employees and downstream employers; and*
> - *development and implementation of employee training programs regarding hazards of chemicals and protective measures."*
>
> ***1910.1200(d)(1)*** – *"Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to classify the chemicals in accordance with this section. For each chemical, the chemical manufacturer or importer shall determine the hazard classes, and, where appropriate, the category of each class that apply to the chemical being classified. Employers are not required to classify chemicals unless they choose not to rely on the classification performed by the chemical manufacturer or importer for the chemical to satisfy this requirement."*

The written hazard communication program should include the following:

> ***1910.1200(e)(1)*** – *"...at least describes how the criteria specified in paragraphs (f), (g), and (h) of this section for labels and other forms of warning, safety data sheets, and employee information and training will be met, and which also includes the following:*

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[24] 29 C.F.R. §1910.1200.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099

- A list of the hazardous chemicals known to be present using a product identifier that is referenced on the appropriate safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and,

- The methods the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas."

Standard 1910.119: Process Safety Management of Highly Hazardous Chemicals[25]

Brief summary of regulation
The Process Safety Management (PSM) standard *"contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals"* [26]. Even though West Fertilizer stored ammonia in excess of the threshold specified for ammonia in the PSM standard, this regulation did not apply to West Fertilizer Company, because of the exemption granted to retail facilities.

Compliance Requirements for facilities covered by the PSM standard
Companies covered under the PSM standard must develop and implement a program covering the following 14 elements:

- Employee Participation
- Process Safety Information
- Process Hazard Analysis
- Operating Procedures
- Training
- Contractor Safety
- Pre-Startup Safety Review
- Mechanical Integrity
- Hot Work Program
- Management of Change
- Incident Investigation
- Emergency Planning and Response
- Compliance Audits
- Trade Secrets

[25] 29 C.F.R. §1910.119. Available at:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760
[26] 29 C.F.R. §1910.119.

APPENDIX B

Potential Coverage/Oversight of West Fertilizer by EPA Regulations

The US Environmental Protection Agency (EPA) is authorized to regulate production, distribution, storage, and release of most chemicals in commerce. The Emergency Planning and Community Right to Know Act (EPCRA) and Section 112(r) of the Clean Air Act (CAA) directly address the potential risks from facilities holding chemical hazards[27]. *Both EPCRA and the CAA section 112(r) Risk Management Program encourage communication between facilities and the surrounding communities about chemical safety and chemical risks*[28].

The Emergency Planning and Community Right-to-Know Act (EPCRA)
EPCRA has four major provisions[29]*:*

- *Emergency planning (sections 301-303), Office of Emergency Management Factsheet EPCRA September 2012*
- *Emergency release notification (section 304),*
- *Hazardous chemical storage reporting requirements (sections 311-312), and*
- *Toxic chemical release inventory (section 313).*

*EPCRA, **Section 311**, requires owners or operators of local facilities covered by the Occupational Safety and Health Act to submit a material safety data sheet (MSDS) for each "**hazardous chemical**," or a list of such chemicals, to the SERC, the LEPC, and the local fire department.*

*EPCRA, **Section 312**, requires the same employers to submit annually an emergency and hazardous chemical inventory form to the SERC, LEPC, and local fire department. These forms must provide estimates of:*

- *Maximum amount of the chemicals present at the facility at any time during the preceding year*
- *Average daily amount of chemicals present*
- *General location of the chemicals in the facility*

The West Fertilizer facility was exempt from the EPCRA requirements because of exemptions granted to retail fertilizer facilities. EPCRA Section 311(e)(5) excludes certain substances, including "fertilizer held for sale by a retailer to the ultimate customer."[30] [31]

[27] Shea, D., Schierow, L. and Szymendera, S. (2013). Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia. CRS Report for Congress. Available at: http://www.fas.org/sgp/crs/homesec/R43070.pdf

[28] How LEPCs and Other Local can include information from RMP in their ongoing work: http://www.epa.gov/oem/docs/chem/lepc-rmp.pdf

[29] What Does EPCRA Cover: http://www.epa.gov/oem/docs/chem/epcra.pdf

[30] Exemptions under Sections 311 and 312: http://www.epa.gov/osweroe1/content/epcra/epcra-qa_exempt_311.htm#s311e5_4

[31] http://emergencymanagement.supportportal.com/link/portal/23002/23016/Article/13919/Are-farm-suppliers-and-retailers-exempt-from-311-and-312

Section 112(r) of the Clean Air Act[32]

Background

- *The Act requires EPA to promulgate an initial list of at least 100 substances that, in the event of an accidental release*[33]*, are known to cause or may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment*[34]*.*
- *In developing this list, EPA was required to consider, but was not limited to, the list of extremely hazardous substances (EHSs) promulgated under EPCRA (SARA Title III) section 302. EPA did not propose to adopt the entire EHS list because it includes a number of* ***solids and non-volatile liquids*** *for which an effect beyond the fenceline in the event of an accidental release is expected to be less likely than for gaseous or volatile liquids*[35]*.*
- *Congress listed the following 16 substances to be included in the initial list (Chlorine,* ***ammonia and anhydrous ammonia****, methyl chloride, ethylene oxide, vinyl chloride, methyl isocyanate, hydrogen cyanide, hydrogen sulfide, toluene diisocyanate, phosgene, bromine, anhydrous hydrogen chloride, hydrogen fluoride, anhydrous sulfur dioxide, and sulfur trioxide).*
- *Explosive materials (Division 1.1. under DOT classification) were initially included in the list of highly hazardous materials when the EPA regulation was developed. However, explosive materials were delisted*[36] *in 1998 with the proviso that ATF covered all the aspects that are necessary under RMP, except for public disclosure*[37]*. The industry voluntarily agreed to make that public disclosure that makes it equivalent to RMP.*

The West Fertilizer facility was covered under Program 2 of the EPA Risk Management Program because of ammonia. However, ammonium nitrate is not included in the covered list and West Fertilizer would not have had to report any analysis or calculations regarding ammonium nitrate in their submissions to EPA.

Table B-1 shows a summary of the criteria used by EPA for determining extremely hazardous materials and the corresponding thresholds to be covered under the RMP rule. Based Table B-1, ammonium nitrate is not covered by the RMP rule because ammonium nitrate does not meet the requirements to be considered as toxic or flammable.

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[32] Clean Air Act Section 112(r): Accidental release prevention/RMP Rule: http://www.epa.gov/osweroe1/docs/chem/caa112_rmp_factsheet.pdf

[33] Based on CAA Section 112(r)(2)(A): An accidental release is defined as "an unanticipated emission...into the ambient air from a stationary source."

[34] EPA list of regulated substances and thresholds: http://www.ncair.org/112r/files/40cfr68(9&68)_01141994.pdf

[35] EPA list of regulated substances and thresholds (pag 19): http://www.ncair.org/112r/files/40cfr68(9&68)_01141994.pdf

[36] RMP rule amendments: http://www.epa.gov/R5Super/eepps/pdfs/applicability-faq-200405.pdf

[37] RMP hearing. March 1999: http://books.google.com/books?id=oyy7IP0X3lAC&pg=PA18&lpg=PA18&dq=rmp+include+explosives?&source=bl&ots=hPVRLfJ49y&sig=3lguj7tddGoZH6Y05IkyagjetwM&hl=en&sa=X&ei=rtrEUYDvE9KJrQGV3IGIDw&ved=0CEcQ6AEwAw#v=onepage&q=rmp%20include%20explosives%3F&f=false

Table B-1. Summary of categories and thresholds of extremely hazardous materials[38]:

Categories	**Requirements**	**Threshold quantities (lb)***
77 Toxic substances	*Acute toxicity:* - Inhalation: LC50 = 0.5 mg/L or - Dermal: LD50 = 50 mg/kg of body weight, or - Oral: LD50 = 25 mg/kg of body weight *Vapor pressure* >10 mmHg *Accident history*	500 – 20,000
63 Flammable substances	FP < 73 °F (22.8 °C) BP < 100 °F (37.8 °C)	10,000

*Substances in mixtures would be exempted from the threshold determination if they represent less than one percent of the mixture by weight. (EPA List of Regulated Substances is found in reference 39)[39].

- **Listing criteria:**
  - ***Toxicity:*** *Listed toxic substances are expected to rapidly become airborne, thus human exposure by the inhalation route is of primary concern. The listing criteria established for toxic substances considers not only acute toxicity, but also physical/chemical properties (physical state, vapor pressure), and accident history.*
    The acute toxicity criteria:
    (a) Inhalation LC50 0.5 milligrams per liter of air (for exposure time 8 hours), or
    (b) Dermal LD50 50 milligrams per kilogram of body weight, or
    (c) Oral LD50 25 milligrams per kilogram of body weight.

    Vapor pressure cut off:
    Initially, a vapor pressure criterion of ***0.5 mm Hg*** *was used as a baseline, based on the vapor pressure of toluene diisocyanate, a substance mandated for the initial list by Congress. However, EPA considered that this low vapor pressure level may lead to an overly conservative listing of chemicals that pose a relatively lower potential for air releases. Then,* ***EPA decided to set the vapor pressure criterion at the higher level of 10 mm Hg****. Substances with pressures above 10 mm Hg are likely to be volatilized and released, even after a timely facility response occurs, potentially causing off-site impacts.*

    Accident history:
    Substances that "are known to cause ... death, injury, or serious adverse effects on human health or the environment" may be included on the list under section 112(r)(3).

  - ***Flammable gases and volatile flammable liquids:*** *Based on the flash point (FP) and boiling point (BP) criteria used by NFPA. Based on both accident reports and modeling*

[38] EPA list of regulated substances and thresholds: http://www.ncair.org/112r/files/40cfr68(9&68)_01141994.pdf
[39] http://www.epa.gov/R5Super/cepps/pdfs/rmp-listed-chemicals-200708.pdf

results, EPA considered that flammable substances that meet the listing criteria, in quantities above the threshold quantity of 10,000 lb, could present a hazard to the public from a vapor cloud explosion.
OSHA's PSM Standard provides an exemption for flammable liquids kept in atmospheric tanks below their normal boiling point. Unlike OSHA, EPA considers these substances to be intrinsically hazardous, regardless of conditions of storage, and, therefore, no exemption is provided in those cases.

Requirements if ammonium nitrate were covered by CAA 112:
EPA defined three "program levels" to ensure that individual chemical processes are subject to appropriate requirements based on the size of the process and the associated risks [40].

- **Program 1 eligibility (provided in section § 68.10) [41].**

1. *For the five years prior to the submission of an RMP, the process has not had an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following offsite: (i) Death; (ii) Injury; or (iii) Response or restoration activities for an exposure of an environmental receptor.*
2. *The distance to a toxic or flammable endpoint for a worst-case release assessment conducted under Subpart B and § 68.25 is* ***less than the distance to any public receptor****, as defined in § 68.30.*
3. *Emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.*

- **Program 1 requirements (provided in section § 68.12):**

1. *Analyze the worst-case release scenario for the process(es), as provided in § 68.25; document that the nearest public receptor is beyond the distance to a toxic or flammable endpoint defined in § 68.22(a); and submit in the RMP the worst-case release scenario as provided in § 68.165;*
2. *Complete the five-year accident history for the process as provided in § 68.42 of this part and submit it in the RMP as provided in § 68.168;*
3. *Ensure that response actions have been coordinated with local emergency planning and response agencies; and*
4. *Certify in the RMP the following: Based on the criteria in 40 CFR 68.10, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: Within the past five years, the process(es) has (have) had no accidental release that caused offsite impacts provided in the risk management program rule (40 CFR 68.10(b)(1)).*

- **Program 2 eligibility (provided in section § 68.10):**

A covered process is subject to Program 2 requirements if it does not meet the eligibility requirements of program 1 and 3.

- **Program 2 requirements (provided in section § 68.12):**

1. *Develop and implement a management system as provided in § 68.15;*
2. *Conduct a hazard assessment as provided in Sec.§ 68.20 through 68.42;*

[40] RMP requirements: http://www.epa.gov/emergencies/docs/chem/clean_air_guidance.pdf
[41] APPENDIX A. 40 CFR 68(pag 9): http://www.epa.gov/osweroe1/docs/chem/Appendix-A-final.pdf

3. *Implement the Program 2 prevention steps provided in Sec.§ 68.48 through 68.60 or implement the Program 3 prevention steps provided in Sec.§ 68.65 through 68.87;*

- **Program 3 eligibility (provided in section § 68.10):**

A covered process is subject to Program 3 if the process does not meet the requirements of program 1 of this section, and if either of the following conditions is met:

1. *The process is in NAICS code 32211, 32411, 32511, 325181, 325188, 325192, 325199, 325211, 325311, or 32532;* ***or***
2. *The process is subject to the OSHA process safety management standard, 29 CFR 1910.119.*

- **Program 3 requirements (provided in section § 68.12):**

1. *Develop and implement a management system as provided in § 68.15;*
2. *Conduct a hazard assessment as provided in Sec.§ 68.20 through 68.42;*
3. *Implement the prevention requirements of Sec.§ 68.65 through 68.87;*
4. *Develop and implement an emergency response program as provided in Sec.§ 68.90 to 68.95 of this part; and*
5. *Submit as part of the RMP the data on prevention program elements for Program 3 processes as provided in § 68.175.*

Figure B-1 can be used to identify the program level. In general, the requirements under the RMP rule include development of a hazard assessment, a prevention program, and an emergency response program.[42]

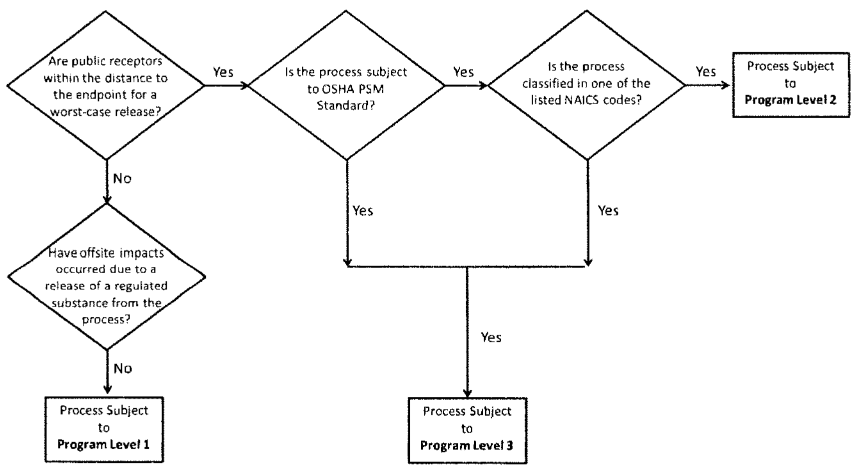

Fig. B-1. Diagram of the decision rules on determining Program level[43]

[42] http://www.epa.gov/osweroe1/docs/chem/ammonitr.pdf
[43] Decision rules on determining EPA Program level: http://www.epa.gov/osweroe1/docs/chem/Chap-02-final.pdf

Based on the eligibility criteria, West Fertilizer Company would not be included in Program 1 because the distance to a toxic or flammable endpoint for a worst-case release assessment is greater than the distance to any public receptor.

