U.S. CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

BP AMERICAN REFINERY EXPLOSION

PUBLIC MEETING

Wings of Heritage Room
2010 5th Avenue North
Texas City, Texas

Tuesday,
March 20, 2007

The above-entitled meeting came to order,

pursuant to notice, at 6:00 p.m.

BOARD MEMBERS:

CAROLYN W. MERRITT, Chairman
JOHN S. BRESLAND
GARY L. VISSCHER
WILLIAM B. WARK
WILLIAM E. WRIGHT

STAFF PRESENT:

CHRISTOPHER WARNER, General Counsel

I N D E X

P R O C E E D I N G S

MS. MERRITT: Good evening, and welcome to this public meeting of the United States Chemical Safety Board, the CSB. I'm Carolyn Merritt; I'm chairman and chief executive officer of the board. With me this evening are board members Gary Visscher, John Bresland, William Wright at the end and William Work, and next to me, on my left, is general counsel, Chris Warner, and members of the CSB staff.

Before we begin, let me draw your attention to the emergency exits from this room, should that be necessary. The doors in the back are exits to the outside, as well as doors marked exit on each side. As a courtesy to the audience and to the presenters, I would ask that you turn off or mute your telephones; if you would please do that now. Everyone -- somebody always forgets, so if you would check and do that now, I would appreciate it.

I'd like to thank Mayor Doyle for the use of this outstanding facility, and would like to acknowledge the many distinguished guests in the audience here tonight, and we appreciate your presence here.

For the past five years, it has been my privilege and honor to serve as a leader of the

Chemical Safety Board. I can tell you that there is no more dedicated group of public servants than the people of this small agency and they have put absolutely everything they have to give into this investigation that we will discuss here tonight. Tonight the CSB presents its final report on the worst industrial accident in this country since 1990, the explosion at the BP Texas City refinery just a short distance from this auditorium. Fifteen workers died and 180 others were injured and Texas City found itself the site of grief and mourning. Many of you here tonight had family members or co-workers who were victims of this explosion, which occurred two years ago this Friday. To all of you I express my deepest condolences and sincere wishes that society never allows another accident like this to occur.

I believe that BP will be forever changed by what happened here on March 23, 2005. BP has committed itself to sweeping changes and investments throughout the U.S. and overseas. I commend BP for these actions and I urge BP to establish itself as an international leader on process safety issues. It is an essential part of being a green and socially responsible corporation. I urge other oil and chemical companies to respond right now to what BP has

endured over the last two years. Companies and boards of directors need to pay the closest attention to maintaining and monitoring safe process systems. There needs to be a chain of accountability from the board of directors right to the shop floor. Companies should use appropriate leading indicators to identify emerging catastrophic threats before lives are lost and families are shattered.

The CSB involvement here in Texas City community dates from March 2004 -- I'm sorry March 24, 2005, when our investigative team began the long process of understanding the root causes of what happened to cause so much suffering and destruction. Under the leadership of investigations manager Bill Hoyle and supervisory investigator Don Holmstrom, the team conducted our longest field investigation ever, lasting well into the summer of this year.

During that period, we discovered a number of things that gravely concerned us. First, we found that key alarms and instruments that should have warned BP operators of dangerous conditions during unit start-up were unreliable and failed to work. Second, we found, along with the rest of the community, that this facility continued to have serious safety problems. On July 28 and August 10 of

that year, other serious process accidents occurred at the refinery. In fact, I understand that this very building where we meet tonight was used as a shelter by some community members from the smoke that billowed from the plant.

On August 17, 2005, the CSB issued the first urgent safety recommendation in its eight year history, calling on BP to establish an independent safety panel to examine the company's culture and safety management at its five U.S. refineries. BP immediately accepted this recommendation, promised its cooperation and put great thought and substantial resources into making this panel a reality and a success. Eleven distinguished panelists were appointed, including former Secretary of State James Baker as chairman.

The panel's final report, issued on January 16 of this year, made stark conclusions about BP's culture and governance. It found what it termed material deficiency in the safety of all five of BP's U.S. refineries. This report is a landmark effort, which will, I believe, shape the actions of corporate boards and executives in positive ways for years to come.

One week ago, the Chemical Safety Board voted to

designate its urgent safety recommendations as closed acceptable actions. We look forward to BP's implementation of the ten major corporate recommendations of the panel. They'll make BP a stronger and safer company. I should emphasize that the Baker panel report and our report, although they reached some similar conclusions, have very different methods and objectives. The Baker panel report presented a detailed picture of BP's culture across all of its North American refining operations. Our investigation is a deep analysis of the root causes of the March 23 accident in Texas City. Our recommendations, as provided by statute, are broadly directed at a national level. The purpose of our report is not to affix blame or apportion responsibility for this tragedy. It's rather to inform all of industry about how to avoid similar disasters and to produce new safety recommendations that will make such accidents less likely in the future.

Because of the importance of this case, the Chemical Safety Board issued a number of early recommendations before the report was even completed. In October of 2005, we called upon the American Petroleum Institute to develop a new recommended

practice to insure that occupied trailers are not placed in hazardous areas of petrochemical facilities. In October 2006, we recommended API and the Occupational Safety and Health Administration (OSHA), to take steps to eliminate unsafe atmospheric relief systems from refineries and chemical plants. Although these recommendations are now in progress and will not be the focus of tonight's meeting, they are important to safety and I urge all stakeholders to pay close attention to the progress of these initiatives.

I'd now like to introduce the members of the investigative team, who will present the new findings, root causes, and recommendations contained in the final report.

Following the investigators' presentation, there will be a period for the board to ask questions of the investigators. We'll take a short break at that time, and then we will take comments, but not questions, from the public and proceed to consider the report for approval. If you have not yet signed up, and you would like to offer a spoken comment of two minutes or less, please register at the sign-in table sometime in the next 90 minutes.

I'll now recognize supervisory investigator, Mr. Don Holmstrom, who led the team. Mr. Holmstrom has a

natural science degree from Stanford University and a law degree from the University of Colorado. In addition, he spent a number of years in the oil refining industry as a chief operator. He has led many important projects for the CSB since 1998, including our investigation of the Tosco refinery fire in Northern California. Accompanying Mr. Holmstrom is Mr. Mark Kaszniak, who is a graduate of the University of Illinois in chemical engineering and a certified fire and explosion investigator. Beside him is Mrs. Cheryl MacKenzie, a specialist in the analysis of human factors, a masters graduate of Cornell University. At that point, I would -- and then, of course, Bill Hoyle, who is the leader of all of them. At this point, I would ask Mr. Holmstrom to please take the floor and proceed.

MR. HOLMSTROM: Thank you, Madam chairman. I want to thank you, the board, and CSB managers for the tremendous support and leadership you have provided in this extensive two-year investigation. I especially want to thank the members of the CSB investigation team for their hard work and dedication to this project.

The CSB approached the investigation of the BP Texas City incident in a manner to that used by the

Columbia accident investigation board in its probe of the loss of the space shuttle. Using this model, the CSB examined both the technical and organizational causes of the incident. We determined, as did the Baker panel, that a positive safety culture is important for good process safety performance and is an important analysis tool. In this regard, our approach is much broader than past CSB investigations. As you will see in our presentation, we took this approach because of the compelling findings of both organizational and technical deficiencies.

On March 23, 2005, the BP Texas City refinery experienced a severe explosion and fire. This was caused by the release of flammable hydrocarbons and resulted in 15 deaths, 180 injuries, many of them serious, and significant economic losses. The accident was the worst U.S. industrial accident since 1990.

In brief, here is what happened. The accident occurred during the start-up of a tower called the raffinate splitter that processes large quantities of flammable hydrocarbons. This tower is in the Isomerization, or ISOM, Unit, that increases the octane of blended gasoline. Starting up such a unit is one of the most potentially dangerous events in an

oil refinery.

During start-up, this tower and associated piping were overfilled and overpressured. This resulted in flammable liquid venting from the tower to a piece of equipment called a blowdown drum with a tall stack that is open to the atmosphere. The blowdown drum and stack are shown here in the photo. This blowdown drum completely filled with flammable liquid.

A geyser-like release erupted out of the top of the stack. A large flammable vapor cloud developed at ground level, drifting toward and underneath the unprotected trailers which housed contract workers. The trailers had been placed close to the blowdown drum. The vapor cloud exploded and killed 15 workers in and around these trailers.

The CSB investigation into the causes of the BP refinery accident is the largest and most far-reaching investigation in the agency's history. The CSB team has examined the immediate causes, safety system deficiencies, corporate oversight and, for the first time, the role of safety culture in causing a major chemical accident.

We looked at the safety management systems of both Amoco, which formerly owned the refinery and BP.

The two companies merged in 1999. The team has conducted 370 interviews; reviewed over 30,000 documents; conducted equipment, instrumentation, and chemical testing; and worked with a variety of technical experts in refinery process modeling, relief system design, blast modeling, instrumentation, safety culture, and human factors.

In this presentation, we will show an animation of the immediate sequence of events that led to the accident, including an analysis of the vapor cloud explosion and how it became so large and catastrophic.

We will explain how and why the refinery distillation tower was overfilled, why that led to the release of flammable liquid to the atmosphere, and why there were occupied trailers sited so close to the hazardous process area.

All three of these events were necessary for the vapor cloud explosion to lead to the 15 fatalities. We will explain that all three events involved procedures that were not followed and mistakes that were made. But this does not explain why these events occurred.

In the word of safety expert, Sidney Decker, human error becomes the starting point, not a conclusion. The investigation examined the human

factors, the underlying work environment that influenced human behavior, and the safety system deficiencies, such as previous blowdown drum releases that went unreported or uncorrected.

The CSB investigation examined how it was possible that there was a history of fatality incidents and how they continued and to what degree the corporation intervened to correct the problems. We examined the safety culture and issues of corporate governance that contributed to the accident. We also examined the role of OSHA enforcement and the adequacy of its safety regulations that cover high hazard facilities.

Finally, we will present proposed recommendations to prevent similar tragedies from occurring in the future.

We will now show a video that details the immediate sequence of events that led to the release of flammable liquid and the ISOM explosion.

(Video playing)

NARRATOR: At about 2:00 a.m. on March 23, 2005, Isomerization Unit operators began introducing highly flammable liquid hydrocarbons into the raffinate splitter tower. In normal operations, only about 6-1/2 feet of liquid should be present in the bottom of

the tower. Near the base of the tower, there was a level indicator that measured how much liquid was inside and transmitted this information to the control room; however, this indicator was not designed to measure any liquid above the ten foot mark, and above that point, operators would have no idea how high or how dangerous the level was.

A high level alarm activated and sounded in the control room when the tower overfilled, but a second redundant alarm failed to activate. By 3:30 a.m., the feed was stopped and the level indicator showed that the liquid had filled the bottom ten feet of the tower. We now know that this indicator was not providing accurate readings. We calculate that the tower was actually filled above the range of the indicator to a height of about 13 feet.

At about 9:50 a.m., operators began circulating the liquid feed and adding more liquid to the already full tower. Even though the liquid was going into the tower, there was no flow out, as specified in the start-up procedures. The valve that controlled the liquid flow out of the tower was left closed. Ten minutes later, at about 10:00 a.m., operators lit burners on the furnace to begin heating up the feed, part of the normal process. Unknown to operators, the

tower continued to fill rapidly with liquid to more than 20 times the normal level. We now calculate that the level reached 138 feet inside the tower, while the inaccurate level indicator told operators that the liquid was below ten feet and falling.

Around 12:40 p.m., a high pressure alarm was activated. Two burners were turned off in the furnace to lower the temperature. The valve specified in the procedures for controlling pressure didn't work, so an operator used a manual chain valve to vent gases to the blowdown drum and into the atmosphere.

At about 1:00 p.m., operators opened the valve to send liquid from the bottom of the tower to storage tanks. This should have improved conditions inside the flooded tower, but the liquid at the bottom of the tower was very hot and, as it exited through the heat exchanger, it suddenly raised the temperature of the feed going into the tower by over 150 degrees. By 1:05 p.m., the liquid entering the tower was beginning to boil and expand, causing the level inside the tower to increase further. At 1:10 p.m., the tower began overflowing liquid into the piping off the top of the tower. Liquid built up in this vertical piping and exerted great pressure on the emergency relief valve 150 feet below. At 1:14 p.m., the three emergency

valves opened, and liquid began flooding the blowdown drum at the other end of the Isomerization Unit. Some liquid overflowed from the blowdown drum into a process sewer, but the high level alarm on the blowdown drum didn't go off. The drum filled completely and bystanders saw a geyser-like eruption from the top of the blowdown stack. The eruption lasted about one minute. Liquid fell to the ground, creating a large flammable vapor cloud. This model predicts how far the vapor cloud expanded across the area, just one minute after the release began from the stack.

At 1:20 p.m., the cloud ignited, causing a series of explosions. The CSB believes the vapor cloud was most likely ignited by a diesel pick-up truck parked about 25 feet from the blowdown drum.

The next computer simulation shows how the blast pressure wave is predicted to have moved after the cloud was ignited. The blast pressure wave is accelerating as it moves through the ISOM Unit, causing heavy destruction and igniting more fires. This is the area where two trailers were destroyed, fatally injuring 15 contract workers.

