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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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June 20, 2007

The Honorable Samuel W. Bodman
Secretary of Energy
U. S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585-1000

Dear Secretary Bodman:

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose a copy of our Second Quarterly Report to Congress on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects. Congress mandated the Board to write this report in the House Conference Report 109-702 (Section 3201), on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122).

The conferees directed the Board and the Department of Energy to prepare jointly a report on efforts toward more timely resolution of technical issues raised by the Board. Until such time as the jointly prepared report is submitted, the conferees have directed the Board to provide quarterly reports on the status of significant unresolved technical differences between the Board and the Department of Energy concerning design and construction.

Sincerely,

A. J. Eggenberger
Chairman

Enclosure: as stated

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June 19, 2007

To the Congress of the United States:

On September 29, 2006, House Conference Report 109-702 on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122) was released and approved by both houses of Congress. The Conference Report, Section 3201, directed the Defense Nuclear Facilities Safety Board (Board) to provide quarterly reports on the status of significant unresolved technical differences between the Board and Department of Energy (DOE) concerning design and construction of DOE's defense nuclear facilities. Quarterly Reports are required until a joint report is issued by the Board and DOE on a process for timely identification and resolution of safety issues and recommendations, if any, for legislation that would strengthen and improve the Board's technical safety oversight of DOE.

The Board and DOE are continuing discussions aimed at improving the timeliness of issue resolution and have begun preparation of the requested joint report. The Board and DOE are identifying actions that will improve issue resolution. Some actions are already being implemented, including (1) "project letters" issued by the Board early in the design process and updated, as necessary, throughout the project life cycle, and (2) periodic reviews with DOE on the status of open Board issues. Other actions are being explored, such as the need for additional changes in DOE's critical decision process.

The Board held public meetings in 2005 and 2006 that stimulated DOE actions to improve the early integration of safety into the design of new defense nuclear facilities. These actions included revising pertinent directives to better integrate safety into the design of new defense nuclear facilities at the earliest stages of project management. A new standard, DOE-STD-1189, *Integration of Safety into the Design Process*, recently entered DOE's formal review process and is expected to be issued this summer. The Board's third public meeting, held on March 22, 2007, considered early issue identification, communication of the Board's issues to DOE, issue management, and timely closure or resolution of issues. During this meeting, DOE acknowledged that resolving safety issues early in the design process is central to mitigating cost and schedule risks and outlined improvements that have occurred as a result of its safety-in-design initiatives. DOE also identified the need for strong and persistent federal oversight of new design and construction projects.

The second quarterly report builds on the first report of February 15, 2007, and identifies changes in the status of issues. The status of many of the issues did not change significantly in the period due to the nature of the design process for complex, high-hazard facilities. The notation that there has been no significant change in a project does not imply that progress has not been made during the last several months. No new unresolved issues were identified by the Board during the period of this report.

In the first quarterly report, the Board identified those defense nuclear facilities of greatest concern to the Board. The status of issues associated with these high-profile facilities is summarized in Enclosure 1, while a complete status of all facilities of interest is provided in Enclosure 2. This second quarterly report reflects the status generally through the end of April 2007.

A list of facilities of greatest Board concern is provided below. In this quarterly report, the Board has added a brief comment on the status of each facility. The Board notes that significant progress has been made on resolving issues associated with several of these facilities.

- *Savannah River Site, Salt Waste Processing Facility*—This facility has been of particular concern to the Board because of technical shortcomings in the design process—a lack of geotechnical requirements, structural issues, and issues related to structural modeling. A Board letter dated January 13, 2007, summarized these concerns and encouraged their prompt resolution to improve nuclear safety and to avoid adverse schedule and cost impacts. The Board is satisfied with the recent actions taken by DOE and its contractor to resolve issues associated with the design of the Salt Waste Processing Facility. Appropriate structural design expertise and DOE oversight have been brought to bear on the project. Geotechnical requirements are being finalized, and changes to the structural design and the analysis methodology have been made. Significant work remains to finalize the design. The Board will work with DOE to ensure the final design provides adequate safety.
- *Hanford, Waste Treatment Plant*—This complex plant includes four major facilities. The Board has identified issues in the areas of seismic ground motion, structural engineering, chemical processing safety, and fire protection. DOE is making progress toward resolving these issues. The Board believes the path forward identified by DOE and its contractor for addressing these issues should achieve an acceptably safe design.
- *Los Alamos National Laboratory, Chemistry and Metallurgy Research Replacement Project*—Early in this project, the Board noted its concern regarding the acquisition strategy being employed. The National Nuclear Security Administration recently directed that the acquisition strategy for the project be changed to a more traditional design-bid-build approach, which resolves the Board's concern about the acquisition strategy. The Board was also concerned about the need to establish conservative design criteria for several safety-related systems—ventilation, fire suppression, and nuclear material container design. Board concerns with the ventilation system design have been resolved. An additional issue is the need to account for a revised site characterization due in June 2007 that is expected to include up to a 50% increase in the seismic criteria for this facility. However, a conservative seismic design criterion has been established to allow the design process to proceed.
- *Y-12 National Security Complex, Uranium Processing Facility*—The Uranium Processing Facility project was selected by the Board and the National Nuclear Security Administration to help establish a mutual understanding of safety

expectations under the new DOE Order 413.3A and demonstrate the early incorporation of safety into design. In light of progress made in the past several months, the Board believes the safety basis controls identified at the conceptual level of design for the facility provide an adequate basis for continuing the design process into the preliminary design phase. This project will be removed from the Board's list of facilities of greatest concern.

- *Hanford, K-Basin Closure Sludge Treatment Project*—The Board was concerned that the design for this project did not ensure that safety systems would satisfy the requirements of the Preliminary Documented Safety Analysis. Consistent with the Board's concern, DOE issued its safety evaluation report with conditions of approval that halted procurement activity until the design could be assured of performing credited safety functions. Design issues associated with the safety systems that were raised by the Board have been formally documented for resolution by the project. The baseline schedule for the project is being reevaluated. Resolution of safety and operational issues will likely result in delaying the start of operations.

As directed by Congress, the Board will continue to exercise its existing statutory authority.

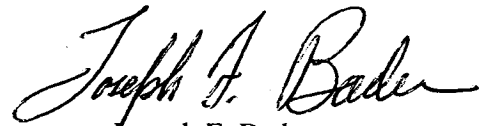
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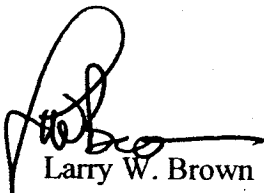
A. J. Eggenberger
Chairman



John E. Mansfield
Member



Joseph F. Bader
Member



Larry W. Brown
Member



Peter S. Winokur
Member

Enclosures

ENCLOSURE 1

SUMMARY OF THE MOST SIGNIFICANT UNRESOLVED ISSUES WITH DOE DESIGN AND CONSTRUCTION PROJECTS

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES (See Enclosure 2, Section 4)
			Critical Decision Approved	Design Completion	Construction Completion	
Hanford Site	Waste Treatment Plant	12,200			<i>(Operational 2019)</i>	
	a. Pretreatment Facility		CD-3	70%	25%	1. Seismic ground motion 2. Structural engineering 3. Chemical process safety
	b. High Level Waste Treatment Facility		CD-3	80%	20%	1. Seismic ground motion 2. Structural engineering 3. Fire protection
	c. Low Activity Waste Facility		CD-3	92%	44%	1. Fire protection
	d. Analytical Laboratory Facility		CD-3	86%	37%	1. Fire protection
	K-Basin Closure Project Sludge Treatment Project	100	being evaluated	90%	Starting <i>(Operational 2008)</i>	1. Completeness of Preliminary Documented Safety Analysis
Los Alamos National Laboratory	Chemistry and Metallurgy Research Replacement Project	975	CD-1	70% of preliminary design 30% of final design	Some ground work <i>(Operational 2014)</i>	1. Design-build-acquisition strategy — <i>resolved (2)</i> 2. Site characterization and seismic design 3. Safety-significant active ventilation system — <i>resolved (2)</i> 4. Safety-class fire suppression system 5. Safety-class and safety-significant container design
Savannah River Site	Salt Waste Processing Facility	660 being reevaluated	CD-1	35%	Not started <i>(Operational 2011)</i>	1. Geotechnical investigation 2. Structural evaluation 3. Quality assurance — <i>resolved (2)</i>
Y-12 National Security Complex	Uranium Processing Facility	1,500 being reevaluated	CD-0	10%	Not started <i>(Operational 2017)</i>	1. Preliminary hazards analysis development — <i>resolved (2)</i> 2. Nonconservative airborne release fraction and respirable release fraction values

(#) — indicates the Quarterly Report in which issue was considered resolved

Enclosure 2

**2nd Quarterly Report to Congress on the
Status of Significant Unresolved Issues with
the Department of Energy's
Design and Construction Projects**

Defense Nuclear Facilities Safety Board

May 2007

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1. INTRODUCTION

On September 29, 2006, House Conference Report 109-702 on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122) was approved by both houses of Congress. Section 3201 of this report directed the Defense Nuclear Facilities Safety Board (Board) and the Department of Energy (DOE) to continue discussions on the timely identification and resolution of technical differences concerning design standards and other safety issues at DOE's nuclear facilities. DOE and the Board are to provide a jointly prepared report on efforts to improve the timeliness of issue resolution. Until that report is submitted, the conferees directed the Board to provide to the congressional defense committees quarterly reports, reporting on the status of significant unresolved issues.