The West Fertilizer facility would not be included in Program 3 because the company NAICS code (42451-Facility grain and field bean merchant wholesalers) is not listed in the Program 3 eligibility requirements AND the West Fertilizer facility is excluded from the PSM program because of the retail exemption.

Hence, the West Fertilizer facility would be covered by Program 2 of the EPA Risk Management Program, but only because of the storage of ammonia.

APPENDIX C

Potential Coverage/Oversight of West Fertilizer by DHS Regulations

With regard to ammonium nitrate, DHS regulations include the proposed rule regulating the control of the purchase and the sales of AN (Section 563) and the Chemical Facility Anti-Terrorism Standards (CFATS). To-date, DHS has not published the final rule mandated under the congressional statute (Section 563) summarized below. CFATS regulation is administered by DHS, and the requirements under CFATS are also discussed in this Appendix.

Section 563, Subtitle J, Secure Handling of Ammonium Nitrate Public Law 110-161
Section 563 of the 2008 Consolidated Appropriations Act, Subtitle J, Secure Handling of Ammonium Nitrate ("Section 563"), Public Law 110-161,[44] requires the Department of Homeland Security to "regulate the sale and transfer of ammonium nitrate by an ammonium nitrate facility ... to prevent the misappropriation or use of ammonium nitrate in an act of terrorism." [45]

''Subtitle J—Secure Handling of Ammonium Nitrate

> *SEC. 899A. DEFINITIONS.*
> *SEC. 899B. REGULATION OF THE SALE AND TRANSFER OF AMMONIUM NITRATE.*
> *SEC. 899C. INSPECTION AND AUDITING OF RECORDS.*
> *SEC. 899D. ADMINISTRATIVE PROVISIONS.*
> *SEC. 899E. THEFT REPORTING REQUIREMENT.*
> *SEC. 899F. PROHIBITIONS AND PENALTY.*
> *SEC. 899G. PROTECTION FROM CIVIL LIABILITY.*
> *SEC. 899H. PREEMPTION OF OTHER LAWS.*
> *SEC. 899I. DEADLINES FOR REGULATIONS.*
> *SEC. 899J. AUTHORIZATION OF APPROPRIATIONS."*

For example, SEC. 899B, states:
"SEC. 899B. REGULATION OF THE SALE AND TRANSFER OF AMMONIUM NITRATE.
(a) IN GENERAL.—The Secretary shall regulate the sale and transfer of ammonium nitrate by an ammonium nitrate facility in accordance with this subtitle to prevent the misappropriation or use of ammonium nitrate in an act of terrorism.
(b) AMMONIUM NITRATE MIXTURES.—Not later than 90 days after the date of the enactment of this subtitle, the Secretary, in consultation with the heads of appropriate Federal departments and agencies (including the Secretary of Agriculture), shall, after notice and an opportunity for comment, establish a threshold percentage for ammonium nitrate in a substance.
(c) REGISTRATION OF OWNERS OF AMMONIUM NITRATE FACILITIES.—
(1) REGISTRATION.—The Secretary shall establish a process by which any person that—

[44] 2008 Consolidated Appropriations Act, Subtitle J, Secure Handling of Ammonium Nitrate ("Section 563", Public Law 110-161) http://www.gpo.gov/fdsys/pkg/PLAW-110publ161/pdf/PLAW-110publ161.pdf
[45] http://www.dhs.gov/ammonium-nitrate-security-statutes-and-regulations

(A) owns an ammonium nitrate facility is required to register with the Department; and

(B) registers under subparagraph (A) is issued a registration number for purposes of this subtitle.

(2) REGISTRATION INFORMATION.—Any person applying to register under paragraph (1) shall submit to the Secretary—

(A) the name, address, and telephone number of each ammonium nitrate facility owned by that person;

(B) the name of the person designated by that personas the point of contact for each such facility, for purposes of this subtitle; and

(C) such other information as the Secretary may determine is appropriate.

(d) REGISTRATION OF AMMONIUM NITRATE PURCHASERS.—

(1) REGISTRATION.—The Secretary shall establish a process by which any person that—

(A) intends to be an ammonium nitrate purchaser is required to register with the Department; and

(B) registers under subparagraph (A) is issued a registration number for purposes of this subtitle.

(2) REGISTRATION INFORMATION.—Any person applying to register under paragraph (1) as an ammonium nitrate purchaser shall submit to the Secretary—

(A) the name, address, and telephone number of the applicant; and

(B) the intended use of ammonium nitrate to be purchased by the applicant.

(e) RECORDS.—

(1) MAINTENANCE OF RECORDS.—The owner of an ammonium nitrate facility shall—

(A) maintain a record of each sale or transfer of ammonium nitrate, during the two-year period beginning on the date of that sale or transfer; and

(B) include in such record the information described in paragraph (2).

(2) SPECIFIC INFORMATION REQUIRED.—For each sale or transfer of ammonium nitrate, the owner of an ammonium nitrate facility shall—

(A) record the name, address, telephone number, and registration number issued under subsection (c) or (d) of each person that purchases ammonium nitrate, in a manner prescribed by the Secretary;

(B) if applicable, record the name, address, and telephone number of an agent acting on behalf of the person described in subparagraph (A), at the point of sale;

(C) record the date and quantity of ammonium nitrate sold or transferred; and

(D) verify the identity of the persons described in subparagraphs (A) and (B), as applicable, in accordance with a procedure established by the Secretary.

(3) PROTECTION OF INFORMATION .—In maintaining records in accordance with paragraph (1), the owner of an ammonium nitrate facility shall take reasonable actions to ensure the protection of the information included in such records.

(f) EXEMPTION FOR EXPLOSIVE PURPOSES .—The Secretary may exempt from this subtitle a person producing, selling, or purchasing ammonium nitrate exclusively for use in the production of an explosive under a license or permit issued under chapter 40 of title 18, United States Code.

(g) CONSULTATION .—In carrying out this section, the Secretary shall consult with the Secretary of Agriculture, States, and appropriate private sector entities, to ensure that the access of agricultural producers to ammonium nitrate is not unduly burdened.

(h) DATA CONFIDENTIALITY .— … …
(i) REGISTRATION PROCEDURES AND CHECK OF TERRORIST SCREENING DATABASE .—
(1) REGISTRATION PROCEDURES .—
(A) GENERALLY .—The Secretary shall establish procedures to efficiently receive applications for registration numbers under this subtitle, conduct the checks required under paragraph (2), and promptly issue or deny a registration number.
(B) INITIAL SIX -MONTH REGISTRATION PERIOD .—The Secretary shall take steps to maximize the number of registration applications that are submitted and processed during the six-month period described in section 899F(e).
(2) CHECK OF TERRORIST SCREENING DATABASE .—
(A) CHECK REQUIRED .—The Secretary shall conduct a check of appropriate identifying information of any person seeking to register with the Department under subsection (c) or (d) against identifying information that appears in the terrorist screening database of the Department. "

Chemical Facility Anti-Terrorism Standards (CFATS)
CFATS addresses hundreds of chemicals, including ammonium nitrate, and is directed at the security of high-risk facilities. DHS stated in the CFATS interim final rule that "if a retail establishment does exceed any of these [screening threshold quantities], *the retail establishment will have to complete the Top-Screen.*"[46]

The DHS lists 322 chemicals and screening threshold quantities for each chemical to determine the need to comply with CFATS[47]. *The DHS considers each chemical in the context of three threats: release; theft or diversion; and sabotage and contamination. The regulation lists two formulations of ammonium nitrate (one used as a blasting agent, the other as fertilizer) as a chemical of interest and identifies them as release and theft or diversion threats.*
The screening threshold quantity differs depending on whether the ammonium nitrate is a blasting agent or fertilizer. Facilities having at least 5,000 lbs of AN (400 lbs, if packaged for transportation), as a blasting agent (ammonium nitrate with more than 0.2% combustible substances), or at least 2,000 lbs of transportable fertilizer (with nitrogen concentration of 23% or greater, or fertilizer mixture containing at least 33% of AN) are considered a high risk facility. Therefore, they should follow CFATS[48].

"Assignment of tiers is based on an assessment of the potential consequences of a successful attack on assets associated with chemicals of interest. The Department of Homeland Security uses information submitted by facilities through the Chemical Security Assessment Tool Top Screen and Security Vulnerability Assessment (SVA) processes to identify a facility's risk, which is a function of the potential impacts of an attack (consequences), the likelihood that an attack on

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[46] 72 Federal Register 17688-17745 (April 9, 2007) at 17697 (in page 17697, it is the last sentence of "1. Definition of ``Chemical Facility or Facility''", right above "2. Multiple Owners and Operators"). http://www.gpo.gov/fdsys/pkg/FR-2007-04-09/html/E7-6363.htm
[47] DHS list of chemicals: http://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf
[48] 72 Federal Register 65396-65435 (November 20, 2007) at 65407, http://www.gpo.gov/fdsys/pkg/FR-2007-11-20/html/07-5585.htm

the facility would be successful (vulnerabilities), and the likelihood that such an attack would occur at the facility (threat). All facilities that were individually requested by the Assistant Secretary or that meet the criteria in Appendix A [of CFATS] *must complete the CSAT Top Screen. The highest tier facilities, or Phase 1 facilities, are those specifically requested by the Assistant Security to complete the Top Screen; these are addressed by the Department first. All facilities that must complete the Top Screen are preliminarily tiered. These facilities are required to complete a Security Vulnerability Assessment (SVA), which provides more in-depth information that allows the Department to assign a final risk tier ranking to the facility. Preliminarily tier 1, 2, and 3 facilities must subsequently submit a CSAT Security Vulnerability Assessment. Tier 4 facilities may submit an Alternative Security Program (ASP) for the Department of Homeland Security to consider in accordance with 67 CFR 27.235(a). Tier 3 and 4 facilities may choose to submit an Alternative Security Plan for the Site Security Plan for consideration by the Department in accordance with 6 CFR 27.235(a)."* [49]

Top screen questions:
http://www.dhs.gov/xlibrary/assets/chemsec_csattopscreenquestions.pdf
http://www.dhs.gov/xlibrary/assets/chemsec_csattopscreenusersmanual.pdf

Security Vulnerability Assessment (SVA) questions:
https://www.dhs.gov/sites/default/files/publications/chemicalsecurity_svaquestions%20v3.pdf

[49] http://www.dhs.gov/risk-chemical-facility-anti-terrorism-standards-cfats

APPENDIX D
Potential Coverage/Oversight of West Fertilizer by DOT Regulations

Ammonium nitrate is covered by DOT, according to the following paragraph taken from § **173.127**:

"*173.127 Class 5, Division 5.1—Definition and assignment of packing groups. (a) Definition. For the purpose of this subchapter, oxidizer (Division 5.1) means a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials. (1) A solid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter), its mean burning time is less than or equal to the burning time of a 3:7 potassium bromate/cellulose mixture. (2) A liquid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria, it spontaneously ignites or its mean time for a pressure rise from 690 kPa to 2070 kPa gauge is less then the time of a 1:1 nitric acid (65 percent)/cellulose mixture.*"[50]

All DOT requirements for ammonium nitrate are with regard to safe transportation. Last known inspection of the West Fertilizer site was conducted by DOT on September 23, 2011. The inspection resulted in a fine of $5,250 with a total of 2 violations; illegible data on ASME placards and/or missing flammable gas placards (front and/or rear) and no security plan.[51] [52] [53] All the penalties/fines were with regard to anhydrous ammonia.

"**Section 172.800(b)**[54] states, in part, "*Each person who offers for transportation in commerce or transports in commerce one or more of the following hazardous materials must develop and adhere to a transportation security plan for hazardous materials that conforms to the requirements of this subpart. As used in this section, "large bulk quantity" refers to a quantity greater than 3,000 kg (6,614 pounds) for solids or 3,000 liters (792 gallons) for liquids and gases in a single packaging such as a cargo tank motor vehicle, portable tank, tank car, or other bulk container.*"

Section 172.802(b) [55] states *(a) "The security plan must include an assessment of transportation security risks for shipments of the hazardous materials listed in §172.800, including site-specific or location-specific risks associated with facilities at which the hazardous materials listed in*

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[50] 49 CFR § 173.127. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title49-vol2/pdf/CFR-2010-title49-vol2-sec173-127.pdf
[51] Inspection / Investigation Report No. 1220047. Available at: http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Press%20Releases/west_fertilizer_rpt_redact.pdf
[52] Compromise order. Available at: http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Hazmat/Enforcement/West%20Fertilizer%20Comp%20Order%20Jun%202012.pdf
[53] Notice of Probable Violation. Available at: http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Hazmat/Enforcement/West%20Fertilizer%20NOPV%20Jan2012.pdf
[54] 49 CFR §172.800. Available at http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol2/pdf/CFR-2011-title49-vol2-sec172-800.pdf
[55] 49 CFR §172.802b. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol2/pdf/CFR-2011-title49-vol2-sec172-800.pdf

***§172.800** are prepared for transportation, stored, or unloaded incidental to movement, and appropriate measures to address the assessed risks. Specific measures put into place by the plan may vary commensurate with the level of threat at a particular time. At a minimum, a security plan must include the following elements:*

(1) Personnel security. Measures to confirm information provided by job applicants hired for positions that involve access to and handling of the hazardous materials covered by the security plan. Such confirmation system must be consistent with applicable Federal and State laws and requirements concerning employment practices and individual privacy.