This videotape, shot by Houston station KHOU, shows the ISOM Unit as fires continue to burn after

the explosion. You can see the blowdown stack still emitting flames as hydrocarbons are released. Several vehicles were set on fire and burned in the aftermath. Over 50 large chemical storage tanks were damaged. Firefighters struggled to rescue the injured and locate the missing.

The Chemical Safety Board's investigation to determine the root causes of the tragedy began the following day.

(End of video)

MR. HOLMSTROM: I will now introduce Mr. Mark Kaszniak, who will present the explosion analysis.

MR. KASZNIAK: Thank you, Mr. Holmstrom. As you just saw in the animation, a flammable hydrocarbon liquid was released off the top of the blowdown drum stack. We used a computer program to help us understand this event and to calculate the total amount of liquid released out the stack.

First, the team calculated that approximately 51,900 gallons of hydrocarbon liquid flowed through the safety relief valves of the raffinate splitter tower in just over six minutes. Next, the team calculated that it took 31,130 gallons of hydrocarbon liquid about 4.2 minutes to fill the downstream piping and the blowdown drum and stack. Then, as the

gooseneck drain from the blowdown drum was open at the time of the incident, the team calculated that 12,200 gallons flowed into the process sewer, as the blowdown drum stack filled up.

Finally, the team was able to calculate that approximately 7600 gallons of flammable hydrocarbon liquid was released at the top of the blowdown drum stack in about 1.8 minutes before the safety relief valves closed. This is nearly a full load for a gasoline tanker truck that you have undoubtedly seen traveling down the highway.

In order to understand how the vapor cloud grew so large prior to the explosion, the CSB investigation team used another computer dispersion model, configured for liquid release. As the hydrocarbon liquid ejected from the blowdown stack was below its normal boiling point, only about half of this liquid vaporizes as it dispersed in the wind and fell to the ground. About one-third of the falling liquid splashed onto elevated ISOM Unit process equipment that surrounded the blowdown drum, producing multiple smaller drops and sprays which then vaporized.

The falling liquid that reached the ground formed an ever-widening pool at the base of the blowdown drum, which then began to vaporize due to the

heat of the ground.

The CSB has now concluded that the ignition source was a diesel truck as shown in the photo at the right. It was parked and idling about 25 feet from the blowdown drum. The CSB previously reported that eyewitnesses saw and heard the engine over-revving and backfiring sparks that ignited the flammable vapor cloud. The diesel truck is the only identified ignition source that is consistent with the observed structural damage which has been verified by the computer blast model that we have run.

This slide shows a blast over-pressure map of the ISOM Unit and the areas immediately surrounding it. Notice the parallel lines running vertically near the center of the slide. These represent the ground level pipework that ran between the ISOM Unit and the trailer area. Locations of portable trailers are shown by red rectangles in this drawing. The numbers near the circle indicate explosion overpressured in pounds per square inch. The three smaller diameter circles with numbers inside them, near the center of the slide, are called intense pressure regions. They occurred when the flame front accelerated when it reached congested or confined areas as it burned through the flammable vapor cloud. When a flame front

accelerates, the overpressure increases, which also increases the potential for destructive damage.

To give you a sense of the destructive potential of explosion overpressure, a 2.5 overpressure is capable of cracking a concrete or cinder block wall and can totally destroy a wall constructed of wood.

An intense pressure region occurred between the pipe rack and the trailer area. Here the vapor cloud was confined by the pipe rack and the trailers. Portions of the vapor cloud also spread underneath the trailers, which were supported on concrete blocks or by stands. The overpressure created by the accelerating flame front in this area was sufficient to destroy the trailers. This is the area where 15 fatalities occurred and a number of workers were seriously injured.

We focused our analysis on the trailers because all the fatalities and a number of serious injuries occurred inside or nearby them. Over 40 trailers were damaged in the vapor cloud explosion. Some examples are shown in the photos on the right, and 13 trailers were totally destroyed. Occupants were injured inside trailers as far as 479 feet from the blowdown drum. We noted damage in trailers almost 1,000 feet from the blowdown drum and, although the explosion overpressure

that far away was not high, generally less than one-half a pound per square inch, trailers were still damaged due to their weak construction.

I will now turn the presentation over to Ms. MacKenzie to discuss the human factors portion of the investigation.

MS. MACKENZIE: Thank you, Mr. Kaszniak. Human factors played an important role in the March 23 incident. Human factors are the environmental, organizational and job-related factors that influence behavior at work and can impact safety performance.

I'm now going to discuss human factors and safety system deficiencies in the ISOM incident that led to the troubled start-up and the overfilling of the raffinate splitter tower.

As was stated in the introduction of this presentation, errors and procedural deviations occurred in the start-up that led to the overfilling of the tower for three hours; however, it is important to recognize that individuals do not plan to make mistakes. They are doing what makes sense to them at the time, given the work environment, the organization's goals and other job-related factors. Errors are actually symptoms of underlying problems in the workplace. For this reason, the investigation

went beyond individual errors and examined the underlying human factors issues to gain a deeper understanding of why the incident occurred.

Renowned process safety expert, Trevor Kletz puts it plainly: "To say accidents are due to human failings is like saying falls are due to gravity. Though it may be true, it does not help us prevent them."

With this in mind, one must ask, why did those individuals take the actions that they did. Understanding and correcting the factors in the work environment that are conducive to human error will help prevent not just the same incident from recurring but will have a much greater impact in the industry overall.

The investigation team found numerous underlying conditions and safety system deficiencies that influenced operators' decision making and actions leading up to the March 23rd incident.

Specifically, the CSB found that there were procedural deviations, ineffective communication between shifts, operator fatigue, inadequate power instrumentation, insufficient staffing and supervision, ineffective training, and poor design of the control board display.

Contrary to the start-up procedures, the valve that lets liquid hydrocarbon out of the tower was left closed and in manual mode. In our investigation we asked, why did the board operator make these decisions. The answer began to unfold as we looked at data from 19 raffinate splitter tower start-ups. We found that the actions taken by the board operator on the day of the incident were actually common in past start-ups. This led us to another question. Why was there a long history of procedural deviations during start-up? In examining the 19 raffinate splitter tower start-ups, we found that in 15 of the 19 start-ups, the tower level was filled above the range of the level transmitter. When this occurred, operators have no means to determine how much liquid is in the tower. This makes overfilling the tower much more likely, and in 18 of the 19 start-ups, the tower demonstrated experienced dramatic swings in liquid levels, which made controlling the tower start-up much more difficult. Operators knew that the swings in levels could result in a loss of flow at the bottom of the tower. This loss of flow could damage the furnace tubes and potentially result in an emergency shut-down of the unit. Operators ran the tower level higher than called for in the procedures because doing so

reduced the likelihood of a loss of flow out the bottom of the tower.

Despite these recurring procedural deviations and abnormal tower levels, none of the start-ups were investigated to correct the underlying problems.

BP management did not update the start-up procedures or correct the operational problems that led to the dramatic swings in level during start-ups. Other major accident investigations have revealed that workers often adjust practices to suit actual operating conditions that are not addressed in formal procedures.

The American Petroleum Institute Safety Guidance on Human Factors states that when operators are not -- excuse me -- when operating procedures are not updated or correct, "workers will create their own unofficial procedures that may not adequately address safety issues."

The procedural deviations from the last 19 start-ups were not typically subjected to any management of change review, which was contrary to BP's own policy. Procedural workarounds were accepted as normal. The ISOM start-up procedures provided inadequate instructions by not describing the serious safety implications of failing to control tower

levels. Nor did the instructions inform operators how to calculate how much liquid was in the tower, based on flows in and out. Such a calculation would have been a useful check against a potentially faulty tower level indicator.

Communication between operations personnel was ineffective, leading to several critical miscommunications. Prior to the start-up, the control board operator thought he had been instructed to close the level control valve and not send any heavy raffinate liquid from the bottom of the tower to storage. Other operators believed they were instructed not to send any light raffinate liquid to storage tanks. Consequently, the board operator closed the level control valve and no liquid was sent to storage. The board operator received his instructions over the phone. The instructions were never contained in the log book or in the start-up procedure prior to the start-up.

Additionally, the condition of the equipment was not communicated between operators, because there was no face-to-face discussions between the night operator who filled the tower and the day board operator.

BP had no policy for effective communication between operations personnel or requirements for shift

turnover. This explains the board operator's initial decision to close the valve. The investigation team further examined why this valve remained closed for three hours. One important reason was that malfunctioning tower instruments influenced operators' decision making during the three-hour start-up.

The level transmitter was mis-calibrated and provided false readings to operators that the tower level was less than nine feet and declining during start-up. The level was actually increasing dramatically, reaching 158 feet at 1:00 p.m., about 20 minutes prior to the explosion.

The tower had a sight glass on the outside, but it was dirty and unreadable. It could not be used as a visual check of the accuracy of the level transmitter.

While one tower high-level alarm associated with the level transmitter went off during the prior shift and remained in alarm state throughout start-up, a separate redundant high-level alarm failed to sound. No other level indicator, such as a bottom pressure indicator, that could signal a level increase in the tower, was available to the operators.

The investigation team found that the tower level transmitter was giving faulty readings because

the instrument was mis-calibrated. The type of level transmitter used on the tower was very sensitive to the specific gravity of the liquid hydrocarbon being processed. As the temperature of the liquid increases, its specific gravity decreases; therefore, it's important to calibrate the type of level transmitter at the liquid's normal operating temperature. We found that the specific gravity setting for the transmitter was incorrectly set at 0.8, as you can see here in the photo. The actual specific gravity of the liquid in the bottom of the tower at normal operating temperatures is very different, 0.55 as shown in green.

The incorrect setting was likely due to using instrumentation data sheets that hadn't been updated since 1975, 30 years prior to the incident. At that time, in 1975, the tower was part of a completely different refinery process with a different specific gravity.

Even though the level indicators were faulty, it is still curious that the tower was left filling for three hours with no liquid being removed. Why didn't the board operator or crew realize that something was wrong? One reason is that operators were likely fatigued. The ISOM operators were working seven days

a week -- 12-hour shifts, seven days a week for 29 or more consecutive days. Fatigue can increase errors, delay responses, and cloud decision making. Fatigue causes cognitive fixation and can impair judgment. Fatigue could lead operators to fixate on one operational parameter, such as the declining level, while inhibit their ability to troubleshoot or connect data points to see the overall picture. For example, the board operator and others misdiagnosed the rise in pressure at 1:14 p.m. and did not believe it was related to the tower being overfilled.

We noted in our investigation that BP has no fatigue prevention policy. In fact, there are no widely used or accepted fatigue prevention guidelines or restrictions on hours and days of work throughout the refining industry, even though fatigue is recognized as a serious safety issue in other hazardous sectors like transportation, health care and the nuclear industry.

In addition to fatigue, supervisor and operator staffing was insufficient. As we have stated, unit start-up is especially hazardous. The Center for Chemical Process Safety reports that process safety incidents are five times more likely during start-up than normal operations. BP recognized this fact and

had policies recommending additional assistance from supervisors or technically trained personnel during start-up; however, the one supervisor who had ISOM experience left the refinery that morning for a family emergency, and there was no replacement assigned as required by BP policy.

BP Texas City's 1999 business strategy calls for a 25 percent reduction in fixed costs, including reduced staffing. In that year, there was a consolidation made in the ISOM area control room that reduced two board operators to one. Then, in 2003, a third process unit was added to the responsibility of the one remaining ISOM board operator.

A 2003 hazard review recommended that during all start-ups in the ISOM area, a second board operator should be present, but this recommendation was never fully implemented.

We found that BP's operator training was also ineffective, especially for abnormal conditions such as start-up and process upsets. Prior to the incident, numerous audits and reports identified deficiencies in operator competency and training. In spite of this, Texas City managers reported to the chief executive of refining and marketing in 2004 that they had adopted a compliant strategy of relying more

on operations personnel and less on engineering controls to prevent incidents, which would increase risk but would be less costly.

Additionally, operator training was not effective because it relied almost exclusively on computer training modules and testing, without an effective mechanism to gauge operator performance and ability.

BP's centralized training department, budget and personnel were reduced significantly from 1999 to 2004. Several cost reduction actions were implemented in response to BP London's instruction in 1999 to cut costs 25 percent.

Simulators, which can provide operators with realistic training on how to handle abnormal situations and scenarios, were not made available for operations personnel, even though their use had been recommended by a 2003 Texas City refinery incident investigation. The head of the Texas City centralized training department stated that efforts to utilize simulators prior to the March incident had been turned down for cost reasons.

Another human factor that likely impacted the board operator was the design of the control board display, which provided insufficient data to the board

operator. It lacked adequate indications of how much liquid was in the tower.

This is an actual display screen from the ISOM unit control board in Texas City. Using this screen, the operator could have only determined how much liquid was leaving the unit, outlined here in the red square on the right, but there is no indication of how much liquid was entering the unit. This data was listed on another screen. Neither screen highlighted the importance of such information during start-up, although the display screen could have been configured to do so.

