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TESTIMONY

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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
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Chairman Boxer, Ranking Member Vitter, distinguished members of the Committee, thank you for the opportunity to appear before you today. My name is Dr. Michael Wilson and I serve as Chief Scientist in the California Department of Industrial Relations, which resides within the state's Labor and Workforce Development Agency. Our Department is charged with protecting the health and safety of California's 18 million workers. We are a core member of the Governor's Interagency Refinery Task Force, whose views I represent today.

California has taken action to protect workers, the public and our industrial infrastructure from process safety incidents.

Over 10 years ago, California formed a special unit within our Cal/OSHA program, called the Process Safety Management (PSM) unit, after the Bay Area's Tosco refinery experienced a naphtha explosion on a crude oil distillation tower. The explosion engulfed four Tosco workers, who had to be painstakingly extricated off the 13-story tower. All of these young men subsequently died of their injuries. Two years before this incident, a worker at the same plant was killed in an explosion in the hydrocracker unit.

Throughout the 1990s, the Tosco plant led the U.S. refining industry in the number of environmental and worker safety violations. It had a history of poor maintenance and understaffing and had developed a reputation for being a hazardous place to work.

To this day, and despite similar kinds of incidents occurring fairly regularly across the country, California's dedicated PSM unit is the only one of its kind in the nation. I've watched our Cal/OSHA PSM safety engineers do their work in the oil refineries, and I wish you could have the opportunity to share this experience. Cal/OSHA's professionals make a real difference in the lives of these workers, who our society depends on for the fuels that power our economy.

California has made a basic commitment to protecting the people who work in the refineries and other hazardous industries by funding a specialized PSM unit and enforcing PSM regulations and standards.

California has a companion program that is focused on protecting the communities near refineries and other hazardous industries. The California Accidental Release Prevention Program (CalARP) is managed by the Governor's Office of Emergency Services, overseen by the California Environmental Protection Agency (Cal/EPA) and implemented by the local Unified Programs at the county and city level. The CalARP program operates in parallel with the federal Chemical Accident Prevention Provisions, with certain additional state-specific requirements.

The regulatory requirements of the Cal/OSHA PSM program and the CalARP program are similar because the same industrial processes that can injure or kill workers can also affect public health and the environment. Both programs include requirements related to process safety information, process hazard analyses, mechanical integrity, and management of change. The difference is in focus: the PSM program focuses on potential on-site chemical releases and processes that affect the health and safety of workers, while the CalARP Risk Management Program focuses on chemical releases with the potential for off-site impacts that might require public notification and emergency response.

California is committed to strengthening both programs to protect workers and the public from industrial accidents and to motivate companies to invest in good engineering practices that protect industry itself and—more broadly—our state's industrial infrastructure and economy.

Industrial safety and security regulations could be expanded to focus on both the management and prevention of hazards.

In reviewing our programs through the lens of refinery safety, it has become clear that California's PSM and RMP regulations could be improved by addressing a basic design flaw: the regulations currently require facilities to place *protections* around industrial hazards. They do not, however, require facilities to develop strategies to continuously *reduce* those hazards, wherever feasible, such as through the use of less hazardous chemicals, processes, or materials.

The regulations currently call on industry to apply layers of protection around a hazard—such as by using alarm systems, special procedures, or protective equipment for workers—but they do not require industry to engage in a deliberate process of evaluating whether the hazard itself can be mitigated.

The same can be said for the Federal OSHA PSM Standard, EPA's Risk Management Plans, and the Department of Homeland Security's Chemical Facility Anti-Terrorism Standards (CFATS), all

of which are the subject of the Obama Administration's Executive Order 13650. These agencies, and the statutes from which they draw their authority, share a common regulatory approach to risk: they accept the risks as given, and they seek to manage those risks through the development and implementation of facility safety plans.

An alternative approach would give the agencies the authority to seek solutions that do more to avoid or reduce industrial safety risks through strategies that motivate attention to, and investments in, inherently safer design. Executive Order 13650 specifically calls on the agencies to consider this approach. This is the path California is now actively pursuing.