(2) Unauthorized access. Measures to address the assessed risk that unauthorized persons may gain access to the hazardous materials covered by the security plan or transport conveyances being prepared for transportation of the hazardous materials covered by the security plan.

(3) En route security. Measures to address the assessed security risks of shipments of hazardous materials covered by the security plan en route from origin to destination, including shipments stored incidental to movement.

(b) The security plan must also include the following:

(1) Identification by job title of the senior management official responsible for overall development and implementation of the security plan;

(2) Security duties for each position or department that is responsible for implementing the plan or a portion of the plan and the process of notifying employees when specific elements of the security plan must be implemented; and

(3) A plan for training hazmat employees in accordance with §172.704 (a)(4) and (a)(5) of this part.

(c) The security plan, including the transportation security risk assessment developed in accordance with paragraph (a) of this section, must be in writing and must be retained for as long as it remains in effect. The security plan must be reviewed at least annually and revised and/or updated as necessary to reflect changing circumstances. The most recent version of the security plan, or portions thereof, must be available to the employees who are responsible for implementing it, consistent with personnel security clearance or background investigation restrictions and a demonstrated need to know. When the security plan is updated or revised, all employees responsible for implementing it must be notified and all copies of the plan must be maintained as of the date of the most recent revision.

(d) Each person required to develop and implement a security plan in accordance with this subpart must maintain a copy of the security plan (or an electronic file thereof) that is accessible at, or through, its principal place of business and must make the security plan available upon request, at a reasonable time and location, to an authorized official of the Department of Transportation or the Department of Homeland Security."

APPENDIX E

Potential Coverage/Oversight of West Fertilizer by ATF Regulations

The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) regulates ammonium nitrate-based blasting agents. It has regulations on the necessary distance to be maintained between ammonium nitrate and other explosive materials.

Subpart K – Storage§555.202. [56] *Classes of explosive materials.*
"(c) Blasting agents. (For example, ammonium nitrate-fuel oil and certain water-gels (see also § 555.11)."
§ 555.11 Blasting agent. [57] *"Any material or mixture, consisting of fuel and oxidizer, that is intended for blasting and not otherwise defined as an explosive; if the finished product, as mixed for use or shipment, cannot be detonated by means of a number 8 test blasting cap when unconfined. A number 8 test blasting cap is one containing 2 grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate, or a blasting cap of equivalent strength. An equivalent strength cap comprises 0.40–0.45 grams of PETN base charge pressed in an aluminum shell with bottom thickness not to exceed to 0.03 of an inch, to a specific gravity of not less than 1.4 g/cc., and primed with standard weights of primer depending on the manufacturer."*

§ 555.220 Table of separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

Donor weight (pounds)		Minimum separation distance of acceptor from donor when barricaded (feet)		Minimum thickness of artificial barricades (inches)
Over	Not over	Ammonium nitrate	Blasting agent	
0	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	10	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Table: National Fire Protection Association (NFPA) Official Standard No. 492, 1968

[56] 555.202 ATF Federal Explosives Law and Regulations (2012) http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf
[57] 555.11 ATF Federal Explosives Law and Regulations(2012) http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf

555.220 (1) [58] *"This table specifies separation distances to prevent explosion of ammonium nitrate and ammonium nitrate-based blasting agents by propagation from nearby stores of high explosives or blasting agents referred to in the table as the "donor." Ammonium nitrate, by itself, is not considered to be a donor when applying this table. Ammonium nitrate, ammonium nitrate-fuel oil or combinations thereof are acceptors. If stores of ammonium nitrate are located within the sympathetic detonation distance of explosives or blasting agents, one-half the mass of the ammonium nitrate is to be included in the mass of the donor."*

However, ATF does not regulate ammonium nitrate as fertilizer because of the exemption in subpart H.

Subpart H- Exemptions §555.141.(a).(8) [59] *"Gasoline,* ***fertilizers****, propellant actuated devices, or propellant actuated industrial tools manufactured, imported, or distributed for their intended purposes."*

If ammonium nitrate as fertilizer was covered by ATF, and stored nearby other explosives or other blasting agents, it would be required to be stored in accordance with the above table. In the case of West Fertilizer, no other explosives are stored nearby to the best of our knowledge. Thus, even if ATF regulations had covered ammonium nitrate as fertilizer, the ammonium nitrate in the West Fertilizer facility would not to be required to be stored in accordance with the above table.

[58] 555.220 (1) ATF Federal Explosives Law and Regulations 2012 http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf

[59] ATF Federal Explosives Law and Regulations (2012) http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf

Questions from the Honorable David Vitter
Ranking Member, Committee on Environment and Public Works, US Senate

Question 1:
During the hearing, you mentioned some federal laws associated with Ammonium Nitrate and that, in your view, those laws should be properly implemented prior to other agencies duplicating efforts. Could creating multiple new regulatory schemes without fixing existing law potentially hurt first responders' efforts and chemical facility safety rather than help it?

Response to Question 1:
As with many such issues the answer to this question is not straightforward. The creation of even one new regulatory scheme, much less several, always presents the possibility of hurting overall safety if the effort is not managed and implemented effectively. Further, the creation of multiple new, possibly overlapping regimes is most likely not what is required in this case. A single, effective, regulatory regime is desired, whether this comes through the modification and expansion of an existing regime, or by scrapping an existing regime in favor of a new one.

However, the problem that must be addressed is not with the existing law and a change to existing law is not necessarily required at this time. The current failing lies in the enforcement of existing law, not with the law itself. Recordkeeping exemptions granted to small businesses, in my opinion, do not and should not apply to exemptions from regulations specifically intended to protect the workplace employees and the public from specific and imminent harm.

29 CFR 1910.109 is an existing OSHA regulation that already explicitly deals with the storage of Ammonium Nitrate (AN) in bulk quantities. The existing regulation already makes stipulations as to the:

- materials of construction of buildings wherein AN is mixed or stored
- ventilation of such buildings
- design of mixing equipment
- materials of construction for mixing equipment
- disposal of empty containers
- design and use of transportation vehicles
- minimum separation distances between AN and combustible or explosive material (Table H-21), readily combustible fuels, and combustible materials
- minimum separation distances between AN storage areas and highways, railways, and inhabited buildings (Table H-22)
- minimum thickness of protective barricades
- sensitivity of the stored material
- storage temperature
- prevention of contamination
- height and depth of piles
- security of the storage area and control of access to the storage area
- required fire protection systems

Under the language and stipulations of 29 CFR 1910.5 and 29 CFR 1910.109, all of these laws already applied to the West facility and, had they been implemented and enforced, would have prevented the fire and explosion of April 17, 2013. Additional regulations provided under 29 CFR 1910.38 and 29 CFR 1910.39 required written emergency action plans and fire protection plans that do not appear to have existed with West. However, OSHA had not visited or inspected the facility in West, Texas in over 28 years and no enforcement activity had occurred all of that time. It is therefore lack of compliance with and enforcement of §1910.109, §1910.38, and §1910.39 that allowed the incident at West to occur, not a fault, gap or weakness in the law.

In summary, the implementation of new or multiple regulatory regimes has the potential to negatively impact first responder and facility safety. In the event of an emergency or crisis, first responders will seek to take control of the scene and establish control. Part of this is the designation of a central authority, someone who is in charge of the overall response effort. New regulatory schemes and the presence of multiple responding agencies with overlapping jurisdiction can confuse the issue of who has overall authority over a situation. Any resulting confusion, duplication of effort, or conflict between the responders will waste time and resources, and hinder the response at a crucial stage. This is also true of accident investigations and control of an accident scene after the initial crisis has been resolved.

The flow of information is also critical in a first response situation. Responders will need to know how to quickly access essential information about the hazards they're facing in a quick, reliable way. As old systems for disseminating information are retired or new ones are introduced, responders must be made aware of what is out there, how it can help them and how to access it quickly. In West, the time between the start of the fire and the explosion that did most of the damage was less than 30 minutes. That is not much time to arrive on scene, establish control, gather necessary information and respond accordingly.

More information on the criticality of organizational hierarchies and the flow of information can be found in the work of Shen and Shaw[1].

Yes, the implementation of new regulatory regime has the potential to diminish overall safety and security at chemical facilities, principally by squandering limited resources. Every regulation that a facility must comply with requires resources, not just to comply with the regulation but to document that compliance for future reviews and audits. Every agency that a facility must communicate with and answer to adds to the regulatory burden of that facility. Every audit a facility must comply with from those agencies consumes time and resources. To some extent this compliance burden is necessary in order for regulation and regulators to be effective. However, when multiple regulators require the same type of tests and inspections, conduct overlapping audits, and create a duplication of effort resources are wasted. The resources that a facility puts into complying with redundant regulations and inspections could be applied to other efforts to further improve the performance, reliability, and physical security of a process rather than generating redundant paperwork.

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[1] Shen, Stella Ying, Michael J. Shaw. "Managing Coordination in Emergency Response Systems with Information Technologies." *Proceedings of the Tenth Americas Conference on Information Systems.* New York. 2004.

Additionally, unless efforts are undertaken to identify the entire regulated community and unless efforts are undertaken to effectively enforce existing regulations a new regulatory scheme will not solve the problem. The facilities that are already aware of the regulations and compliant with them will be burdened with an additional requirement. The facilities that do not currently comply with existing regulations, or who claim to be ignorant of them, will continue to claim ignorance and skirt compliance. This in effect hurts those who are acting in good faith to comply with regulations and operate safely while having no impact on poor performers and doing nothing to improve the overall safety of the chemical infrastructure and the public at large.

Question 2:
What are some examples of industry sharing forums where best practices on Process Safety Management are shared and what are your thoughts on the value of these forums?

Response to Question 2:
There are many different forums for companies to share process safety management best practices, some of which are meetings, online or in person discussion forums, and multiple day conferences. In general, these forums do a good job at transferring best practice knowledge to different companies and keeping people up to date. One of the challenges though is that the majority of the attendees of these forums are from companies that are already safety conscious. Companies who lack safety awareness do not send representatives to safety forums and never get the useful information. The problem is not the amount of information, although more information can take process safety to new heights, it is the inability to spread that information to the companies that do not already think about safety.

Other factors influencing the usefulness of forums and industry associations include:

- Size of the company and resources
- Need to reach out (when a need to improve safety has been identified in a company)
- Level of Education and Experience of owner/person in charge

Without doubt, industry sharing forums are valuable and have an important place in process safety management, but the division of knowledge is a very serious problem that forums attended voluntarily cannot address.

Other alternatives might be tried in order to reach smaller companies and promote regulatory compliance. For example, federal agencies such as OSHA, EPA and DHS could host seminars to explain regulations and clarify questions from the public in a friendly environment. In order to ensure that small companies are actually reached, federal agencies could work with industry associations and distribute information about workshops and seminars through them, *e.g.*, DHS could contact the Agricultural Retailers Association (ARA), who has about 7,000 member companies, to distribute information on CFATS.

The following is a partial list of forums at National, International, Regional and Industry Specific levels.

Conferences at International Level

- **EFCE Symposium on Loss Prevention and Safety Promotion in the Process Industries**
  http://www.wp-lossprevention.eu/home
  The purpose of the Working Party on Loss Prevention and Safety Promotion in the Process Industries of the European Federation of Chemical Engineers is to promote safety and loss prevention in the process industries, at a European level, by exchanging information and stimulating the development of new methods and the dissemination of data, which may reduce the risk of fires, explosions and loss of containment in the process industries.

- **Mary Kay O'Connor Process Safety Center Annual International Symposium**
  http://psc.tamu.edu/symposia/2013-sym
  This annual international symposium serves as the crossroads for process safety where industry, academia, government agencies and other stakeholders come together to discuss critical issues of research in process safety. Experts from around the world gather as part of this two and a half-day symposium, to share the latest information on current topics aimed at making the process industry a safer place.

- **Global Congress on Process Safety (Center for Chemical Process Safety)**
  http://www.aiche.org/ccps/conferences/global-congress-on-process-safety/2014
  From its initial meeting in 2005, the Global Congress on Process Safety has grown into the world's largest gathering of process safety experts. Presented by the Center for Chemical Process Safety (CCPS) and the AIChE Safety & Health Division, this annual events drawn more than 1100 attendees from around the globe at its last meeting (9th GCPS) in San Antonio.

- **National Safety Council Congress & Expo**
  http://www.congress.nsc.org/nsc2013/public/Content.aspx?ID=2073
  It is an event for safety, health and environmental professionals, designed to build awareness of the tools available to organizations as they continue down the path to safety excellence.

- **IChemE Hazards Symposium**
  http://www.icheme.org/events/conferences/hazards-24/overview.aspx

  Hazards 24 will address both the offshore and onshore process safety challenges, providing a platform for current thinking and latest research on all aspects of chemical and process safety alongside a trade exhibition of related products and services.

Conferences at National Level

- **American Fuel & Petrochemicals Manufacturers (AFPM, Former NPRA)**
  https://www.afpm.org/Conferences/
  AFPM offers a variety of events, including the National Occupational and Process Safety Conference. This conference features an overview of safety challenges and issues affecting refineries and petrochemical plants. The Exhibition, held as part of the conference, gives attendees the opportunity to meet and talk with representatives of companies offering a variety of safety-related services to the refining and petrochemical industries.

Conferences at Regional Level

- **National Safety Council – Texas Safety Conference & Expo (Galveston, TX)**
  http://www.tsce.nsc.org/tsce2013/public/enter.aspx

The National Safety Council Texas Safety Conference & Expo is an annual event for safety professionals from the Gulf Coast and beyond looking to improve safety in their organization. The conference allows attendees of all experience levels to learn best practices and trends, network in a variety of settings and discover safety solutions from more than 170 exhibitors.

- **Annual Workplace Safety & Health Conference (Austin, TX)**
  http://www.tdi.texas.gov/wc/safety/summithome.html
  The Texas Safety Summit features top safety professionals, valuable information, and education on some of the most prevalent safety and health issues in Texas.

- **Ohio Safety Congress & Expo**
  https://www.ohiobwc.com/employer/programs/safety/schedule.asp
  It offers more than 150 educational sessions on topics such as safety program development, emergency planning, cost-cutting safety strategies, construction safety, injury management and ergonomics.