The flows of liquid into and out of a unit are critical and inter-related information used to assist the board operator in understanding how much liquid is in the unit, particularly the tower throughout the start-up process. This was found to be a significant human factors issue in another major accident investigation. The Milford-Haven incident at the Texaco plant in the UK experienced a hydrocarbon overfill of process equipment, leading to explosion and fire. Similar to the BP incident, at the Texaco facility, the control board screens did not provide an overview display of the process with all critical information, including how much liquid was entering

and leaving the unit in one single display. Government investigators of the accident made a recommendation to the UK refinery, which included BP, to insure that display systems be configured to provide an overview of the full condition of the process, including the critical information of how much liquid is entering and leaving the unit, but that was not done at Texas City.

I am now going to turn the presentation back over the Mark Kaszniak, who will discuss process safety deficiencies at the refinery.

MR. KASZNIAK: The ISOM unit was covered under the OSHA process safety management standard, which is the primary federal safety regulation to protect workplaces from catastrophic chemical hazards. This standard requires that refineries and chemical plants implement 14 specific management systems to identify and control process hazards.

We reviewed the implementation of the PSM standard at the BP Texas City refinery and found a number of deficiencies.

If the process safety management standard had been thoroughly implemented at the refinery, as required by the federal regulation, this accident likely would not have occurred. I will now discuss

the specific process safety elements where the team found deficiencies.

First, BP Texas City incident investigations were ineffective. The CSB investigation team found evidence to document eight serious ISOM blowdown incidents from 1994 to 2004. In six, the blowdown system released flammable hydrocarbons vapors that resulted in vapor clouds forming at ground level and the ignition of such vapor clouds could have resulted in an explosion or a fire. In two other cases, released flammable vapors did ignite, causing small fires. While the incidents were early warnings of serious hazards with the ISOM blowdown system, only three of the incidents were investigated by the refinery.

Furthermore, when the team looked to see if corrective action from these investigations had been implemented, we could not verify that all the action items had been resolved. For example, a corrective action item to verify the adequacy of the ISOM Unit blowdown drum after one incident in the early 1990s was never addressed; however, BP's problems with incident investigations were not isolated to the ISOM Unit. External audits conducted by BP at the refinery in 2003 and 2004 also uncovered problems. For

example, the 2003 audit found that "a coordinated self-monitoring and self-assurance process was not evidenced throughout the line organization." Because BP did not effectively track historical trends in blowdown incidents, the company was not in a position to recognize the dangers of the ISOM blowdown system.

Second, tower indication was poorly designed. None of the instruments showing the levels in the tower were working properly on March 23, 2005, as shown in the animation earlier and as further explained in the human factors discussion.

In 1994, we found there was a previous ISOM incident involving a different ISOM tower that was overfilled with liquid due to blockage in the bottom pump. In this case, the tower was also overfilled with liquid, but large amounts of vapor were released from the safety release valve into the blowdown stack. Like the 2005 explosion, a malfunctioning level transmitter misled operators about the liquid level in the tower. In fact, faulty level measurement and control has been determined to be the primary causes of high level events in distillation towers, based on public case history by Henry Kister of 900 tower malfunctions over a 20-year period in the petroleum and petrochemical processing industry. BP relied on

operators taking correct and timely actions and following procedures to prevent excessive liquid levels. While procedures are essential to any process safety program, they are the least reliable safeguards to prevent process accidents.

Failures with potentially severe consequences, such as overfilling a distillation tower with flammable liquids, should require multiple redundant active safeguards such as safety shutdown systems or interlocks, based on Instrument Society of America guidelines. These automatic systems could stop the feed or shut down the tower in case of a high liquid level.

Third, the pressure relief piping and disposal systems for the raffinate splitter tower were inadequately designed. While examining the design basis of this equipment, the investigation team found that both the blowdown drum and the relief valve disposal piping were undersized. All credible release scenarios were not identified and the release flow rates were not calculated.

Amoco and BP did not follow several internal safety and engineering standards for the placement and safe design of blowdown drums. These standards stipulated that the blowdown drum should have been

moved away from the ISOM Unit process equipment and that the drum should also have been vented to a flare or a vapor recovery system, not directly to the atmosphere. The safety relief valve header valve and header study for the raffinate splitter and blowdown drum had not been completed as of March 23, 2005. It was 13 years overdue. This study should have been completed before the first unit process hazard analysis was completed in 1993, but budget cuts kept delaying the completion of the study and it still hadn't been completed when the March 2005 explosion occurred. A thorough relief valve study would have likely revealed that the blowdown drum and relief valve piping was undersized and that they should not have vented directly to the atmosphere.

Over the 15 years prior to the March 25 explosion, several previous attempts to remove blowdown drums in the refinery were canceled as a result of cost consideration and production pressures. For example, a 2002 -- in 2002, an option to convert the ISOM unit blowdown drum into a flare knockout drum and reroute the discharge to a flare, as part of an environmental initiative, was not done because it was believed that there was not sufficient time to complete the relief valve and header study before the

2003 turnaround where this change would be made.

Later, as the project costs of this environmental initiative soared, this project was canceled in the ISOM Unit totally.

Fourth, the siting of trailers was unsafe. Office and equipment trailers shown by the red rectangles in the drawing on the right were sited in the unoccupied area adjacent to the ISOM Unit just north of the catalyst warehouse, primarily for reasons of convenience. The area was selected because trailers were being used by contractors to perform maintenance turnaround work in the Ultra cracker unit, which is located just across Avenue F as shown in the drawing. This area had been used as a location to site turnaround trailers for years. In fact, support utilities specifically for use by trailers had been installed in this area in 2002.

The refinery's management of change procedures were also not followed. These procedures required that a hazard analysis be conducted for siting trailers closer than 350 feet from a process unit. The first trailer placed in this area in preparation for the Ultra cracker turnaround, the large double-wide trailer shown in the diagram, was sited within 121 feet of the ISOM Unit blowdown drum because the

hazard analysis procedures were not properly applied. No management of change procedures or hazard analysis were conducted for the remaining trailers, which were placed in this area after the double-wide trailer was sited.

Upon further investigation, the CSB investigation team also determined that the methodology used by the refinery was also flawed, as it was actually less protected than the industry consensus standard upon which it was based.

Moreover, the CSB has now determined that the siting method used by BP at the refinery and the industry consensus standard, the American Petroleum Institute, the API, recommended practice 752 were not adequate to protect personnel in trailers.

The actual damage to trailers in the March 23, 2005 explosion was worse than predicted by either siting method. This is illustrated by the graph shown on this slide for single wood-frame trailers, the most common type of trailers damaged during the explosion.

This graph plots vulnerability, which is the percentage this trailer occupants killed or seriously injured inside a trailer against increasing explosion overpressure in pounds per square inch. When compared against the vulnerability data from the actual

explosion damage, as shown in the graph, both the BP and API siting methods underpredict death and injuries for all explosion pressures.

In light of these findings, and because API -- because the API 752 method is used for siting in many industries, the CSB issued an urgent recommendation to API regarding trailer sitings, that was discussed earlier by chairman Merritt. In December of 2005, BP announced a new trailer siting policy that provides exclusion zones around refinery process units, where trailers are now not permitted.

Fifth, the maintenance program at the ISOM Unit in the refinery was found to be deficient. The goal of a refinery -- of a maintenance program is to insure that all instrumentation equipment and systems function as intended to prevent release of dangerous material, to insure equipment operates reliably; however, when the raffinate splitter section of the ISOM Unit was being started up on March 23, 2005, six instruments were not working.

As the CSB determined that four of the malfunctioning instruments were causally related to the explosion, the team examined the maintenance program and identified a number of problems. The level indicator on the raffinate splitter tower was

not included in the list of critical pieces of equipment in the ISOM Unit, even though the 1993 process hazard analysis identified level instrumentation as one of the primary safeguards against tower overfilling. The instrument data sheets for the tower level transmitter was out of date. It contained the wrong specific gravity for the hydrocarbon mixture being processed in the raffinate splitter.

Formal testing and maintenance procedures were not established for all critical pieces of equipment. For example, the instrument data sheet for the high level alarm on the blowdown drum did not contain a method for testing it. As you may recall, this is the high level indicator that failed when the blowdown drum filled up. Maintenance personnel typically tested it by manually moving its float. This test method can produce -- potentially damage the float and is not recommended by the equipment manufacturer.

Also the refinery had created, but never fully implemented, a computerized maintenance management system. As a result, the work order process did not require verification that scheduled maintenance work had actually been completed. Consequently, work orders could be closed, even if no work had been done.

The investigation team also identified problems in a number of other process safety areas that I will now briefly discuss, regarding process hazard analyses. A review of the process hazard analysis conducted in the ISOM Unit prior to the explosion revealed that serious fire and explosion risks were not identified, such as the consequences of high level and pressure in the raffinate splitter tower and high level in the blowdown drum. Also, previous incidents with catastrophic potential were not examined. For example, a hydrocarbon release that occurred in 1994 and another one that occurred in 1999 were not part of the hazard analysis.

The next area was management of change. The refinery made numerous changes to processes, equipment, procedures, buildings, and personnel that were not reviewed for the impact of health and safety. Examples include siting trailers and changing operating procedures in the ISOM Unit without conducting a management of change review.

The next area is with regard to audit. Many process safety problems were identified by BP's internal audit for the process safety management program conducted in 2001 and 2004, but most of these issues were not resolved. For example, the 2001 audit

found that 15 percent of process hazard analysis action items were past their original due dates and incident investigation action items were not being closed out in a timely manner.

The 2004 PSM audit found that the design calculations for many relief valves did not exist. The audit noted that this was a long-term problem that had existed nearly ten years at the refinery. In other areas with regard to prestart-up safety reviews, no prestart-up safety review was conducted in the ISOM Unit prior to the March 2005 start-up. If this review had been done per BP procedures, it would have required that non-essential personnel be removed from the ISOM and neighboring units.

Finally, is in the area of vehicle traffic control. The vehicle traffic control policy prepared for the Ultra cracker turnaround did not address the use of parking of vehicles adjacent to process units. Furthermore, the prohibitions against parking on either side of Avenue F, along the ISOM Unit, were not being enforced.

I will now turn the discussion back to lead investigator Holmstrom to discuss the safety culture of the BP explosion.

MR. HOLMSTROM: Thank you, Mr. Kaszniak. As the

science of major accident investigation has matured, analysis has gone beyond technical and system deficiencies to include an examination of organizational culture. Safety culture has been described as a combination of group values and behaviors that determine how safety is managed, or more succinctly, the way we do things around here. While safety management systems are important for prevention, effective organizational practices, such as encouraging the reporting of incidents and allocating adequate resources for safe operation, are required to make safety systems work effectively.

The March 2005 ISOM disaster was an organizational disaster. The BP Texas City tragedy is an accident with organizational causes embedded in the refinery's history and culture. Causes extended beyond the ISOM Unit to actions of people at all levels of the corporation.

Our investigation found multiple, often systematic, safety deficiencies. We found also a history of fatal incidents at the facility. Our safety culture examination, first we looked at BP's approach to safety; second mounting safety -- process safety problems at Texas City prior to the incident; and third, organizational deficiencies and corporate

governance issues that led to the ISOM incident.

In the 30 years prior to the ISOM incident, the Texas City site suffered 23 fatalities, not counting the 15 deaths on March 23rd. In 2004 alone, three major incidents caused three fatalities. There were four major mechanical integrity incidents at the refinery from 2004 to 2005, two of which occurred after the ISOM incident. This series of safety failures led the investigation team to examine the deeper organizational and cultural problems, both at the plant and the corporation.

Many of the safety problems that led to the March 23, 2005 incident were recurring problems that had been previously identified in audits, reports, and investigations. The graphics displayed here identifies a number of key events that described or influenced the safety culture at the Texas City site.

Our findings showed that BP group executives and Texas City managers became aware of serious process safety problems at the refinery, starting in 2002, continuing through 2005. These executives and managers were attempting to make improvements during this period, but they were largely focused on personal safety issues, such as slips, trips, and falls, rather than placing additional emphasis on process safety

performance, which continued to deteriorate. This decline, combined with the legacy of safety and maintenance budget cuts from prior years, led to major problems in mechanical integrity, training, and safety leadership.

In 2000, three incidents at BP's Grangemouth Refinery in Scotland, included a large process unit fire and two serious upsets. The UK Health and Safety Executive, which is similar to OSHA in the United States, investigated the causes of the incident and released a major report in 2003. A BP investigation task force published lessons learned on the incident, as well. The Health and Safety Executive and BP task force stated that one key lesson for industry was that preventing major incidents requires a specific focus on process safety management over and above conventional safety management, and they recommended the company develop key performance indicators for major hazards, to provide an early warning system for safety deficiencies.

Process safety indicators, such as PSM action item closure or equipment inspection, completed by the target date, can provide a check of system functioning prior to an incident. The Health and Safety Executive's report found that BP's decentralized

management impaired their major accident prevention program, and was a barrier to learning from previous incidents. This report also recommended a wider message to industry, that corporate boards have a duty to manage health, safety, environmental risks to prevent major accidents.

BP's own task force determined that "cost targets" played a role in the incident, stating, "There was too much emphasis on short-term cost reductions, reinforced by key performance indicators and performance contracts, and not enough longer term investments for the future. Health and safety was unofficially sacrificed to cost reductions and cost pressures inhibited the staff from asking the right questions. Eventually, staff stopped asking." We found these lessons from Grangemouth were similar to causal issues in the ISOM incident, but needed changes had not been effectively implemented at the Texas City refinery.