The first quarterly report was submitted to Congress on February 15, 2007. The status of many of the Board's issues presented in this first report are not expected to change significantly in the period of a few months due to the nature of the design process for complex, high-hazard facilities. Accordingly, it is the Board's intent that subsequent quarterly reports build upon the first report. The Board believes that the majority of the projects have an appropriate path forward to resolve outstanding issues. The notation that there has not been a significant change in a project does not imply that progress has not been made during the last several months. This second quarterly report reflects status generally through the end of April 2007.

It should be noted that the subject of this quarterly report represents but one of four functions assigned to the Board in Section 2286a of its enabling legislation, the Atomic Energy Act, 42 U.S.C., Section 2286. The other three functions are review and evaluation of standards, conduct of investigations, and analysis of design and operational data. The Board's current activities in these other areas are described in the Board's annual reports to Congress.

2. SUMMARY

2.1 GENERAL

The Board and DOE have continued discussions aimed at improving the timeliness of issue resolution and have begun preparation of the requested joint report. The Board and DOE have explored case studies of both good and bad interactions during the design and construction of defense nuclear facilities. In particular, the Board and DOE are examining the elements that contribute to or impede the identification, communication, management, and resolution of safety issues related to the design and construction of defense nuclear facilities. Through these efforts, the Board and DOE are identifying actions that will improve issue resolution. Some of these actions are already being implemented, such as project letters issued by the Board early in the design process and updated, as necessary, as the design, construction, testing and startup proceeds to apprise DOE, where appropriate, of the status of Board issues, and periodic reviews with DOE of the status of open Board issues. Other actions are still being explored, such as the need for additional changes in DOE's critical decision process. These discussions, together with information gleaned during the Board's third public meeting conducted on March 22, 2007, on the integration of safety into design, will serve as input to the joint report.

The Board's public meetings in 2005, 2006, and 2007 concerning the integration of safety into design stimulated actions by DOE to improve the early integration of safety into the design of new defense nuclear facilities. As a result, DOE is making progress towards completing revisions of its relevant directives. DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, was issued in July 2006, and DOE is working to revise DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*. A new standard, DOE-STD-1189, *Integration of Safety into the Design Process*, is in the final stages of development and should be issued in the summer of 2007. These directives are expected to mandate an appropriate set of requirements intended to better integrate safety early into the design of new defense nuclear facilities. The status of these directives is discussed further in Section 3. The implementation of these directives in a cohesive, integrated manner is critical if DOE is to effectively integrate safety early in the design process.

The Board has met with DOE headquarters personnel, federal project personnel, and contractor personnel to discuss several key projects, intended to demonstrate the early integration of safety into design, including the Uranium Processing Facility at the Y-12 National Security Complex and the Integrated Waste Treatment Unit at Idaho National Laboratory. These meetings have been aimed at developing a mutual understanding of the safety requirements for these new facilities and establishing common expectations for early design maturity and early identification of safety issues and their resolution.

2.2 ISSUES REGARDING DEFENSE NUCLEAR FACILITIES IDENTIFIED BY THE BOARD

There are currently 25 defense nuclear facility design activities being undertaken by DOE that are within the Board's jurisdiction. These activities have a total project cost of about \$20 billion, which includes \$12.2 billion for the Hanford Waste Treatment Plant. The Board utilizes its technical staff of approximately 60 engineers in fulfilling its obligations established by its enabling legislation. The review of facility design and construction is but one of four major functions assigned to the Board in Section 2286a of its enabling legislation, Atomic Energy Act, 42 U.S.C. Section 2286.

These functions include the review and evaluation of DOE directives and standards, the investigation of events or practices at defense nuclear facilities, the systematic analysis of design and operational data, and the review of facility design and construction. Although the Board's technical staff are highly matrixed, currently about 12 engineers are specifically assigned to follow DOE's defense nuclear facility design activities. In addition, these engineers are supported by various expertise within the technical staff, as well as by a handful of highly specialized outside experts.

To improve the efficiency of its reviews, the Board has also assigned resident site representatives to certain sites. These site representatives provide the Board with a continuous onsite presence to facilitate all of the Board's review efforts. The Board currently has a total of 11 site representatives assigned to six DOE sites (Los Alamos National Laboratory, the Hanford Site, Lawrence Livermore National Laboratory, the Pantex Site, the Savannah River Site, and the Y-12 National Security Complex).

The Board's concerns with defense nuclear facilities, historically fall into several general areas:

- ***Safety basis strategy and controls.*** Issues in this area typically result from one or a combination of the following: less than adequate analysis of facility hazards, poorly developed accident scenarios, less than rigorous assessment of the quantity and form of radioactive materials released following a hypothesized accident, and poorly developed safety-related controls resulting from a lack of process knowledge.
- ***Structural design.*** Issues in this area are frequently due to less than rigorous geotechnical investigations, inadequate specification of requirements, shortcomings in the layout of a facility that unnecessarily complicate the design process, and inadequacies in structural modeling and analysis.
- ***Application of codes and standards.*** Issues in this area commonly result from the inappropriate selection or application of codes and standards and the inadequate flow of these requirements down to subtier vendors.

The DOE design process is an iterative process from identification of the mission need through design, construction, and startup of the facility. There are several defined key milestones (Critical Decisions) throughout the process which are intended to provide formal DOE decisions to assess the need for a design, progress of the design, schedule for completion, likelihood of success, and cost. The project phases represent a logical maturing of the project design. Each critical decision point marks an increased DOE commitment to the project and, correspondingly, the necessary resources to complete the next phase of the project. The critical decisions are:

- Approve Mission Need (Critical Decision-0),
- Approve Alternative Selection and Cost Range (Critical Decision-1),
- Approve Performance Baseline (Critical Decision-2),
- Approve Start of Construction (Critical Decision-3), and
- Approve Start of Operations or Project Completion (Critical Decision-4).

Many DOE projects have a reasonable path forward for achieving safety in the design. For other projects, the Board and DOE will have to arrive at an agreed-upon path forward to develop the needed design details early in the next stage of the design. The goal is to resolve outstanding issues with defense nuclear projects as early during the design phase of the project as logically possible. The recent changes to DOE Order 413.3A require earlier development of important safety decisions that are formally approved by DOE. The Order now requires preparation of a Conceptual Safety Design Report and a Preliminary Safety Validation Report to support Critical Decision-1. DOE Order 413.3A has been issued but is not required to be implemented until 6 months after DOE-STD-1189 has been issued.

DOE is currently preparing DOE-STD-1189 which provides the details of the expectations for implementing the requirements of the revised DOE Order 413.3A. Many current DOE projects are in transition between the existing design approach and the new approach that emphasizes earlier identification of safety-related systems. These projects will meet existing design expectations, but may not develop the design early enough to identify safety-related systems by the completion of the conceptual design, which is DOE's current goal. Some ongoing projects are attempting to address these new expectations but lack the necessary design maturity. This situation results from an incomplete understanding of the new expectations, insufficient design detail to fully address safety-in-design objectives in the early design phases, inability to advance the design prior to a scheduled critical decision, overly aggressive schedules, or a lack of funding to advance the design.

The 25 facility design activities that the Board is following fall into three broad categories:

- Those facilities with the most significant issues,

- Those facilities with lesser issues, and
- Those facilities that currently have no issues or have not been reviewed by the Board in any detail

The defense nuclear facilities in the first of these categories are discussed in Section 2.3 below. More detailed discussion of these facilities, as well as discussion of those facilities in the latter two categories, is provided in Section 4.

2.3 FACILITIES WITH THE MOST SIGNIFICANT ISSUES

Significant progress has been made toward resolving issues associated with several of these facilities since the Board's first quarterly report. The status of these issues is summarized below.

Savannah River Site, Salt Waste Processing Facility. This facility has been of particular concern to the Board because of technical shortcomings in the design process—a lack of geotechnical requirements, structural issues, and issues related to structural modeling. A Board letter dated January 13, 2007, summarized these concerns and encouraged their prompt resolution to improve nuclear safety and to avoid adverse schedule and cost impacts. The Board is satisfied with the actions taken by DOE and its contractor to resolve issues associated with the design of the Salt Waste Processing Facility. Appropriate structural design expertise and DOE oversight have been brought to bear on the project. Geotechnical requirements are being finalized, and changes to the structural design methodology and the structural design have been made. While significant design work remains to be completed, the path forward to continue the design process is acceptable. DOE is taking action to address these issues and the Board is working closely with DOE to minimize impacts on the high-level waste program at the Savannah River Site.

Hanford, Waste Treatment Plant. This complex plant includes four major facilities. The Board has identified issues in the areas of seismic ground motion, structural engineering, chemical processing safety, and fire protection. DOE is making progress toward resolving these issues. The Board believes the path forward identified by DOE and its contractor for addressing these issues should achieve an acceptably safe design.

