

**Testimony of Carolyn W. Merritt
Chairman and Chief Executive Officer
U.S. Chemical Safety Board
Before the U.S. House of Representatives
Committee on Energy and Commerce
Subcommittee on Investigations and Oversight
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Mr. Chairman, Ranking Member Whitfield, and distinguished members of the Committee: thank you for the opportunity to testify this morning. I am Carolyn W. Merritt, a member of the U.S. Chemical Safety Board or CSB, an independent federal agency that investigates major chemical accidents. I testify today in my individual role as Chairman of the Board and Chief Executive Officer.

On March 20, 2007, the CSB completed its investigation of the causes of the March 2005 explosion and fire at the BP Texas City refinery. This explosion killed 15 workers and injured 180 others. It caused the greatest loss of life of any U.S. workplace disaster since 1990.

The accident occurred during the startup of the refinery's octane-boosting isomerization (ISOM) unit, when a distillation tower and attached blowdown drum were overfilled with highly flammable liquid hydrocarbons. Because the blowdown drum vented directly to the atmosphere, there was a geyser-like release of highly flammable liquid and vapor. The equivalent of nearly a full tanker truck of gasoline rained onto the grounds of the refinery in less than two minutes. The vapor ignited, causing a series of explosions and fires that swept through the unit and the surrounding area. All the fatalities and most of the injuries occurred in and around occupied work trailers, which were placed too close to the ISOM unit and were not evacuated prior to the startup.

Our investigation determined that the Texas City disaster was caused by organizational and safety deficiencies at all levels of the BP Corporation. Adhering to and enforcing federal regulations already on the books would likely have prevented this accident and its tragic consequences.

At the Committee's request, we reviewed a report prepared by Booz Allen Hamilton, under contract to BP, on the 2006 pipeline events in Prudhoe Bay, and compared the findings with our own. I emphasize that the CSB did not independently investigate the events in Prudhoe Bay, and we did not have access to the evidence, witnesses, or authors who contributed to the Booz Allen report. We took the statements and conclusions in the Booz Allen report at face value. Based upon that review, I make the following observations.

There are striking similarities in the reported causes of the 2006 events involving BP's Prudhoe Bay pipelines and the 2005 explosion at the BP Texas City Refinery. Most if not all of the seven root causes¹ that BP consultants identified for the Prudhoe Bay incidents have strong echoes in Texas City.

¹ Booz Allen Hamilton, *2006 Management Systems Review* (March 2007), p. 56

Budgetary Concerns Overshadowed Growing Risk

The Booz Allen report states that “Alaska was under severe budget pressure from BP.”² The budgeting process was “largely driven by top-down targets”³ rather than an analysis of risks, and the “top-down targets were considered sacrosanct and were rarely exceeded.”⁴ The cost pressures, we are told, resulted in staff reductions throughout BP Alaska and specifically in the corrosion control program, and in the deferral of integrity projects. The report states that “from 2002 to 2004, a series of reorganization projects focused on streamlining business operations and cutting costs.”⁵

Furthermore, the Booz Allen report states that “budgets and funding [were] largely based on affordability (vs. necessity) and were not supported by an analytical process to prioritize risk. Senior management incentives [were] based on cost and production.”⁶ This finding is essentially identical to the “checkbook mentality” we uncovered at the Texas City Refinery, based upon a 2003 finding from BP’s own health and safety audit of the facility. As noted in our report, “The ‘checkbook mentality’ meant that the budgets were not large enough to address identified risks, and that only the money on hand would be spent, rather than increasing the budget.”⁷

In the CSB’s report, we found that cost cutting, production pressures, and a failure to invest left the BP Texas City refinery vulnerable to a catastrophe. Shortly after acquiring Amoco in 1999, the BP Group Chief Executive ordered an across-the-board 25% cut in fixed spending. Such policies were particularly imprudent in light of the age and condition of some of BP’s newly acquired assets, including the Texas City Refinery. A 2002 internal BP report, cited in our investigation, noted 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.”⁸

Cost considerations discouraged BP Texas City officials from replacing the refinery’s antiquated and unsafe ISOM blowdown drum with an inherently safer flare system, a measure that would have prevented or greatly minimized the severity of the March 2005 accident.