In 2002, a new site director was appointed at Texas City and observed that the infrastructure and equipment were "in complete decline." In response, the director ordered a study that looked at the site's conditions and economic opportunities. The study, which was shared with BP executive managers, concluded

that mechanical integrity was one of the biggest problems at the refinery. The study stated that its findings were "urgent and far reaching with important implications for the site, including the integrity of ongoing site operations." The study also warned of "serious concerns about the potential for a major site incident" due to mechanical integrity problems. The study found other problems, such as a lack of operator competency and training and high levels of overtime.

The BP refining vice president of the group suggested a follow-up inquiry asking, "How has Texas City gotten into such a poor state?" A follow-up report was issued later in 2002 that found, "The current integrity and reliability issues at the Texas City refinery are clearly linked to the reduction in maintenance spending over the last decade." The report stated that from 1992 to 2000, capital spending was reduced 84 percent and maintenance spending was reduced 41 percent. Additionally, the refinery was to accept cost -- excuse me. Additionally, the report stated that "the prevailing culture at the Texas City refinery was to accept cost reductions without challenge and not to raise concerns when operational integrity was compromised."

The 2002 report was seen by executive managers, including the group chief executive for refining and marketing and the group vice president for refining.

Now let's move to the following year. In 2003, BP's Texas City managers conducted a refinery maintenance study, which concluded that maintenance and mechanical integrity problems persisted at Texas City. The assessments concluded that scores were "fairly low for all areas." The ISOM area scored low, and the report stated that "cost-cutting measures have intervened with the group's work to get things right; usually reliability improvements are cut."

Also in 2003, an external safety audit required by BP's group safety management system called Getting Health and Safety Right found inadequate training, a large number of overdue action items and a concern about "insufficient resources to achieve all commitments." The report also found that "the condition of the infrastructure and assets is poor."

Another year passes. In 2004, BP Texas City refinery process safety performance was declining. There were three major accidents and three fatalities at the refinery, two of which were process-safety related, including the $30 million fire pictured here in the Ultraformer number four process unit. In

August 2004, the Texas city process safety manager gave a presentation to plant leaders that showed year to date, Texas City accounted for 136 million, or over 90 percent of the total process safety losses across BP's 18 refineries world-wide.

The site also had serious problems with unresolved PSM action items. The target for closing these action items was 90 percent, but in 2004, the closure rate was only 79 percent. This was down from 95 percent in 2002. The PSM manager stated that the closure rate had fallen since 2003 because the PSM indicator was removed from the formula for calculating employees' bonuses.

In 2004, BP's internal audit group in London reviewed the company's own health and safety audit for 2003, and found a number of serious safety deficiencies common throughout the corporation. The BP auditors reviewed the 35 units that included Texas City. The audit report, released in March of 2004, found significant common problems, including widespread tolerance for non-compliance with basic health and safety rules, core implementation of health and safety management systems, and a lack of leadership competence and understanding to effectively manage all aspects of HSE. This report was seen by

the BP chief executive of refining and marketing.

In 2004, BP documents do show that maintenance spending increased, but we found that the increases were largely due to environmental compliance requirements and responding to major incidents and outages related to equipment failures, including the 2004 Ultraformer fire. The focus was still not on preventative maintenance before incidents occurred.

Despite recognized problems in the condition and maintenance of the Texas City refinery, BP group refining executives ordered a 25 percent reduction challenge for the 2005 budget. The Texas City business unit leader objected and was able to partially restore some of the maintenance funds; however, he stated that plant morale was negatively impacted, with employees believing that the leadership was not really serious about cultural change.

Warnings about the risks of a serious incident continued in 2005. The Refinery Safety Business Plan developed for site leadership before the ISOM incident listed the key -- the following key risks: mechanical integrity, operator competency, and, disturbingly, the possibility that "Texas City kills someone in the next 12 to 18 months."

In late 2004, the site performed a safety

culture assessment. The survey was initiated by the business unit leader to determine the "brutal facts" concerning the management systems and safety culture at the site. Researchers from safety culture consultants, the Telos Group, surveyed over a thousand employees and interviewed over a hundred. The interviewees included members of the leadership team and 69 supervisors. The assessment team included a report with a recommendation, called the Telos report in January 2005, which was "embraced" by the site leadership team, and a summary was presented to the group vice president for refining. The executive summary of the Telos report found serious safety culture deficiencies, including serious mechanical integrity hazards led to "an exceptional degree of fear of catastrophic incidents."

"Production and budget compliance gets rewarded before anything else" and "pressure for production, time pressure, and under staffing are the major causes of incidents. "Leadership commitment" is undermined by the lack of resources to address severe hazards."

The CSB investigation found that these organizational problems provide an underlying link to numerous safety system failures throughout the Texas City refinery.

We will now discuss our analysis of the organizational causes of the March 2005 incident. The Center for Chemical Process Safety's guidelines for investigating chemical process incidents notes that almost all serious accidents are typically foreshadowed by earlier warning signs, such as near misses in similar events. Safety authority James Reason explained that an effective safety culture avoids incidents by being informed. We found that BP Texas City lacked a recording and learning culture to keep personnel informed of emerging safety problems. Reporting bad news was not encouraged, and often, Texas City managers did not effectively investigate incidents or take appropriate corrective actions.

Although the BP safety policies required that organizational changes be managed to insure continued safe operations, these policies and procedures were generally not followed. Poorly managed corporate mergers, leadership and organizational changes, and budget cuts greatly increased the risk of catastrophic incidents.

BP executives and Texas City managers did not effectively evaluate the safety implications of major organizational, personnel, or policy changes. Some examples of changes that lacked a safety review and

the consequence: the merger of BP and Amoco led to a lack of focus on process safety; numerous reorganizations of the Texas City site reduced the stability and prominence of the process safety functions; policy changes such as budget cuts and the elimination of process safety matrix from bonus plans impaired process safety performance.

From 1998 to 2004, a series of leadership changes occurred at the Texas City site. The Baker report concluded that the Texas City refinery senior leadership turnover had been high, with nine different plant managers since 1997, five just from 2001 to 2003. The authors of the Telos report concluded that they had never seen such a history of leadership changes. This organizational instability made the establishment of effective process safety systems difficult.

BP's senior executives did not adequately control the risk of major incidents. BP executives primarily paid attention to, measured, and rewarded personal safety. Reliance on low personal injury rates at Texas City, as a safety indicator, failed to provide a true picture of process safety performance. BP executives and managers did not effectively implement the lessons of Grangemouth that addressed

this key issue.

In response to reports of safety problems, executives oversimplified the risks. For example, maintenance spending was increased to address integrity deficiencies in the plant infrastructure, such as tanks and docks, but did not provide sufficient funds to effectively correct the same issues in the process unit. As a result, in 2004 to 2005, there were four major mechanical integrity-related incidents in the refinery's process units.

BP board of directors did not effectively monitor and control major accident risks. Due to BP's decentralized structure of safety management, organizational safety and process safety management were largely delegated to the business unit level, with no effective oversight at the executive or board level to address major accident risk. The Baker report similarly reported that BP's board of directors had not insured, as a best practice, effective implementation of process safety.

The Financial Reporting Counsel, the UK's independent regulator for corporate reporting and governance, has adopted guidance for directors of corporate boards, commonly referred to as the Turnbull guidance. The Turnbull guidance recommends the United

Kingdom boards maintain a system of internal risk controls that include safety and risk management, and that boards review the control systems' effectiveness annually. As we discussed earlier, the UK Health and Safety Executive's Grangemouth report also addresses the importance of board safety oversight. The Health and Safety Executive also recommends that boards appoint one of their number to be the health and safety director to insure there is appropriate expertise on the board to carry out this important responsibility.

Additionally, as we have discussed, BP executives did not effectively respond to reports detailing critical PSM problems.

In conclusion, the investigation found that BP executives made spending cuts without assessing the safety impact of those decisions. The Center for Chemical Process Safety, CCPS, of which BP is a member, developed 12 essential process safety management elements in 1992.

The first element is accountability. CCPS highlights the "management dilemma" of "production versus process safety." The guidelines emphasize that to resolve this dilemma, process safety systems "must be adequately resourced and properly financed. This

can only occur through top management commitment to the process safety management system."

Audits and studies show that spending cuts and production pressures impaired process safety performance in areas such as mechanical integrity and training. The response to those identified deficiencies was neither timely nor sufficient.

So far, we have talked about deficiency of BP safety systems and safety cultures that led to the ISOM incident. Now, we're going to discuss the role of the Occupational Safety and Health Administration or OSHA. OSHA's mission is to assure the safety and health of America's workers, in part by setting and enforcing workplace standards. The purpose of OSHA's process safety management standards is to prevent catastrophic releases of hazardous chemicals from process plants. Given the history of major accidents and fatalities at the Texas City refinery, the investigation examined OSHA's PSM standards and its enforcement. In the 20 years prior to the ISOM incident, OSHA records show ten incidents at the site resulting in ten fatalities. Although three workers died in 2004, OSHA did not conduct any planned inspections that year. Prior to the March 23, 2005 incident, OSHA had conducted only one planned PSM

inspection of the Texas City facility in 1998. Planned OSHA inspections of work sites are scheduled, based on national, regional, or local plans, targeting programs, or special emphasis programs.

The 1998 planned inspection was related to a local emphasis program. All other Texas City inspections were unplanned, the result of an accident, complaint, or referral from another agency or an inspection of another company, such as a BP contractor. During the 20-year period OSHA issued citations resulting in proposed penalties of $270,000, of which $77,000 was paid in negotiated settlements.

In 1992, OSHA cited and fined Amoco on the hazardous design at a similar blowdown drum and stack at the Texas City refinery, alleging that nine relief valves did not discharge to a safe place, and exposed employees to flammable and toxic vapors. The abatement method, suggested by OSHA, was to reroute the discharges to a closed system with a flare.

In 1994, OSHA and Amoco reached a settlement agreement regarding the citation. As part of that settlement, OSHA agreed to withdraw the citation and Amoco stipulated that the blowdown drum met industry safety guidelines, citing API recommended practice 521, Guide for Pressure Reliving and Depressuring

Systems.

After the settlement, the refinery continued to use blowdown drums in stacks without flares and blowdown drum incidents continued to occur.

The PSM standards contain broad requirements to implement management systems, identify and control hazards, and prevent catastrophic releases of highly hazardous chemicals. After the deadly explosion of the Phillips Chemical Plant in Pasadena, Texas that killed 23 in 1989, OSHA issued a report that recognized the importance of a different type of inspection priority system, other than one based on industry injury rates.

The agency proposed that "OSHA will revise its current systems for setting agency priorities to identify and include the risk of catastrophic events in the petrochemical industry."

OSHA established an enforcement program for preventing these accidents that required planned, comprehensive compliance inspections in facilities with accident histories or other indications of a risk of a catastrophic incident; however, such a program has never been fully implemented.

OSHA's primary enforcement program for the PSM standards states that "the primary enforcement model

for the PSM standard shall be the PQV or program quality verification inspection." OSHA's PSM enforcement program states that "it is anticipated that PQV inspections will be highly resource intensive."

The directive describes a PQV inspection as "a large and complex undertaking" and states that a PQV inspection is "long-term, possibly several weeks or months." They are to be conducted by a "select, well-trained and experienced team."

The ten OSHA regions each are directed to submit five candidate facilities drawn from eight targeted sectors with the greatest number of accidents. The positive sectors include oil refining. The table shown here looked at PQV inspections from 1995 to March 2005 by federal OSHA and by 26 states that run their own safety and health programs. The data shows that OSHA has conducted few planned PQV inspections.

Federal OSHA conducted nine planned PQV inspections in targeted industries from March -- excuse me, from 1995 to March 2005, while OSHA' state-plan jurisdictions conducted 48. Federal OSHA conducted no planned PQV inspections in oil refineries during this period. During the same period, federal OSHA conducted 77 unplanned PQV inspections and state

programs conducted 29.

Unplanned inspections are typically narrow in scope, shorter, and limited to possible regulatory violations raised from accidents, complaints, or referrals from another regulatory agency.

OSHA's compliance directive for the PSM standard, states that the main vehicle for enforcements are the planned, comprehensive inspections; however, the data show that these PQV inspections are infrequent. Over time, OSHA has adjusted enforcement priorities to reflect new workplace data in enforcement initiatives.

For example, during the 1990s, OSHA began collecting site-specific injury data, which allowed adjusted targeting of planned inspections, and likely, had the effect of putting greater emphasis on injury rates and overall inspection priorities; however, the workplaces that have catastrophic risks often have high personal injury rates. The March 2005 incident underscores the need for OSHA to refocus resources on preventing catastrophic accidents to greater PSM enforcement.

We have been discussing OSHA's PSM enforcement. Now we will examine the provisions of the OSHA PSM standard, specifically management of change, or MOC.