Los Alamos National Laboratory, Chemical and Metallurgy Research Replacement Project. Early in this project, the Board noted its concern regarding the acquisition strategy being employed. Additionally, the Board was concerned about the need to establish conservative design criteria for several safety-related systems—ventilation, fire suppression, and container design. An additional issue is the lack of final site characterization and seismic design criteria. The preliminary design is expected to be complete in fiscal year 2007. Since the Board's first quarterly report, the National Nuclear Security Administration (NNSA) has directed the project to revise its Acquisition Execution Plan. According to the revised plan, the final

design will be completed and approved before the performance baseline (Critical Decision-2) for the project, which will not occur earlier than fiscal year 2009. Based on this revised direction, an approved final design and preliminary documented safety analysis will be established before the performance baseline. This action resolves the Board's issue with the previous acquisition strategy. Issues related to the ventilation system design have been resolved. Site characterization and development of the final seismic design criteria are under way. Conservative seismic design criteria have been established to allow the design process to proceed in light of an expected 50 percent increase in the seismic criteria for this facility. DOE and its contractor are working to resolve the remaining issues; however, the details remain to be developed.

Y-12 National Security Complex, Uranium Processing Facility. This project is very early in the design phase; the conceptual design has not been approved by NNSA. This project was selected by the Board and NNSA to help establish a mutual understanding of safety expectations under the new DOE Order 413.3A and to demonstrate early incorporation of safety into the design of this complex facility. In light of progress made in the past several months, the Board believes the safety basis controls identified for the facility at the conceptual level of design provide an adequate basis for continuing the design process into the preliminary design phase. This project will be removed from the Board's listing of facilities of greatest concern.

Hanford, K-Basin Closure Sludge Treatment Project. The design of this project is almost complete, and the project is approaching the start of construction. The Board is concerned that the safety basis document submitted to DOE for approval was not based on the current design of the system and does not ensure that safety systems will perform credited safety functions. Consistent with the Board's concern, DOE evaluated the safety basis document and issued its safety evaluation report with conditions of approval that halted procurement activity until the design could be assured of performing credited safety functions. Design issues associated with the safety systems that were raised by the Board have been formally documented for resolution by the project. The baseline schedule for the project is being reevaluated. Resolution of safety and operational issues will likely result in delaying the start of operations.

3. STATUS OF OTHER ONGOING INITIATIVES

3.1 REVISION OF PERTINENT DOE DIRECTIVES

The Board is required by its enabling statute to review and evaluate the content and implementation of health and safety standards, including DOE's orders, rules, and other safety requirements, practices, and events relating to system design, construction, operation, and decommissioning of DOE's defense nuclear facilities. In response to the Board's public meetings concerning early integration of safety into the design of defense nuclear facilities, DOE acknowledged that safety was not consistently being integrated into its new defense nuclear facilities. DOE is taking action to revise the following directives to better define its expectations for integration of safety early in the design of new defense nuclear facilities.

3.1.1 DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*

The Order was recently revised to reflect senior DOE management's objective of early integration of safety into the design process. In particular, the Order requires that safety design reports be prepared at the conceptual design and preliminary design stages, in addition to the Preliminary Documented Safety Analysis at the final design stage. These reports are envisioned to contain an evaluation of the safety aspects of the design. The Order delineates the need to charter an Integrated Project Team led by the Federal Project Director at the conceptual design stage and further clarifies the safety role of DOE's Central Technical Authority, Chief of Defense Nuclear Safety, and Chief of Nuclear Safety. These are positive changes that will enhance safety in design.

Implementation of the Order is being held in abeyance by DOE until 6 months after a new standard, DOE-STD-1189, *Integration of Safety into the Design Process*, has been issued.

3.1.2 DOE-STD-1189, *Integration of Safety into the Design Process*

This standard is intended to provide guidance on expectations for integrating safety into the design of the more hazardous nuclear facilities as delineated in DOE Order 413.3A. The standard is expected to focus on developing the majority of a design's safety requirements by the end of the conceptual design phase (Critical Decision-1) and obtaining formal DOE agreement with those requirements. Progress toward developing the standard is continuing in accordance with DOE's plans. A draft of the standard was submitted for formal review at the end of March 2007. This review is scheduled to last 60 days and will be followed by a formal comment resolution period. DOE anticipates that the standard will be issued in the summer of 2007.

3.1.3 DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*

DOE's Office of Engineering and Construction Management is responsible for revising this manual to reflect the recent changes to DOE Order 413.3A. The Office of Engineering and Construction Management has chosen to restructure the existing manual into a series of guides. These guides will be prepared during roughly the next year and a half. Although the Office of Engineering and Construction Management is the assigned lead, it will not be responsible for preparing the content of individual guides. Instead, it has elected to have individual programs (e.g., NNSA and the Office of Environmental Management) prepare each guide. The intent is to have programs with the appropriate technical expertise prepare the guidance, with the Office of Engineering and Construction Management taking the role of project manager. This relationship appears to be suitable for involving appropriate expertise in the effort.

3.2 THE BOARD'S PUBLIC MEETINGS ON INCORPORATING SAFETY IN DESIGN

During the Board's first public meeting on incorporating safety in design, on December 7, 2005, DOE acknowledged that safety was not being integrated consistently into the design of new defense nuclear facilities. In preparation for that meeting, DOE outlined its expectations for integrating safety into design and established a framework for achieving needed improvements.

During its second public meeting on this topic on July 19, 2006, the Board explored the early integration of safety into design and progress being made toward implementing DOE's expectations to this end. Some progress had been made, but many of the actions being undertaken by both the Office of Environmental Management and NNSA had not yet been completed. The Board believes completion of these actions should help establish a robust process that will ensure consistent early integration of safety into design. Once such a process has been established, continued senior management attention, resources, and cooperation among DOE programmatic elements will be necessary to ensure its proper implementation.

The Board's third public meeting on March 22, 2007, considered early issue identification, communication of the Board's issues to DOE, issue management, and timely closure or resolution. During this meeting, DOE outlined many of the improvements that have occurred as a result of its safety-in-design initiatives. DOE noted that resolving safety issues early in the design process is central to mitigating cost and schedule risks. DOE also identified the need for strong and persistent federal oversight of new design and construction projects. The results of this meeting will assist the Board and DOE in their efforts to evaluate potential improvements in the timeliness of issue resolution as requested by Congress. During the meeting, DOE committed to completing the development of DOE-STD-1189 and the planned revisions to DOE Manual 413.3-1. DOE also committed to developing a strategy for implementation of DOE-STD-1189; this strategy is expected to be completed by late summer 2007.

4. STATUS OF UNRESOLVED ISSUES

The Board's reviews of the design and construction of major facilities and projects are resource-intensive and time-consuming. Therefore, the Board's review efforts are generally subject to prioritization. The Board prioritizes its review efforts based on an informal rating of three characteristics: risk (assessment of both safety and programmatic risks for the facility), complexity (assessment of the relative difficulty of successfully implementing the design), and significance (overall importance of the facility to the mission of the complex).

Many current DOE projects are in transition between the existing design approach and one that meets the new DOE Order 413.3A expectation that emphasizes earlier identification of safety-related systems. These projects will meet existing design expectations, but will not develop the design early enough to identify safety-related systems by the completion of the conceptual design, which is DOE's current goal. Some ongoing projects are attempting to address these new expectations, but lack the necessary design maturity. This lack of design maturity results from an incomplete understanding of the new DOE Order 413.3A expectations, insufficient design detail to fully address safety-in-design objectives in the early design phases, the inability to advance the design prior to a scheduled critical decision, an overly aggressive schedule, or a lack of funding for the advancement of the design.

In its first quarterly report, the Board identified 25 defense nuclear facilities being constructed or having major modifications performed for which it has jurisdiction. Significant progress has been made toward resolving issues associated with several of these facilities. This section provides a brief review of the status of significant issues associated with these facilities that remain unresolved. For each facility, the following information is provided: (1) a short description of the project, (2) status of the facility, (3) status of significant issues identified by the Board, which includes the status provided in the Board's first quarterly report, followed by an updated status. As used here, the term "unresolved issues" does not necessarily imply that the Board has a disagreement with DOE or believes DOE's path forward is not appropriate. Some of the issues addressed here simply await final resolution through further development of the facility design. All of the significant unresolved issues discussed here have been communicated to DOE personnel. Minor issues that the Board believes can be easily resolved and have an agreed-upon path forward are not included; such issues will be followed as part of the Board's normal design review process. It is important to note that this summary represents current status; additional issues may be identified as the Board conducts its continuing design reviews. No new issues have been identified by the Board during the period of this report. The appendix to this report provides a summary of the Board's issues by project.

4.1 HANFORD

4.1.1 Waste Treatment Plant

The Waste Treatment Plant comprises four major facilities (Pretreatment, High Level Waste, Low Activity Waste, and Analytical Laboratory) and numerous support facilities (Balance of Facilities) that will treat and immobilize high-level waste currently in 177 underground storage tanks at the Hanford Site.

The Board was not initially involved in the review of the Waste Treatment Plant, which began in 1995 as a privatization program not under the Board's jurisdiction. Starting in 1997, and for about three and a half years, the Nuclear Regulatory Commission assisted DOE in performing reviews consistent with its regulatory approach.

In mid-2000, DOE abandoned this privatization approach, and by the end of that year awarded a contract to Bechtel National Incorporated to complete the project as a DOE-owned facility. For about a year, Bechtel National Incorporated was engaged in various activities such as validation of the baseline, hiring and training, due diligence review of the previous design, and safety basis certification as contractually required by DOE. Significant design activity recommenced toward the end of 2001, at which time the Board began to exercise safety oversight of the project.