- **Chesapeake Regional Safety Council - Annual Meeting and Conferences**
  http://www.chesapeakesc.org/events.php
  The Chesapeake Region Safety Council hosts a variety of events throughout the calendar year. Each event is designed to present health and safety information to companies and their personnel, and to recognize outstanding safety performance in the area.

Industry specific safety conferences

- **National Chemical Safety Symposium – Hosted by SOCMA's ChemStewards**
  http://www.socma.com/events/index.cfm?eventCat=2&articleID=3799
  http://www.socma.com/ChemStewards/
  SOCMA, the Society of Chemical Manufacturers and Affiliates, Inc., is the only U.S.-based trade association dedicated solely to the batch, custom and specialty chemical industry. ChemStewards® is an environmental, health, safety and security (EHS&S) management program designed to help your facility optimize its performance, save money and enhance its role as a good corporate citizen in your community. The program was established in 2005 to meet the unique needs of the batch, custom and specialty chemical industry. As a mandatory requirement for SOCMA members engaged in the manufacturing or handling of synthetic and organic chemicals, ChemStewards helps participants strive for superior EHS&S performance.

- **58th Annual Safety in Ammonia Plants and Related Facilities Symposium (August 25-29, 2013 Marriott Frankfurt Hotel, Germany)**
  http://www.aiche.org/conferences/annual-safety-ammonia-plants-and-related-facilities-symposium/2013
  The Ammonia Safety Symposium is an annual event developed by AIChE's Ammonia Safety Committee. This committee is dedicated to making the plants that manufacture ammonia and related chemicals as safe as possible.

Question 3:

What are the regulations that are already in place that contribute to industry having a strong Process Safety Management program and culture?

Response to Question 3:

Currently there are three main regulatory programs that apply to process safety in the chemical process industry. These are:

- OSHA's Process Safety Management Standard (29 CFR 1910.119)
- BSEE's Safety and Environmental Management Systems (SEMS and SEMS-II)
- EPA's Risk Management Plan (RMP)

In general, these are all good programs, but ultimately, results depend on competency of the industry, regulators and audits/inspections done by the federal agencies. Questions can be raised at this point, such as:

- Are audits being performed regularly?
- Do these federal Agencies have the capabilities to audit the regulated industries?
- Are auditors competent to perform such audits?

The following table summarizes the scope of the regulations that allow industry to have a strong Process Safety Management program and culture.

Process Safety Management of Hazardous Materials (OSHA 29 CFR 1910.119)	**Safety and Environmental Management Systems - SEMS (API RP 75, adopted by BSEE)**	**Risk Management Program (EPA)**
Employee Participation Process Safety Information Process Hazard Analysis Operating Procedures Training Contractors Pre-startup Safety Review Mechanical Integrity Hot Work Permit Management of Change Incident Investigation Emergency Planning and Response Compliance Audits Trade Secrets	Process Safety Information Process Hazard Analysis Operating Procedures Safe Work Practices Training Critical Equipment QA Mechanical Integrity Pre-startup Safety Review Emergency Response and Control Process-Related Incident Investigation Auditing of PHM Systems In addition, SEMS-II is making its way through rulemaking	Varying levels of requirements based on program level, which is determined based on risk

OSHA – Process Safety Management (PSM) Standard[2]

The Process Safety Management (PSM) standard *"contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals."* [3]

Companies covered under the PSM standard must develop and implement a program covering the following 14 elements: [4]

- Employee Participation
- Process Safety Information
- Process Hazard Analysis
- Operating Procedures
- Training
- Contractor Safety
- Pre-Startup Safety Review
- Mechanical Integrity
- Hot Work Program
- Management of Change
- Incident Investigation
- Emergency Planning and Response
- Compliance Audits
- Trade Secrets

BSEE – Safety and Environmental Management Systems (SEMS, API RP 75)[5]

SEMS has its origins going back to the 1990 finding of the National Research Council's Marine Board that the Minerals Management Service's (MMS) prescriptive approach to regulating offshore operations had forced industry into a compliance mentality. In response to the Marine Board findings in May 1993, the API, in cooperation with the MMS, developed **Recommended Practice 75 - Development of a Safety and Environmental Management Program for Outer Continental Shelf Operations and Facilities** ("SEMP" or "API RP 75").

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly the Minerals Management Service (MMS), was replaced by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) as part of a major reorganization.

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[2] https://www.osha.gov/SLTC/processsafetymanagement/

[3] 29 C.F.R. §1910.119.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760

[4] https://www.osha.gov/SLTC/etools/evacuation/eap.html

[5] DiGiglia, J. M. (2012). "BSEE Enforcement of SEMS Regulations". Presentation to the Professional Landmen's Association of New Orleans. February 16, 2012.

Before BOEMRE was split and dissolved, it proposed revisions to the SEMS Rule on September 14, 2011, which has been dubbed SEMS II and "Son of SEMS." The proposed SEMS II Rule requires (1) procedures to authorize any and all employees on the facility to implement a Stop Work Authority (SWA) program when witnessing an activity that creates a threat or danger to an individual, property, and/ or the environment, (2) clearly defined requirements establishing who has the ultimate authority on the facility for operational safety and decision making at any given time, (3) a plan of action that shows how operator employees are involved in the implementation of API RP 75, (4) guidelines for reporting unsafe work conditions related to an operators SEMS program, that provide all employees the right to report a possible safety or environmental violation(s), (5) guidelines for employees to request a BSEE inspection of the facility if they believe there is a serious threat of danger or their employer is not following BSEE regulations, (6) revisions that require operators with SEMS programs to engage independent third party auditors to conduct all audits of operators' SEMS programs and that the independent third party (IP3) auditors must meet certain specific qualification criteria and (7) additional requirements for conducting a Job Safety Analysis.

BSEE is undergoing an organizational culture change moving from the MMS's highly compliance-oriented organization to a new performance-based culture.

EPA – Risk Management Plan (RMP)[6]

This federal regulation was mandated by section 112(r) of the Clean Air Act Amendments of 1990. The regulation requires facilities to develop and implement proper risk management program to mitigate risk, in term of frequency and severity of chemical plant incidents.[7]

RMP is mandatory for facilities that use more than a certain threshold quantity of regulated highly hazardous chemicals. These facilities submit their Risk Management Plan (RMPlan) to the EPA and subsequently the RMPlan is made available to governmental agencies, the state emergency response commission, the local emergency planning committees, and communicated to the public.

EPA's Risk Management Program has provisions for Prevention Programs that are very similar to OSHA's PSM. However, differences exist because EPA and OSHA have different responsibilities. RMP is designed specifically for protection of the public and the environment, whereas PSM is designed specifically for the protection of workplace employees.

[6] 40 CFR 68.67. http://www.gpo.gov/fdsys/pkg/CFR-2004-title40-vol14/pdf/CFR-2004-title40-vol14-sec68-67.pdf

[7] Crowl, D. A, Louvar J. F, Chemical Process Safety Fundamental with Application, U.S. Prentice Hall, 2002.

Table 1. Different program levels for EPA's Risk Management Program[8]

Program1	Program 2	Program 3
Program Eligibility Criteria		
No offsite accident history No public receptors in Worst-case circle Emergency response coordinated with local responders	Process not eligible for program 1 or 3	Process is subject to OSHA PSM (29 CFR 1910.119) Process is SIC code 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911
Program Requirements		
Hazard assessment Worst-case analysis 5-year accident history Certify no additional steps needed	Hazard assessment Worst-case analysis Alternative releases 5-year accident history Management program Document management system	Hazard assessment Worst-case analysis Alternative releases 5 -year accident history Management program Document management system
	Prevention Program	
	Safety information Hazard review Operating procedures Training Maintenance Incident investigation Compliance audit	Process safety information Process hazard analysis Operating procedures Training Mechanical integrity Incident investigation Compliance audit Management of change Pre-startup safety review Contractors Employee participation Hot work permits
	Emergency response program	
	Develop plan and program	Develop plan and program

[8] Lees' Loss Prevention in The Process Industries Vol.1, Vol.2 and Vol.3 Hazard Identification, Assessment and Control 3rd Edition, Elsevier, 2004.

Additional regulations/programs

DHS – Chemical Facility Anti-Terrorism Standard (CFATS)

Section 550 of the DHS Appropriations Act of 2007 grants the Department the authority to regulate chemical facilities that "present high levels of security risk." Under this authority, in April 2007, the Department of Homeland Security promulgated the Chemical Facilities Anti-Terrorism Standards (CFATS) regulation. Facilities that may be required to comply with at least some provisions of the CFATS regulation largely fall into the following categories[9]:

- chemical manufacturing, storage and distribution;
- energy and utilities;
- agriculture and food;
- paints and coatings;
- explosives;
- mining;
- electronics;
- plastics; and
- healthcare.

Any facility that possesses an Appendix A Chemical of Interest (COI) in a quantity at or above the listed thresholds for any period of time is covered by the standard, and must submit a Top Screen (within 60 calendar days) consequence assessment to DHS through the secure online Chemical Security Assessment Tool (CSAT).

Following the Department's review of a facility's Top-Screen submission, the facility may be notified in writing that it is required to complete and submit a Chemical Security Assessment Tool (CSAT) Security Vulnerability Assessment (SVA).[10]

This rule establishes risk-based performance standards for the security of chemical facilities. It requires covered chemical facilities to:

- Prepare Security Vulnerability Assessments: identify facility security vulnerabilities
- Develop and implement Site Security Plans: including measures that satisfy the identified risk-based performance standards.
- (certain covered chemical facilities) Submit Alternate Security Programs in lieu of a Security Vulnerability Assessment, Site Security Plan, or both.

DOT (PHMSA)

Regulates transportation, packaging, and hazard communication of hazardous materials transported by highway, rail and water.

Risk Management of PHMSA: [11]

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[9] http://www.dhs.gov/identifying-facilities-covered-chemical-security-regulation

[10] http://www.dhs.gov/csat-security-vulnerability-assessment

(Risk Management Self-Evaluation Framework (RMSEF) could be found at http://www.phmsa.dot.gov/hazmat/risk/rmsef [12])

The purpose of the Hazardous Materials Transportation Program is to identify and manage risks presented by transportation of hazardous materials in commerce.

The hazardous materials transport system is highly heterogeneous and complex. Hazardous materials transport is a chain of events involving multiple players (*e.g.*, shippers, carriers, packaging manufacturers, container reconditioners, distributors, freight forwarders, consignees (receivers of shipment), emergency responders, government regulators, enforcement personnel) having different roles in the process of safely moving hazardous materials from their origin to their destination.

PHMSA believes that implementing a robust, systematic approach to hazardous materials transportation risk management can have at least two valuable products.

- Identify critical areas demanding greater attention and control.
- Identify those areas where additional controls may not be necessary.

EPA

Besides the Risk Management Plan previously mentioned, there are some other EPA regulations that contribute to a good process safety management. They are listed below:

Tier II report: EPCRA (311/312)

Tier II requires reporting of hazardous chemicals (ammonium nitrate is included) stored above certain quantities. Tier II reports are submitted to local fire departments and emergency planning and response groups to help them plan for and respond to chemical disasters.

- In Texas, the reports are collected by the Department of State Health Services. Over the last seven years, according to reports filed by West Fertilizer, 2012 was the only time the company stored ammonium nitrate at the facility.[13]

OSHA (Department of Labor)

Classifies hazards of chemical products, regulates communication of those hazards, and regulates storage of chemical products.

Besides the Process Safety Management (PSM) standard previously mentioned, there are some other OSHA programs and regulations that contribute to a good process safety management. They are listed below:

- Standardized Emergency Management System[14]: This regulation is required by the California Emergency Services Act (ESA) for managing multiagency and multijurisdictional responses to emergencies in California.[15]

[11] http://www.phmsa.dot.gov/hazmat/risk

[12] http://www.phmsa.dot.gov/hazmat/risk/rmsef

[13] http://www.chicagotribune.com/news/sns-rt-us-usa-explosion-regulationbre93k09h-20130421,0,7972342.story?page=2

- Safe work practices:
  Depending on the type of industry and the operations, work practices for specific OSHA standards or to recognized hazards may be required. Some of these specific areas include:
  - Respiratory Protection [29 CFR 1910.134].
  - Lockout/Tagout [29 CFR 1910.147].
  - Confined Space Entry [29 CFR 1910.146].
  - Hazard Communication [29 CFR 1910.1200, 29 CFR 1926.59].
  - Blood borne Pathogens [29 CFR 1910.1030].
  - Hearing Conservation [29 CFR 1910.95].
  - Laboratory Chemical Hygiene [29 CFR 1910.1450].

- A preventive maintenance program is required for overhead and gantry cranes, [29 CFR 1910.179]

- Medical programs consist of everything from a basic first aid and CPR response for sophisticated approaches for the diagnosis and resolution of ergonomic problems. [See OSHA standard 29 CFR 1910.151(b) for first aid requirements. Also, the Bloodborne Pathogens Standard has requirements to protect employees who administer first aid and 29 CFR 1910.1030.]

- "General Duty Clause" of the Occupational Safety and Health Act (P.L. 91-596)[16]
  The "General Duty Clause" requires employers to provide employees with a workplace that is free from *"recognized hazards that are causing or are likely to cause death or serious physical harm"*[17].

- Emergency Action Plan _ OSHA Standard 1910.38[18, 19]
  An emergency action plan (EAP) is a written document required by particular OSHA standards [29 CFR 1910.38(a)]. The purpose of an EAP is to facilitate and organize employer and employee actions during workplace emergencies.[20]

  At a minimum, the plan must include but is not limited to the following elements [29 CFR 1910.38(c)]:

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14 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDwQFjAA&url=https%3A%2F%2Fwww.osha.gov%2Fdte%2Fgrant_materials%2Ffy06%2F46j6-ht40%2F2-command-control.ppt&ei=mPolUvm9FMmf2QWg44CwCw&usg=AFQjCNHlwkNj8WUDub1EwMEr8PxybRLCGQ&sig2=mFusgzRXPFz1ucSGGTzybg&bvm=bv.50500085,d.aWc

15 http://www.calema.ca.gov/planningandpreparedness/pages/standardized-emergency-management-system.aspx

16 https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=2743&p_table=OSHACT

17 29 U.S.C. §654(a). Available at: http://www.gpo.gov/fdsys/pkg/USCODE-2010-title29/pdf/USCODE-2010-title29-chap15-sec654.pdf

18 Shea, D.A., Schierow, L.J., Szymendera, S. (2013) Congressional Research Service. *Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia.*

19 https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9726&p_table=STANDARDS

20 https://www.osha.gov/SLTC/etools/evacuation/eap.html

- Means of reporting fires and other emergencies
- Evacuation procedures and emergency escape route assignments
- Procedures to be followed by employees who remain to operate critical plant operations before they evacuate
- Procedures to account for all employees after an emergency evacuation has been completed
- Rescue and medical duties for those employees who are to perform them
- Names or job titles of persons who can be contacted for further information or explanation of duties under the plan

- National Emphasis Program[21, 22]
  The National Emphasis Program (NEP) was developed to focus OSHA resources on workplace health and safety issues of specific occupational exposure.