The investigation found that mergers, reorganizations, staffing cuts and reassignments, budget cuts, and other policy changes impacted the effectiveness of BP Texas City safety systems. Audits and other assessments found that the MOC program ineffectively reviewed organizational and personal change. The OSHA PSM standard requires that, at a minimum, a company's MOC policy apply to "process chemicals, technology, equipment and procedures and changes to facilities." Industry's own good practice guidelines, such as those from the American Chemistry Council, recommend that MOC apply also to organizational, personnel, and policy changes that could affect process safety. OSHA does not require employers to evaluate these types of changes.

If BP had reviewed the safety implications of changes to personnel, policy, and organization, the March 23rd disaster would have been less likely to occur. In addition, adoption of broader MOC requirements by OSHA would help companies like BP avoid catastrophic events.

Madam Chairman, now in summary, we will present the root and contributing causes. Root causes are the underlying prime reason why an incident occurred. Contributing causes made the incident more likely to

occur or increased the consequences of the incident.

Root causes: first, BP board did not provide effective oversight of major accident prevention; second, BP senior executives focused, measured, and rewarded mostly personal safety performance, but not process safety. Additionally, BP senior executives did not provide adequate resources to prevent major accidents. BP senior executives did not insure a safety review of organizational, personnel, or policy changes.

Additional root causes: BP Texas City managers did not create an effective reporting and learning culture. They did not follow and enforce up-to-date procedures. BP Texas City managers did not incorporate good practice, equipment design, and they did not effectively incorporate human factors into their process safety programs.

Contributing causes: Texas City managers lacked an effective, mechanical integrity program. The managers did not have an effective policy to control vehicular traffic near hazardous process areas. Texas City managers did not effectively implement their prestart-up safety review policy to remove non-essential personnel during start-up. Finally, Texas City managers' policy for siting trailers was not

sufficiently protective of trailer occupants.

That concludes our presentation. Madam chairman, we'll now take questions from the board.

MS. MERRITT: Thank you, Mr. Holmstrom. We feel like we need to breathe after that, don't we?

At this time, I'd like to open the floor for comments or questions from board members. Is there anybody who has any questions? Mr. Wark.

MR. WARK: Thank you, Madam chair. I would like to ask a question of the staff as to how you determined that the operator was likely fatigued, the operator in question. Was the BP management aware of the long hours that the operators were working, and did fatigue, in your judgment, play a role in the lack of critical communications during the shift change?

MS. MACKENZIE: We used the methodology that NTSB uses in its investigation of aviation accidents. It calculates fatigue by examining the physiological aspects of an individual's sleep wake cycle. Basically, these aspects -- they call them fatigue factors -- such as how much sleep you had in a 24-hour period, or over a period of time, like a week. I used -- and then we find evidence, if evidence is there, that suggests that those fatigue factors affected human performance in some way.

In this case, we found that cognitive fixation and impaired judgment likely was the result of fatigue, affecting operators' performance.

I didn't catch the second part of your question, how it relates to --

MR. WARK: -- the shift change.

MR. HOLMSTROM: Yeah, there were three critical miscommunications that occurred during shift change. Number one, during the shift change, there was a miscommunication about the state of the equipment, what equipment had been filled and which equipment hadn't been filled. Second, there was a miscommunication about whether the -- which raffinate was supposed to run down to storage and which wasn't. The board operator understood that the heavy raffinate was not to go to storage and other operators were informed light raffinate was not to go to storage.

And finally, there was a miscommunication in the shift directors' meeting. There was an understanding at the end of the meeting that the ISOM Unit was not to be started up; however, the supervisor from the ISOM area attended that meeting; when he returned to the ISOM area, did not communicate that fact to the supervisors and operators in that area. The reason

given for the discussion about not starting up the ISOM unit was that the tanks were filling and, indeed, we found from the log in the tank farm area, that the tanks that were holding heavy raffinate were filling up.

MS. MERRITT: Mr. Wright.

MR. WRIGHT: Thank you, Madam chairman. I was wondering if you could tell me who authorized the start-up on that date and why it continued, if they were -- if they found equipment not working properly.

MR. HOLMSTROM: Well, the first question of who authorized the start-up, the CSB was only able to determine that shift supervisors, front-line supervisors, authorized the start-up; however, we believe that, in typical refinery practice, units do not start up based on instructions from the front-line supervisors.

Second, there was an instruction that, due to the tanks filling up, that it was understood that the unit would not start up that day; however, that was not effectively communicated to the area.

And the last part of your question, Mr. Wright?

MR. WRIGHT: Why did they continue the start-up when they found equipment not working properly?

MR. HOLMSTROM: Well, the level transmitter, as

an example, was understood to be mis-calibrated prior to the incident; however, a decision was made by managers and supervisors that that repair would be deferred until after the start-up; however, as Mr. Kaszniak has pointed out, an accurately functioning level transmitter is very important during the critical period of start-up.

MS. MERRITT: Mr. Visscher.

MR. VISSCHER: Thank you, Madam chairman. My questions are kind of follow up with what Mr. Wark and Mr. Wright have asked. First of all, with regard to the fatigue issue, you indicated that the methodology used is one that was developed by the NTSB. Does that estimate the degree of reduction in performance of -- tied to how much fatigue there is, or is it just a kind of a general finding of -- that it was more likely than not fatigue? In other words, is there an ability to estimate a 20 percent decrease in functionality for example, anything with that precision?

MS. MACKENZIE: The way the methodology works is that there are several fatigue factors that keep -- that recur in incidents, where the findings are that people have fallen asleep at the wheel or -- in a plane, and these fatigue factors, such as how much

sleep in a 24-hour period, how much continued hours of wakefulness in a 24-hour period, consecutive build-up of the loss of sleep over time, these factors, if they're present, they increase the likelihood that fatigue played a role in the incident.

Then we look at how the incident unfolded and what the -- in this case, operators, were thinking and doing at that time and had their decisions -- would they have been different had they had sleep or not. And --

MR. HOLMSTROM: I think, to add to that answer, the NTSB methodology doesn't calculate a percentage of fatigue, but it's if -- whether or not fatigue factors are present that led to the effect on the behavior of the worker. In this case, the evidence that was calculated from the NTSB methodology is those fatigue factors were present and had an effect on issues like cognitive fixation, which would, in this particular case, allow the operator to just focus on the level in the transmitter, rather than, additionally, looking at other operational parameters like the feed coming into the tower and the feed leaving the tower and piecing together that the tower had been filling for three hours and was likely filling up, and fatigue would impair that cognitive ability.

MR. VISSCHER: Have a method of matching likely -- the likely result of being fatigued with the indicators that were present in that situation, yeah. When did the operators sort of recognize that there was a problem?

MR. HOLMSTROM: There was a high pressure excursion that took place after one o'clock and the operators reacted to that high pressure; however, they did not diagnose the fact that the high pressure was due to the building level within the raffinate splitter tower; rather, they believed that either the bottoms had over-heated or there was a lack of reflux, and so they responded by cutting the heater and also by starting reflux, but none of the operators understood at that point that the tower was over-filling and that was leading to the rapidly rising pressure that they were observing.

MR. VISSCHER: You mentioned in the presentation that swings in the level in the tower were kind of normal. Even though the procedures didn't anticipate it, but it was normal in terms of the experience of the start-up. Was there a particular reason for that in this particular unit, or is that a common occurrence in refining towers of this sort? Was there a problem that was never diagnosed or was there a

problem in the procedures that didn't anticipate, I guess is what I'm asking.

MR. HOLMSTROM: Well, the swing that occurred during -- well, it was dramatic that occurred -- in most of the start-ups, is a condition that can exist during start-up, when you have a more unstable feed going to the tower and you're possibly going to have swings in the level. The operators reacted to that, because a loss of flow out the bottom could possibly damage equipment such as the associated heater to the tower. They reacted to that by running a higher level, typically as we saw, from the previous 18 previous start-ups, 19 start-ups in total, by running it above the level of the transmitter. The problem with running it above the level of the transmitter is you don't know where the level is at, and it makes over-filling the tower much more likely.

MR. VISSCHER: You may have mentioned the redundant high level alarm in the tower not functioning, had that been noted before the start-up or not?

MR. HOLMSTROM: No, it hadn't been noted before the start-up.

MR. VISSCHER: Okay. Thank you.

MS. MERRITT: Are there any other questions?

Mr. Bresland?

MR. BRESLAND: Getting back to the fatigue issue that some of the other board members have talked about, what was the -- what is the normal shift rotation at the BP refinery?

MR. HOLMSTROM: Normal shift rotation is 12-hour shifts, rotational shifts for operations.

MR. BRESLAND: And in the days and weeks and almost a month leading up to the incident, people were working 12-hour shifts every day as opposed to two or three or four days a week?

MR. HOLMSTROM: That's correct.

MR. BRESLAND: Yeah. Now was this done -- who decides whether you're going to work 29 days in a row, 12-hour shifts? Is that done voluntarily on the worker's side or is it done by edict from the company's side?

MR. HOLMSTROM: Our understanding that it was required, during the turnaround, to work that schedule of continuous 12-hour shifts.

MR. BRESLAND: Question about the instrumentation: what type of instrumentation would have worked better to give them an indication of the fact that the level in the distillation column was well above the indicated level using the one measuring

device that they had?

MR. HOLMSTROM: Well, we determined in this case that this particular instrument was sensitive to the specific gravity of the processed hydrocarbon that was in the tower, and if it had been properly calibrated, it would have indicated 100 percent; however, because it was mis-calibrated, as the tower heated up, it showed the level declining from about 99 percent at the beginning of the start-up to 78 percent at the time of the incident, which the operator believed and relied upon.

As stated in our report, there are other additional indications of levels that can give operators additional information. One example is a bottom pressure indicator, which will increase -- show an increase in pressure if the level is rapidly increasing. Another example that's discussed in our report that's actually been suggested by an expert in distillation, Henry Kitster, is an additional level indicator above the existing range of level indication that would provide indication -- if the bottom level indicator failed -- would provide additional indication that the level was rising in the tower higher than the normal range of the lower transmitter.

MR. BRESLAND: Do you know if, in the work that

has been taking place at the refinery since the accident, what BP is doing in the way of improving level indications?

MR. HOLMSTROM: Well, we understand that BP has been reviewing both its design and instrumentation, as well as their mechanical integrity programs. We know, from an incident that occurred after this incident in another refinery of BP's in North America, where there was a similar overfill incident, there was a recommendation in that incident for additional indicators of level in the tower, including an additional level transmitter and additional pressure indicators on the tower, as well as an automatic safety shut-off, which was discussed by Mr. Kaszniak.

MR. BRESLAND: Okay, thank you.

MS. MERRITT: Are there any other questions? Mr. Wark?

MR. WARK: I have one more, Madam chair. You said that BP relied too heavily on injury rates and not enough on process safety indicators. Could you provide us an example of such a process safety indicator and how it might be used?

MR. HOLMSTROM: Well, process safety indicators give an early warning that your process safety systems aren't functioning appropriately. Some examples of

leading process safety indicators -- and both leading and lagging are important -- but leading indicators would be process safety action items, the percentage that have been completed. Another process safety indicator would be the percentage of equipment testing that had been conducted on the deadline of the date that those equipment tests are supposed to be conducted. That percentage would be a leading indicator of process safety. This would tell you how your safety management systems were performing prior to an incident.

MR. WARK: Thank you.

MS. MERRITT: Thank you. If there are no other questions, I know everybody will be glad to know we're going to take a 15 minute recess and we'll reconvene here at ten minutes after -- ten minutes after the hour, and please be prompt, so that we can resume our proceedings.

(15 minute recess)

(Back on the record at 8:10 p.m.)

MS. MERRITT: We're going to begin in a few minutes, so please have your -- take your seats.

If I could have your attention, how we're going to proceed is I'm asking the investigative team to present now their recommendations and then we will

open the floor to the public comments, for the public comments period.

We have quite a number of people who want to be heard, and we encourage you to speak. We would ask you to keep your comments to two minutes, so that everybody gets a chance to have their turn, and to be ready to come up when I call your name.

So, with that, I'd like to turn the floor back over to Don Holmstrom, for the recommendations.

MR. HOLMSTROM: Madam chairman, the team will now present a summary of the recommendations. Board members, the complete text of the recommendation is in your binder.

The first recommendation is to the American Petroleum Institute and the United Steelworkers Union. The recommendation is to create two new consensus standards for refining and petrochemical industry. The first standard is performance indicators for process safety and the second standard is fatigue prevention guidelines.

The next recommendation is to OSHA, which reads, strengthen enforcement of the planned comprehensive PSM inspections.

An additional recommendation to OSHA is amend the proper safety standard to require a management of

change, MOC, safety review for organizational, personnel, and policy changes.

The next recommendation is to the Center for Chemical Process Safety. Issue guidelines for the safe management of major organizational, personnel, and policy changes.

Recommendations to the BP board of directors. Appoint an additional non-executive member of the board of directors with expertise in refining operations and process safety.

The second recommendation to the board of directors is insure and monitor an incident investigation program at all of your refineries.

Another recommendation is insure and monitor the use of leading and lagging indicators at all of your refineries.

Recommendation to BP Texas City. Evaluate all process units to insure critical process equipment is safely designed, including multiple level indicators, automatic controls, clear indication of material balance on process control systems.

Another recommendation to BP Texas City. Insure all instrumentation and process equipment necessary for safe operations is maintained and tested.