California Governor Jerry Brown established an Interagency Working Group on Refinery Safety in 2012.

On August 6, 2012 the San Francisco Bay Area's Chevron Richmond refinery experienced a catastrophic failure of a corroded pipe. The pipe emitted an explosive vapor cloud that rapidly expanded through the unit to about the size of a football field. It engulfed 19 workers, who narrowly avoided injury or death by escaping into other areas of the plant about 90 seconds before the cloud ignited. One Chevron firefighter escaped through the ensuing fire wearing protective clothing.

The resulting smoke plume spread well beyond the refinery confines and ultimately caused some 15,000 people in nearby communities to seek medical attention for symptoms related to possible exposure to the combustion products.

Immediately following the incident, Governor Jerry Brown established an Interagency Working Group on Refinery Safety, made up of 13 state agencies and departments, and charged the Group with figuring out what went wrong in Richmond and what should be done to prevent an incident such as this from happening again. The Working Group spent the next 18 months gathering input from the public and from technical experts in industry, labor, the U.S. Chemical Safety Board, emergency responders, and regulatory agencies.

The Governor's Report addresses both refinery incident prevention and response.

Last month, the Governor's Interagency Working Group on Refinery Safety released a final Report of its findings and recommendations, entitled *Improving Public and Worker Safety at Oil Refineries*.⁽¹⁾ The Report addresses both incident *prevention* and *emergency response*.

¹ Governor Edmund G. Brown, Jr. *Improving Public and Worker Safety at Oil Refineries: Report of the Interagency Working Group on Refinery Safety* (February 2014) Available: <http://www.dir.ca.gov/dosh/interagency-refinery-task-force.html> (Accessed March 2, 2014).

The Report's findings include the following:

- Oversight and Coordination

Multiple regulatory agencies have responsibility for oversight of refineries, sometimes with overlapping jurisdiction. Agency efforts to ensure information sharing, joint prioritization of enforcement, and other coordinated actions can and should be improved.

- Emergency Response and Preparedness

Regulations need to define more precisely a refinery's requirements for reporting losses of containment or other releases of hazardous materials to local and state agencies. Response protocols and communication between public agencies and refineries need to be clarified and strengthened. Hazardous Materials Area Plans developed at the local level are written as general response guidelines and do not address the unique hazards of refinery processes. The current air monitoring network does not provide real-time tracking of toxic air contaminants or pollutants in most geographic regions.

- Safety and Prevention of Hazardous Events

Refineries are subject to the CalARP Risk Management Program (RMP) and the Cal/OSHA Process Safety Management (PSM) regulation, as well as an Industrial Safety Ordinance (ISO) in Contra Costa County, where four refineries are located. There are gaps in these regulatory structures, including limitations on the ability of agencies to address key aspects of process safety, and regulatory ambiguities that can make enforcement difficult.

Regulatory agencies face several challenges related to their enforcement capacity, including difficulties in hiring, retaining, and training inspectors; a lack of mechanisms for sharing information and coordinating efforts with sister agencies; deficiencies in information provided by the refineries; and penalties that are insufficient to create meaningful deterrence.

- Community Education and Alerts

There are shortcomings in community emergency alert systems, public education, and timely dissemination of public information, including challenges in communicating with

communities regarding health risks and actions the public should take during an incident. Public involvement has not been well integrated into air monitoring improvement discussions.

The Report's recommendations include the following:

- Oversight and Coordination

An Interagency Refinery Task Force has been created within CalEPA to coordinate agency activities and carry out the recommendations in this Report. The Task Force will be staffed by a new Refinery Information Officer at CalEPA, who will serve as a central point of contact on refinery-related matters for agencies, industry, and the public. New funding for PSM inspector positions will increase Cal/OSHA's capacity to conduct inspections in the refineries and other large facilities.