TSA
Regulates freight and passenger rail systems and reduces the risk associated with the transportation of security-sensitive materials.

Safety Information System (SIS): A total risk-based management and analysis system capable of recording and tracking injuries and illnesses in compliance with OSHA recordkeeping requirements, generating risk assessments, tracking safety inspections, and monitoring corrective actions resulting from incident reports and inspections. This is the system of record for all injury, illness, and workers' compensation data for TSA employees.[23]

TSA/FTA Security and Emergency Management Action Items for Transit Agencies [24]

- Establish Written System Security Programs and Emergency Management Plans
- Define roles and responsibilities for security and emergency management.
- Ensure that operations and maintenance supervisors, forepersons, and managers are held accountable for security issues under their control
- Coordinate Security and Emergency Management Plan(s) with local and regional agencies
- Establish and Maintain a Security and Emergency Training Program
- Establish plans and protocols to respond to the DHS Homeland Security Advisory System (HSAS) threat levels
- **Establish and use a Risk Management Process to assess and manage threats, vulnerabilities and consequences (Note: Risk management includes mitigation measures selected after risk assessment has been completed)**

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[21] https://www.osha.gov/OshDoc/Directive_pdf/CPL_03-00-017.pdf
[22] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=24273
[23] http://www.tsa.gov/video/pdfs/mds/TSA_MD_2400_1_FINAL_090611.pdf
[24] http://transit-safety.volpe.dot.gov/security/securityinitiatives/actionitems/actionlist.asp

USCG

Regulates security, trade and commerce carried out at ports includes bulk cargo, containerized cargo, passenger transport and tourism, and intermodal transportation systems that are complex to secure.

Operational Risk Management

All Coast Guard missions and daily activities, both on- and off-duty, require decisions managing risk. ORM's target audience includes all those involved in operations, maintenance, and support activities. While risk assessment and risk management concepts generally apply to all Coast Guard activities and decision-making, some areas require additional tools and techniques.[25] The seven steps of the Operation Risk Management (ORM) process are:[26]

- Define Mission/tasks
- Identify the Hazards
- Assess the Risk
- Identify options
- Evaluate Risk vs. Gain
- Execute the decision
- Monitor the situation

Risk Management [27]

Risk Based Decision Making (RBDM) provides a defensible basis for making decisions and helps to identify the greatest risks and prioritize efforts to minimize or eliminate them.

[25] http://www.uscg.mil/directives/ci/3000-3999/Ci_3500_3.pdf

[26] http://www.uscg.mil/petaluma/e-pme/e-pme/journeyman/knowledge/E6/E6k14601.pdf

[27] http://www.uscg.mil/hq/cg5/cg5211/risk.asp

Senator BOXER. Thank you. And then we call on, last but not least, Mr. Kim Nibarger. Mr. Nibarger is a Health and Safety Specialist at United Steelworkers International Union.

STATEMENT OF KIM NIBARGER, HEALTH AND SAFETY SPECIALIST, HEALTH, SAFETY AND ENVIRONMENT DEPARTMENT, UNITED STEELWORKERS INTERNATIONAL UNION

Mr. NIBARGER. Chairman Boxer, Ranking Member Vitter and members of the Committee, thank you for the opportunity to testify at this hearing.

We represent the majority of organized workers in the petrochemical industry as well as hundreds of thousands of workers who use chemicals on the job. I worked in a West Coast oil refinery for 17 years.

First I would like to point out that the two events under discussion, the explosions at the West, Texas fertilizer plant and the Williams chemical facility, are in no way isolated incidents. Also in April of this year, 12 workers were burned at the Exxon Mobile Refinery, two of who subsequently died from their injuries. Later that month, eight workers were sent to the hospital after an explosion and fire at the Chevron Port Arthur refinery. And on this past Monday, an explosion at a fertilizer plant in Indiana killed one person.

Since 2008, the oil industry has reported an average of over 45 fires a year. So far, 2013 appears to be right on track with 22 fires through June 21st. These are industry self-reported and do not include many small fires that our members bring to our attention. It also does not include oil rigs, pipelines or storage terminal fires and does not include chemical plants.

These sometimes deadly and potentially catastrophic events take place all too often in this industry. The first response from industry after a tragedy is that the safety of their employees is their top priority. The widowed wives and husbands, children left without a father or mother, may feel differently. More must be done to prevent these types of incidents from occurring in the first place.

The regulatory process relies on much self-reporting which, in essence, allows the industry to self-regulate. As seen in the November 2012 EPA Risk Management Inspection at the ExxonMobil facility in Baton Rouge, the company had never done a compliance audit for risk management planning although it is required to be done every 3 years.

In order to assess compliance, the EPA reviewed the PSM audits, which they had conducted, since they were similar. The EPA evaluation found that not only were required elements missing altogether, but even where an element was addressed the company did not follow the appropriate technical procedures and practices.

One of the problems with the Process Safety Management Standard which governs the health and safety of facilities using a specified volume of highly hazardous chemicals is that it is performance based. The standard tells you what to do but how it is done is left up to the company.

This is necessary to a degree in that it allows the employer to bring in new technology or what is termed Recognized and Generally Accepted Good Engineering Practices, or RAGAGEP, to make improvements under the standard. But what we typically see are employers riding on past practices, that this was RAGAGEP at the time it was put into place so we do not need to upgrade it now.

OSHA is under-funded and under-staffed. The Process Safety Management Standard requires considerable technical expertise to enforce and there are not enough adequately trained compliance officers to address the PSM covered sites as is the case with RMP under EPA.

The Process Safety Management Standard itself is written to require certain plans but there is no requirement that these plans be good, only that certain items be addressed. For example, an MOC meets the regulatory compliance if it is done. So, all you need is a check sheet or a checklist.

We also hear that workers have stop work authority, that if they identify an unsafe condition they can stop the work until it is deemed safe to continue. That was not the case for members at the Chevron Richmond refinery in California. Workers who wanted to take the unit that caught fire off line were overruled. While as workers we have the authority, we certainly do not have the power. This is a fallacy in talking about a safety culture. It is based on a harmonized model. Without the power, the authority means nothing.

While we complain about the lack of regulatory involvement, what about the companies' responsibility to act? When the leak was discovered at Chevron, the decision should have made to de-pressure and shut the unit down based on material and volume. To maintain the idea that it is safer to operate a unit with a hole in the pipe which was not going to get better than to shut a unit down is absurd. If that is the case, you need to take a serious look at your operating procedures and parameters. Calling this type of operation risk-based management is not managing the risk at all. It is just taking a risk.

Thank you again for the opportunity to raise some fears workers have about the state of process safety in the petrochemical industry.

[The prepared statement of Mr. Nibarger follows:]

Testimony of Kim Nibarger, United Steelworkers
Before the
U.S. Senate Committee on Environment and Public Works

Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosion in West, TX and Geismar, LA

June 27, 2013
Washington, DC

Chairman Boxer, Ranking Member Vitter and members of the committee, thank you for the opportunity to testify at this hearing. My name is Kim Nibarger. I am a health, safety and environmental specialist for the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union, or USW for short. We are the largest and most diverse industrial union in the US. The relevant fact for this hearing is that we represent the majority of organized workers in the petrochemical industry, as well as hundreds of thousands of workers who use chemicals on the job. My own background is in the refining industry; I worked in a West Coast oil refinery for 17 years.

First, I would like to point out that the two events under discussion; the explosions at the West Texas fertilizer plant and the Williams Chemical facility are in no way isolated incidents. On April 17 of this year, 12 workers were burned at the ExxonMobil Beaumont refinery, two of whom subsequently died from their injuries. On April 27, eight workers were sent to the hospital after an explosion and fire at the Chevron Port Arthur refinery. And on this past Monday an explosion at a fertilizer plant in Indiana killed one person.

Since 2008 the oil industry has reported an average of over 45 fires a year; so far 2013 appears to be right on track with 22 fires through the 21st of June. These are industry self-reported and do not include many smaller seal fires or electrical fires that USW members bring to our attention. This also does not include oil rigs, pipelines or storage terminal fires nor does it include fires in chemical plants.

These sometimes deadly and potentially catastrophic events take place all too often in this industry. The first response from industry after a tragedy is that the safety of their employees is their top priority. The widowed wives and children left without a father or mother may feel differently. More must be done to prevent these types of incidents from occurring in the first place.

The USW recently released a study entitled, "A Risk Too Great, Hydrofluoric Acid in U.S. Refineries." Twenty three USW sites were surveyed, which represent nearly half of the fifty US refineries that use hydrofluoric acid (HF) as a catalyst in the alkylation process.

EPA requires companies using or storing highly toxic chemicals to develop a risk management plan (RMP) in part to gauge how far a worst case release might travel and how many people might be in harm's way. For HF releases from US refineries, the range is three to 25 miles, depending mostly on the amount stored. Twenty-six million people live within the vulnerable zone of these US refineries, many in urban areas like Philadelphia, Memphis, Salt Lake City, and the Houston – Galveston corridor. These locations would be impossible to evacuate quickly in the event of a major release. No other chemical operation puts as many people at risk.

The sites were asked to rate on a descending scale from very effective or very prepared to very ineffective or very unprepared their sites were in taking the necessary steps for maintaining safety in the facility. Questions asked dealt with mechanical integrity, effectiveness of existing safety systems, preparedness of emergency responders, both on and off site. Rarely was the highest level reached. In an alarming number of cases, workers rated the site as unprepared or ineffective.

From this survey, we made seven recommendations to improve safety in these facilities. Two of them, investigate and learn about safer alternatives to HF and pilot test alternative solutions speak to the heart of the problem; there are safer alternatives for manufacturing available.

A pilot project and even conversion is not expensive compared to the possibility of a Macondo-type event at one of these refineries using HF acid. Solid acid catalyst and liquid ionic catalyst are two possible options. They have been piloted successfully and only lack industry's commitment to make the change. But industry has been resistant, citing the cost for conversion. Eight oil companies operate 18 of the study refineries. In total, these eight companies had gross operating profits in 2011 of approximately $150 billion.

The USW also released a survey in October of 2007 of the oil refineries we represent in the US. Following the BP Texas City disaster 70% of the local unions we surveyed reported that their facilities were less than very prepared for emergencies. Time and again we hear from our members that staffing is not adequate on a day to day basis, overtime is excessive and they do not have enough people on the units for emergencies. The companies tell us that they do not staff for emergencies. I cannot think of a more critical situation to be staffing for.

As seen at the West fertilizer plant and the fire last year at the USW-represented Chevron refinery in Richmond California, the events at these facilities can have a far reaching impact on the communities. These potential impacts are the very reason the EPA requires companies to develop a RMP. While the EPA does many plant inspections during a year I would dare say that most of these are air or water inspections as opposed to RMP inspections. To a great extent the limited numbers of inspections are tied to budget and staffing conditions, not unlike what we hear with federal OSHA.

The regulatory process relies on much self-reporting which in essence allows the industry to self-regulate. As seen in the November 2012 EPA RMP inspection report on the ExxonMobil facility in Baton Rouge, 40 CFR (Code of Federal Regulations) 68.79 which addresses Compliance Audits says; "The owner and operator shall certify they have evaluated compliance with the provisions of this subpart at least every three years to verify that procedures and practices developed under this subpart are adequate and are being followed."

The refinery has done two OSHA Process Safety Management (PSM) audits but had never completed a compliance audit for RMP, which are required every three years. In order to assess compliance, EPA reviewed the PSM audits since the regulations are similar. The EPA evaluation found that not only were required elements missing altogether, but even where an element was addressed, the company did not follow the appropriate technical procedures and practices that are required to be reviewed, developed and followed.

One of the problems with the OSHA PSM standard (29CFR 1910.119) which governs the health and safety of facilities using a specified volume of highly hazardous chemicals is that it is performance based. The standard tells you what to do but how it is done is left up to the company. This is necessary to a degree in that it allows the employer to bring in new technology or what is termed recognized and generally accepted good engineering practices (RAGAGEP) to make improvements under the standard. What we typically see are employers riding on past practice as this was RAGAGEP at the time it was put in place, so they don't need to upgrade it now. There are certainly some elements of PSM that could be made prescriptive and standardized throughout the industry.

But this calls back to the difficulty with inspections; OSHA is underfunded and under staffed. The PSM standard requires considerable technical expertise to enforce and there are not enough adequately trained compliance officers to address the PSM covered sites, as is the case with RMP under the EPA.

And then there is the Process Safety Management standard itself; it is written to require certain plans but there is no requirement that these plans be good, only that certain items are addressed. For example, as long as a site has done a Management of Change (MOC) on a replacement other than in kind, they are seen as meeting the standard for compliance or regulatory purposes; there is no requirement to do a beneficial or comprehensive MOC. A simple check-the-box checklist is sufficient. There is no required rigor that has to be built into a MOC.

The USW has been involved with a consortium of groups in California involved in sending comments to Governor Jerry Brown in the aftermath of the Chevron Richmond refinery accident. Even though no one was killed in this event, 15,000 community folks sought medical attention. Nineteen workers who were in the area at the time escaped death or serious injury due to sheer luck.

Our coalition has sent a broad number of proactive steps that can be taken to improve refinery safety and we applaud the state of California for embarking on this journey.

While we have made mention of OSHA and EPA being underfunded and short staffed which hinders their ability to sufficiently do inspections, I want to emphasize that part of following a performance based standard is performing. You can have a great written plan but if you are not following it, it is of little benefit.