The condition of BP Texas City’s infrastructure and assets deteriorated due to a lack of required maintenance expenditure, and budget pressures also led to cuts in operator training and staffing levels. Training positions were cut by nearly 75%, and the training of operators was inadequate, particularly in the handling of abnormal situations. In 1999, to economize, BP also eliminated one of two control board operators who oversaw the ISOM unit and an adjacent process unit. In 2001, a third process unit was added to the

² *Ibid.*, p. 3

³ *Ibid.*, p. 71

⁴ *Ibid.*, p. 41

⁵ *Ibid.*, p. 27

⁶ *Ibid.*, p. 82

⁷ U.S. Chemical Safety and Hazard Investigation Board, *BP Texas City Final Investigation Report* (March 2007), p. 161

⁸ CSB, p. 158

responsibilities of the sole remaining board operator. Each of these process units is itself a sprawling complex of pipes and equipment that may cover several acres. Our report documents how diminished human performance – due to poor communication, excessive work hours, fatigue, and a lack of adequate staffing, training, and supervision – contributed to the accident.

Although spending at the Texas City Refinery increased between 2000 and 2004, most of the increases were focused on environmental projects and emergency capital needs – not on correcting chronic problems with equipment maintenance and integrity. In 2004, BP executives challenged their refineries to cut yet another 25% from their budgets for the following year. This cut was promoted (and partially realized) despite clear evidence from safety audits, seen by at least one member of BP’s executive board of directors, indicating that the lack of investment in maintenance and new equipment was compromising safety in Texas City and leaving the site at risk for a major accident.

Management of Change Processes Were Deficient

The Booz Allen report speaks of “a ‘normalization of deviance’ where risk levels gradually crept up due to evolving operating conditions.”⁹ In the case of the aging Prudhoe Bay lines, the report cites increasing water and sediment levels and decreasing flow as insidious risk factors for corrosion. We observed a similar indifference to growing catastrophic risk in our Texas City investigation. Unit startup procedures and processing conditions evolved over time without a formal assessment of the safety impact. Most startups of the ISOM distillation tower from 2000 to 2005 exhibited abnormally high internal pressures and liquid levels but these were not investigated as near-misses nor were corrective measures taken. Furthermore, the integrity of tower equipment deteriorated over the years, so that by the day of the accident there were six key alarms, instruments, and controls that were not functioning properly.

Changes in process conditions, instrument operability, or startup procedures should have immediately triggered what are called “management of change” safety reviews. Each review is a formal, documented process to analyze the safety ramifications of the change. In oil refineries, such reviews are mandatory under the OSHA Process Safety Management (PSM) standard. However, we found that there were serious, longstanding deficiencies in Texas City’s management of change program.

As described in our report, a number of design and equipment changes were never evaluated under BP’s management of change policy, even though the refinery had designated the equipment as “safety critical.”¹⁰ Our report also notes that BP management allowed operators and supervisors to alter, edit, add, and remove procedural steps without conducting management of change reviews to assess the safety risk.

BP policies required management of change reviews for the placement of trailers in the refinery. However, the majority of the portable trailers in the vicinity of the ISOM unit were placed in harm’s way without conducting such safety reviews. Even when BP

⁹ Booz Allen Hamilton, p. 78

¹⁰ CSB, p. 332

conducted a management of change analysis – e.g. for the placement of a double-wide trailer where twelve occupants later perished – there was no closure of hazard review action items or final approval of the proposed change by the unit superintendent, as required by BP procedures.

The Booz Allen report draws broadly similar conclusions. It notes that BP Alaska operated under a management of change policy. However, “the established risk assessment processes and practices were not adequate to detect and address new risks due to evolving operating conditions.”¹¹ In the words of the report, “There was no analysis of the potential effects of changing flow composition and rates on the [oil transit lines].” These lines were erroneously perceived as “low risk”¹² in the same way that Texas City’s unsafe trailers, blowdown drums, obsolete procedures, and deteriorated equipment came to be treated as acceptable.

