BLUEGREEN ALLIANCE

CREATING GOOD JOBS, A CLEAN ENVIRONMENT, AND A FAIR AND THRIVING ECONOMY

FOLLOW-UP RESPONSES

July 30, 2018

Michael P. Wilson, Ph.D., MPH
National Director for Occupational and Environmental Health
BlueGreen Alliance
Before the 115th United States Congress, House Committee on Energy and Commerce, Subcommittee on Environment
The Chemical Facilities Anti-Terrorism Standards Program (CFATS): A Progress Report
Rayburn House Office Building, Room 2123
Thursday, June 14, 2018

---

1) ***In your written testimony, you discussed your previous experience as Chief Scientist in California's Department of Industrial Relations, including the important lessons you learned about including workers in risk management and response. You wrote that industrial employees bring experience, expertise, accountability, and transparency, and added that "workers need strong regulatory language to gain a seat at the decision-making table."***

a) ***Do you believe that the CFATS program, in its current form, is well-suited to give workers a seat at the table?***

I. Summary response

The requirements pertaining to employee input in CFATS represent an important step forward, but much more is needed. To be effective, CFATS needs to include the following additional requirements of employers, each of which is contained in California's 2017 process safety management (PSM) regulations for petroleum refineries:

(1) the right of employees to participate throughout all phases of CFATS decision-making, from design to implementation, training, evaluation and maintenance;

2) the right of employees to select their representatives who participate in management's CFATS decision-making processes;
(3) access by employees to documents or information relevant to CFATS decision-making, including information that might be subject to protection as a trade secret;
(4) the right of employees to anonymously report site security weaknesses; and,
(5) the obligation of employers to maintain a record of all employee reports of site security weaknesses.

II. Detailed response

CFATS section 2102(b)(2) on Employee Input requires that, "to the greatest extent practicable, a facility's security vulnerability assessment and site security plan shall include input from at least 1 facility employee and, where applicable, 1 employee representative from the bargaining agent at that facility, each of whom possesses, in the determination of the facility's security officer, relevant knowledge, experience, training, or education as pertains to matters of site security."

Industry recognizes that employees must have a meaningful decision-making role in process safety.

In its *Guidelines for Risk Based Process Safety*, the chemical process industry's Center for Chemical Process Safety (CCPS) lists workforce involvement as one of 20 management systems necessary to reduce process safety risks and prevent chemical accidents, pointing out that:[1]

> "…workers are potentially the most knowledgeable people with respect to the day-to-day details of operating the process and maintaining the equipment and facilities, and may be the sole source for some types of knowledge gained through their unique experiences. Workforce involvement provides management a formalized mechanism for tapping into this valuable expertise."

The CCPS defines "workforce involvement" as a "system for enabling the active participation of company and contractor workers in the design, development, implementation, and continuous improvement of the Risk Based Process Safety

[1] Center for Chemical Process Safety (CCPS) American Institute of Chemical Engineers (2007). *Guidelines for Risk Based Process Safety.* Wiley and Sons. (p. 124).

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

management system." [2] This same definition could be applied to the role of employees in facility security systems.

The CCPS *Guidelines* were developed and reviewed by experts from many of the nation's leading chemical process companies, including Dow, DuPont, ExxonMobil, Chevron Energy Technology Company, 3M, Air Product and Chemicals Inc, Shell Chemical, BP, Olin Corporation, Bayer Material Science and others.[3]

The evidence suggests that the 2012 Richmond, Chevron refinery fire might have been prevented if managers had been required to involve employee representatives in process safety decision-making.

Evidence identified by the CSB points to a lack of employee participation in process safety decision-making as a key factor leading up to the 2102 Richmond, Chevron refinery fire, which endangered the lives of 19 worker and caused some 15,000 are residents to seek medical attention for symptoms related to smoke and fire gas exposure.

The CSB's interim report of that incident shows that it would have been prevented if Chevron's managers had followed the recommendations of their own engineers. The fact that they did not resulted in part because Chevron employee representatives were *excluded* from management's decision-making process.

Over a period of several years leading up to the catastrophic pipe failure and fire, Chevron's engineers issued at least six reports calling attention to the problem of sulfidation corrosion in the crude unit and recommending a more aggressive pipe inspection and monitoring program. As the CSB's report pointed out, Chevron's engineers made these recommendations against a backdrop of serious sulfidation corrosion incidents in the U.S. refinery sector that occurred at Chevron's El Paso, Texas refinery (1988), Chevron's Pascagoula, Mississippi refinery (1988 and 1993), Chevron's Salt Lake City, Utah refinery (2002), the Richmond, California refinery itself (2007), the Silver Eagle refinery in Woods Cross, Utah (2009), the Regina Saskatchewan, Canada refinery (2011), and the BP Cherry Point, Washington refinery (2012).[4]

---

[2] CCPS, *op cit.* (p. 124).
[3] CCPS, *op cit.* (Preface).

[4] U.S. Chemical Safety and Hazard Investigation Board (CSB) (April 2013). *Interim Investigation Report.* Chevron Richmond Refinery Fire of August 6, 2012. (pp. 24-27) (Available: https://www.csb.gov/chevron-refinery-fire/). Accessed June 27, 2018.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

By 2009, Chevron's engineers warned of the potential for a catastrophic pipe failure, and still management chose not to act. The pipe finally failed in 2012 as the engineers predicted it would, and 19 workers nearly lost their lives.