During March 2002, the Board commenced detailed review of the Waste Treatment Plant site characterization and ground motion. Four months later, in July 2002, the Board provided formal correspondence to the Assistant Secretary for Environmental Management documenting its concern that the seismic design criteria being used for the Waste Treatment Plant underestimated the seismic loads. During the ensuing years, the Board has communicated other safety-related issues to DOE concerning structural design, chemical process safety, fire protection, electrical distribution, confinement ventilation and development of the safety basis. The Board's reviews were purposefully aggressive to permit early identification of issues and to accommodate DOE's desire to pursue an aggressive design and construction schedule.

In October 2005, the Board transmitted a letter to DOE that summarized the safety issues identified by the Board that remained unresolved. The Board believed this summary would be useful to DOE in understanding the state of the Board's nuclear safety reviews at the Waste Treatment Plant. The Board continued to advise DOE to focus on providing and preserving adequate margins using conservative assumptions to ensure that the design and construction of the Waste Treatment Plant would result in a safe, robust, and successful facility. DOE has made progress in addressing the Board's concerns but several issues as noted in the following pages still remain. The Board expects that each issue can be resolved in a satisfactory manner.

4.1.1.1 Pretreatment Facility

Description: The Pretreatment Facility will receive high-level waste from the Hanford tank farms. It will separate the waste into high-activity waste that will be treated in the High Level Waste Facility and low-activity waste that will be treated in the Low Activity Waste Facility.

Status of Facility: Critical Decision-3 has been approved. The facility is expected to be operational in 2019. The design is about 70 percent complete. Construction is about 25 percent complete.

Status of Significant Board Issues:

Seismic Ground Motion

Issue—The initial ground motion for the design basis earthquake was not technically defensible and was revised upward to address uncertainties in subsurface soil and rock properties. A deep drilling program is under way to address these uncertainties; it involves directly measuring soil and rock properties and completing supporting laboratory sample analysis. These data potentially affect the specified ground motion for the design basis earthquake.

Safety Significance—The Pretreatment Facility structure and a significant amount of processing equipment are classified as safety-class to protect the public. A technically defensible design basis earthquake will ensure that the facility structure is designed properly to resist unacceptable degradation and that safety-class components would continue to perform their safety function following a design basis earthquake.

Expectation—The geologic characterization of soil and rock will confirm that the currently specified ground motion is conservative to support completion of the design of the structure and equipment.

When—Geologic work is expected to be completed in early 2007.

Updated Status (2)¹—The field work for the deep drilling program has been completed. Analyses are under way to assess the impact of the new soil and rock properties on the ground motion for the design basis earthquake.

¹ (#) indicates in which quarterly report the updated status was presented.

Structural Engineering

Issue—The Board raised several issues regarding the structural design—inadequate modeling, no clear seismic load transfer capability in the structure, and an inadequate finite element analysis. DOE developed new structural design criteria that address the issues raised by the Board. The details of the application of these criteria are still being developed by the contractor and thus have not been evaluated by the Board.

Safety Significance—The Pretreatment Facility structure and a significant amount of processing equipment are classified as safety-class to protect the public. A technically defensible structural analysis will ensure that the facility is designed properly to resist unacceptable degradation and that safety-class components would continue to perform their safety function following a design basis earthquake.

Expectation—Details and results of analyses will be provided in revised structural summary reports requested by the Board for the Pretreatment Facility. These results should show that the facility meets structural design requirements.

When—DOE has not provided a completion date for the summary structural report for the Pretreatment Facility. Issuance of the report is dependent on completion of the Pretreatment Facility reanalysis.

Updated Status (2)—DOE provided an outline of the summary structural report and committed to completing the report by the end of 2007.

Chemical Process Safety

Issue—The issue relates to hydrogen accumulation in plant equipment. Some of the equipment is in black cells that are not intended to be accessible for the life of Waste Treatment Plant operations.

Safety Significance—Hydrogen explosions could damage safety-class and safety-significant systems or components that protect the public and workers from radioactive exposure. Additionally, repair following an explosion would result in increased exposure to workers, and interrupting Pretreatment Facility operations would impact overall risk reduction efforts for the site.

Expectation—DOE will implement engineered and administrative controls to protect the public and workers. Where hydrogen explosions could damage equipment, DOE must develop and implement engineered or administrative controls. The administrative controls, if properly implemented, will be adequate to reduce the likelihood and impact of an explosion. DOE has developed a conservative design criterion, but the contractor is still attempting to demonstrate that failure of process

components is unlikely and that the consequences of such failure are adequately mitigated. The approach for in-line components has not yet been demonstrated.

When—The contractor has not yet completed all calculations and related engineering work, including determination of the impact of a hydrogen detonation on process components. The remaining work is scheduled for completion by March 2007.

Updated Status (2)—The contractor has made significant progress toward completion of calculations and related engineering work, including the impact of a hydrogen detonation on process components. DOE is evaluating the supporting documentation. The Board expects to review DOE's findings and issue resolution by the end of 2007.

4.1.1.2 High Level Waste Facility

Description: The High Level Waste Facility will receive the high-activity portion of the high-level waste from the Pretreatment Facility. This waste will be immobilized by vitrification for subsequent disposal in an offsite high-level waste repository.

Status of Facility: Critical Decision-3 has been approved. The facility is expected to be operational in 2019. The design is about 80 percent complete. Construction is about 20 percent complete.

Status of Significant Board Issues:

Seismic Ground Motion

Issue—The initial ground motion for the design basis earthquake was not technically defensible and was revised upward to address uncertainties in subsurface soil and rock properties. A deep drilling program is under way to address these uncertainties; it involves directly measuring soil and rock properties and completing supporting laboratory sample analysis. These data potentially affect the specified ground motion for the design basis earthquake.

Safety Significance—The High Level Waste Facility structure and a significant amount of processing equipment are classified as safety-class to protect the public. A technically defensible design basis earthquake will ensure that the facility structure is designed properly to resist collapse and that safety-class components would continue to perform their safety function following a design basis earthquake.

Expectation—The geologic characterization of soil and rock will confirm that the currently specified ground motion is conservative to support completion of the design of the structure and equipment.

When—Geologic work is expected to be completed in early 2007.

Updated Status (2)—The field work for the deep drilling program has been completed. Analyses are under way to assess the impact of the new soil and rock properties on the ground motion for the design basis earthquake.

Structural Engineering

Issue—The Board raised several issues regarding the structural design—inadequate modeling, no clear seismic load transfer capability in the structure, and an inadequate finite element analysis. DOE developed new structural design criteria that address the issues raised by the Board. The details of the application of those criteria are still being developed by the contractor and thus have not been evaluated by the Board.

Safety Significance—The High Level Waste Facility structure and a significant amount of processing equipment are classified as safety-class to protect the public. A technically defensible structural analysis will ensure that the facility is designed properly to resist unacceptable degradation and that safety-class components would continue to perform their safety function following a design basis earthquake.

Expectation—Details and results of analyses will be provided in revised structural summary reports requested by the Board for the High Level Waste Facility. These results should show that the facility meets structural design requirements.

When—A revised draft summary structural report for the High-Level Waste Facility was forwarded to the Board in December 2006. Comment resolution and issuance of the report is dependent on completion of the High Level Waste facility re-analysis.

Updated Status (2)—The Board provided comments to DOE on a draft summary structural report. DOE agreed with these comments and committed to issuing the revised report by end of 2007.

Fire Protection

Issue—Typical construction practices provide fireproof coatings on structural steel members that may be subjected to fire. DOE and the contractor have proposed not providing a fireproof coating if it is determined that the facility would not be adversely affected should a steel member fail in a fire.

Safety Significance—The High Level Waste Facility structure is classified as safety-class to protect the public. Heating of the steel members weakens them, potentially to the point that they would be unable to carry any load. This could ultimately lead to building collapse and loss of confinement.

Expectation—The contractor will develop a technically sound methodology for identifying structural steel members that do not require a fireproof coating. Structural

analyses should support the conclusion that such a structural steel member could fail without impacting the structure or adjacent safety systems.

When—The methodology for identifying structural steel members that could fail without jeopardizing the High Level Waste Facility is scheduled for completion by February 2007. The contractor has not identified a date for completion of the supporting structural analyses using this methodology.

Updated Status (2)—The methodology for identifying structural steel members that could fail without jeopardizing the facility was presented to the Board in March 2007 and was found acceptable. The analytical work is now scheduled for completion in the summer of 2007.

4.1.1.3 Low Activity Waste Facility

Description: The Low Activity Waste Facility will receive the low-activity portion of the high-level waste from the Pretreatment Facility. This waste will be immobilized by vitrification for subsequent disposal onsite.

Status of Facility: Critical Decision-3 has been approved. The facility is expected to be operational in 2019. The design is about 92 percent complete. Construction is about 44 percent complete.

Status of Significant Board Issues:

Fire Protection

Issue—Typical construction practices provide fireproof coatings on structural steel members that may be subjected to fire. DOE and the contractor have proposed not providing a fireproof coating if it is determined that the facility would not be adversely affected should a steel member fail in a fire.

Safety Significance—The Low Activity Waste Facility structure is classified as safety-significant to protect workers. Heating of the steel members weakens them, potentially to the point that they would be unable to carry any load. This could ultimately lead to building collapse and loss of confinement.