A recommendation to BP Texas City and United

Steelworkers. Work together to establish a joint program that allows for reporting and learning from incidents, near misses, process upsets, and hazardous conditions, without fear of retaliation.

Additional recommendations for BP Texas City. Improve training with face-to-face instruction and simulation technology. BP Texas City require additional board operator staffing during times of start-up, shutdown, and abnormal conditions.

BP Texas City insure that all procedures are updated and reflect actual process conditions.

BP Texas City require knowledgeable supervisors or other technically trained personnel be present during hazardous operation phases, such as units start-up.

That concludes the recommendations we have presented to the board, Madam chairman.

MS. MERRITT: Thank you. As you probably are aware, these are the summaries of the recommendations, and the wording for the exact recommendations can be found in the report, if you would like to review that.

With that, we would like to go to public comment. What I'm going to do is call names, two at a time, so that you will be ready when the microphone is open, and the first two people I would like to call

are Brent Coon and Ms. Eva Rowe. Yes, right here. Please state your name and spell it for our recorder.

MR. COON: Good evening, Madam chairman. Brent Coon, B-R-E-N-T C-O-O-N and Eva Rowe.

MS. ROWE: E-V-A R-O-W-E.

MR. COON: Madam chairman, members of the CSB team, I am the regional general counsel for the United Steelworkers. I'm personal trial counsel to over 200 of the injured workers from this explosion. I'm personal trial counsel to Eva Rowe, who lost both of her parents in this explosion. I'm lead counsel for the civil litigation pending in Galveston and liaison to the investigative agencies, including the Department of Justice and the CSB. I've had the pleasure of working with Mr. Holmstrom and their investigative team.

Our legal team has reviewed over 7 million documents in this case in the civil litigation and have taken over 100,000 pages of deposition testimony of BP personnel and executives in Galveston, Houston, Chicago, and London.

It's been our contention since the early months of discovery that this tragedy was unnecessary, avoidable, and sadly, even predicted, predicted many times over a number of years. From 1977, when process

safety standard number 6 was out, generally banning the continued practice of using open distillation systems in the Amoco facilities, all the way to 3/23/05, the date of the explosion, when an ISOM supervisor in an employment satisfaction index reported that his unit, in his opinion, that if it was an aircraft carrier, it would be at the bottom of the ocean. Sadly, hours later, that's where that unit was.

Budget cuts, which reduced staffing, training, technology, and maintenance caused this explosion. The Texas City facility made a profit of a billion dollars in 2004, only to be told to cut their budget more in 2005. We're pleased to see that the CSB has dedicated its full resources to this investigation and that your report concurs with us. We hope that not only BP, but the entire petrochemical industry, embraces your recommendations. But if they don't, we've drafted legislation which has sponsors in Texas and in Washington, D.C.; drafts can be found at rememberthe15.com.

We have also placed much of the discovery that we have obtained in this litigation in the website texascityexplosion.com to enable the media, legislators, industry influencers, and the public to

better understand the myriad of problems which culminated in the perfect storm on March 23, 2005.

Our discovery and other efforts continue and we appreciate very much the work product put forth by the CSB tonight, which will hopefully make our plants a better and safer place to work. Eva and I will be in Washington, D.C. Thursday to speak to the Congressional Labor and Education Committee and to Austin Friday, to memorialize the second anniversary of this explosion and to promote the legislation being presented there.

We thank you again for your dedication and efforts, which will certainly help us in these efforts. And in closing, it is our belief that our society should not embrace the concept that going to work at a refinery is a game of Russian roulette. Plants can and should be made safe to work at, first by regulations, but then by severe criminal penalties if necessary.

Thank you, Madam.

MS. MERRITT: Thank you. Ms. Rowe, would you say your name again and spell it for our recorder?

MS. ROWE: Eva Rowe, E-V-A R-O-W-E. Hello, my name is Eva Rowe. Both of my parents, James and Linda Rowe, were murdered on March 23, 2005. I was driving

down to visit them for Easter when it happened. My life and my brother Jeremy's life changed drastically that day and forever.

At first, I did not understand and I was just sad. As I found out more, I got mad. I do not believe this was an accident. How could BP ignore all the warnings? Why have trailers there? Why have a blowdown drum instead of flares? Why reduce training for workers? Why cut staff on units? Why let the plant run down? Why not tell the non-essential personnel to evacuate the area? Had this been done, my parents would not have been murdered that day. We know why -- money, money and profit. I have dedicated myself to changing these things so this never happens again. Thank you for your report. It will help us greatly.

MS. MERRITT: Thank you.

MS. ROWE: Thank you.

MS. MERRITT: We're going to get them to move the microphone. Those spotlights are blinding the board. Could you move the mic to right in the center here, maybe?

I'd like to announce the next two people. That's a little better. Roby Plemons and Najm Meshkati. Thank you.

MR. PLEMONS: Roby Plemons. R-O-B-Y P-L-E-M-O-N-S. I'd like to thank the investigation board and the CSB for the work they've done on this investigation. I've worked in this industry for almost 30 years now, and in order to make these plants safer -- I'm talking about all these plants in the oil industry and the chemical industry that's on this channel in the state of Texas -- it's going to take the Justice Department to come in. They're not going to do it on their own. You don't climb the corporate ladder by spending money on safety. You climb the corporate ladder by reducing budgets and increasing production. People's lives are being lost every day. I'm afraid this board will stay very busy until this happens. It's going to take these managers at these plants to be held accountable, much like Enron was held accountable. That's what it's going to take to change these plants. These plants are being understaffed; training's being cut, all in the name of the budget. Production's being run when they know there's safety problems in these units.

We need to change what we're doing today. They're making record profits, as Mr. Brent Coon's pointed out. It's not a money issue. They need to spend the money on safety and protecting people's

lives. There's been too many people, too many families been tragically, catastrophically lost. Thank you.

MS. MERRITT: Thank you.

MR. MESHKATI: Good evening. My name is Najm, N-A-J-M, last name Meshkati, M-E-S-H-K-A-T-I. I'm a professor of civil environmental engineering and industrial and systems engineering at the University of Southern California-Los Angeles.

I would like to commend this staff and the distinguished board members and you, especially, Ms. Merritt, for excellent investigation that you conducted on this case. I have been conducting research in the area of nuclear, petrochemical, and aviation safety for the last 25 years. I have been to many accident sites, including Chernobyl in 1997. Some of my students, they ask me did I look this shiny before going to Chernobyl or after coming back from Chernobyl. I tell them, no, I looked always like this.

Ms. Rowe, my heart goes for you, and as I mentioned to you during the break, I showed the tape of the 60 Minutes interview that you and Ms. Merritt were there, to all my classes. You both ladies; I'm very proud of your performance.

However, I would like to suggest the board, please let's think about to move on. What should we do after -- after this great work that you and the Baker panel did. I always remember a beautiful quote from the very great American philosopher and psychologist, William James. William James said, "Great emergency and crisis show us how much greater our wider resources are than we had supposed." Great dimensions in crisis show us how much greater our wider resources are than we had supposed.

I think we have a great resource in the board. We have a great resource in this excellent report. We have also a great resource in the Baker panel. I think what you have done will not only impact the safety of petrochemical industry in this country, but I venture to say, transportation industry, because of the issue of the cumulative fatigue Ms. MacKenzie, and also nuclear industry, nuclear power plants, and also health care industry. Please don't stop here. Please carry on the ball and please go for codifying this recommendation into better OSHA C.F.R. 1910(1.119), Cost of Safety Management, and also better regulation for other industries. I want really to commend, and I think the board and the staff, they both get an A from me. Thank you.

MS. MERRITT: Thank you. Our next two are Scott Berger and Kim Nibarger.

MR. BERGER: Hello, I'm Scott Berger. That's B-E-R-G-E-R.

MS. MERRITT: You have to tip that up to your mouth, I think, Scott. Thank you.

MR. BERGER: Okay, thank you. So, good evening, Madam chairman. I am the director of the Center for Chemical Process Safety, which was mentioned during the report earlier this evening, CCPS. CCPS is a global organization that's organized under the American Institute of Chemical Engineers, which has 90 corporate members, both in the U.S. and around the world. And, on behalf of the CCPS, we will be taking the findings and the recommendations from this evening very, very seriously. CCPS is dedicated to advancing technologies and management practices for process safety, and we're grateful for the existence of the Chemical Safety Board for investigating incidents of this nature, and for communicating them to the industry and to the public, to everybody who needs to know.

Over the past eight years, CCPS has been following your work very carefully. We've learned a lot from your investigations, and it's really helped

us focus the activities of our work in areas as diverse as chemical reactivity, dust explosion prevention, human factors, and process safety culture.

So, on behalf of CCPS, I accept the recommendations that were made to us by the board this evening, regarding the guidelines for development of management of change. In June of this year, we will publish about half of that recommendation in a new guideline, a management of change. We've recently started a new guideline on process safety as it relates to mergers and acquisitions, so that is also in progress.

I think the previous speaker made the point about we have to turn forward and that's what we're doing here at CCPS. We do -- we have taken the lessons learned from CSB investigations and for other investigations that have been shared with us, and started in 2004 a project to rewrite the guidelines on process safety that were mentioned earlier, as well, in this report. And, during the development of this book, we did take advantage of all the material that was being shared by the CSB, by BP, by the Baker panel and tried to build this into our new guidelines for risk-based process safety, which will be released on March 30th. So we're very pleased to have that; I

think that will help the industry as a road map going forward.

We do want to publicly acknowledge the openness of BP in publishing their internal findings. I know it must have been difficult for them to allow the CSB, to allow the Baker panel to look so deeply into their organization, and it's only providing value to the rest of industry to learn these lessons and so I have to offer my acknowledgment to BP for this. Obviously, that doesn't excuse what happened; it just -- just the acknowledgment of what happened afterwards.

So I'd like to conclude by thanking the board, by thanking the investigators for the hard work that you did, and offer my support as we go forward. Thank you.

MS. MERRITT: Thank you.

MR. NIBARGER: My name is Kim Nibarger. K-I-M N-I-B-A-R-G-E-R. I work for the United Steelworkers Health, Safety and Environment Department. Madam chair, members of the board, we want to first thank the board for dedicating the time and resources necessary to undertake an investigation of this magnitude, and our thanks to the investigators involved, for all their hard work.

We would like to convey to the board, the

community, and to BP that the United Steelworkers have heard the recommendations to us from the investigation results, and we support them.

We welcome the opportunity to be a party to work on developing new industry standards and to see that they are meaningful enough to make a real difference in the workplace.

We need a tool that can tell us if we are spending our money in the areas that will allow us to operate in the safest manner possible, and we need to be able, to the extent possible, to see the future. We know what the results are when we depend on history to teach us.

It is our hope that the petrochemical industry as a whole takes a serious look at the findings in your report and that if any one company sees anything that looks a little familiar, they do not delay in acting to fix the problem. And if we get into something every once in a while that could have lasted a month or two longer, isn't that better than being one second too late? Thank you.

MS. MERRITT: Thank you so much. The next two people I would like to call are Gary Kenney and Charles Osbonna, O-S-B-O-N-N-A. Are they here? No. Okay, Joe McCalty, Lee Medley? David Wilson? Please

say your name and spell it for the recorder.

MR. MEDLEY: Lee Medley, L-E-E M-E-D-L-E-Y. I'm the president of the Galveston County Central Labor Council. My family has been here in Texas City in Galveston County since the explosion in the '40s in Texas City. Both my grandfathers, my father, me and my brother worked in all these refineries and all that.

This problem began a long time ago, and it began with doing away with the proprietary jobs that we have and contracting out our missions, everything from our training, inspection, all that, we continue to contract those out just to save a buck. And we were contracting them out to trained people; now we're contracting them out to anybody that'll take the job. We have -- we hear, every time they have a turnaround, they have trouble getting qualified people to do these jobs, but yet we have a pipefitters' hall full of journeymen that can't get a job in Texas City.

I'll also say that BP just drew the short straw. This could have happened in any one of these refineries or chemical plants from Brownsville all the way to Pensacola, Florida. I mean, we see the same thing in every one you work at. It's shortcuts; it's job consolidation; we've got to get to the Solomon

index; it's global economy; there's always some reason to make someone work a little more overtime. There's always some reason we need to consolidate this job. This operator can have more control loops; this operator has too much time on his hands, so we consolidate those jobs.

But it comes down to corporate greed. We continue to live in these communities. The managers don't live here. I mean, my in-laws live within a quarter mile of Dow now; it used to be Carbide. We live in here; we appreciate everything y'all have done. We hope they go forward with these recommendations. I guess I'm going to have to take a wait and see.

As brother Coon said earlier, they're going to ask for legislation. I hope the Texas legislature doesn't do its general rollover and die act when industry asks it to. We need to, in Galveston County, hold our state legislators and federal legislators accountable for their votes on this very issue. We need to have Mr. Ireland and Mr. Taylor stand up and say, yes, my members work in these facilities; they go there every day and they come home every day from there, and we will support you. So I hope they're listening tonight and they hear what we're saying,

because they need to step up and do what their constituents are asking them to. Thank you.

MS. MERRITT: Thank you.