Had Chevron been required to involve employee representatives in management's pipe corrosion assessments, those representatives would likely have been aware of the engineers' reports, and they would almost certainly have requested that the engineers' recommendations be implemented. In taking those actions, the serious state of corrosion in the crude unit would have become apparent. This would likely have resulted in a shut-down of the unit to replace damaged sections of pipe, thereby preventing the catastrophic failure that ultimately occurred in August 2012.

b) In your opinion, how could the employee input requirements of CFATS be strengthened to guarantee that employee voices are heard?

I. Summary response

Employees and their representatives will not normally be invited to participate with any real authority in management's decision-making committees, including those focused on plant safety and security. At a minimum—including with a unionized workforce—employees need regulatory authority to obtain a seat at the table. For employee participation to be meaningful, however, that authority must provide much more than the basic right to participate; it must provide for at least seven key elements described below.

II. Detailed response

The perspectives of rank-and-file employees are invaluable in site security decision-making, but only if they are given the right to meaningfully participate.

The requirement for employee input is critical to the success of CFATS and should be expanded. Experienced employees often have a deep understanding of the practical workings of a plant, and they can apply this experience in helping to set priorities and determine if a proposed security measure will function as intended. Employees have a direct stake in protecting the safety of the facility. As the CSB identified in the Chevron, Richmond incident, effective employee participation can improve the transparency and accountability of management

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

decision-making, which can otherwise be skewed by production and financial pressures.

To be effective, employee input into site security must be underpinned by clear regulatory requirements of owners or operators to:

> (1) allow employees to select their representatives, either through their collective bargaining agent, where present, or by a transparent process established by the employer;
> (2) ensure and document employee participation, to the greatest extent practicable, throughout all phases of site security decision-making, not simply as a final "rubber stamp" to management's proposals;
> (3) provide for ongoing participation in the implementation and maintenance of security measures, not simply during the final decision-making phase;
> (4) provide for participation in the training and evaluation of site security measures;
> (5) provide a means for anonymous reporting of site security problems, and an obligation of owners or operators to maintain a record of such reports;
> (6) provide a means for confidential input by employees to regulators during CFATS audits and inspections; and,
> (7) provide a means to certify that employee input has been received and integrated to the greatest extent practicable into plant security measures.

California's 2017 refinery safety regulations include new rights of employees and their representatives to participate in process safety decision-making.

Employees and their representatives will not normally be invited to participate with any real authority in management's decision-making committees, including committees that work on plant safety and security problems. At a minimum—including with a unionized workforce—employees need regulatory authority to obtain a seat at the table. For employee participation to be meaningful, however, that authority must provide much more than the basic right to participate; it must provide for the seven elements listed above.

In recognition of this fact, the 2017 California Process Safety Management (PSM) and Accidental Release Program (Cal/ARP) regulations include employee participation rights that require the first five of the elements noted above, while also providing for the right of employees to refuse unsafe work; request that a

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

process be shut down; and—for operators—actually shut down a refinery process.

Each of these elements could be included in CFATS to improve the effectiveness of its employee input provisions.

---

2) It was mentioned during the hearing that the communication and emergency response requirements of CFATS are adequate, and any deficiencies could be attributed to the Emergency Planning and Community Right to Know Act (EPCRA)

a) Please describe the areas, if any, where the emergency planning and response elements of EPCRA overlap with CFATS.

I. Summary response

The statement noted in this question was made by the representative from the Society of Chemical Manufacturers and Affiliates (SOCMA) and is misleading. While it is true that the intended emergency response outcomes of EPCRA have not materialized, it is also true that the emergency response provisions of CFATS are even less robust than those of EPCRA; in fact, they are woefully inadequate. CFATS needs to do much more to enable effective emergency planning, preparedness and response.[5]

II. Detailed response

EPCRA has had limited success in improving emergency planning and response.

Congress passed EPCRA in 1986 in response to the Bhopal disaster and other U.S. industrial chemical accidents. It consists of three major elements: the Toxics Release Inventory (TRI); an emergency planning provision; and a citizen suit provision.

Under its emergency planning provisions, EPCRA requires industry to provide chemical information to responders through Local Emergency Planning

[5] In addition to the references cited, the author's responses also take into account his experiences from 13 years in the emergency services as a firefighter, paramedic and EMT; seven years with the U.S. Coast Guard Reserve; five years as a hazardous materials specialist with FEMA USAR Task Force 4; and service as the representative of the California Department of Industrial Relations to the State Emergency Response Commission.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

Committees (LEPC) and State Emergency Response Commissions (SERC), and to local fire departments, either by submitting copies of Material Safety Data Sheets (MSDS) or by providing a list of chemicals that are used and stored on site. EPCRA requires the LEPCs to update this information annually, and it requires them to develop annual emergency response plans to be used during a major chemical accident. It requires facilities (under section 311) to submit an annual Emergency and Hazardous Chemical Inventory Form with information on how and where chemicals are stored on site.

EPCRA certainly improved industry transparency with regard to the production and release of hazardous chemicals, and it represents an important step forward for emergency planning and response. Its contributions to improving actual emergency operations, however, have been constrained by a lack of resources; limited capacity among fire departments to assimilate and act on industry information; an outdated informational architecture; and uneven enforcement.