Expectation—The contractor will develop a technically sound methodology for identifying structural steel members that do not require a fireproof coating. Structural analyses should support the conclusion that such a structural steel member could fail without impacting the structure or adjacent safety systems.

When—The revised methodology for the Low Activity Waste Facility was scheduled for completion in December 2006. The formal methodology has not been provided to the Board.

Updated Status (2)—The methodology for identifying structural steel members that could fail without jeopardizing the facility was presented to the Board in March 2007 and was found acceptable. The analytical work is now scheduled for completion in the summer of 2007.

4.1.1.4 Analytical Laboratory Facility

Description: The Analytical Laboratory Facility provides an onsite analysis capability to support the high-level waste treatment and vitrification processes. Its analyses are intended to validate the feed input requirements, allow treatment optimization throughout the processes, and allow certification of the final vitrified glass waste form.

Status of Facility: Critical Decision-3 has been approved. The facility is expected to be operational in 2019. The design is about 86 percent complete. Construction is about 37 percent complete.

Status of Significant Board Issues:

Fire Protection

Issue—Typical construction practices provide fireproof coatings on structural steel members that may be subjected to fire. DOE and the contractor have proposed not providing a fireproof coating if it is determined that the facility would not be adversely affected should a steel member fail in a fire.

Safety Significance—The Analytical Laboratory Facility structure is classified as safety-significant to protect workers. Heating of the steel members weakens them, potentially to the point that they would be unable to carry any load. This could ultimately lead to building collapse and loss of confinement.

Expectation—The contractor will develop a technically sound methodology for identifying structural steel members that do not require a fireproof coating. Structural analyses should support the conclusion that such a structural steel member could fail without impacting the structure or adjacent safety systems.

When—The revised methodology for the Analytical Laboratory Facility was scheduled for completion in December 2006. The formal methodology has not been provided to the Board.

Updated Status (2)—The methodology for identifying structural steel members that could fail without jeopardizing the facility was presented to the Board in March 2007 and was found acceptable. The analytical work is now scheduled for completion in late summer 2007.

4.1.2 Demonstration Bulk Vitrification System Project

Description: The Demonstration Bulk Vitrification System project consists of research, development, and demonstration of a vitrification process for high-level waste that will supplement processing done by the Waste Treatment Plant. Research and development of the process involves laboratory, engineering, and full-scale testing. The process is being evaluated to support a decision regarding supplemental treatment of low-activity waste from the high-level waste tanks at Hanford.

Status of Facility: Critical Decision-1 has been approved. The facility is expected to be operational in 2011. The design is about 90 percent complete. Some initial ground work and concrete foundation work have been completed, but construction of the facility has not started.

Status of Significant Board Issues:

Confinement Strategy

Issue—The early design had a number of major vulnerabilities with respect to the overall confinement of the hazardous wastes to be processed. The confinement strategy has been evolving. The Board is now satisfied with the general confinement strategy presented by project personnel. However, neither the technical analysis confirming the adequacy of the confinement barriers and the magnitude of the radiological source term nor the technical rationale for discounting certain major accident scenarios is yet available.

Safety Significance—To protect workers and the public, hazardous waste in portions of the system must be appropriately confined.

Expectation—The technical justification for the confinement barriers, source term, and accident scenarios being considered will be provided.

When—A revised Preliminary Documented Safety Analysis should be available in late 2007. This analysis should allow evaluation of the adequacy of the confinement barriers.

Updated Status (2)—No significant changes.

4.1.3 K-Basin Closure Project Sludge Treatment Project

Description: Sludge Treatment is a subproject of the overall K-Basin Closure Project that involves a major modification of two operating facilities to provide a capability to treat waste sludge from corroded spent uranium fuel and package it for disposal. The

sludge will be treated at moderately high temperature and pressure to ensure full oxidation of remaining metallic spent uranium prior to disposal.

Status of Project: The design is about 90 percent complete, and the project is approaching what would be Critical Decision-3, Start of Construction. However, this subproject is not implementing critical decision points and is not formally implementing DOE Order 413.3.

Status of Significant Board Issues:

Completeness of Preliminary Documented Safety Analysis

Issue—The contractor submitted a Preliminary Documented Safety Analysis to DOE for approval; however, it is not based on the current design of the system. In addition, several safety-related systems, structures, and components are still being designed and need further analysis (e.g., single-point failure, redundancy, separation) to determine whether they can adequately perform their safety functions.

Safety Significance—The Sludge Treatment process has the potential for significant safety consequences to workers and the public. The approval of a Preliminary Documented Safety Analysis based on incomplete information fails to ensure that the safety equipment being fabricated and installed provides adequate protection for workers and the public.

Expectation—The Preliminary Documented Safety Analysis will be based on the current design and will provide assurance that the safety systems can adequately perform their credited safety functions.

When—The Preliminary Documented Safety Analysis is expected to be approved in early 2007.

Updated Status (2)—DOE has recently decided to formally implement the requirements of Order 413.3 for this subproject. Consistent with the Board's concern, DOE issued conditions of approval in its safety evaluation report for the Preliminary Documented Safety Analysis that halted procurement activity until the design has matured sufficiently to assure that safety systems will be capable of performing credited safety functions. DOE terminated review of an updated Preliminary Documented Safety Analysis until the design issues are resolved and final design information is incorporated. Approval of the Preliminary Documented Safety Analysis is now expected in the summer of 2008. Design issues related to the safety systems that were raised by the Board have been formally documented for resolution by the project. The project is reevaluating the baseline schedule. Resolution of safety and operational issues will result in delaying the start of operations.

4.1.4 Tank Retrieval and Waste Feed Delivery System

Description: This system comprises several subprojects that are being undertaken to provide the capability to mix, retrieve, and transfer high-level waste from individual waste tanks as feed to the Hanford Waste Treatment Plant.

Status of System: One individual subproject does not appear to be managed with formal critical decision milestones. Some of the work started in the mid-1990s, and the subprojects are at various stages of completion. The individual subprojects are essentially on hold because of the delay in the schedule for the Waste Treatment Plant or reduced funding.

Status of Significant Board Issues: The Board is not currently reviewing these subprojects because of higher priorities and the delay in the schedule for the Waste Treatment Plant. The Board did previously identify issues regarding the design pressure rating of the waste transfer system.

Design Pressure Rating of Waste Transfer System

Issue—The Board found that the analysis performed to determine the minimum design pressure rating of the waste feed delivery transfer system was not technically defensible because of the many uncertainties in the assumptions made. DOE formed an expert panel that concluded that these uncertainties are accommodated by using conservative values. However, the panel noted the need for an improved understanding of process variations, additional testing, and model revisions. Recently, the contractor noted that work to close several recommendations made by the expert panel had never been completed. DOE and its contractors are working to address the technical issues associated with waste transfer.

Safety Significance—Proper system design and operations are needed for adequate flow during waste transfer to prevent the settling of solid material and plugging. Plugging of the transfer line could impact waste feed delivery. Line blockages that could not be cleared by flushing would require manual repair, which poses the potential for radiation exposure to workers.

Expectation—DOE will disposition the recommendations of its expert panel.

When—Recommendations of the expert panel need to be dispositioned in time to support any needed improvements in the system before waste is transferred to the Waste Treatment Plant. A firm schedule for accomplishing this has not been developed.

Updated Status (2)—An action plan and revised, updated status is now expected to be provided to DOE and the Board by the contractor in June 2007.

4.1.5 Immobilized High-Level Waste Interim Storage Facility Project

Description: This project will provide interim storage of immobilized high-level waste from the Waste Treatment Plant. The interim storage facility will store vitrified waste until it can be sent to a national repository for final disposition.

Status of Facility: Critical Decision-3 has been approved. Further work on the project has been deferred until fiscal year 2010 because of delays in the schedule for the Waste Treatment Plant, and a schedule for the start of operations has not been established.

Status of Significant Board Issues: The Board has identified no issues regarding this project. The Board is not currently reviewing this project because of higher priorities and the delay in the schedule for the Waste Treatment Plant.

Updated Status (2)—No significant changes.

4.2 IDAHO NATIONAL LABORATORY

4.2.1 Integrated Waste Treatment Unit Project

Description: The Integrated Waste Treatment Unit will use steam reforming technology to convert approximately 900,000 gallons of sodium-bearing waste at the Idaho National Laboratory to a solid carbonate or mineralized product for permanent disposal at the Waste Isolation Pilot Plant or an offsite monitored geologic repository. The Integrated Waste Treatment Unit will also stabilize additional wastes generated by continued cleanup efforts at the site. The facility may have a future mission to support the recovery of high-level waste calcine for offsite disposal.

Status of Facility: Critical Decision-2/3B was approved in late December 2006. The final design review is scheduled for March 2007. Construction is planned to begin in March 2007 with concrete foundation placement. The phased Critical Decision-3 approach authorizes procurement of long-lead material and early site preparation work. The facility is expected to be operational in 2009.

Status of Significant Board Issues: The Board has identified no significant issues regarding this project at this time. However, the Board is following several matters because of their importance in achieving overall safety in the final design. These matters include the following:

Pilot Plant Testing

Issues—The final disposition location for the waste has not been established. The expected disposition path is to send the carbonate waste form to the Waste Isolation

Pilot Plant. If this path is not available, a mineralized waste form may be necessary for disposal at a geological repository. Pilot plant testing of the carbonate and mineralized waste form has been completed, but the final mineralized test report will not be available for review until early 2007.