Let's go back to Chevron Richmond. The company had a written Mechanical Integrity program that covered inspection of piping. Some engineers raised concerns on a number of occasions that the section of pipe that ultimately failed should have come under more scrutiny. Somewhere along the line a decision was made to not do further inspections or replace the pipe.

We hear that workers have the "Stop Work Authority", that if they identify an unsafe condition, they can have the work stopped until it is safe to continue. That was not the case for our members at Chevron. Workers wanted to take the unit offline but were overruled. While we as workers may have the authority, we certainly do not have the power. This is the fallacy in talking about a safety culture; it is based on a harmonized model. Without the power, the authority means nothing.

While we complain about the lack of regulatory involvement, what about the companies responsibility to act? The same when the leak was discovered; the decision should have been made to depressure and shut the unit down based on material and volume. To maintain the idea that it is safer to operate a unit with a hole in the pipe – which is not going to get better – than to shut a unit down is absurd. If that is the case, you need to take a serious look at your operating procedures and parameters.

Calling this type of operation risk based management is not managing the risk at all. It is just taking a risk.

The core issue is that too often, huge quantities of toxic and/or flammable materials are stored on site posing a needless risk to workers and communities – particularly when reducing quantities or using safer alternatives is possible.

Thank you again for the opportunity to raise some fears workers have about the state of process safety in the petrochemical industry.

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Region 6 Enforcement Division Surveillance Section RMP Inspection Report, 11-05-2012

Environment and Public Works Committee Hearing, June 27, 2013

Senator Boxer Follow-Up Questions Response for Written Submission

Question 1

Can you please describe the three things that you believe are most important for enhancing safety at industrial facilities that handle dangerous chemicals?

Response

1) Proper levels of qualified staffing.
2) Rigorous mechanical integrity programs, including inspections and turnarounds.
3) Correcting deficiencies in the Process Safety Management (PSM) standard that allow facilities to operate in unsafe environments.

1) Proper levels of qualified staffing:

Refiners have at every opportunity reduced staff and consolidated jobs in an effort to rein in costs. When you look at the huge profits in this industry, made possible by the conscientious and dedicated work force, one wonders why the companies are so willing to reduce numbers.

The USW, our members and informed residents in the community are concerned that particularly in emergency situations there will not be enough trained personnel to react and provide an adequate response.

Often the increased development or use of automation is the criteria judge for eliminating positions. But you cannot rely on automation to feel a different vibration in the pavement to lead an operator to detect a bearing on a pump that may be going bad. Automation cannot feel a pump case and realize it is warmer than normal and maybe the impellers are worn and it is working harder than normal.

Automation can also cause a sense of over dependence as you rely on the automation and try to work the human element out. This phenomenon has been identified in a number of aircraft incidents. The same dependence is being created and enforced in refinery board or console operators. They are relying on their automated controls and not on their training or background experience.

When that emergency hits, it invariably involves more than one area in a unit and now with the tight integration of process units in refineries, typically the problem affects multiple units. Operators are trying to get a number of process points in order among multiple units; not having an adequate number of people just adds to the stress and increases the ability for situations to get worse.

As the workforce dynamics change, this will become an ever more challenging process as operators with many years of experience who have seen many different events occur over the years are leaving and being replaced by younger operators who lack that years of service experience and have not lived through as many or maybe even not experienced the problems that the retiring workforce has been through.

Faced with a sudden loss of computer control for the systems some of the newer operators are not sure how to react. For instance, when a computer loop shuts off on a tower operation newer console operators have not had enough practical experience to know whether they need to add reflux to the tower or cut back to save the accumulation drum level even though pressure and temperatures on the column are rising. The computer normally takes care of that and they do not pay attention to the nuances of a specific distillation column.

With the cutbacks in personnel there is not an operator that can come in from outside to assist as there may only be one operator outside and he has too much going on outside to help the console operator. He may even have two operating units to cover, both of which are in upset mode and need him to manually operate controls outside or verify valve positions or vessel levels.

Maintenance personnel are seeing their positions filled by contractors who do not have the same commitment to the company like a proprietary employee. The contractor objective is to be able to come back and do more work.

Maintenance personnel are not allowed to do the preventive maintenance (PM) that is required because there are not enough bodies. Mechanics are too busy doing breakdown maintenance – going from one urgent repair job to another. They may not be familiar with the equipment because they no longer focus on one operating unit but are working all across the facility. They are also being tasked with more multi-skill, cross craft work that has reduced expertise by dedicated machinist, or welders or skilled fitters.

We have seen attention recently through a public meeting held by the US Chemical Safety and Hazard Investigation Board (CSB) on how changes in personnel should be handled from a recommendation following the BP Texas City investigation report.

When the local unions and the International have made requests for improvements in the staffing level, industry has responded that they do not staff for emergencies. What are refiners staffing for if not emergencies? What time is more critical to have an adequate number of personnel to respond than an emergency?

Consistently staffing levels have been raised by our members every time we poll them on their health and safety concerns.

Solomon numbers, something every refinery worker knows, are an arbitrary set of guidelines around number of employees, maintenance costs and other operating factors related to the cost of a barrel of oil processed. The goal is being in that first quartile. Problem is that the first quartile is always moving. Consequently the other numbers, like employees and dollars spent on maintenance is moving too, down, to try and compete with the 'benchmark'.

This has driven employers to reduce workforces and reduce money spent on repairs and upkeep to dangerously low numbers.

More automation added to the process is used as an excuse to reduce the number of personnel operating a process unit. Problem being that many Risk Management Programs (RMP) submitted by the companies rely on operator intervention as the means to control a worst case release scenario. Today, those operating personnel are simply not there and the ones remaining have too much area to cover, requiring them to be in more places than they can possibly be.

2) Rigorous mechanical integrity programs, including inspections and turnarounds:

Over the last 20 years, the great majority of serious accidents, those not only resulting in a large dollar loss, or equipment loss, but also resulting in loss of life, has been from mechanical failures.

In that same timeframe, we have seen turnarounds (T/A), periods when the refineries are taken off line and repair work done, being pushed out further and further.

It is like changing oil in a car. When you have a new automobile, you are cautious about changing the oil at 3,000 miles, when you have a ten year old automobile, you don't change oil at 10,000 miles; it is more critical as the automobile ages that proper maintenance schedules are maintained.

This is the situation we are experiencing in the refining sector. These plants are getting older and yet over the years the 'oil change' in this case, unit turnarounds, are being pushed out in some cases from one to two years to three to five years. Not the most reliable way to treat 'an old car'.

As seen in the Chevron Richmond refinery fire; even though the company was repeatedly informed by their own engineering staff of a deficient section of piping that required replacement, the company choose to not to replace that section. They instead risk managed it by gambling that it would last to a later date. This even though they had experienced a similar failure at another of their refineries and others in the industry had suffered similar failures. We call that taking a risk, not managing risk.

The failed exchanger at the Anacortes Washington Tesoro refinery was another example of a well know industry mechanism of failure, high temperature hydrogen attack (HTHA) yet the company was not conducting inspections which would be able to identify this problem. They were not tracking temperature excursions in this system that were precursors to this failure mode.

An Environmental Protection Agency (EPA) inspection at an ExxonMobil facility in Baton Rouge, LA uncovered the fact that the facility was not conducting inspections required under the Risk Management Program (RMP). When the EPA inspectors fell back on some OSHA required inspections under the Process Safety Management (PSM) standard that were similar and would answer the inspector's questions, they discovered over 1500 lines that were not inspected or mitigated, more than 250 lines that were under the minimum thickness that were not identified and another 200 plus lines that were discovered in 2011, that were not included in the prior list from 2007 and 2010 inspections. Consequently they were cited for "Failure to inspect underground piping, failure to have inspection records, and failure to correct deficiencies as required in the Prevention program 3."

There are many more examples but I think this gives a representative example of the hazards the workers and ultimately the community as well face every day.

To sum up; we are not seeing new causes of accidents in the refining sector. The causes of accidents are the same time and time again. An increased commitment to mechanical integrity is needed, assuring that we are inspecting the right equipment in the correct locations at the proper times and then taking appropriate steps to correct the identified hazards.

3) Correcting deficiencies in the Process Safety Management (PSM) standard that allow facilities to operate in unsafe environments:

The OSHA PSM standard is a performance based standard. This is necessary because process safety is not the same as a handrail; it is not a one size fits all situations safety device.

But having said that, there is a lot more rigor that could and should be written into the PSM standard. There are too many instances that have vague definitions of what is required and this leaves too much open to interpretation by the employers and ultimately to review commission attorneys and Judges as the companies contest health and safety citations written them by OSHA compliance officers

Companies are instructed to follow recognized and generally accepted good engineering practices (RAGAGEP) yet the definition is not delineating. Here is what OSHA says about RAGAGEP:

"Recognized And Generally Accepted Good Engineering Practice" (RAGAGEP) – are engineering, operation, or maintenance activities based on established codes, standards, published technical reports or recommended practices (RP) or a similar document. RAGAGEPs detail generally approved ways to perform specific engineering, inspection or mechanical integrity activities, such as fabricating a vessel, inspecting a storage tank, or servicing a relief valve (See CCPS [Ref. 33]).

But fails to describe whose codes you are required to follow; individual company, corporate, industry or trade association standards? For instance, an industry standard for inlet pressure drop for pressure relief valves is 3%. Yet specific companies have a corporate policy of 5%. So who is right? Are they both good engineering practices? Are they both recognized?

As long as RAGAGEP is not stipulated and there is not an agreed upon consensus of what constitutes RAGAGEP it will continue to be different things to different people. This even though there is an industry developed consensus standard that calls for a 3% inlet pressure drop for pressure relief valves.

This also gives companies the ability to not upgrade equipment when technology has improved. All they have to do is claim that the equipment followed RAGAGEP at the time of its construction and installation, so it still meets the standard. This certainly was not the intent of the PSM standard, yet it does not violate the letter so it is not citable and therefore not enforceable.

Currently there is not an OSHA requirement for doing a Management of Change (MOC) when it comes to reducing personnel or consolidating jobs. There is an OSHA letter of interpretation on MOC that purports to address personnel changes (Management of Organizational Change) through the MOC process when in actuality the only time personnel issues are addressed through the PSM standard are if there is a requirement in a procedure for a specific number of individuals to accomplish a task or if it comes up in a Process Hazard Analysis (PHA) review or for a newly constructed process.

On the other hand, Contra Costa County (California) Industrial Safety Ordinance has a specific element to address management of organizational changes (Section B, Chapter 7) that require this review specifically prior to reducing the number of personnel, increase in job duties or changes in responsibilities.

This type of specificity is what is needed in the PSM standard to require that companies take a look at how the personnel changes will effect process safety and not just do a matter of convenience MOC to justify making the change.

There needs to be a certain level of rigor built into the standard that forces companies to meet a minimum level of action that is definable by all parties; employer, regulator and employees.

Question 2

What actions do you think the Environmental Protection Agency could quickly take under existing law to enhance safety at industrial facilities that handle dangerous chemicals?

Response:

There are many who think that the general duty clause in the Clean Air Act is sufficient to allow EPA the authority to issue new guidance. EPA also, under 112(r)(7)(A) has authority to issue new rules.

Section 112(r)(1), the General Duty clause obligates all owners and operators (that fall under the Act) to "design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

This could include inherently safer technologies, which does not mean a redesign of a facility; it could be as simple as substitution of a less toxic or hazardous substance or even a reduction in the volume of a hazardous substance stored onsite, the idea being to eliminate or reduce the hazard when possible.

Please see the following link for a detailed explanation of the preceding point:
https://www.documentcloud.org/documents/404584-petition-to-epa-to-prevent-chem-disasters-filed.html

EPA could immediately take action to initiate 112(r) inspections on companies they determine to be the most dangerous, e.g., that put the largest populations in danger. These inspections should include workers who often have added insight into the company actions or inactions. (EPA has clarified their position on employee involvement through a memo issued February 11, 2011 that can be seen here: http://www.epa.gov/emergencies/docs/chem/clean_air_memo.pdf). Inspections find problems. EPA could set up a schedule for these inspections over a 3 or 4 year period and include employee interviews and walk-around inspections.

Non-compliance with RCRA (Resource Conservation and Recovery Act) and Tier II reporting requirements under EPCRA (Emergency Planning and Community Right-To-Know Act) has gone on for quite a period of time with little enforcement. Companies have concluded that they do not need to follow the reporting rules because they will suffer no consequences. Further, some states are refusing to comply with EPRCA's right-to-know provisions, even after repeated written requests by denying the public's access to Tier II forms. EPA should begin aggressive enforcement of these regulations against industries and states that refuse to comply. There is a strong possibility that if they are not following these elements, there may well be other elements that are not being followed.

One example is the April 2009 RCRA inspection of a Honeywell facility in Metropolis, IL. The company paid a criminal fine of $11.8 million for violations that had their roots back as far as

2002. The RCRA violations led to further inspections which brought in the NRC who raised questions of concern which caused the NRC to demand 31 requests for additional information.

An example of a state's non-compliance with EPCRA is the refusal of the Commonwealth of Pennsylvania's refusal to provide Tier II forms to United Steelworkers for three refineries in Philadelphia where the union represented workers. (Documentation of our repeated inquiries and PA's denial of the data the can be provided upon request.)

EPA could give more support and guidance to Local Emergency Planning Committees (LEPC) which would help to prevent the exposure suffered by emergency responders and community members.

A recent train derailment in New Jersey exemplified what can happen with ineffective preparations. Rail tank cars containing vinyl chloride, a highly hazardous chemical, left the track and ruptured discharging much of their contents. Many responders were not aware of and could not find out what the product was in the rail cars. There are early photos of the scene with police in the area with no personal protective equipment on such as respirators.

An effective emergency plan, with training and communication among all parties involved can avoid situations like this and provide instant information to not only responders but also the community so that they know what the hazards are and what precautions need to be taken in the case of a release.

The EPA conducts a lot of inspections in a year, but are they inspecting the locations that are the most hazardous or pose the biggest community threat? Maybe that focus of 112(r) inspections on the most hazardous sites would yield better results; less inspections yearly, but more in-depth and focused with worker involvement, community and first responder involvement and an eye toward reducing the hazard by minimizing the chance of exposure.

Senator BOXER. Thank you. It was very well said.

I am going to ask Senator Vitter to lead off with the questions, then I will follow and we will finish in time to vote.