EPCRA's reliance on LEPCs is particularly problematic because the LEPCs are voluntary entities that do not possess the capacity to receive and organize complex industrial chemical information and update and distribute emergency planning documents. Chemical information from facilities must be curated and formatted to be useful to fire departments and other emergency responders. Fire departments are not well suited—due to insufficient training and capacity—to organize, assimilate and act on chemical hazard information provided by companies. There is limited evidence that U.S. EPA is enforcing violations of EPCRA's information and planning requirements.[6]

The sparse CFATS emergency response provisions do not compensate for the weaknesses of EPCRA.

CFATS sections 2103(b) and (c) pertain to the sharing of information by the secretary with first responders, in order to improve their "situational awareness" in responding to a chemical release.[7] While this requirement is useful, it is far

---

6 Purifoy DM (Summer 2013). EPCRA: A Retrospective on the Environmental Right-to-Know Act. *Yale J. Health Policy Law Ethics* 2013 13(2):375-417 (Available: https://www.ncbi.nlm.nih.gov/pubmed/2434082). Accessed June 27, 2018.

7 Public Law 113-254 (Dec 18, 2014). Protecting and Securing Chemical Facilities from Terrorist Attacks Act of 2014. itle XXI—Chemical Facility Anti-Terrorism Standards. 6 USC 621, Section 2103, Protection and Sharing of Information, at (b) *Sharing of Information with States and Local Governments,* and at (c) *Sharing of Information with First Responders.*

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

from sufficient to meet the stated objective. It will almost certainly have the same limited outcome as similar requirements under EPCRA; that is, even when the information is provided by facilities to the secretary and transmitted to fire departments, it will be difficult for departments to apply the information in actual response planning. The information in and of itself will be of limited value without additional site-specific information, coordination and training. For fire departments, chemical information about a facility is essential, but it is not enough to execute an effective emergency response.

Curated information, combined with appropriate resources and ongoing coordination, planning and training, are key to an effective emergency response.

To be useful to responders, information needs to be facility-specific and continuously updated, and it needs to be part of a broader coordination, planning and training effort between the facility and responders. All of this requires financial and human resources.

In responding to a chemical release at an industrial facility, responders need to have trained sufficiently with the facility in order to quickly answer several questions, including the following:

(1) the identity of the chemical substance(s) involved in the release;
(2) the scale of the release;
(3) physical-chemical properties of the substance(s);
(4) the health hazards of exposure to the substance(s);
(5) the anticipated plume size and direction;
(6) safe operating and evacuation distances;
(7) appropriate suppression, containment and extinguishing practices;
(8) the potential for escalation to nearby vessels or piping;
(9) appropriate personal protective equipment; and,
(10) on-scene conditions, including actions taken by the facility to contain and mitigate the release, numbers of persons injured or trapped, and any associated hazards.

These types of questions can only be answered by knowledge and experience gained through: (1) curated, facility-specific chemical information, as well as site lay-out and structure; (2) planning and training with the facility; (3) appropriate technical skills, personnel and equipment; (4) effective mutual aid systems; and (5) technical training on plume modeling, evacuation perimeters, hazardous materials operations, and so forth.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

b) In your opinion, how could the emergency response requirements of CFATS be strengthened?

I. Summary response

CFATS could improve emergency planning and response by requiring facilities to:

(1) generate and transmit useful, facility-specific chemical hazard information directly to fire departments and other public agencies;
(2) coordinate, plan and train for a major incident with those agencies; and,
(3) correct any weaknesses identified in an assessment of the capacity of those agencies to respond to a major chemical incident.

II. Detailed response

Chemical facilities need to communicate, plan and train with responders to improve the likelihood of a more effective response to a major release.

The U.S. Chemical Safety and Hazard Investigation Board (CSB) has identified emergency response deficiencies as a contributor to at least 14 major industrial chemical incidents. Most of the deficiencies occurred in the following areas:

(1) Training for emergency responders, including hazardous materials training;
(2) Emergency planning and community response plans and teams;
(3) Use of community notification systems;
(4) Use of an incident command system and the National Incident Management System;
(5) Conducting emergency response exercises;
(6) Sharing of information among facilities, emergency responders and the community; and
(7) Communicating during emergencies.[8]

A UC Berkeley report identified key deficiencies in coordination, planning and training between the Bay Area's industrial facilities and fire departments.

[8] U.S. Chemical Safety and Hazard Investigation Board. *Drivers of Critical Chemical Safety Change: Emergency Planning and Response (Preparedness).* (Available: https://www.csb.gov/recommendations/emergency-response-/) Accessed June 27, 2018.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

A June 2013 evaluation by UC Berkeley of some aspects of the emergency response to the 2012 vapor cloud explosion and fire at the Richmond, Chevron oil refinery found that fire departments responding to that incident were unable to communicate with the Chevron fire department because they operated on different radio frequencies. This communication failure affected the incident command system and endangered the safety of responders and the public.[9]

More generally, the UC Berkeley report found that: (1) fire department personnel were not always provided access to an industrial facility when they arrived at the plant gate to investigate an incident reported by the public; (2) some fire departments had difficulty gaining access to industrial facilities for planning and training; and (3) there was a pervasive lack of communication between industrial facilities and fire departments with regard to response planning and training.

The UC Berkeley report also identified problems with the response capacity of other entities outside of fire departments. The Bay Air Quality Management District (BAAQMD), for example, did not have "sufficient capacity to monitor atmospheric conditions, plume travel, and real-time emissions" during the Chevron fire, nor was BAAQMD able to communicate air quality information to the public.[10] As a result, community air quality concerns were addressed in the media not by a BAAQMD official but by a Chevron spokesperson.