In an observation that also applies to Texas City, the Booz Allen report states: “The change management processes become more important as time passes, especially with an aging kit. If equipment drawings do not reflect the true as-built condition, there is added risk (that may be unknown to the operator) because of the lack of understanding of the system configuration.”¹³ In Texas, the written startup procedures for the ISOM unit became increasingly out-of-date, as various pieces of equipment ceased working as intended, and informal deviations from written procedures became the norm. Those deviations increased the likelihood of the catastrophic overfilling of the tower.

Failure to Close Action Items, Audit Findings

The Booz Allen report states that BP’s “corrosion management strategy was developed in the late 1990s, and had not been substantially reviewed or revised until now, despite specific direction in a 2004 internal technical audit to do so A number of key assurance processes (e.g. Audit, Management of Change) were not ‘closed loop’ to ensure that required changes were truly implemented and documented.”¹⁴ The report goes on to state, “The absence of third-party verification and sanction led to long delays in implementation, administrative documentation of close-out even though remedial actions were not actually taken, or simple non-compliance.”¹⁵

The CSB made essentially identical findings in Texas City. The CSB report points to a 2004 BP audit of 35 different business units, including the Texas City Refinery, which found common problems, including “a lack of leadership focus on closing action items from audits and other safety reviews, as well as a backlog of maintenance items.”¹⁶ More specifically, the closure rate for process safety management action items was actually decreasing in Texas City, falling to 79% by 2004. The closure rate for action items from process safety incident investigations was a dismally low 33%.

¹¹ *Ibid.*, p. 56

¹² *Ibid.*, p. 73

¹³ *Ibid.*, p. 81

¹⁴ *Ibid.*, p. 7

¹⁵ *Ibid.*, p. 75

¹⁶ CSB, p. 166

We also found information system deficiencies, as did the Booz Allen report. For example, our investigation found that the refinery’s computerized work order process did not require verification that required maintenance had been completed before closing a job order. We found that BP maintenance personnel were in fact authorized to close job orders even if work had not been completed.

Inadequate Communication and Excessive Decentralization

The Booz Allen report found that BP Alaska “operated in vertical silos. There was minimal cross functional communication ...”¹⁷ The report went on to state that inadequate communications “preclude the efficient exchange of information related to corrosion.”¹⁸ A 2004 safety audit in Texas City similarly revealed that the refinery lacked a formal process for communicating lessons learned from incidents. This finding was corroborated in the 2004 BP audit of 35 different business units, which found what it termed “poor processes”¹⁹ to disseminate lessons learned.

Among the lessons *not* learned in Texas City were those from three serious process incidents at the BP refinery in Grangemouth, Scotland, in 2000, which became the subject of a major report by the U.K. Health and Safety Executive. The Grangemouth incidents were linked to excessive cost-cutting, a lack of focus on and measurement of process safety, and a decentralized management structure that impaired efforts to prevent major accidents.

The Booz Allen report also points to a decentralized management structure for the pipelines, stating, “There was no single owner of the [oil transit lines] as a system. Accountability for them was divided geographically among the six [Greater Prudhoe Bay] Area Managers.”²⁰ The report notes that business unit leaders “are given significant autonomy to deliver against [their] performance contracts”²¹ which is consistent with the CSB’s findings about BP’s management practices.

The Booz Allen report notes further, “Because [the Corrosion, Inspection, and Chemicals Group] was hierarchically four levels down from senior leadership, corrosion risk management had less visibility.”²² We made an analogous finding in our report: following BP’s mergers with Arco and Amoco “process safety functions were largely decentralized and split into different parts of the corporation. These changes to the safety organization resulted in cost savings, but led to a diminished process safety management function that no longer reported to senior refinery executive leadership.”²³ The decentralized approach led to a lack of focus on process safety, the CSB report concluded.