An overtemperature condition developed in the charcoal adsorber bed during testing. Investigation of the root cause of this event is being finalized.

Safety Significance—Formally documenting the mineralized test results will help identify major process issues associated with this waste form, supporting the design of a facility that can provide adequate protection for facility workers should this waste form be required in the future.

A completed root-cause investigation into the charcoal adsorber bed overtemperature event will potentially identify controls needed to prevent recurrence of such an event in the Integrated Waste Treatment Unit. A charcoal adsorber bed overtemperature event requires safety-significant controls to protect facility workers from a mercury release.

Expectation—Investigation of the charcoal adsorber bed overtemperature event will be completed, and any needed safety controls will be incorporated into the Integrated Waste Treatment Unit to preclude such an event. Applicable lessons learned from mineralized testing will be incorporated into the full-scale facility's design if the mineralized waste form is chosen.

When—The adsorber bed investigation should be completed in early 2007. The final mineralized test report will also be issued in early 2007.

Updated Status (2)—No significant changes, reports have not been issued yet.

Waste Characterization

Issue—Further characterization of the waste or the safety-related control on the feed is needed to ensure that the safety basis assumptions regarding the radionuclide content of the waste are valid. Additional tank sampling began in 2006 but is not yet complete.

Safety Significance—Characterization of the sodium-bearing waste (through either tank sampling or feed qualification) will ensure that the Integrated Waste Treatment Unit will be operated within the bounds of its safety basis, thereby providing adequate protection of facility workers.

Expectation—Results will be reviewed to ensure that existing radionuclide data are conservative. If the data do not support the safety basis, an additional safety-related control on the feed will be incorporated into the design and operation of the

Integrated Waste Treatment Unit to ensure operation within the bounds of the safety basis.

When—Sampling results should be available for review in early 2007.

Updated Status (2)—No significant changes, sample results are not yet available.

Distributed Control System Design

Issue—The Distributed Control System is relied upon to place the process in a safe condition should a safety limit be exceeded or to shut the process down via fail-safe logic if the control system should fail. However, the final design is not yet complete. Further, the ability of the system to monitor process conditions following an earthquake is not assured with the current design.

Safety Significance—Adequate design of the Distributed Control System will ensure that the system will perform its safety-significant functions. Design of the fail-safe logic and provision of a limited means of monitoring the process following a seismic event will provide defense-in-depth assurance of safe shutdown to protect facility workers involved in recovery operations.

Expectation—The Distributed Control System design will be demonstrated to be capable of placing the process in a safe configuration if operational safety limits are exceeded or if the system fails (e.g., during a seismic event). Postseismic monitoring capability will be considered for the Integrated Waste Treatment Unit process to provide assurance that the process is in a safe configuration.

When—The Distributed Control System design should be finalized by early 2007.

Updated Status (2)—No significant changes, design has not been finalized.

4.3 LOS ALAMOS NATIONAL LABORATORY

4.3.1 Chemistry and Metallurgy Research Replacement Project

Description: The Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory is being planned to relocate and consolidate support capabilities for analytical chemistry, materials characterization, and actinide research and development now housed in the Chemistry and Metallurgy Research Facility. The project consists of three primary elements: the Radiological Laboratory/Utility/Office Building, Special Facility Equipment, and the Nuclear Facility. The Nuclear Facility will be a Hazard Category 2 facility and poses the greatest hazard because of its substantial inventory of uranium and plutonium, as well as the presence of various hazardous materials. Only the Nuclear Facility is discussed here.

Status of Facility: Critical Decision-1 has been approved. The preliminary design of the Nuclear Facility is about 70 percent complete. Critical Decision-2/3 is expected to be approved in July 2007. The Nuclear Facility is expected to be operational in 2014.

Status of Significant Board Issues:

Design-Build Acquisition Strategy

Issue—NNSA acquisition strategy for the Chemistry and Metallurgy Research Replacement Project combines Critical Decision-2 (approval of performance baseline) and Critical Decision-3 (approval to start construction). *This strategy essentially eliminates NNSA's formal review of the final design prior to construction.*

Safety Significance—As noted, NNSA's acquisition strategy essentially eliminates the agency's formal review of the final design prior to construction, raising concern that critical safety-related design issues may be overlooked. NNSA personnel have acknowledged the Board's concern but believe they have a plan to execute the project that includes a rigorous review of the final design of the facility. This plan includes a design acceptance review prior to release for construction, but details of that review have not been established.

Expectation—The preliminary design will be more developed than is typically expected at Critical Decision-2 to support a combined Critical Decision-2/3 decision. To this end, an essentially final design and a completed Preliminary Documented Safety Analysis with an NNSA safety evaluation report will be required. The details of the planned NNSA design acceptance review will be established, and the resources necessary to conduct this review will be available prior to approval of Critical Decision-2/3 authorizing the start of construction. This is critical for design-build projects as the design cannot be changed once construction has started without major project impacts.

When—Critical Decision-2/3 is anticipated in July 2007.

Updated Status (2)—Since the Board's first quarterly report, NNSA has directed the project to revise its acquisition execution plan. The preliminary design is expected to be complete in fiscal year 2007. Once the preliminary design has been completed, reviewed, and accepted, the project will continue into the final design phase. According to the revised plan, the final design will be completed and approved before the performance baseline (Critical Decision-2) for the project is established. The performance baseline will not be established earlier than fiscal year 2009.

This revised direction essentially modifies the acquisition strategy to a more traditional design-bid-build approach, thereby resolving the Board's issue with the previous acquisition strategy. This issue is therefore considered closed.

Site Characterization and Seismic Design

Issue—The seismic design ground motion criteria have not been finalized. Los Alamos National Laboratory is updating the probabilistic seismic hazard analysis in part to support establishment of the seismic design ground motion for the Chemistry and Metallurgy Research Replacement Project. Initial results are available and are being used for the project, but the final report has not been published. Initial geotechnical data from the geotechnical exploration program are also available, but the final geotechnical report also has not been published. A small exploratory trench at the building site revealed a possible fracture that Los Alamos National Laboratory geologists interpreted as a tree root. The full excavation will be mapped to assess the presence of faults and the age of fault movement, if any.

Safety Significance—The Chemistry and Metallurgy Research Replacement Project structure and significant amounts of equipment are classified as safety-class or safety-significant, requiring appropriate seismic design. Los Alamos National Laboratory personnel are proceeding with the Chemistry and Metallurgy Research Replacement Project design based on initial estimates of seismic design ground motion. A technically defensible seismic design will ensure that facility's safety-related structures, systems, and components could perform their intended safety functions under ground motion for the design basis earthquake.

Expectation—The final probabilistic seismic hazard analysis report and final geotechnical report will be completed. The structural evaluations will appropriately incorporate the final seismic design ground motion.

When—The probabilistic seismic hazard analysis report is expected in early 2007. The geotechnical report is anticipated by July 2007. Excavation mapping is expected to be completed in April 2007.

Updated Status (2)—A draft of the probabilistic seismic hazard analysis report was published in March 2007. This report is undergoing final comment resolution and is expected to be issued in June 2007. Excavation mapping is currently under way and is now expected to be completed in August 2007.

Safety-Significant Active Ventilation System

Issue—The current active ventilation system is designated as safety-significant and helps confine hazardous material during accident scenarios, including earthquakes. The current design does not ensure that the active ventilation system would remain operable following a design basis earthquake and relies on a passive confinement mechanism that the Board has found to be neither conservative nor technically defensible.

Safety Significance—The active ventilation system would confine hazardous material during accident scenarios, including earthquakes. Adequate seismic design will ensure that the ventilation system would remain operable following the design basis earthquake.

Expectation—A comprehensive set of design requirements for a safety-significant ventilation system, along with the system design implementing those revised requirements, will be completed in time to support a combined Critical Decision-2/3. The Board agrees with the revised seismic design expectations for the ventilation system.

When—The preliminary design system description for the ventilation system is expected by April 2007. Critical Decision-2/3 is expected in July 2007.

Updated Status (2)—The system design description for the ventilation system is now expected by May 2007. The preliminary design is expected to be completed in fiscal year 2007. The project has committed to designing the safety-significant active ventilation system to ensure its operability following a design basis earthquake. On the basis of this commitment, the Board considers this issue closed at the preliminary design stage. Implementation of the final design will be monitored.

Safety-Class Fire Suppression System

Issue—The fire suppression system has been designated as safety-class. This will be the first new fire suppression system in the DOE complex built as safety-class. While the overall design approach appears reasonable, detailed design requirements and a system design implementing these requirements have not been prepared.

Safety Significance—The establishment of appropriate design requirements relates directly to the credited safety function for the safety-class fire suppression system. Typical requirements for safety-class systems, such as redundancy and single-point failure criteria, need to be established. A comprehensive set of design requirements, along with a system design implementing these requirements, needs to be completed.

Expectation—A comprehensive set of design requirements for a safety-class fire suppression system, along with a system design implementing these requirements, will be completed in time to support a combined Critical Decision-2/3. Typical requirements for safety-class systems, such as redundancy and single-point failure criteria, will be established.

When—The preliminary fire hazards analysis is expected in spring 2007. The preliminary system design description for the fire suppression system is expected by April 2007. Critical Decision-2/3 is expected in July 2007.