While the CSB later reported that some 15,000 people downwind of the fire had sought medical attention for symptoms related to smoke exposure, the UC Berkeley report found that there was no surveillance system in place to identify these individuals or track their health over time.[11] Moreover, the report found that Richmond's emergency public warning system failed to function effectively during the Chevron fire, and that there was no public agency prepared to provide regular updates to the public. This left thousands of residents in the dark about steps they should take to protect themselves and their families during the fire.

---

[9] Wilson MP. *Refinery Safety in California: Labor, Community and Fire Agency Views. Summary Report* (June 4, 2013). Prepared for the Office of Governor Jerry Brown, Interagency Task Force on Refinery Safety. University of California, Berkeley (p. 9) (Available: http://lohp.org/lohp-refinery-safety-report/) Accessed June 27, 2018.
[10] Wilson MP. *Op cit.* (pp. 11-12).
[11] U.S. Chemical Safety and Hazard Investigation Board (CSB) (April 2013). *Interim Investigation Report.* Chevron Richmond Refinery Fire of August 6, 2012. (p. 6) (Available: https://www.csb.gov/chevron-refinery-fire/). Accessed June 27, 2018.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

The Chevron pipe failure occurred not as an intentional act but as a result of inattention by managers to the effects of sulfidation corrosion; the outcome, however, would likely have been the same. A refinery pipe failure that creates a large flammable vapor explosion and smoke plume will take its course regardless of its cause.

Problems with the emergency response to the Chevron fire would likely have been avoided if Chevron had been required to: (1) generate and transmit useful, facility-specific chemical information to fire departments and other public agencies; (2) plan and train for a major incident with those agencies; and (3) correct any weaknesses identified in an assessment of the Bay Area's regional response capacity.

Several measures could be included in CFATS to strengthen its emergency response elements.

The emergency response elements of CFATS could be improved by requiring facilities to:

(1) transmit specific types of chemical and facility information to fire departments and other public response agencies;
(2) conduct regular planning meetings and training exercises with fire departments and other agencies;
(3) conduct an assessment to understand the capacity of fire departments and other agencies to respond effectively to a major chemical incident; and,
(4) implement corrective actions to address gaps identified in the assessment.

These requirements would provide a foundation for improving the capacity of local fire departments and other agencies to respond effectively to a major chemical incident, whether it occurs as the result of an intentional act, an extreme weather event, a mechanical or structural failure, or a power outage.

Alongside these improvements in CFATS, there is a need for a comprehensive, national emergency planning assessment to identify at-risk communities and develop realistic response plans. Many communities—particularly those served by volunteer fire departments—have very limited capacity to respond to a major industrial chemical release.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413

1020 19th Street NW, Suite 600
Washington, D.C. 20036

369 Pine Street, Suite 700
San Francisco, CA 94104

3) While I certainly support chemical facilities developing plans to increase security, I believe we should also be prioritizing ways to lessen the need for these security measures by minimizing the risk at chemical facilities. This can be accomplished by eliminating targets and reducing the amount of chemicals stored on site, or using "inherently safer technologies," such as shifting to a safer chemical or process.

a) Do you believe the CFATS program currently incentivizes facilities to reduce their risk instead of simply securing the facility to protect an existing risk?

I. Summary response

CFATS is a risk management—rather than risk prevention—framework; that is, it assumes that industrial chemical hazards cannot be reduced or eliminated, and that those hazards therefore need to be "surrounded" by layers of security.

CFATS could do more to motivate and require facilities to reduce chemical hazards by requiring that they investigate—and implement to the greatest extent feasible—safer chemicals and processes. The industry's Center for Chemical Process Safety (CCPS) recognizes that inherently safer systems are the most effective and enduring means of improving facility safety.

California's 2017 Process Safety Management (PSM) regulations for petroleum refineries can serve as a model for such an approach in CFATS.[12]

II. Detailed response

Millions of Americans live in the vulnerability zone of an industrial chemical release, and one in three school children attend school in such an area.[13]

---

[12] California Occupational Safety and Health Standards Board, Department of Industrial Relations (May 2017). General Industry Safety Order §5189.1. *Process Safety Management for Petroleum Refineries*. (pp. 18-20) (Available: https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018.

[13] Center for Effective Government, "Kids in Danger Zones: One in Three U.S. Schoolchildren at Risk From Chemical Exposures," September 2014. Available: https://www.foreffectivegov.org/kids-in-danger-zones.

1300 Godward Street NE, Suite 2625 Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600 Washington, D.C. 20036 | 369 Pine Street, Suite 700 San Francisco, CA 94104

African Americans, Latinos, and lower-income communities continue to be at greatest risk.[14]

The CSB, EPA and OSHA have all pointed out that these risks are *preventable* through modern engineering and management practices that the industry itself has developed and recommended.

There is some evidence that the risk management measures required under CFATS are causing some companies to implement risk reduction strategies. DHS reports that thousands of high-risk facilities have chosen to meet their chemical security obligations not only through traditional security measures, but also by (1) consolidating chemicals from multiple sites into one or two sites; (2) replacing a hazardous chemical with a less hazardous one; (3) reducing the total quantity of a chemical held onsite; or (4) switching to a less concentrated form of the chemical.[15]

Each of these actions does more than manage risk—it reduces risk not only from an intentional attack, but also of an extreme weather event or earthquake, a power outage, or mechanical failure.

Assuming DHS is confident in the veracity of these claims (and is taking steps to validate them) these approaches represent progress toward reducing industrial chemical risks at existing facilities.