High Management Turnover

¹⁷ *Ibid.*, p. 8

¹⁸ *Ibid.*, p. 77

¹⁹ CSB, p. 167

²⁰ Booz Allen Hamilton, p. 7

²¹ *Ibid.*, p. 34

²² *Ibid.*, p. 78

²³ CSB, p. 147

As stated in the Booz Allen report, BP Alaska’s “senior management tenure averaged roughly three years. This lack of continuity contributed to perceptions of disconnection”²⁴ The report notes that only two senior managers from 2000 remained in place by 2006.²⁵ Both the CSB’s report and the independent Baker panel report (which the CSB recommended and BP funded) draw similar attention to the extraordinary management turnover in Texas City. Since 1997, the refinery has had nine different plant managers. During the critical period between 2001 and 2003, there were five different plant managers, as noted in the Baker report.

The impact of this constant turnover was pointed out in a safety culture survey of the Texas City site completed on the eve of the accident, known as the Telos report. The Telos report authors stated, “We have never seen an organization with such a history of leadership changes over such a short period of time.”²⁶ The Telos report as well as the CSB investigation found that the constant turnover impaired efforts to improve process safety at the facility. Constant management turnover persuaded employees that any new initiatives would be short-lived. It also promoted short-term decision-making by management, who would reap the reward for meeting cost targets but who would be gone before the consequences for such risk-loaded decisions were realized.

Focus Was Personal Safety; Process Safety Measures Lacking

One of the major themes in the CSB report, as well as the Baker panel report, is that BP did not use effective metrics for process safety. In fact, one of the principal organizational causes of the accident, according to our report, was that “BP management paid attention to, measured, and rewarded personal safety rather than process safety.”²⁷

BP focused its safety efforts on improving statistics for personal injuries – chiefly from slips, trips, falls, and vehicle accidents – and made progress in that area. However, growing catastrophic process risks were either overlooked or not effectively controlled. The CSB report found that in the refining and marketing sector, managers’ performance contracts and incentive plans were heavily weighted in favor of financial performance and what was termed “cost leadership.” Safety received a weighting of only 10% in pay plans and the sole metric for safety performance was the recordable injury rate, a measure of personal safety. Likewise, the Booz Allen report found: “Performance Contracts included metrics for recordable injury frequency (RIF) as the only explicit target for risk management.”²⁸ The report also noted that “HAZOP [Hazard and Operability] studies focused on personnel safety”²⁹

As stated in our report, “Financial and personal safety metrics largely drove BP Group and Texas City performance, to the point that BP managers increased performance site bonuses even in the face of the three fatalities in 2004.”³⁰ Similarly, the Booz Allen

²⁴ Booz Allen Hamilton, p. 8

²⁵ *Ibid.*, p. 27

²⁶ CSB, p. 193

²⁷ *Ibid.*, p. 179

²⁸ Booz Allen Hamilton, p. 72

²⁹ *Ibid.*, p. 39

³⁰ CSB, p. 178

report found: “Because no leading risk indicators or root causes were studied, when the product composition changed, it was not flagged as an important corrosion management issue. This led to an increase in corrosion risk on the [oil transit lines] that ultimately precipitated the two incidents.”³¹

Corporate managers and regulators should not rely on recordable injury rates to assess the likelihood of catastrophic process accidents. In its final report, the CSB recommended that the American Petroleum Institute (API) and the United Steelworkers (USW) collaborate with other stakeholders to develop a standard for leading and lagging process safety performance indicators in the refining and petrochemical industries. The recommendation ask the organizations to work together with a diverse group of industry, labor, public interest, and environmental organizations and scientific experts in developing the new standard. The Baker Panel also recommended that BP take a leading role, in collaboration with the CSB and other stakeholders, in developing and implementing process safety performance indicators.

OSHA Enforcement at High-Risk Chemical Facilities

As requested by the Committee, I will summarize the CSB’s findings on OSHA enforcement at the BP Texas City refinery and other high hazard chemical facilities. Our BP investigation determined that diligent implementation of OSHA safety rules that are already on the books would have prevented the accident. Specifically, the OSHA Process Safety Management standard, enacted in 1992, has 14 required elements for preventing catastrophic accidents at facilities that handle highly hazardous chemicals.