MR. WILSON: My name is David Wilson. D-A-V-I-D W-I-L-S-O-N. Excuse me. First of all, I'd like to congratulate you on your findings and diligent look into the blast at the refinery. I do agree with a lot of points. I do like the fact -- and I was here for the last meeting -- that you did bring up more of the human factor this time. The one thing I do disagree; I don't think they should be recommendations; I think they should be requirements of the industry. They need to look at it, if you put all this stuff into a pot and stir it, it still comes up the money, and they're always going to put money ahead of lives in this industry. The reason that we work 12-hour shifts, 7 days a week, it's cheaper than three shifts. They're always going to do that; it's always going to follow the money, and as long as we have groups out there that are going to keep an eye on this and make sure that -- I mean, they're making plenty of profit in the oil industry, and it's costing some lives, and if we can look at that, maybe we can prevent something like this from happening in the future. Thank you.

MS. MERRITT: Thank you. Mr. Kevin Yackly and

John Reilly. Warren B-O-Y-N-E-S, Boynes. David Senko, S-E-N-K-O. Find another one. Jay Jackson. Jimmy Easter. Go ahead, thank you.

MR. YACKLY: Thank you. Madam Chairman, first of all, from a local person like I am, I want to welcome you to Texas City. We wish you could be here under better circumstances.

BP, I think, as they said from the union, drew the small straw. It's very important that you make sure for industry standards that we build more refineries. I've been in business in Texas City for about 20 years, and I don't believe it's a culture of deception. I believe that we all work together and we're all a family. If you could please make sure in Washington that we build three more refineries in Texas City and hire local people, the problems would disappear.

The problem that I can see is consumption. We all want to get as much gasoline as we can get our hands on, and that's what keeps our economy strong, but what we need is for people like yourselves to make sure that new permits are given out, so we can build more refineries which will take over and have less -- we'd have more oil, and that means that the stress of each individual plant wouldn't be so high. The people

that work at BP are all professionals. They all work to ensure that the economy grows in the United States. If we put too much pressure on the system, the problem that I can see is that we don't have -- we all want to drive a car. My daughter's 14 and she wants a fast car, but if we had alternatives and we had ways of granting new permits in Texas, and around the Gulf Coast, then the pressure off these plants would be taken off, and we would be able to continue prospering without having to not purchase what we want to purchase, gasoline.

The problem is over-working people, but we have to have more -- my question to you is where were you-all before it happened, you know? If this would have been oversight and would have been noticed, then maybe -- we're paying taxes. We want to make sure that you-all are doing your job and making sure that these plants follow the rules, and they do. But we just need more plants, more, more, then problems would go away, because we'd have new environment, policies, but the most important to us, then we'd have more gasoline and a safer environment for everybody that works here in Texas City.

We are, I think we produce 5 percent, but when these people that are most -- if you ask how many

people were here on the day of the explosion, not everybody was here. I was here. One thing that it did do, it did bring our community closer together. Everybody volunteered, and BP was not cheap. They asked everybody to participate, and helping the problems that were caused by the explosion.

But what I'm asking for you-all is to please go to Washington, get us more plants, because we need more oil. It's not going to go away. You can tell us we can have wind, we can have nuclear, but we want to start our automobiles, and somehow or another, with your help, that we'll be able to have more gasoline available, which would relieve these plants from having to run 24, and keeping all the workers working hard. Thank you.

MS. MERRITT: Thank you.

MR. EASTER: My name is Jimmy Easter, and you spell it J-I-M-M-Y E-A-S-T-E-R. I've worked in the chemical industry here for 15 to 20 years now. I appreciate very much the work that this panel has put together. There's no way that we can comprehend the hours that has gone into the labor that is here, and by the same token, unless you have been in our plants, not after, but during the time of these explosions, which many of us have been, then you, yourselves, may

not understand our apprehensions, our angers, our fears, our distresses, that these things continue to happen to the families that are here. The PSM standard and the MOC requirements that are there are so absolutely necessary and so needed to be followed, and if they are implemented and are absolutely followed, they will work, and they will save lives and they will stop the nonsense that goes on.

Where OSHA is concerned, and on your recommendations, I fully hope and trust that your recommendations are pointed toward getting OSHA the funding to be there. OSHA has been a friend of mine, and I have appreciated the work and the hard labor, and many times they've responded to us when we have called. The thing that we, I feel like they need more help in, is that they get more resources and more people, because I know they are challenged as to what their resources are. The other end of that is that their solicitors stand behind them and work with them diligently, to the point that where a citation is issued that it has every chance to stand up against high dollar corporate attorneys that are ready to take it to task and go somewhere and do something with it. We need that support for them. I don't want it if it's not right, but when it's right, there shouldn't

even be a fight about it. Let's get it pushed through to where it works.

MS. MERRITT: Thank you. Lloyd Jewell and Jim or Tim Webster.

MR. JEWELL: My name is Lloyd Jewell, L-L-O-Y-D J-E-W-E-L-L, and I'm probably going to be less politically correct than some of the people have been before me, but I'm a machinist and a union steward at the ISOM complex. Some of my friends are no longer with us, because of BP's arrogance and stupidity. Really and truly, if you look at what went on here tonight, your opening remarks were asking people to turn off their cell phones, and when Mr. Holmstrom was finishing up his remarks, somebody's cell phone rang in the back. I think right there is the root cause of everything. Nobody listens; nobody pays attention. I can tell you that unless you act upon it, then nothing is going to change. I mean, you told people to turn their cell phones off, and you still hear cell phones ringing in here. Why is that? It's not because people are stupid; it's because they won't listen.

A lot has changed at BP since the ISOM incident. We're spending a butt-load of money. I've never seen money being slung around like it is now. You need equipment, tools, if you see something, they are doing

a lot to do it, but we're missing the forest for the trees here. We've gone to training blocks; it's all computer-based training, and we've said for years that this computer-based training is ridiculous. I mean, I'm a machinist of 27 years at the, you know, in this industry. I couldn't pass a test if I had to, but I can work on equipment. We're not taking operators around, teaching them the things that we used to.

We lost something when we gave up the chief operator and I'm sure that conversation probably came up with these guys. The chief operator has cost us a bunch of heartache and a bunch of pain. Used to, we had -- a gentleman had time or knew the unit well, they'd put these young operators under his wing, and of course, obviously when I hired in, things weren't so politically correct. If you were sitting in there with your feet up on the desk, playing solitaire, that chief operator was going to chastise you and you were not going to be doing that. You better be out tracing lines.

I guess BP has gotten, in my opinion, probably a little bit slack, and it may not be the popular thing for a union person to say, but I think BP really doesn't take the job serious. When I hired in out there 24 years ago, I was expected to do a job and

they made it real clear that if you don't do your job, and you don't learn your job, you won't be here. Well now, we -- I really can't think of a good word to say it, but we clown around with these people. They basically get away with murder. It's not a good thing to say, but we are not bringing up the next generation the way we should, because we have to be politically correct. I can't step on their toes, you know. If I get on them for poor job performance, then I'm being a you-know-what. And I think we've lost something in that ability to, you know -- when I hired in out there and I've worked under a lot of union chairmen, we had a little influence with our own. Now we don't.

Our maintenance crew -- I saw some comments in here about staffing, operations staffing, I'm assuming is where that's going. Nine years ago, when I went back to the ISOM complex for my second tour of duty down there, we had 12 people in our maintenance crew. And we lost two when we give up the builders, but we still had a crew of ten. We have a crew of three to five on our unit on a daily basis, and I cover three units. I cover AU2, MDU, and ARU, which is basically like the equivalent of two units. We used to have the ISOM in the mix, but we still have three units that we have to cover, do turnaround work on, and running

maintenance three to five people is not going to cut it.

I've been fortunate enough to be in -- and stuff here the last couple days and I saw things that we were a few moments away from ripping up a set of blades and expanded metal, because, we're not there. There's not enough of us to be out there all the time.

We've had no pipefitters for four weeks. We haven't had one single pipefitter on our unit, in our complex of three units, in four weeks, due to retirements, due to people that were hurt during the incident, other people on just sick leave, vacation. We haven't had one pipefitter in four weeks. We've had one pipefitter, at best, for seven weeks. Now what's wrong with that picture?

I compliment the CSB on their report, but I think we've really missed a lot of things that we shouldn't have. There's a lot of equipment that is out of date, that was designed for a Ultraformer process, not for an Isomerization process. I know for a fact that management had warnings about these, and they didn't listen. Until we learn to listen to each other, nothing's going to change.

MS. MERRITT: Thank you.

MR. WEBSTER: Yes, my name's Tim Webster, T-I-M

W-E-B-S-T-E-R. I'm with the United Steelworker's Local 13, 2001 at the Exxon-Mobil Baytown facilities. I will have 28 years of service this year.

I would like to thank the board and the investigation team for the many hours of hard work that you've put forth in this investigation. You were very thorough, and I commend you for that.

I noticed that the team addressed the staffing levels during the start-up of the unit in this tragedy, but I would like to address the staffing levels as is related to operational units on a day-in and day-out basis. This is, seemingly, becoming an ever-growing issue at my facility and, from what I understand, at other facilities up and down the Houston ship channel.

Current PSM requirements in regard to emergency response requires that facilities have in place emergency response procedures, but it does not address minimum day-in and day-out staffing requirements to appropriately and safely respond to unplanned unit upsets. Industry management is keenly aware that there are no regulatory requirements in this area and view these staffing reductions as easily achievable cost-cutting measures.

What I thought I heard the investigation team

say tonight is that there will be an adoption of broader MOC requirements and that might be a future vehicle to address these staffing issues, hopefully.

My question to be considered is how, exactly, would this be achieved? Would that be by reopening the PSM standard, or by some other means? By reopening the standard, would it be appropriate to have industry comments in that area?

And I would like for this to be looked at as covering normal operational staffing levels, as well as start-up and shutdown scenarios. I don't know if y'all were considering that or not, just start-up and shutdown or day-in and day-out operations? Thank you.

MS. MERRITT: Thank you. Shon Jones and Jim Dallas.

MR. JONES: My name is Shon Jones, S-H-O-N Jones, and I don't have any formal speech. I just came here and wanted to hear y'all's remarks and then give my comments, and I'm a little tired because I got forced last night to work overtime. That was one of the issues that I'm seeing in our industry. I've been in -- I'd like to back up. I've been a millwright for 26 years in this industry. I've worked hard all my life. I've watched our skills get diminished through attrition and retirements. We have no training

programs in my facility at this time. As a union member, we have tried to get apprenticeship programs implemented back into the workplaces, to get skilled people in our plants to do the jobs that are required, such as the transmitter problem you had. I don't know if this guy was a trained instrument technician. I really don't know that, but I can tell you right now, in the labor industry, we have a four-year degree, people that go to four-year apprenticeship programs that are trained well, that prevents a lot of accidents in the workplace.

The other topic I'd like to touch on is the forced overtime. It is -- you know, several of you had questions about that. I will tell you that we are forced every other day and sometimes 18 hours a day. I'm a union guy; we have a contract language that prevents some of that, but it still does not prevent all of it. We do get forced a lot of overtime, and yes, it does play a factor, in the fatigue factor that you mentioned, and it's because we are forced to work. And, in saying that, I mean I like y'all's recommendation and I hope we move forward with this. And I would like to add one recommendation that I'd like y'all to consider is to look into the mechanical industry -- I mean the mechanics in the industry, and

let's get a program going again like we did in the '70s, with an apprenticeship program, where we get skilled and trained mechanics and millwrights and E&I technicians in the plants to prevent accidents. Thank you very much.

MS. MERRITT: Thank you.

MR. DALLAS: Good evening. My name is James Dallas, J-A-M-E-S D-A-L-L-A-S. I'm here tonight as a student. I'm a third year law student at the University of Houston, in the energy environmental program there. I'm writing a paper currently about BP's corporate culture with regards to their pipeline program up in Alaska, and so I thought tonight's meeting would be interesting for me. But in listening to the presentation and in reading over the materials, I've recognized that there are some things that I would like to bring to the board's attention.

First, I would like to praise the staff for looking at the Columbia accident investigation board. I'm currently a volunteer at NASA's Johnson Space Center, and I have to say that that report has had a tremendous effect on us, and I think that it was a good place for y'all to start.

Secondly, I would like to briefly touch upon the inter-relationship between safety and environmental

concerns. I'd like to thank the staff. I think as someone who's reading y'all's material and looking at it at an intellectual level, for talking with the Environmental Protection Agency and the Texas Commission on Environmental Quality. The reason I do this is because, in many ways, environmental and safety issues are the same. Safety issues are what happens on your side of the property line; environmental issues are what happens on someone else's side of the property line.

Although I think the discussion could have gone a little bit farther, the report as it's been stated, talks fairly extensively about the problems with OSHA's regulatory scheme. They don't have entirely sensible rules; they don't do enough inspections; they don't have a workforce to do enough inspections, and I think the same arguments could be made, to a large extent, about federal, state, and local environmental regulators, the EPA, the TCQ, as well as Galveston County and whatever health and safety program the Texas City government may have.