On the other hand, there are about 3,500 other facilities that have remained in the CFATS high-risk tier and that pose a substantive risk to the safety of workers and nearby communities.[16] These facilities are presumably continuing to rely on active and procedural safeguards. Changes to the CFATS program are needed to drive down risks at these facilities.

CFATS could do this with new risk prevention—or risk reduction—requirements. The Center for Chemical Process Safety (CCPS) describes risk

---

[14] Earthjustice, *Another Year Of Preventable Chemical Disasters*, April 2018. Available: https://earthjustice.org/news/press/2018/another-year-of-preventable-chemical-disasters.

[15] Suzanne E. Spaulding, DHS Under Secretary (January 11, 2017). Correspondence to the Honorable Bennie G. Thompson, ranking member, Committee on Homeland Security. See Addendum at page 6, item 12.

[16] Coalition to Prevent Chemical Disasters, "Testimony of Paul Orum, Chemical Safety Advocate," February 2018. Available: https://homeland.house.gov/wp-content/uploads/2018/02/Testimony-Orum.pdf.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413

1020 19th Street NW, Suite 600
Washington, D.C. 20036

369 Pine Street, Suite 700
San Francisco, CA 94104

reduction strategies as those that minimize the use of hazardous chemicals, or substitute them with safer chemicals, or that simplify or modify chemical processes to make them less vulnerable to failure.

California's 2017 process safety management (PSM) regulations shift process safety from a largely reactive, risk management framework to a more proactive, risk prevention framework.

California's 2017 PSM regulations include a suite of new risk prevention elements, including a mandatory decision-making process based on the "hierarchy of controls." This approach integrates the concept of inherent safety into regulatory language in manner that is enforceable, practical and meaningful.

Following the August 2012 Richmond, Chevron fire, a February 2014 report of the Governor's Interagency Working Group on Refinery Safety, *Improving Public and Worker Safety at Oil Refineries*, found that "regulatory changes were needed to: [17]

(1) implement inherently safer systems to the greatest extent feasible;
(2) perform periodic safety culture assessments;
(3) adequately incorporate damage mechanism hazard reviews into process hazard analyses;
(4) complete root cause analyses after significant accidents or releases;
(5) explicitly account for human factors and organizational changes; and
(6) use structured methods such as layer of protection analysis to ensure adequate safeguards in process hazard analysis."

In response to the report's finding regarding the need for "inherently safer systems," the Department of Industrial Relations (DIR) and California EPA included a provision in the Process Safety Management (PSM) and California Accidental Release Program 4 (Cal/ARP) regulations, respectively, that requires refiners to conduct a "hierarchy of hazard controls analysis" for serious process safety hazards.[18]

---

[17] Governor's Interagency Working Group on Refinery Safety (February 2014). *Improving Public and Worker Safety at Oil Refineries.* (Available: http://www.caloes.ca.gov/FireRescueSite/Documents/Refinery%20Rpt%20Feb%202014.pdf). Accessed June 27, 2018.

[18] California Occupational Safety and Health Standards Board, Department of Industrial Relations (May 2017). General Industry Safety Order §5189.1. *Process Safety Management for Petroleum Refineries.* (pp. 18-20) (Available:

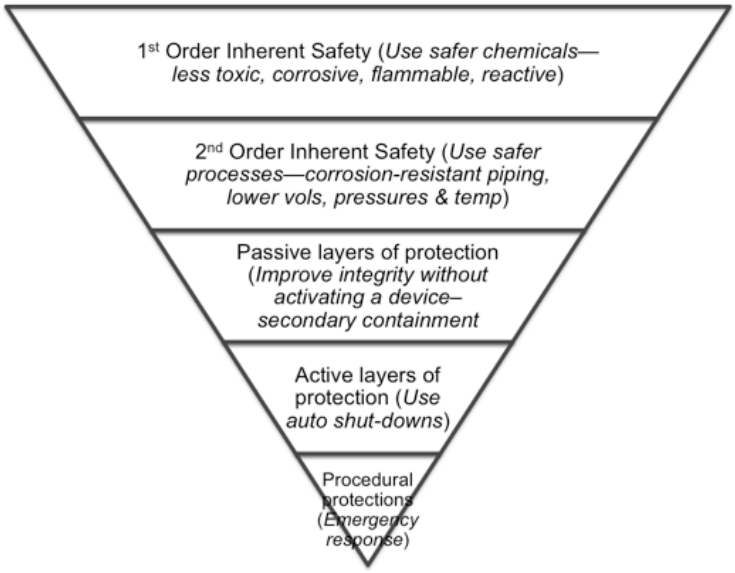
1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

California's hierarchy of controls approach incorporates inherent safety measures as part of a logical sequence of safety decision-making.

This mandatory sequence consists of the following five elements, which are described in more detail below (Figure 1):

(1) First-order inherent safety measures;
(2) Second-order inherent safety measures;
(3) Passive safeguards;
(4) Active safeguards; and,
(5) Procedural safeguards.

Figure 1. *Framework of the California PSM and Cal/ARP Hierarchy of Hazard Controls Analysis (HCA).*



Effective October 1, 2017, California refiners are required to ensure the safety of refinery processes by applying corrective actions that follow this sequence and priority order.[19]

First-Order Inherent Safety Measure. This is a measure that

https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018.