- Emergency Response and Preparedness

The Governor's Office of Emergency Services (Cal OES), formerly the California Emergency Management Agency, will coordinate improvements in emergency response practices by clarifying reporting thresholds during a hazardous materials release (or threatened release) and will work with local Certified Unified Program Agencies (CUPAs) to create refinery-specific elements in the Hazardous Materials Area Plans.

The Working Group has identified at least four elements that must be included in the Area Plans: (1) alignment of radio communications between public fire agencies and refinery fire brigades; (2) clearer criteria for the establishment of Unified Incident Command and a Joint Operation Center during incidents; (3) plans and protocols for communicating health and safety information to hospitals, schools, transit agencies, and other entities during an incident; and (4) requirements for joint drills and exercises between public response agencies and refineries.

The California Air Resources Board (ARB), in collaboration with the California Air Pollution Control Officers Association (CAPCOA), is working on a parallel effort focused on toxic air contaminant monitoring, which will improve technical knowledge and sharing of real-time air monitoring data.

The Report notes that operational effectiveness is critical in the area of emergency response, but that "the central goal of the state's effort on refinery safety is to prevent

the conditions that give rise to an emergency by increasing inherent safety and continuous improvement in health, safety and environmental performance.”⁽²⁾

- Safety and Prevention of Hazardous Events

Existing regulations and practices must be strengthened to ensure that relevant safety and health information is provided by refineries to agencies, workers, and the public. Agency enforcement capabilities need to be enhanced. Six prevention strategies should be implemented as soon as possible, directing refineries to: (1) implement inherently safer systems to the greatest extent feasible; (2) perform periodic safety culture assessments; (3) incorporate damage mechanism hazard reviews into Process Hazard Analyses; (4) complete root cause analyses after significant accidents or releases; (5) 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.

The Working Group identified three additional areas that will require further study: reporting of leading and lagging indicators; increasing worker and community involvement; and exploring the safety case approach.

- Community Education and Alerts

Agencies will evaluate improvements to public input during the emergency planning process, create enhanced public information and outreach protocols for use during a chemical release or fire, and improve alerts and public access to information during incidents. Agencies are also working to improve public access to air monitoring data and other health and safety information.

The Report highlights the importance of prevention through a hierarchy of controls, in which inherently safer design is the primary objective.

Relevant to today's hearing, the Report is noteworthy because—like Executive Order 13650—it expands the focus of chemical safety from requiring industry to install protections *around* hazards to requiring industry to continuously evaluate and *reduce* those hazards, wherever feasible. It concludes that in complex industrial systems, prevention is best achieved through

² Brown, *op cit.* p. 25.

the application of a hierarchy of controls, in which inherently safer design is the primary objective.⁽³⁾

The intent of inherently safer system requirements is to ensure that refineries incorporate the greatest degree of hazard reduction, to the maximum extent feasible, in order to avoid accidents or releases. The focus is on adopting measures that are permanent and inseparable from the production process, as opposed to adding safety equipment or installing external layers of protection. For example, had such a requirement been in place at its Richmond refinery, Chevron would have been required to demonstrate why the continued use of low-silicon metal (susceptible to corrosion) was a viable process safety solution, given other inherently safer options.

In general, inherently safer design reduces risks through the use of less materials or processes; it represents a “passive” form of risk reduction that reduces both the likelihood and the consequences of an industrial hazard—without the need to take action or activate a protective system or device. Under the recommendations of the Report, refineries would be required to use a Hierarchy of Controls approach to select inherently safer options (see Figure 1). This would include requirements to report the methodologies, findings, rationale, and conclusions used to select particular processes and materials during Process Hazard Analyses and during rebuilds, repairs, corrective actions, and incident investigations.

In addition to the focus on inherently safer design within a Hierarchy of Controls, the Governor’s Report described a number of other areas where improvements are needed, including the following:

- Require Refineries to Perform Periodic Safety Culture Assessments

An organization’s safety culture is reflected in the way risk is perceived by workers and managers, as well as in the way that priorities are adjusted in day-to-day decision-making. Safety culture assessments that involve frontline workers in meaningful ways can improve safety and reduce incidents throughout a facility, particularly in facilities that involve complex and hazardous industrial processes.