The PSM standard requires process hazard analyses, management of change reviews, investigation of incidents, and preventative maintenance programs. All these functions were deficient for many years at the Texas City refinery, our report found. After the March 2005 accident, OSHA conducted an inspection at the refinery, focusing largely on the ISOM unit, which is but one of 30 units in the refinery. This inspection resulted in the biggest OSHA fine in history, \$21 million, which is indicative of the extent of the pre-existing safety problems at the facility.

Our investigation found that prior to the 2005 accident, OSHA did not conduct any comprehensive, planned process safety inspections at the Texas City Refinery. Furthermore, our investigation found that in the ten years from 1995 to 2005, federal OSHA only conducted nine such inspections anywhere in the country, and none in the refining sector.

The Texas City Refinery was an extremely dangerous workplace, with 23 workers killed in the 30 years prior to March 23, 2005, not counting the 15 workers who were fatally injured that day. OSHA did conduct unplanned inspections of the Texas City Refinery in response to accidents, complaints, or referrals. But these unplanned inspections are typically narrower in scope and shorter than planned inspections. Proposed OSHA fines during the twenty years preceding the March 2005 disaster – a period when ten fatalities occurred at the refinery – totaled \$270,255; net fines collected after negotiations totaled \$77,860.

³¹ Booz Allen Hamilton, p. 80

Our report concluded OSHA has focused its inspections for a number of years on facilities that have injury rates. While OSHA is to be commended for trying to reduce these rates, the Chemical Safety Board believes that OSHA should also pay increased attention to preventing less frequent, but catastrophic, process safety incidents such as the one at Texas City. If necessary, we suggest that Congress consider providing OSHA with additional resources for this activity. Following the Sago mine disaster, there has been an effort to significantly increase the resources for conducting federal mine safety inspections, and mines were already inspected far more frequently than most oil and chemical facilities.

When the PSM standard was created, OSHA envisioned a highly technical, complex, and lengthy inspection process for regulated facilities, called a Program Quality Verification or PQV inspection. The inspections would take weeks or months at each facility and would be conducted by a select, well-trained, and experienced team. Indeed, thoroughly inspecting a 1,200-acre chemical complex with 30 major process units – like the Texas City Refinery – is a significant undertaking. However, the statistics we gathered from public records during our BP investigation indicate that OSHA has not developed sufficient capacity to conduct these inspections on a widespread basis.

We note in our report that other safety authorities do conduct regular, comprehensive process safety inspections at hazardous chemical facilities. For example, the U.K. Health and Safety Executive, which oversees a much smaller oil and chemical industry than exists in the U.S., has 105 specialized inspectors for high-hazard facilities; each covered facility in the U.K. is thoroughly inspected every five years. Contra Costa County in California has its own industrial safety ordinance and has a program to inspect each covered oil and chemical facility every three years. A team of five engineers performs an average of 16 inspections each year. The program costs a relatively modest \$1 million a year, which is financed through fees collected from the regulated facilities.

In our final report on BP, the Chemical Safety Board called on OSHA to identify and conduct comprehensive inspections of those facilities at the greatest risk of a catastrophic accident. We also recommended that OSHA hire or develop new, specialized inspectors and expand the PSM training curriculum at its National Training Institute. We urge OSHA to accept and promptly implement these recommendations, which will make U.S. chemical facilities safer and protect the communities where they operate from the consequences of chemical disasters.

Conclusion

The CSB report and the Booz Allen report point to similar cultural factors within BP, in both its upstream production and downstream refining operations. The similarity in the two reports underscores how safety culture truly is set at the top at a corporation. After all, the upstream and downstream sides of BP have separate reporting lines all the way to the Group Chief Executive and the board of directors in London.

Our report further points to the need for improved federal oversight of refineries and chemical plants. Many corporations are already doing an excellent job of preventing major process-related accidents and are investing the necessary resources on a long-term

basis. More stringent federal oversight will not only help level the playing field but more importantly will protect our workers and our communities from chemical disasters. Improved process safety efforts also protect the American public from gasoline refinery and petroleum supply disruptions that can cost millions of dollars a day at the pump.

I thank the Committee for convening this important hearing today and will be pleased to answer any questions.