[19] California Occupational Safety and Health Standards Board, *op cit.* (pp. 18-20). (Available: https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

eliminates a hazard. Changes in the chemistry of a process that eliminate the hazards of a chemical are usually considered first-order inherent safety measures—for example, by substituting a toxic chemical with an alternative chemical that can serve the same function but is nontoxic, or less toxic.

Second-Order Inherent Safety Measure. This is a measure that effectively reduces a risk by reducing the severity of a hazard or the likelihood of a release, without the use of add-on safety devices. Changes in process variables to minimize, moderate, or simplify a process are usually considered second-order inherent safety measures—for example, by redesigning a high-pressure, high-temperature system to operate at ambient temperatures and pressures.

Passive Safeguard. This is a process or equipment design feature that minimizes a hazard by reducing either its frequency or its consequence, without the active functioning of any device—for example, by constructing a diked wall around a storage tank of flammable liquids that is intended to contain a release of the liquid, rather than allowing the spill to extend into other areas of the plant or surrounding areas.

Active Safeguard. This is a control, alarm, instrument, or other mitigation system that is used to detect and respond to deviations from normal process operations—such as a pump that is shut-off by a high-level switch.

Procedural Safeguard. This is a policy, operating procedure, training program, administrative check, employee response, or other management approach that is used to prevent incidents or minimize the effects of an incident. Examples include hot work procedures and emergency response procedures.

These requirements appear in subsection (l) of the PSM regulation, known as the Hierarchy of Hazard Controls Analysis, or HCA.[20] The HCA requires refiners to prioritize first- and second-order inherent safety measures over passive or active safeguards, which must be prioritized over procedural safeguards. This

[20] California Occupational Safety and Health Standards Board, *op cit.* (pp. 18-20). (Available: https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

ensures that refiners evaluate and implement the most effective approaches to protecting against a major process accident.

For example, to address pipe corrosion and thinning caused by high temperatures and sulfidation, a refiner would be required to assess a range of solutions in priority order, such as in the following example:

> (1) reduce the sulfur content of the chemical feedstock materials to reduce their corrosiveness—a first-order inherent safety measure;
> (2) change the process conditions, such as temperature and pressure, to reduce corrosiveness, or replace the pipe with more corrosive-resistant piping—a second-order inherent safety measure;
> (3) apply welded patches over thinning sections of pipe to prevent a leak from occurring—a passive safeguard;
> (4) install automated corrosion probes that continuously monitor thinning in vulnerable areas—an active safeguard; or,
> (5) conduct routine inspections of the thickness of the pipe—a procedural action.

California's approach favors inherent safety measures by requiring that HCA teams recommend inherent safety approaches "to the greatest extent feasible;" it does not, however, attempt to "mandate" inherent safety measures.

b) Based on your previous experience in California, how could the CFATS program be strengthened to include both risk management and risk prevention, and encourage continuous improvement at covered facilities?

I. Summary response

The 2017 California PSM regulation offers a possible model for CFATS, in that it contains both risk management and risk prevention requirements in regulatory language that is practical, meaningful and legally enforceable.

II. Detailed response

CFATS could draw from key elements of the California Process Safety Management (PSM) regulation.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

Drafting the California PSM regulation required nearly five years of effort and hundreds of hours of meetings with refinery managers, process safety experts, and leaders of the union representing refinery workers. The resulting regulation reflects the industry's own best engineering and management practices, developed over the last 20 years.

The regulation expands the focus of refinery safety from a largely reactive, risk management framework to a more proactive, risk prevention framework. The risk management elements have been modernized and clarified. The California PSM offers a possible model for CFATS, in that it contains both risk management and risk prevention requirements in regulatory language that is practical, meaningful and legally enforceable.

Many of the PSM requirements could be applied to CFATS, including the following:

Risk Management Examples

Safeguard Protection Analysis (SPA)
Under the Process Hazard Analysis (PHA) requirements, refiners are required to conduct an SPA to ensure redundancy and independence of safeguards. This is intended to protect against a cascade of failures in a plant's safeguards after an initiating event, such as a power outage or small fire.

Management of Change (MOC)
The MOC procedures are intended to prevent refiners from introducing new process hazards when they make a change to a process or replace a piece of equipment.

Management of Organizational Change (MOOC)
The MOOC procedures require refiners to assess the effects on safety of staffing changes and other personnel stressors, such as fatigue and shift rotations.

Human Factors
Human factors analyses are required throughout the PSM regulation and are intended to integrate the limitations of human performance into safety engineering systems.

Process Hazard Analysis (PHA).

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

In consultation with employee representatives, refiners are required to develop worst-case scenarios associated with chemicals and processes, and then implement corrective actions to prevent those scenarios from occurring.

Mechanical Integrity
All processes and equipment must be Refiners are required to continually inspect and certify that processes and equipment meet or exceed Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) and are fit for service.

Risk Prevention Examples

Hierarchy of Hazard Controls Analysis (HCA)
As described above, this element requires the implementation of a hierarchical decision-making framework in selecting corrective actions to address process hazards identified in the PHA.

Incident Investigation—Root Cause Analysis
Following a major incident or near miss, refiners are required to conduct a root cause analysis and implement corrective actions.

Damage Mechanism Reviews (DMR)
This is similar to a security vulnerability assessment but focused on physical damage mechanisms (such as corrosion, high temperature hydrogen attack, embrittlement etc) and on the corrective actions necessary to mitigate those mechanisms.

Process Safety Culture Assessments (PSCA)
Refiners are required to conduct a PSCA every five years, with interim corrections at the three-year mark. This could be used to assess the security culture at a facility.