I had the honor of working for six months last year for the City of Houston's city attorney's office, the land use division. The City of Houston has an aggressive environmental enforcement program, and our

division was in charge of that program. Our client was the Bureau of Air Quality Control, and while I can't go into details, I will say that in reading the accident, or upset incident reports that were given to us by BAQC about a certain refinery in Harris County, it seems to me that they continued to have upsets that were caused either by people not following rules or following rules that were just really dumb, and so I think that the kind of issues that happened here in Texas City are likely to repeat at other refineries unless there's a focus on process safety.

I would argue, though, that we need to increase environmental inspections, because there are extra boots on the ground. There are extra people that can look at problems; they can refer problems to OSHA, because OSHA can't put their own boots on the ground for it. And I think that if we increased environmental inspections and aggressively enforced the federal and state clean air acts, we would probably have fewer industrial problems. Thank you very much.

MS. MERRITT: Thank you. Mr. Joe Bicancicy.B-I-C-A-N-C-I-C-Y. Thank you. Luis Aguils? A-G-U-I-L-S. Miss Irene Jones? George T. Jones? Mark Shalkowski? Bill Phillips? Joe Bilant? Larry Burnweild? I

think we had a lot of people who signed up on the wrong sheet, and Michael McKenna? Selmo DeMerko? Mike Johnson? You've got the floor.

MR. SHALKOWSKI: Mark Shalkowski, M-A-R-K S-H-A-L-K-O-W-S-K-I. Back in the early '90s when I was in college, I worked at this refinery in the Safety Department. I'm a licensed safety engineer, board certified safety professional, with about 15 years safety experience. I work in the petrochemical industry. I like all the recommendations that you had, but I think there's one thing that I'd like you to consider. I'd like you to think about going to ABET, the American Board of Engineering and Technology and, as a requirement for engineering schools to maintain their ABET accreditation, I think all engineers should receive some fundamental training in process safety, because these concepts apply to manufacturing environments, wherever engineers work, because the vast majority of the technical people in the refineries are engineers, and so I got my masters degree in safety engineering from one of the few engineering programs at Texas A&M, and I know Dr. Manning's working on that at Texas A&M with the chemical engineering students, but most of the other disciplines don't have that. So I would think all

engineers would benefit from that sort of training. Thank you.

MS. MERRITT: Thank you very much. At this time, this concludes our public comments period. I'm sorry. Yes, we have one more. I'm sorry.

MR. BEEVERS: Gary Beevers, G-A-R-Y B-E-E-V-E-R-S. I'm the international vice president with United Steelworkers. My primary responsibility is the oil segment, and I guess I'm probably the ranking officer from our union at this hearing tonight.

I want to start off, Madam chairman, members of the board, certainly the investigators, on behalf of Leo Girard and the entire executive board of our union, thank you for the work you did, the quantity, and certainly the quality of this investigation.

I do want to point out, as others did, that it just happened to happen in Texas City, Texas. This is not an issue with just BP; this is an issue with the entire oil industry, and we've taken steps and immediately after this meeting, we're going to have communications and discussions with this industry. This should be the benchmark, and we're going to move forward from tonight with this industry.

So thank you very much for the report and for the work you did. We agree with the recommendations.

On behalf of the steelworkers, we will cooperate fully with the implementation of the issues that were brought forward tonight. We like the recommendations. We will get together with whoever we need to get together with as soon as possible and start working on these things.

On behalf of 30-plus-thousand oil workers, the members of this community, this young lady sitting over here, I urge this board, this full board to vote unanimously to adopt these recommendations. Thank you.

MS. MERRITT: Thank you. We have one more name, Randy Fredrick?

(Pause.)

MS. MERRITT: If there are no other comments, oh, I'm sorry. Yes, ma'am? We're in the light and we're blinded by that.

MS. WILSON: Thank you. My name is Nara Wilson, N-A-R-A W-I-L-S-O-N. What I would like to say is, I've been working on the field for 12 years. I'm a boilermaker, and one thing that is really scaring me today about refineries is the fact, the inability to communicate. There is a reason that we all use the same kind of signals towards a crane when you're flying something, because you must speak the same

language, so putting aside being political correct, English must be spoken in a refinery, because we all need to communicate in a place where things can happen in a split second. And before anybody call me prejudiced, I'm Latino, okay? So English must be spoken; communication, safety must come ahead of any, any political correct. Thank you.

MS. MERRITT: Thank you very much. At this time, are there any other comments? Then I would close the floor for public comments.

At this time, I would like to open the floor to the board members if they have any comments that they would like to make at this time. Yes, Mr. Visscher --

MR. VISSCHER: Madam chairman, is this the right time to offer an amendment?

MS. MERRITT: No.

MR. VISSCHER: Okay.

MS. MERRITT: Do you have any other comments? Do you have any comments? Yes, Mr. Wright.

MR. WRIGHT: Thank you, Madam chairman. I would just like to echo the condolences expressed by the chairman earlier to the families and the victims of the events that occurred here. I would also like to thank the staff for all their hard work. I think this is going to be a historic document, not only from the

vantage point of this incident involving 15 deaths and 180 injuries, but by taking the excursion further and looking at the culture of the organization, which I think is a quantum leap in safety investigations. And I applaud you all for the work that you've done. Thank you.

MS. MERRITT: Thank you, Mr. Wright. Is there any other -- Mr. Wark?

MR. WARK: Thank you Madam chairman. I would like to echo the sentiments also, add condolences to the friends and families of the people who perished or were injured in this terrible tragedy. I have every belief, and I'm sure most of us here do, that the lessons learned from this tragedy will serve to save lives for the years to come, and that is the wonderful legacy that we can look forward to as far as our safety recommendations are concerned, and I also would like to thank the investigative board, the investigators, for the wonderful job that they've done, and it's been a benchmark, I think, and a touchstone for this board, and one that may not be duplicated in a long time. Thank you.

(Applause.)

MS. MERRITT: Thank you. Mr. Bresland.

MR. BRESLAND: I also would like to commend the

investigative team. I arrived with the team on March 24, 2005 and on that day, I got to see the tragic results of the explosion here and I have been certainly in constant communication with the team in the intervening two years, and they've done excellent, excellent work.

Back, about a year ago, I did a presentation for a group of industry folks in Illinois, and I made the comment that when you're running large complex operations like an oil refinery, the model you should follow is: the price of success is constant diligence. You can't afford to run these places sloppily one day and carefully the next day. You have to run them carefully day-in, day-out and if you don't do that, you can see the results, unfortunately.

The day after I did the presentation, I went to tour the facility, and one of the people who had been at that meeting had taken my little few words and had put it on the notice board as you arrive into the plant, the price of success is constant diligence, and I think that's a lesson that the whole industry should learn, the fact that day-in and day-out we need to run these operations as safely as possible to avoid the tragedy that we've seen here in Texas City.

MS. MERRITT: Thank you. At this time, I'd like

to ask if we are ready to move towards discussion with regard to the report, and call for the questions. Motion?

MR. VISSCHER: Madam chair, since I was leaning forward towards the microphone, let me just add to what my fellow board members say, ditto, but since we've been here so long, but I do appreciate the work that's gone in and wanted to add that to -- if I may, I would like to move for a small amendment to recommendation 1.b, it's recommendation 1.b to the Occupational Safety and Health Administration, to amend that recommendation by asserting, or cause to be conducted, after conduct, so that the revised recommendation 1.b would read in its entirety, , "Conduct or cause to be conducted comprehensive inspections, such as those under the Program Quality Verification (PQV) program at facilities identified as presenting greatest risk."

MS. MERRITT: Is there a second to that motion?

MR. WARK: Yes, Madam chairman, I second that motion.

MS. MERRITT: Okay. There is a motion on the floor, and I would open the comments first for, Mr. Visscher, do you want to explain that?

MR. VISSCHER: Just very briefly. I think the

report reflects the difficulty and the challenge and some of our speakers from the audience also reflected on this. I think the difficulty and challenge that an enforcement agency has with an inspection regime for catastrophic risks in highly complex organizations or operations like refineries, and I believe that some new approaches should be tried or could be tried. This amendment doesn't specify that something new is -- some new approach is tried. It encourages OSHA to think about new approaches, if those make sense, and so it adds that to our recommendation. Thank you.

MS. MERRITT: Is there any other comment?

MR. WRIGHT: Yes, one comment.

MS. MERRITT: Yes, Mr. Wright.

MR. WRIGHT: Thank you, chairman Merritt. I think that the amended recommendation will assist OSHA, rather than limiting them in the approaches they can take in trying to improve process safety management here, and that's why I second that motion. Thank you.

MS. MERRITT: Is there any other discussion on this? Then I would call for the vote on the amendment, and I'll read it again. Recommendation 1.b to the Occupational Safety and Health Administration (OSHA) amend by inserting ",or cause to be conducted,"

after conduct. The revised recommendation b. would read: Conduct, or cause to be conducted, comprehensive inspections such as those under the Program Quality Verification (PQV) program at facilities identified as presenting the greatest risk.

So, at this time, I'd like to call for a vote. Mr. Bresland?

MR. BRESLAND: Yes.

MS. MERRITT: Mr. Visscher?

MR. VISSCHER: Yes.

MS. MERRITT: Mr. Wark?

MR. WARK: Yes.

MS. MERRITT: Mr. Wright?

MR. WRIGHT: Yes.

MS. MERRITT: I vote no, and the amendment passes. And then I would like to call for a motion to accept the report and the recommendations as written, as amended. I'll get it right, as amended.

MR. WARK: Thank you, Madam chairman. I would like to move that the board approve this CSB investigation report number 2005-04-I-TX, as amended by the board and at the public meeting on March 20, 2007, regarding the agency's investigation into the refinery explosion and fire that occurred on March 23,

2005 at the BP Texas City refinery in Texas City, Texas.

MS. MERRITT: Call for a second.

MR. WRIGHT: I second.

MS. MERRITT: Seconded by Mr. Wright. At this time, I'd like to reread the amendment and then take the vote.

Approve the CSB investigative report number 2005-04-I-Texas City as amended by the board at the public meeting on March 20, 2007, regarding the agency's investigation into the refinery explosion and fire that occurred on March 23, 2005 at the BP Texas City refinery in Texas City, Texas.

I call for a vote with member of the board Bresland.

MR. BRESLAND: Yes.

MS. MERRITT: Member Visscher?

MR. VISSCHER: Yes.

MS. MERRITT: Member Wark?

MR. WARK: Yes.

MS. MERRITT: Member Wright?

MR. WRIGHT: Yes.

MS. MERRITT: And I vote yes. The motion is carried unanimously.

(Applause.)

MS. MERRITT: And I thank the board for your efforts with regard to this report.

With that vote tonight, we embark on seeking the most significant chemical safety improvements ever pursued by this agency. Although the BP Texas City investigation is now complete, the CSB will continue to play a very active role in following up on all the recommendations that we approved this evening. This activity will go on for months and, indeed, for years to come, until we see these safety measures adopted.

The 15 men and women who died here two years ago must not be allowed to perish in vain. Their lives, their dreams, and their hopes, and the manner in which they lost them must never be forgotten. I implore every company that handles hazardous substances to learn from what happened here on March 23, 2005.

Read our report, which will be posted on the csb.gov within the next week. Read the Baker panel report, available on our website as well. Do not be lulled into complacency. A low injury rate is no proof that tomorrow you will not experience a disaster. Protect your personnel and your facilities to a rigorous process safety program, and measure its effectiveness constantly, using appropriate indicators. Do not allow any other families to suffer

as so many here in Texas City have.

I want to thank the CSB investigative team for their phenomenal creativity, insights, and diligence over the past 24 long months. As I have traveled around, meeting with industry audiences, not a day goes by but I hear of the tremendous impact this investigation is already having among business throughout the country and around the world.

I would like to acknowledge many other CSB staff who contributed to this project, but who are not here tonight, including Mr. Steve Selk, Mr. John Bordebrugen, Jim Lay, Angela Blair, Francisco Altamirano, Johnny Banks, and Ray Perfery, just to name a few.

I want to thank each and every one of my fellow board members. Each of you has worked for months, studying the issues in this report, to assure the best possible product from this agency. All of that effort has resulted in a stronger report.

Finally, I would like to offer one special word of thanks. Don, why don't you stand up for a moment?

(Applause.)

MR. HOLMSTROM: Thank you.

MS. MERRITT: In April 2005, Don Holmstrom rejoined the agency after a two years' absence with a

single-minded purpose of making this investigation the best it could possibly be. It is a task that he has been training for his entire career, whether he knew it or not. Don has been spending much of the past two years in motels and rented rooms, far from his beloved family and home overlooking the mountains of Boulder, Colorado, and has been working extraordinarily long hours.

From a modest office in Washington, he has amassed what must be one of the most voluminous files in the history of chemical safety investigations, and somehow he seems to know everything written on every one of those 30,000 documents that have been reviewed.

He led his team with great skill and deftness to produce a true gemstone of a report, and it is a gem with many facets.

Don, on behalf of the board and the agency and everyone who has been seeking answers as to what happened here in Texas City two years ago, and why, I offer our deepest thanks. Thank you.

MR. HOLMSTROM: Thank you very much.

(Applause.)

MR. HOLMSTROM: Thanks a lot.

MS. MERRITT: And with that, the proceedings are adjourned.

(Whereupon, at 9:20 p.m., the meeting was concluded.)