Updated Status (2)—The preliminary fire hazards analysis is now expected to be completed along with the preliminary design in fiscal year 2007. The preliminary system design description for the fire suppression system is to be provided to NNSA in May 2007. A complete preliminary design (including the system design description, boundaries and interfaces, design requirements, and necessary safety analyses) is required prior to the start of the final design phase in fiscal year 2008.

Safety-Class and Safety-Significant Container Design

Issue—Containers that will be used in the Long Term Storage Vault have been designated as safety-class; other containers have been designated as safety-significant. Definitive design requirements and specifications for these containers have not been established. In the Long Term Storage Vault, thermal design requirements for given geometry and spacing constraints have not been established. Without design requirements and specifications, there is no information with which to judge the adequacy of the overall safety strategy that currently relies on container design to prevent the release of large fractions of the material at risk.

Safety Significance—Design requirements and specifications provide the basis for a container design adequate to provide containment of stored plutonium.

Expectation—A comprehensive set of design requirements for these containers, along with a system design implementing those requirements, will be completed in time to support a combined Critical Decision-2/3. The Board agrees with NNSA's approach of making storage containers safety-related.

When—The preliminary system design description for the containers is expected by April 2007. Critical Decision-2/3 is expected in July 2007.

Updated Status (2)—The preliminary system design description for the containers is to be provided to NNSA in May 2007. A complete preliminary design (including the system design description, design requirements, and necessary safety analyses) is required prior to the start of the final design phase in fiscal year 2008.

4.3.2 Technical Area-55 Reinvestment Project

Description: The Technical Area (TA)-55 Reinvestment Project is a multiyear, multiphased capital investment project intended to improve the safety and compliance posture of Los Alamos National Laboratory's TA-55 facility. The phases of this project include 1A (chiller equipment and cooling towers), 1B (exhaust stack upgrade, uninterruptible power supply, criticality accident alarm systems, confinement doors, air dryers, glovebox stands, and vault water tanks), and 2 (building fire alarm devices, glovebox fire alarm devices, elevator, roof, fire water sprinkler piping, fire alarm panel and wiring, industrial waste, and various ventilation system components).

Status of Project: Execution of Phase 1A, which does not involve credited safety systems, is fully funded and scheduled for completion in June 2010. Phase 1B is partially funded and targeted for completion in 2014 under optimistic funding assumptions. Phase 2 has yet to be funded and is nominally scheduled for completion beyond 2014.

Status of Significant Board Issues: The Board has not yet performed detailed reviews of this project. The Board notes that the expansion of TA-55 missions will significantly increase the fissile material operational tempo in the coming years even prior to completion of Phase 1A. The currently envisioned phased approach for the TA-55 Reinvestment Project needs to be reviewed to ensure the completeness of identification and analysis of safety issues during both the various project phases and subsequent operations.

Updated Status (2)—No significant changes.

4.3.3 Upgrades to Pit Manufacturing Capability at Technical Area-55

Description: Upgrades are currently under way to the pit manufacturing capability at TA-55 through two interrelated programmatic campaigns—the Pit Manufacturing and Pit Manufacturing Capability subprograms. Overall, the objective of these efforts is to install manufacturing equipment necessary to produce increased numbers of pits and establish the capability to manufacture legacy pit types or, if authorized, a Reliable Replacement Warhead.

Status of Project: This activity is being managed to meet Defense Programs, *Program Management Manual*, and not as a formal project under DOE Order 413.3A. Modifications to the pit manufacturing capability at TA-55 are ongoing in a piecemeal fashion and are funded on an annual basis.

Status of Significant Board Issues: The Board recently began reviewing these upgrades and is currently evaluating whether the lack of adherence to DOE Order 413.3A is adversely impacting the integration of safety into the design. This activity will be considered together with the TA-55 Reinvestment Project (see Section 4.3.2).

Updated Status (2)—No significant changes, discussions on a path forward are continuing.

4.3.4 Radioactive Liquid Waste Treatment Facility Upgrade Project

Description: The Radioactive Liquid Waste Treatment Facility Upgrade Project will modernize the 1960s era radioactive liquid waste system at Los Alamos National Laboratory to remediate the system's significant deficiencies. This upgrade is necessary to support Los Alamos National Laboratory's primary programmatic missions.

Status of Project: Critical Decision-1 was approved on June 5, 2006. The Critical Decision-1 package proposed a single new facility. The contractor is developing a new proposal that would divide functions among a transuranic processing facility, a transuranic influent facility, a radiological facility for low-level waste processing, and a utility building. This strategy is designed to meet Critical Decision-1 commitments, but will potentially offer significant cost and schedule savings. A decision on this strategy will be made at the Critical Decision-2 stage, which is expected in the third quarter of fiscal year 2007. The facility is expected to be operational in 2011.

Status of Significant Board Issues: The Board has not performed a detailed review of this project because of higher priorities.

Updated Status (2)—On January 25, 2007, NNSA directed the contractor to proceed with the single facility design. NNSA did not believe the potential life cycle cost savings justified the programmatic risk with changing the previously approved approach.

4.3.5 New Solid Transuranic Waste Facility Project

Description: The State of New Mexico Consent Order requires closure of Area G at TA-54 in 2015. Closure of the existing transuranic waste management capabilities in Area G will result in the need for new transuranic waste management capabilities. Los Alamos National Laboratory cannot continue its programmatic activities involving nuclear materials (e.g., pit manufacturing, stockpile stewardship, and plutonium-238 work) without this capability. The conceptual design envisions four buildings for waste staging, characterization, repackaging, and shipment loading functions.

Status of Project: Critical Decision-1 approval is expected in the third quarter of fiscal year 2007. The facility is expected to be operational in 2011.

Status of Significant Board Issues: The Board has not performed a detailed review of this project because of higher priorities.

Updated Status (2)—No significant changes.

4.3.6 Nuclear Materials Safeguards and Security Upgrades Project, Phase 2

Description: Phase 2 of the Nuclear Materials Safeguards and Security Upgrades Project addresses the protection strategy and security requirements necessary to meet DOE's design basis threat. The project involves primarily increasing the battlefield space by extending perimeters and isolation zones and includes an aerial threat deterrent system above the Plutonium Facility.

Status of Project: A Safety Evaluation Report on the Preliminary Hazards Analysis was completed in September 2006. Critical Decision-2/3 is planned for November 2007. The facility is expected to be operational in 2011.

Status of Significant Board Issues: The Board has not performed a detailed review of this project because of higher priorities. While the direct nuclear safety implications of the project are minimal, the Board's interest in the project is based on the potential for adverse impacts to Plutonium Facility operations, both during and after construction of these upgrades.

Updated Status (2)—No significant changes.

4.3.7 Technical Area-55 Radiography Project

Description: The TA-55 Radiography Project is aimed at reestablishing radiography capability for nuclear weapon components. Currently, components are sent to Lawrence Livermore National Laboratory for evaluation because Los Alamos National Laboratory's facility at TA-8 is unavailable as a result of numerous infrastructure and authorization basis issues.

Status of Project: In September 2006, Los Alamos National Laboratory requested a revision to the project schedule, including retraction of the Critical Decision-1 package, to ensure that the needs of the Complex 2030 vision would be accurately reflected in the project. Future action is dependent on decisions regarding Complex 2030. The facility is expected to be operational in 2010.

Status of Significant Board Issues: The Board has not performed a detailed review of this project because of higher priorities.

Updated Status (2)—No significant changes.

4.4 NEVADA TEST SITE

4.4.1 Device Assembly Facility—Criticality Experiments Facility

Description: The Criticality Experiments Facility project will establish the unique capability within DOE to perform criticality experiments. This capability is being achieved by modifying the Device Assembly Facility at the Nevada Test Site. The criticality experiment assemblies are being relocated from outdated facilities at Los Alamos National Laboratory.

Status of Facility: Critical Decision-2 has been approved. The design of facility modifications is about 90 percent complete. Construction renovation activities have not

started. Prior to the move to the Nevada Test Site, the criticality experiment assembly controls are being updated at Los Alamos National Laboratory. The facility is expected to be operational in 2009.

Status of Significant Board Issues:

Structural Cracks

Issue—The Device Assembly Facility structure has numerous cracks that are considered abnormal for a nuclear facility. The Board's basic concern is that poor construction practices may have adversely affected the concrete's *in situ* strength and contributed to the unprecedented level of cracking.

Safety Significance—Degraded concrete strength could potentially result in failure of the structure following a design basis event.

Expectation—A quantitative assessment of the concrete's present strength will ensure that low-strength concrete did not contribute to the cracking. The Board has suggested that NNSA verify the *in situ* strength of the concrete using an acceptable nondestructive test.

When—NNSA has disagreed with the need for this testing. The Board is considering further actions. No schedule for addressing this issue exists.

Updated Status (2)—No significant changes.

4.5 OAK RIDGE NATIONAL LABORATORY

4.5.1. Building 3019—Uranium-233 Downblending and Disposition Project

Description: The Uranium-233 Downblending and Disposition Project will give DOE the capability to process the inventory of Uranium-233 stored in Building 3019 at Oak Ridge National Laboratory into a disposable form without safeguard requirements. The project will include dissolution of Uranium-233 materials, followed by blending to 0.96 percent equivalent Uranium-235 enrichment, then a denitration step to produce a final uranium oxide product for packaging and disposition. Current plans call for most of the downblended material to be disposed of at the Waste Isolation Pilot Plant, with the remainder going to the Nevada Test Site.