Employee Participation
Collective bargaining agents have the authority to select their representatives who participate "throughout all phases" of PSM decision-making. Operators have the authority to shut-down a process in response to a process safety hazard. All employees have the right to recommend that a process be shut down; to refuse unsafe work; and to anonymously report process safety hazards. Refiners are required to promptly correct hazards that could cause death or serious physical harm to an employee, or that could lead to a major incident.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

Implementation
With certain exception, refiners are required to implement the process safety recommendations of labor-management process safety teams.

Contractors
All contractors and their employees are required to be trained in, and to understand, the hazards of the facility and the ways in which their work could jeopardize plant safety.

These and other elements of California's new PSM regulation could be reshaped for a security context and adopted by CFATS.

Continuous improvement is a foundation of an effective safety and security program that applies to nearly every aspect of management and engineering.

Continuous improvement is essential in the security setting to ensure that a plant's security protections remain current and able to effectively thwart the evolving threats of motivated actors. Under the HCA element of the California PSM regulation, refiners are required to continually improve their process safety systems by analyzing and documenting "publicly available information" on inherent safety measures and safeguards that have been "achieved in practice" by the petroleum refining industry and related industrial sectors, and that have been "required or recommended for the petroleum refining industry and related industrial sectors by a federal or state agency, or a local California agency, in a regulation or report." The PSM regulation requires refiners to report the results of this investigation as part of the rationale for their selection of corrective actions.

This requirement helps ensure that—as refiners contemplate corrective actions to prevent or mitigate process hazards—they learn from the experience of other refiners and industry sectors. This learning includes both engineering advancements and "lessons learned" from major incidents or near misses across industry. Documentation requirements improve the body of evidence in the event of a major incident.

California's requirement that refiners investigate and document industry best practices provides an impetus for refiners to continuously assess and improve the safety of their operations.

Facilities can continuously improve their safety practices by "looking outward" to

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413
1020 19th Street NW, Suite 600
Washington, D.C. 20036
369 Pine Street, Suite 700
San Francisco, CA 94104

best practices that have been adopted and accepted across the industry.

The California PSM regulation requires refiners to apply Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) in maintaining the mechanical integrity of refinery processes and equipment. The Statement of Reasons for the PSM regulation describes RAGAGEP as an "engineering, operation, or maintenance activity that has been accepted and established in a code, standard, technical report, or recommended practice and is published by a recognized and generally accepted organization. RAGAGEP is recognized by subject matter experts as the best way to perform certain engineering, inspection, or mechanical integrity activities, such as fabricating, inspecting, or maintaining a vessel."[21]

Compliance with RAGAGEP ensures that processes and process equipment are designed, constructed, installed, maintained, inspected, tested, and operated in a safe manner.

The California PSM regulation requires refiners to "document that process equipment complies with RAGAGEP, where RAGAGEP has been established for that process equipment, or with more protective internal practices that ensure safe operation," and it requires the refiner's mechanical integrity program (for all processes and equipment) to be consistent with, or to exceed, standards set forth by RAGAGEP. [22]

In an approach that differs from the interpretation of RAGAGEP by federal OSHA, the California PSM regulation does not allow a refiner to develop its own *internal* process safety practices and then claim that those practices constitute RAGAGEP. That is, while each refiner is required to demonstrate that their inspection and testing program for process equipment meets or exceeds the standards set forth by the industry through RAGAGEPs, they are not allowed under the regulation to claim that their internal inspection and testing program itself is a RAGAGEP.

---

[21] California Occupational Safety and Health Standards Board, Department of Industrial Relations. Process Safety Management for Petroleum Refineries. *Initial Statement of Reasons*. p. 8). Available: https://www.dir.ca.gov/oshsb/documents/Process-Safety-Management-for-Petroleum-Refineriess-ISOR.pdf) Accessed June 27, 2018.

[22] California Occupational Safety and Health Standards Board, *op cit.* (p. 7 and pp. 15-17). (Available: https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413

1020 19th Street NW, Suite 600
Washington, D.C. 20036

369 Pine Street, Suite 700
San Francisco, CA 94104

The PSM Statement of Reasons explains that this requirement is "necessary to ensure that employers meet or exceed recognized standards and implement changes in response to new or updated codes and standards that may be amended in response to process incidents in the industry. This is necessary to promote safe operation and ensure that process equipment complies with current standards."[23]

By requiring refiners to apply RAGAGEP in these ways, the California PSM regulation is intended to set a high performance standard for process safety that is continuously informed by the industry's evolving best engineering practices.

California's hierarchy of controls (HCA) requirements and its application of RAGAGEP could be applied to security measures under CFATS.

---

6) The California Industrial Risk Framework

Please provide any additional information on the ways in which CFATS could adopt the risk management and risk prevention strategies of the California PSM regulation.

I. Summary response

California's PSM regulation requires oil refiners to apply a sequential, hierarchical decision-making process to eliminate, reduce, or control process hazards, based on the recommendations of labor-management PSM teams. The regulation requires refiners to implement the most effective approaches (rather than to defaulting to the most expedient, least expensive, or most familiar approaches) but it does not *mandate* any particular approach.

One year after the October 1, 2017 implementation date, it appears that this approach is working reasonably well among the state's 14 refiners. A similar approach could be considered under CFATS to drive down chemical security risks.