Senator VITTER. Thank you all, again, for your work and your testimony.

Mr. Webre, based on the recent Ascension Parish incidents, you all have demonstrated that the emergency preparedness after the fact is first rate. How do you coordinate and integrate your emergency management system with all of your emergency response organizations and social services and volunteers? And specifically, what has been your experience with the local chemical industry and their engagement with the Local Emergency Planning Committee?

Mr. WEBRE. The key to making is successful, Senator, is to have a robust LEPC. And within our LEPC, it is all about first responder, community, fire, EMS, law enforcement communications as well as the chemical industry. It is looking at the risk assessments and what is the most probable from those risk assessments within the chemical industry. And not just the chemical industry. We look at it from an all hazards perspective.

As far as the reaction from the chemical industry, they have been instrumental in supporting in us. I mean, our alerting and warning sirens, they pay for and maintain. Our reverse 911 system, our mass casualty bus, the CARE committee helped fund. I can go on and on and on about some of the things, the hazmat team, they have supported us on.

I have never met one of the plant managers or any of the chemical workers that were not willing to support the LPEC. They want to do the right thing. They live in our community and they have supported us 100 percent.

Senator VITTER. Great. Thank you.

Dr. Mannan, one concern I have whenever something horrible like this happens is that it is used and abused, quite frankly, to advance some preexisting agenda that does not really relate to whatever happened.

So, with that in mind, I want to ask you about an issue that certainly comes up here and may come up again, Inherently Safer Technologies. Would mandating IST have prevented the incidents and explosions in West, Texas or in Ascension Parish, Louisiana?

Mr. MANNAN. Just because I am occupying the seat that the EPA Administrator was sitting on does not mean that it is still the hot seat.

[Laughter.]

Mr. MANNAN. But I appreciate your question and I think it is very important question to look at.

Inherently Safer Technology, there is no question that that is something that should be looked at, something that should be evaluated. But I am still, as I have testified before in other Committee in Congress, I am still not sure that inherent safety as a regulation is a good thing to do because you have got to understand, this is not a technology that you just take off the shelf and implement. And there are lots of opportunities for unintended consequences to occur, like risk transfers, accumulation and things like that.

Having said that, exactly what it would have done in the case of West or Geismar, I think we have to wait and see what actual root cause the investigations indicate. I know a little bit more about West because we have been looking into that much more closely.

I can tell you this. They were covered by OSHA 109. And if you look at OSHA 109, a lot of those requirements that are in there, if they had followed that, my guess is the probability of this incident would have been almost none.

And if you think about it, what would IST have caused them to do? Well, naturally they could have looked for alternate chemicals. That is a possibility and we should always look at that. They could have looked at the issue of contamination and all of that.

But my point is, if any of that is put in, the ultimate issue still comes down to enforcement. And until we come up with a regime where we are doing the enforcement comprehensively in a manner that yields good results, we are not going to accomplish anything. We just add another legislation that does not get enforced.

Senator VITTER. Great. Thank you all very much.

Senator BOXER. Thank you. The vote started at 11:35. I am going to do my questions and if there is a timeframe left, I will ask Senator Boozman.

Does anyone disagree with what I am about to say? So, listen carefully. And if you disagree, please speak up. If you prevent ammonium nitrate from being exposed to fire, would that not be an obvious safety measure? So, would you agree that if you, just forget about all of the ifs, ands and buts around it, if it is isolated from fire, that would be a measure. Does anyone disagree with that?

No. So, to me, what I like to do in my life is kind of take the big, complicated issues and see can we start somewhere. So, it seems to me we know this. It almost seems to me we know, as a result of this important hearing, that the Chemical Safety Board had made that suggestion in 2002. We also know from the EPA that they have not done that and we also know that their safety alert goes back to 1997 and has not been updated.

So, for my question, I want to talk to Mr. Orum who is looking at the issue overall. And as I listened to you, and I went over your recommendations, you talk about the general duty clause that holds firms responsible for understanding and managing their chemical hazards regardless of what the Government does or does not do. And I think it is worth repeating that the industry has an obligation. Am I stating that correctly, Mr. Orum?

Mr. ORUM. Yes. We basically do not want to see a situation where Government actions are deliberately tied up in delay and then the Government is unable to use prevention strategies or enforcement and these delays——

Senator BOXER. Well, that is not answering my question. Is it your opinion that the general duty clause holds firms responsible for understanding and managing their chemical hazards regardless of Government actions or lack of actions?

Mr. ORUM. Well, yes.

Senator BOXER. OK. That is what I want to get at. And do you also believe, I mean, you have written this but I just want it so clear in your testimony, you wrote that risk management planning should include reactive chemicals like that ammonium nitrate that detonated at West Fertilizer. Very straightforward recommendation. Do you stand behind that?

Mr. ORUM. Yes. Yes.

Senator BOXER. OK. I mean, I do agree with Mr. Mannan that you have to enforce. I mean, you could put out the alerts, you can change the regs, but you still have to send out folks to enforce.

But I have to say, it is a bad example to use these days, but practically all of us do pay our taxes regardless of the fact that some people may say well that tax is unfair and I do not like the IRS. Obviously, most of us are not audited and most of us do the right thing.

So at some point, I mean we are not going to be able to look at every single thing, but let me ask you specifically, since you talked about enforcement, in the case of West could you point to one particular regulation that, if it was enforced, could have prevented what happened at West, since you site the lack of enforcement of existing regs as a problem?

What, give me an example of what enforcement could have stopped this problem, of the existing laws?

Mr. MANNAN. Thank you, Chairman Boxer, for that question. Specifically OSHA 1910.109, the Explosive and Blasting Agents Standard, that has a paragraph (i) that is specific to ammonium nitrate.

Senator BOXER. OK.

Mr. MANNAN. And in there, I will quote just one part, it says ammonium nitrate shall be in a separate building or shall be separated by approved-type firewalls of not less than 1 hour fire resistance rating from storage of organic and on and on.

Right there is just one critical element of what you said. Separate ammonium nitrate from combustible——

Senator BOXER. OK. So, are you saying that if OSHA had inspected, they would have caught this problem?

Mr. MANNAN. If OSHA had some competent inspector who had gone there on a regular basis and made that enforcement, yes, they would have looked at that.

Senator BOXER. So, the company is in violation of an OSHA standard?

Mr. MANNAN. It is in violation of an OSHA standard if what we are seeing and hearing now is true.

Senator BOXER. All right. And does that mean that all large facilities are in violation of the OSHA standard if they do not store AN separately?

Mr. MANNAN. I would have to look at that.

Senator BOXER. Or most facilities?

Mr. MANNAN. Most of them, yes, if they do not follow the standard they are in violation.

Senator BOXER. Well, it would be nice if the EPA did a little bit of consulting with OSHA and their alert could update, update their alert to state that OSHA has this regulation. That would be the minimum they ought to do this afternoon.

Do you know what year that OSHA regulation went into place?

Mr. MANNAN. No, Madam Chairman, I do not. But if I could take just a few seconds to say something.

Senator BOXER. Please, go ahead.

Mr. MANNAN. OSHA has 109 in the books. While EPA issued the guidance and should, as you suggested, updated that guidance, we all should be careful that we should not have overlapping regulations. So, if OSHA, through 109, can accomplish the objectives, that is what we should do.

Senator BOXER. Well, see, I do not agree with that at all. If this can cause multiple deaths, it does not bother me that a couple of health and safety agencies have similar laws on the books. But let me just stop you there because I want to give some time to the Senator because the vote has how many minutes left? Four minutes left.

Can I just say thank you, all of you. I mean, I am so happy you are here. This was very important. I am going to be following up with a very important letter to, which will include the White House, about what needs to be done and you have all really helped me, all of you, each of you. Senator.

Senator BOOZMAN. I also want to thank you for being here. I apologize for just being here at the end. I had a conflict with a markup in another Committee.

But in the interest of time, Madam Chair, I think what I would like to do is just submit my questions for the record and see if we can get it done that way. Thank you.

Senator BOXER. Of course. Senator, absolutely. And I have other questions as well that I was unable to do because we have these very big votes now on immigration.

So, we are going to head out. Thank you to all. If our Tim is still here, I think he is, again I want to say thank you so very much for being here and we, I want you to know, and you tell the family, that we are not stopping until we make positive reforms that will make the likelihood of this far less than it is today.

And to the Chemical Safety Board, if I could just say something to you, in this particular case, and you know, I do not know what you are going to do tomorrow, I just, you are my heroes in this. And please do exactly what you are doing, get to the bottom of this, and do not be afraid to say what you believe. It is critically important. And I am very proud of the work you have done.

Thank you very much. We stand adjourned.

[Whereupon, at 11:48 a.m., the committee was adjourned.]

[Additional material submitted for the record follows:]

The Fertilizer Institute
Nourish, Replenish, Grow

AGRICULTURAL RETAILERS ASSOCIATION

STATEMENT OF
Agricultural Retailers Association and The Fertilizer Institute

BEFORE THE
Senate Committee on Environment and Public Works

REGARDING
"Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA."

Thursday, June 27, 2013

Chairman Boxer, Ranking Member Vitter and members of the Committee, thank you for the opportunity to comment on the "Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Disasters." In the statement below, we will address the following:

- Proactive Steps the Fertilizer Industry Has Taken On Fertilizer Safety and Security
- Safety Practices and Regulations Impacting Fertilizer Manufacturers and Retailers
- Facts about Ammonium Nitrate

The following statement is being submitted on behalf of Daren Coppock, President and CEO of the Agricultural Retailers Association (ARA) and Ford West, President of The Fertilizer Institute (TFI). ARA is a nonprofit trade association representing the interests of retailers on legislative and regulatory issues nationwide. TFI is the leading voice for the nation's fertilizer industry, including producers, importers, wholesalers and retailers. On behalf of both of our associations and our members, we continue to extend our thoughts and prayers to the families impacted by the West Fertilizer Company tragedy in West, Texas.

We appreciate the opportunity to provide the Committee with the fertilizer industry's perspective on the tragic incident that took place on April 17 at the West Fertilizer Company's fertilizer retail facility in West, Texas. We are an accountable and responsible industry committed to the safety of the communities in which we operate. Our employees live and work in communities small and large across the country, and nothing is more important than protecting our workers and their neighbors. We are committed to working with the investigators and regulators to understand the cause or causes of the West Fertilizer Company tragedy and taking appropriate action to prevent and/or mitigate future incidents from occurring.

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About the Fertilizer Industry

Fertilizer nourishes plants and soils with necessary nitrogen, phosphorus, potassium and many micronutrients. Fertilizer is responsible for approximately 50 percent of the world's food production. The fertilizer industry consists of a wide variety of businesses that makeup the fertilizer supply chain, from manufacturers and importers to wholesalers, distributors and retailers.

Fertilizer manufacturers produce fertilizer products (e.g., Anhydrous Ammonia, Ammonium Nitrate, Phosphate, Potash) from raw materials through the use of sophisticated chemical processes. Once the product is manufactured it is distributed throughout a network that includes distributors, wholesalers and retailers. West Fertilizer Company was a fertilizer retailer. All of these entities work together to play a vital role in ensuring that critical crop nutrients reach farmers in a safe, timely, and efficient manner.

Proactive Steps the Fertilizer Industry Has Taken On Fertilizer Safety and Security

The fertilizer industry has taken many proactive steps relating to fertilizer safety and security. Here are a few:

- **Fertilizer Compliance Assistance** - TFI and ARA issued a fertilizer industry-wide memorandum on May 8, 2013 making available an on-line Compliance Assistance Tool for agriculture retail facilities to evaluate and control risk and support the continual improvement of a fertilizer retailer's compliance effort. This tool is free of charge to retailers. In making the tool available, TFI and ARA encouraged the entire fertilizer industry - from producers, importers, wholesalers, retailers and state associations - to help increase industry awareness of the availability of this tool and other potential regulatory compliance tools. As of this month, more than 29,000 hits were recorded on the website with more than 1,200 completed assessments.

  Additionally, we distributed information on the tool to the American Agronomic Stewardship Alliance (AASA), a voluntary organization with third-party auditors who inspect bulk pesticide storage at retail agricultural facilities. This year, AASA expects to audit more than 1,000 retail facilities and they will encourage those facilities to complete the compliance tool.

- **Fertilizer Code of Practice** - On May 30, 2013 ARA and TFI announced they would partner to develop a Fertilizer Code of Practice for agricultural retailers. An overview of this initiative is enclosed for the committee's convenience. The goal of the initiative is to help facilities establish basic environmental, health, safety and security performance practices and will lead to uniform guidelines that promote continuous performance improvement for all fertilizer storage facilities. To ensure compliance with these guidelines, a third-party inspection program will also be established.

- **National Fire Protection Association (NFPA)** - For many years the fertilizer industry has served on the NFPA's Technical Committee on Hazardous Chemicals (NFPA 400) which is the committee of jurisdiction over the fire code for recommendations for storage and handling of ammonium nitrate. NFPA has had a code (NFPA 400) for the storage and handling of AN since 1965. NFPA 400 outlines recommended practices that include, but are not limited to; construction of buildings and building floors, ventilation requirements, a list of contaminates that should not be stored in the same building with ammonium nitrate, requirements for electrical installations, when sprinklers are required, signage, handling equipment and fire protection procedures. The fertilizer industry strongly supports and encourages compliance with NFPA 400 for ammonium nitrate.

- **EPA's Risk Management Program (RMP)** -In 2007, The Fertilizer Institute (TFI) partnered with the U.S. Environmental Protection Agency (EPA) and the Asmark Institute, a Kentucky-based regulatory compliance firm for retail fertilizer and agricultural chemical facilities, to develop a web-based compliance assistance program titled *my*RMP for retail fertilizer facilities covered under EPA's Clean Air Act, Section 112(r) Risk Management Program. EPA issued a letter of support for *my*RMP in August 2007.

  In June 2014, the five-year updates of RMP's are due. In an effort to ensure continued cooperation and support of the program, a meeting was held this month with EPA and the Asmark Institute to review the existing *my*RMP and make beneficial updates to the current program. The new edition of *my*RMP is expected to be available late summer 2013 with EPA's support.