³ The concept of inherently safer design can be understood through the example of chlorine, which is used in many industries. Chlorine exists as a gas, and it expands over 400 times if released from a pressurized tank. Its vapors are heavier than air, so they stay at ground level and seek out low points. According to the Centers for Disease Control and Prevention’s Agency for Toxic Substances and Disease Control, when inhaled at 30 parts per million in air (ppm), chlorine gas produces chest pain and shortness of breath; at 50 ppm it produces pulmonary edema; and at about 400 ppm, it is fatal within 30 minutes. The CDC suggests that children might be more susceptible than adults due to their smaller airways. Best industrial practice would replace chlorine gas with safer alternatives, such as sodium hypochlorite; that is, bleach.

Safety culture assessments also help regulators evaluate whether the refinery’s focus on safety is sustained over time, and they provide facility operators with an opportunity to identify and mitigate hazardous operations and practices. Refineries should be required to use an independent evaluator in conducting safety culture assessments at least every three years. Findings should be submitted to agencies by both management and labor, separately or together.

Figure 1: Application of a Hierarchy of Controls to Process Safety

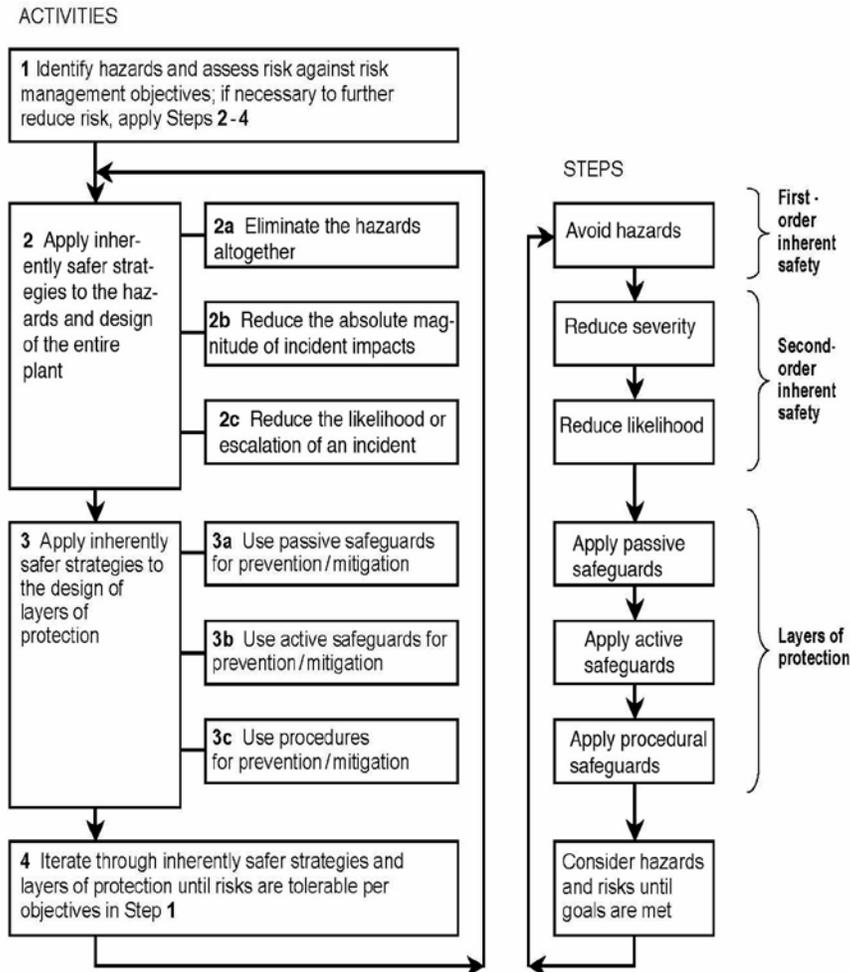


Figure 1 Source: *Inherently Safer Chemical Processes A Life Cycle Approach*, American Institute of Chemical Engineers, Center for Chemical Process Safety, 2009