---

[23] California Occupational Safety and Health Standards Board, Department of Industrial Relations. Process Safety Management for Petroleum Refineries. *Initial Statement of Reasons. Mechanical Integrity, J(4)* (p. 24). Available: https://www.dir.ca.gov/oshsb/documents/Process-Safety-Management-for-Petroleum-Refineriess-ISOR.pdf) Accessed June 27, 2018.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

II. Detailed response

California's hierarchy of controls favors inherent safety measures over passive, active and procedural safeguards but—within certain constraints—it leaves the refinery with final decision-making authority.

Inherent safety measures provide protection in the face of multiple threats. An inherently safer industrial system—one that is operated with safer chemicals, or under lower temperatures, pressures and volumes—is generally less vulnerable to an intentional attack, but it is also less vulnerable to an extreme weather event, a mechanical failure or a power outage.

Inherent safety is integrated into the California PSM regulation through the following provisions of subsection (l), the Hierarchy of Hazard Control (HCA) element: [24]

HCA subsection (l)(1)

Within five years of October 1, 2017 the employer must conduct an initial HCA as a standalone analysis for all existing processes; 50% of these HCAs must be conducted within three years. All HCAs must be revalidated every five years. The regulation integrates the HCA schedule with the process hazard analysis (PHA) schedule.

HCA subsection (l)(2)

Refiners must conduct an HCA in the following cases: (1) for all recommendations made by a PHA team for each scenario that identifies the potential for a major incident; (2) for all recommendations that result from the investigation of a major incident; (3) as part of a "management of change" (MOC) review, whenever a major change is proposed; and (4) during the design and review of new processes, process units, and facilities, and their related process equipment. Each of these analyses represents an opportunity to reevaluate process safety problems and consider new approaches to solving them.

HCA subsection (l)(3)

The regulation requires that HCAs be documented, performed, updated, and

[24] California Occupational Safety and Health Standards Board, *op cit.* (pp. 18-20). (Available: https://www.dir.ca.gov/OSHSB/documents/Process-Safety-Management-for-Petroleum-Refineries-txtbrdconsider.pdf) Accessed June 27, 2018

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

revalidated by a labor-management team with specific types of expertise. The team must include one member with expertise in the HCA method being used and one operating employee who currently works on the process and has experience and knowledge specific to the process being evaluated. The regulation requires the employer to provide for employee participation on all HCA teams and for employees to select their team representatives.

HCA subsection (l)(4)

The labor-management HCA team is required to: (1) compile or develop all risk-relevant data for each process or recommendation; (2) identify, characterize, and prioritize risks posed by each process safety hazard; and (3) identify, analyze, and document all inherent safety measures and safeguards for each process safety hazard in the proper sequence and priority order.

For each process safety hazard that the HCA team has identified, the team is required to develop written recommendations for the refinery management in a manner consistent with the hierarchy of controls noted above.

The HCA team is then required to develop recommendations to "eliminate hazards to the greatest extent feasible" using first-order and second-order inherent safety measures, followed by recommendations to mitigate any residual risks by applying passive, active and procedural safeguards. This approach ensures that inherent safety measures are prioritized over other approaches that rely on safeguards.

HCA subsection (l)(5)

The HCA team is required to prepare a report within 90 days of developing the recommendations that describes the inherent safety measures and safeguards recommended by the team for each hazard. This document helps ensure accountability in the HCA decision-making process and, in the event of a major incident, could be used by regulators to determine the extent to which refinery employers accepted, altered or rejected safety recommendations made by an HCA team.

HCA subsection (l)(6)

The employer is required to implement all HCA team recommendations in accordance with requirements stipulated in subsection (x) of the regulation.

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104

HCA subsection (l)(7)

The employer is required to retain HCA reports for the life of each process. This enables regulators to investigate the refiner's decision-making process over time in the event of a major release.

The hierarchy of hazard controls approach used in California could be applied to security measures under CFATS.

Final considerations for the Committee.

I. Summary response

Railroad tank cars are not designed for storage of hazardous chemicals and are uniquely vulnerable to a terrorist attack. CFATS should include provisions to ensure the safety of rail cars and their appropriate use by facilities.

II. Detailed response

A 2007 report by the Center for American Progress points out that railroad tank cars containing chlorine gas could be potential targets of opportunity for a terrorist attack.[25] There is anecdotal evidence that some facilities may be relying on tank cars for temporary storage of hazardous chemicals.

When companies use safer chemicals or less hazardous chemical formulations, they are less likely to require transportation of large volumes of hazardous chemicals. Wherever appropriate, DHS should consider transportation risks under CFATS by encouraging and requiring facilities to adopt inherent safety measures, as noted above. In addition, DHS should take steps to ensure: (1) that railroad companies have equipped their tank cars with safeguards to prevent a catastrophic release in the event of a roll-over, collision, or equipment failure, such as valve or line failure; and (2) that facilities are not relying on rail cars for storage of hazardous chemicals, on or off-site.

* * * * * * *

[25] Orum P. Toxic trains and the terrorist threat: how water utilities can get chlorine gas off the rails and out of American communities. (April 2, 2007). Center for American Progress. (Available: https://www.americanprogress.org/issues/security/reports/2007/04/02/2901/toxic-trains-and-the-terrorist-threat/). Accessed July 25, 2018

1300 Godward Street NE, Suite 2625
Minneapolis, MN 55413 | 1020 19th Street NW, Suite 600
Washington, D.C. 20036 | 369 Pine Street, Suite 700
San Francisco, CA 94104