- **Ammonium Nitrate Security Program -** The fertilizer industry approached Congress in 2005 to seek traceability regulations for ammonium nitrate. The *Secure Handling of Ammonium Nitrate Act* was signed into law in December 2007. The Act requires the U.S. Department of Homeland Security (DHS) to issue regulations for a tracking system which would require anyone selling or purchasing straight solid ammonium nitrate and any mixture in a percentage to be determined by DHS to register with DHS. An *Advanced Notice of Proposed Rulemaking (ANPR)* was issued in October 2008 and a *Notice of Proposed Rulemaking (NRPM)* was issued in August 2011.

  TFI and ARA strongly supported the Act and have been working with DHS to support development of final regulations. While we have some remaining concerns with the proposal pertaining to the registration verification process and the mixtures proposal, DHS continues to work with TFI and ARA to develop a workable final rule. We have encouraged DHS to issue the final regulations as soon as possible.

- **Outreach and Education Efforts with the FBI** - ARA and TFI have also worked closely with the Federal Bureau of Investigation (FBI) on security education and outreach efforts to help ensure agricultural retailers and suppliers are aware of necessary steps to properly secure essential crop inputs including fertilizers and agricultural chemicals. These efforts are designed to help prevent these products from getting in the hands of potential terrorists. FBI representatives have made presentations on these security measures at association meetings and also participated in the 2012 ARA Annual Conference. Recently, ARA collaborated with the FBI on a poster titled "Potential Indicators of Terrorist Activities," and this poster was mailed to all ARA members to display in their retail facilities. ARA also reviewed a FBI video to accompany the poster.

- **Transportation Community Awareness and Emergency Response (TRANSCAER)** is a voluntary national outreach effort that focuses on assisting communities to prepare for and to respond to a possible hazardous materials transportation incident. TRANSCAER® members consist of volunteer representatives from the chemical manufacturing, transportation, distributor, and emergency response industries, as well as the government. TRANSCAER promotes safe transportation and handling of hazardous materials; educates and assists communities near major transportation routes about hazardous materials, and aids community emergency response planning for hazardous material transportation incidents

- **Voluntary Security Vulnerability Assessment (SVA)** – Following the tragedy of September 11, 2001, ARA and TFI worked with the Asmark Institute to develop a voluntary SVA program tailored to agricultural retail facilities which helps retailers identify and correct potential vulnerabilities in their site security. This plan has been submitted to DHS as a possible way to satisfy agency SVA requirements. In addition, the industry developed "Guidelines to Help Ensure a Secure Agribusiness" to help agricultural retailers, distributors, wholesalers and end-users begin the process of a security assessment for their facilities.

- **National Agronomic Environmental Health and Safety School** – The "Safety School" established in 1978, offers quality hands-on training for response to incidents involving fertilizer and crop protection chemicals used in the agricultural industry. Participants have come to rely on current and accurate training on the various environmental, health and safety issues associated with the operation of agribusiness. The spectrum of training offered covers timely information on transportation and security issues. TFI and ARA both serve on the Board for the safety school.

- ARA has developed a formal working relationship with the American Society of Agricultural and Biological Engineers (ASABE), which is an accredited standards developing organization recognized by the American National Standards Institute (ANSI). A current ASABE project underway involving ARA members includes updating the safety requirements for implements of husbandry used in the local transport and application of anhydrous ammonia for agricultural fertilizer.

Safety Practices and Regulations Impacting Fertilizer Manufacturers and Retailers

In general, the fertilizer industry is highly regulated, with myriad regulations covering risk management and emergency preparedness. In addition to the governmental oversight of the industry, the industry itself works voluntarily and cooperatively to share best practices and improve the safety performance of its members. Our two trade associations work constantly to provide regulatory assistance and knowledge to our members. We serve as an independent body for members to share their best practices in safety and operation. We host several seminars and webinars for our members to ensure that they receive up to date information with regard to safety practices and regulatory requirements. To ensure worker and community safety, product quality and efficacy, and protection of the environment, both fertilizer manufacturers and fertilizer retailers employ a host of safety procedures and are regulated under many different federal and state programs.

Regulations for Fertilizer Manufacturers

The fertilizer manufacturing industry is highly regulated under many different federal and state programs. To manage these safety and compliance requirements, manufacturers employ people with varying expertise. These positions may include chemical, mechanical, electrical and metallurgic engineers, chemists, operators and EH&S professionals. Large manufacturers are also financially strong, maintaining adequate financial resources including solid balance sheets and substantial property damage and general liability insurance coverage. Enclosed for your convenience is a list which details many of the regulatory requirements for fertilizer manufacturers.

Employees are a fertilizer manufacturer's first and most important resource. Industry personnel and contract employees undergo extensive safety and process operations training on a routine basis, including training in hazardous materials (HAZMAT) emergency response and on-site emergency response simulation drills and table top emergency response exercises. Many such drills include first responders from the local community.

Mechanical integrity of operating equipment is inspected, tested and retested to make sure it meets certain specifications. Manufacturing facilities must adhere to comprehensive mechanical integrity programs that include scheduled inspections of pressure vessels, low-pressure storage tanks and safety-related instrumentation and controls. In addition, manufacturing facilities have sprinklers, deluge systems, or dry (inert gas) fire suppression systems to control fires in high-potential fire hazard areas such as compressor decks, wood structure storage buildings and cooling towers, and electrical control center buildings. These sites also have in place extensive fire water systems throughout operating and storage areas that include strategically placed fire hydrants, fire water monitors to apply a large fixed water spray on a fire or vapor release, and redundant fire water supply pumps. These areas are subject to stringent standards based upon insurance carrier requirements.

Monitoring and controls including computer controls, automatic shut-down systems, in plant electronic leak detectors, and automatic monitors for specific chemicals add another layer of protection for employees and neighboring communities.

Hazard reviews are an integral part of the industry's process safety and prevention programs and involve a wide range of checks performed by employee teams. During these reviews, employees investigate multiple "what if" scenarios and resolve any questions as part of the design and operation phases of a project. Process Hazard Analyses (PHA) are conducted prior to starting up a new process and revalidated for existing process areas every five years. PHAs involve a detailed review of all aspects of equipment design, operation, maintenance and history to identify potential hazards and ensure controls are in place to prevent accidents.

Emergency response involves the entire community. This includes alarm systems and highly trained employee responders, as well as off-site emergency responders such as local emergency planning committees, HAZMAT responders and law enforcement. Together, these on- and off-site emergency responders develop emergency response plans that include evacuation routes, notification systems, and shelter-in-place information. Our members make it a priority to maintain good working relationships with local officials to plan and prepare for emergency situations, with an ultimate goal of keeping citizens safe.

Regulations for Fertilizer Retailers

Businesses such as West Fertilizer Company that sell fertilizer directly to farmers are called fertilizer retailers. Fertilizer retailers are also highly regulated under many federal and state programs. Attached is a copy of a May 14, 2013 report by the Congressional Research Service entitled "Regulations of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia" that provides an overview of the extensive federal regulations overseeing the safe storage and handling and security for these fertilizer products.

Facts About Ammonium Nitrate

According to various reports, ammonium nitrate is suspected as the cause of the explosion at the West Fertilizer Company. The Office of the Texas State Fire Marshall and the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) have ruled the cause of the fire that led to the detonation of 28 to 34 tons of ammonium nitrate fertilizer is "undetermined". Three causes of the fire that could not be eliminated were a 120 volt electrical system, a faulty golf cart and an intentionally set fire. A recent report done by the Congressional Research Service (CRS) entitled "*Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia*" states that "the vast majority of ammonium nitrate use occurs without incident. Most experts consider ammonium nitrate itself as a stable chemical with few handling restrictions, but, in combination with a fuel source, it can pose an explosion hazard. Ammonium nitrate requires certain conditions, such as added heat or shock, confinement, or contamination to explode." Ammonium nitrate (AN) is made from ammonia and nitric acid. It is a dry, solid material and represents approximately 2 percent of all directly applied nitrogen-based fertilizers consumed in the United States. It is a preferred nutrient for farmers because it is the most agronomic and environmentally beneficial source of nitrogen for pastureland, hay, fruit and vegetable crops in certain regions of the United States. The leading AN consuming states are Missouri (20 percent of total U.S. consumption), Tennessee (14 percent), Alabama (10 percent) and Texas (8 percent).

In closing, we would again like to thank you for the opportunity to present our perspectives and to share the actions we have taken before and since the West Fertilizer Company incident. These efforts will continue as we await the results of the investigation. It is important to remember that fertilizer is essential to life and its use is responsible for 50 percent of the world's food production. We are proud of our role in helping to feed the world.

Sincerely,

Ford B. West
President
The Fertilizer Institute

W. Daren Coppock
President & CEO
Agricultural Retailers Association

IME
institute of makers of explosives

The safety and security institute of the commercial explosives industry since 1913

July 27, 2013

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

The Honorable David Vitter
Ranking Member
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

RE: Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA

Dear Madam Chairman and Senator Vitter:

On behalf of the members of the Institute of Makers of Explosives (IME)[1], I am submitting a statement for the record on the oversight hearing you are holding on June 27, 2013 to evaluate the effectiveness of federal risk management and emergency planning programs to prevent and address chemical accidents. Consideration of lessons learned in the aftermath of recent tragic events is prudent. Understanding the root and contributing causes of the accident in West, TX are of direct importance to our members because of the involvement of ammonium nitrate ("AN") in this industrial accident. Additionally, we are concerned about misstatements in the press following this incident and welcome the opportunity to correct the public record.

Interest of IME

IME represents U.S. manufacturers and distributors of commercial explosive materials and oxidizers, as well as other companies that provide related services. Millions of metric tons of high explosives, blasting agents, and oxidizers are consumed annually in the U.S. Of this, IME member companies produce over 98 percent of the high explosives and a great majority of the blasting agents and oxidizers, including AN. These products are used in every state and are distributed worldwide.

Background

The "technical grade" AN (TGAN) used in our industry has the same chemistry as the AN used by the agricultural industry; both are classified as a Division 5.1 oxidizer. TGAN is not a Class 1

[1] IME is a nonprofit association founded in 1913 to provide accurate information and comprehensive recommendations concerning the safety and security of commercial explosive materials. Our mission is to promote safety and the protection of employees, users, the public and the environment; and to encourage the adoption of uniform rules and regulations in the manufacture, transportation, storage, handling, use and disposal of explosive materials used in blasting and other essential operations. IME does not sponsor trade shows or other marketing events.

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explosive, as has been suggested in some media reports. Based on industry data, approximately 73 percent of AN consumed annually in the United States is used by the explosives industry. This number, as a proportion to the amount used by the agricultural sector, has been increasing.

Since AN's introduction in the 1950's as a viable primary ingredient in the manufacture of bulk explosives, AN-based explosives have become the most widely used explosives products in the United States and the world. This transition was made for reasons of safety. AN is used in solution as an ingredient in emulsion explosives and in solid form to make other explosives products. AN is an essential ingredient in modern explosives for which there is no viable alternative. Managed properly, AN is a stable, reliable raw material that has played a significant role in our industry's quest to produce less sensitive, more effective explosives.

Sufficiency of Current Rules

As with all materials known to have potentially hazardous properties, knowledgeable and responsible handling and management are critical to minimizing hazards. Because of our industry's long association with AN and the nature of our business, we necessarily have an in-depth technical and scientific understanding of its potential explosive properties, and we have developed safe storage practices that directly reflect that understanding. A number of those practices are set out in the Occupational Safety & Health Administration's ("OSHA") "Explosives and Blasting Agents" regulations at 29 CFR 1910.109. Our industry has been governed by these regulations since 1974.

In addition, the explosives industry complies with other federal safety and security regulations impacting AN, including those promulgated by the Environmental Protection Agency ("EPA"), the Department of Homeland Security, and the Department of Transportation. Where AN storage is co-located with explosives storage, mandatory separation distances between these materials apply under Bureau of Alcohol, Tobacco, Firearms and Explosives regulations.

IME member companies have long observed AN management practices intended to preserve the integrity of the material and prevent contamination, decomposition, or mishandling. Guidelines published in a 1997 EPA Chemical Safety Alert, entitled "Explosion Hazard from Ammonium Nitrate" echo many of these practices, including avoiding localized heating and heating in confined spaces, avoiding exposure to shock waves, avoiding contamination by certain organic and inorganic materials, and maintenance of proper pH levels. Our industry scrupulously observes all of these precautions. We cannot emphasize too strongly the importance of these "good housekeeping" requirements. The introduction of more than 0.2 percent combustible substances, to AN can turn the mixture from a Division 5.1 oxidizer into a Division 1.1 explosive. EPA should consider promulgating its safe handling recommendations as regulation.

In the wake of the tragic event in West, TX, it has been suggested that EPA should consider broadening the reach of its Risk Management Program ("RMP") to include AN. We do not favor the expansion of this program to AN used by the commercial explosives industry, and we do not believe it is necessary. We are unaware of any accidental detonation of AN at facilities that have been compliant with current requirements. These regulations already ensure that AN is managed responsibly by our industry. In the absence of a final report and recommendations from the Chemical Safety Board (CSB), we remain committed to complying with these requirements and, when warranted, to improving upon them.

Identification of "Outliers"

Many of the regulations noted above also applied to the West Fertilizer Company. Numerous media reports and statements made by investigators at the site have revealed that the company had a history of non-compliance with existing environmental, health and safety regulations, and was, in fact, an "outlier" entity unknown to federal security agencies. While the root cause of the explosion at West, TX is not yet known, it is possible that it might have been avoided if existing requirements had been adequately enforced and this habitual non-complier had been more frequently inspected and monitored. Imposing new requirements on users of AN in response to this event will be meaningless to owners and operators who are determined to ignore applicable rules, and will only add to the burden of compliant, responsible users of this commodity. We understand that the White House has tasked an inter-agency working group to make recommendations on how non-compliant outliers can be identified and appropriate action taken to ensure regulatory compliance. We support this initiative.

Conclusion

While we await the final report from the CSB, we urge the Committee to work with EPA to establish common-sense, proven good housekeeping requirements modeled on existing OSHA standards and the agency's own safety recommendations for facilities that store AN. Such regulation levels the playing field and gives agencies the means to take appropriate action against those that are non-compliant. We appreciate the Committee's attention to our recommendations.

Respectfully,

Cynthia Hilton

Cynthia Hilton
Executive Vice President