- Require Refineries to Account for Human Factors

Human limitations and needs must be considered in managing and reducing risks. The outcome of a certain activity or task can be strongly affected by the design of

operational procedures, staffing, the training of workers, existing safeguards, as so forth. Two approaches can help integrate human factors into industrial safety systems: (1) Management of Change (MOC) procedures should include organizational, procedural, and staffing changes made in the facility, and (2) human factors analyses should include training, experience levels, and other issues—such as fatigue—among operators. Federal and state regulations require human factors to be considered during Process Hazard Analysis.

- Require Refineries to Conduct Damage Mechanism Hazard Reviews

Damage Mechanism Hazard Reviews analyze risks presented by all potential process failure mechanisms, including corrosion, stress cracking, damage from high temperatures, and mechanical or metallurgical-assisted degradation. These Reviews should be included as part of the Mechanical Integrity element of a Process Hazard Analysis. The results of the reviews, as well as other Mechanical Integrity reviews, should be provided to agencies and workers.

- Require Root Cause Analyses After Significant Incidents

When incidents occur, a Root Cause Analysis can often reveal the underlying causes that led up to the incident. This information is essential to improve learning in a facility and prevent similar incidents in the future. Incident investigation procedures under current state and federal law require facilities to document findings and recommendations, and identify contributing causes. A thorough Root Cause Analysis, however, is recognized by industry safety experts as necessary to address underlying problems and prevent recurrences.

California is moving forward in implementing the Report's recommendations.

The role of inherently safer design, as a preferred solution in the Hierarchy of Controls, appears throughout the Report. This orientation is informed by the industry's own Center for Chemical Process Safety, within the American Institute of Chemical Engineers.⁽⁴⁾

Like any industrial safety process, of course, inherently safer design is not a perfect science. If improperly applied, it can shift risks along a production or process chain. It can sometimes be difficult and expensive to implement in older facilities, such as California's refineries.

⁴ Amyotte, PR, et al. Incorporation of Inherent Safety Principles in Process Safety Management. *Proceedings of the 21st Annual International Conference of the Center for Chemical Process Safety* (p. 178). See page 29 in Brown, *op cit* at 1.

Despite these challenges, inherently safer design is increasingly recognized by industry leaders as the most effective and enduring defense against potential accidents, natural disasters, or acts of sabotage. Many industry leaders have adopted this approach, perhaps most notably, for example, in their efforts to replace pressurized tanks of highly toxic and mobile chlorine gas with sodium hypochlorite, otherwise known as bleach. This is an example of inherently safer design through chemical substitution.

The Report concludes that "improving refinery safety is a goal strongly shared by government, industry, workers, and communities," and that "refinery safety in California can and must be improved." It calls on government agencies and industry to "work together to develop and implement a culture that fosters inherent safety, including stronger accident prevention and hazard reduction measures."⁽⁵⁾

In order to facilitate implementation of the Report's findings, the Working Group called for the formation of an Interagency Refinery Task Force. The Task Force is now coordinating the state's agencies and departments in moving forward with both regulatory and non-regulatory approaches.

We are heartened to see action on the matter of industrial safety and security at the Federal level, and we applaud the attention the Obama Administration has given to inherently safer design as a well-recognized and effective path forward. We strongly encourage Federal OSHA, the U.S. EPA, and the Department of Homeland Security to continue their collaboration and—wherever possible—to incorporate strategies that will prevent or minimize industrial hazards through the adoption of inherently safer design strategies, which we see as the primary objective in the Hierarchy of Controls.

The State of California offers our support to your efforts in moving this important initiative forward.

Thank you very much for your attention this morning. I would be happy to answer any questions.

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⁵ Brown, *op cit.* p. 34.