Status of Project: Critical Decision-1 has been approved. The project is awaiting Critical Decision-2/3A approval, expected in early 2007. The blenddown design is about 90 percent complete. Removal of Building 3019 equipment and facility modifications required prior to blenddown (construction) will not begin until Critical Decision-3A has been approved. The facility is expected to be operational in 2012.

Status of Significant Board Issues:

Preliminary Documented Safety Analysis

Issue—A revised Preliminary Documented Safety Analysis to support Critical Decision-2/3A has been prepared and submitted to DOE for comment. The revised document lacks detail on safety-related controls. A revision of the document to incorporate these items for DOE approval is not planned until after Critical Decision-2/3A has been approved.

Safety Significance—The process used for the Uranium-233 Downblending and Disposition Project has the potential for significant consequences to workers. The approval of a Preliminary Documented Safety Analysis based on incomplete information fails to ensure that the safety equipment being fabricated and installed will provide adequate protection for workers.

Expectation—A revised Preliminary Documented Safety Analysis will be prepared that provides sufficient detail on the project's safety-related controls to allow an evaluation of the adequacy of those controls.

When—According to current plans, a revised Preliminary Documented Safety Analysis will not be provided until after Critical Decision-2/3A has been approved, expected in early 2007.

Updated Status (2)—No significant changes.

4.6 PANTEX PLANT

4.6.1 Component Evaluation Facility

Description: The Component Evaluation Facility is a new seven-bay complex that will increase the Pantex Plant's existing capacity and provide new capabilities for the surveillance and requalification of weapons and weapon components.

Status of Facility: Critical Decision-0 has been approved. However, the project is on hold and awaiting guidance for reconsideration of the mission need.

Status of Significant Board Issues: The Board has identified no outstanding issues with this project at this time.

Updated Status (2)—No significant changes.

4.7 SAVANNAH RIVER SITE

4.7.1 Pit Disassembly and Conversion Facility

Description: The Pit Disassembly and Conversion Facility is one of two plutonium disposition facilities to be constructed at the Savannah River Site. It is part of a joint U.S.–Russian agreement under which each country will dispose of 34 metric tons of weapons-grade plutonium. The mission of the Pit Disassembly and Conversion Facility is to process excess plutonium pits and metal into oxide feed for the Mixed-Oxide Fuel Fabrication Facility.

Status of Facility: Critical Decision-1 has been approved. Critical Decision-2 is expected to be approved in late 2007. This project is on hold.

Status of Significant Board Issues:

Assumption Regarding Combustible Loading for Seismically Induced Fire

Issue—The Board previously agreed with the project’s approach for evaluation of seismically induced facility fire as a design basis accident contingent on finalization and review of combustible loading and other assumptions. Recent rebaselining reports for the Pit Disassembly and Conversion Facility indicate that the combustible loading may be higher than assumed in the safety analysis.

Safety Significance—The controls required for the design basis accident—a seismically induced facility fire—protect the public and collocated workers. A significant increase in combustible loading would directly increase the safety risk to the public and collocated workers.

Expectation—The assumptions in the safety analysis will be validated to support the facility safety control strategy and to determine whether facility design changes are needed.

When—This issue is expected to be addressed in 2007.

Updated Status (2)—No significant changes.

4.7.2 Salt Waste Processing Facility

Description: The Salt Waste Processing Facility is a new facility that will treat salt waste from high-level waste tanks at the Savannah River Site. It will extract and concentrate strontium, cesium, and actinides from the waste. The concentrated waste will be sent to the Defense Waste Processing Facility for vitrification, and the decontaminated

salt solution will be sent to the Saltstone Facility for disposal in grout vaults. The Salt Waste Processing Facility comprises several buildings. Most of the hazardous waste will be confined in the Central Process Area building.

Status of Facility: Critical Decision-1 has been approved. Critical Decision-2/3A was planned for February 2007, but the schedule is being reviewed, and this critical decision will likely be delayed. Critical Decision-3A would allow site excavation, mud mat placement, and procurement of long-lead material. Construction activities have not started. The facility is expected to be operational in 2011.

Status of Significant Board Issues:

Geotechnical Investigation

Issue—The geotechnical investigation reports have not been issued. The field work was recently completed, but a final determination of the design basis earthquake and the design settlement that could result from an earthquake has not been made. The geotechnical investigation reports are significantly behind schedule for this stage of the facility design. The Central Process Area building is sensitive to settlement.

Safety Significance—The Central Process Area building and a significant number of systems are classified as safety-significant to protect workers. Information from the final geotechnical investigation reports is needed to ensure that the facility structure is designed to properly resist natural phenomena design loads and that safety-significant components would perform their safety function following a design basis event.

Expectation—The geotechnical investigation reports will be completed, and a final design basis earthquake and design settlement requirements will be established. The capability of the Central Process Area building to accommodate the final design basis earthquake and final design settlement load will be evaluated. The Board recognizes that the construction and startup of the Salt Waste Processing Facility are key to the Implementation Plan for the Board's Recommendation 2001-1, *High-Level Waste Management at the Savannah River Site*. Hence, the Board proposes that the Board and DOE senior management work closely to minimize impacts on the high-level waste program. The Board is committed to rapid evaluation of actions taken by DOE and its contractors to resolve geotechnical and structural issues.

When—The geotechnical investigation reports are expected in early 2007. It is not clear when the revised structural evaluation of the Central Process Area building will be accomplished, but this should be done as soon as possible to minimize the impact of any needed building design changes.

Updated Status (2)—Field work needed for the geotechnical investigation is complete. The design basis earthquake has been finalized, but not the design

settlement requirements. While the final geotechnical report is not expected until summer 2007, sensitivity studies now under way will provide a reasonable path forward for bounding the design settlement requirements. There is currently adequate information available to perform the sensitivity studies.

Structural Evaluation

Issue—The Central Process Area building is subject to design loads, including natural phenomena hazards and earthquake-induced differential soil settlement effects. Initial reviews of the structural design documentation for this building revealed several significant errors and deficiencies in the structural analysis. The structural layout of the building does not provide good structural load paths to accommodate seismic and settlement-induced design loads. There are unexplained anomalies in the analysis results that experience suggests may be the result of an inappropriate soil-structure interaction analysis. The structural analysis is not adequate for assessing the capability of the current building design to safely resist the DOE-specified design loads. Further, the in-structure response spectra resulting from the analysis, which are used for equipment design, are not correct.

The Board's ongoing evaluations also revealed that the contractor was using a version of a structural computer code (software) that had not been properly verified from a quality assurance standpoint for the safety-related Central Process Area building structure.

Safety Significance—The Central Process Area building and a number of systems are classified as safety-significant to protect workers. A technically defensible basis for analyzing the Central Process Area building must be established to ensure that the facility structure is designed to resist unacceptable damage and that safety-related components would continue to perform their safety function following a design basis event.

Expectation—DOE will review the structural analysis of the Central Process Area building in detail using experienced structural engineers to verify that the analysis is technically correct. Appropriate soil properties and settlement values from the geotechnical investigation reports (discussed above) will be used. *The project is at significant risk of requiring a potentially costly building redesign or requiring that DOE accept the risk of failure of the building under design basis events should the design effort proceed before this and the above geotechnical issue have been resolved.*

When—It is not clear at this time when the structural analysis for the Central Process Area building will be redone.

Updated Status (2)—The Board is satisfied with the actions taken by DOE and its contractor to resolve issues associated with the design of the Salt Waste Processing

Facility. Appropriate structural design expertise and DOE oversight have been brought to bear on the project. Changes to the structural design methodology and the structural design have been made. While significant design work remains, the path forward to continue the design process is acceptable. The structural analysis is now expected to be completed in the summer 2007.

Quality Assurance

Issue—Several recent quality assurance issues indicate that quality requirements are not being properly implemented. The review of calculations was inadequate, unrealistic results predicted by the software being used were not reported, and unapproved prerelease software was used.

Safety Significance—Adequate facility design relies on validated and verified software and correct design calculations. An inadequately designed facility could fail, with significant consequences to workers. Lacking quality assurance, even an adequate design becomes suspect.

Expectation—A detailed corrective action plan has been developed. DOE will review this plan used to confirm that it satisfactorily addresses all of the issues raised. The plan will then be implemented with follow-up assessments to ensure that actions taken have been effective.

When—Implementation of corrective actions is under way and is expected to be completed in early 2007.

Updated Status (2)—The contractor has completed a corrective action program to address the quality assurance issues. It remains for DOE to verify that the corrective actions taken have been effective. This issue is considered closed but will continue to be followed under the Board's normal oversight.

4.7.3 Container Surveillance and Storage Capability Project

Description: The Container Surveillance and Storage Capability project is a major modification within the K-Area Complex at the Savannah River Site that will provide examination, stabilization, and repackaging capabilities for plutonium-bearing materials. These activities ensure that safe storage conditions are maintained for material that has been packaged for long-term storage in accordance with DOE-STD-3013, *Stabilization, Packaging, and Storage of Plutonium-Bearing Materials*. The Container Surveillance and Storage Capability project will also provide rack storage for about 1,900 containers.

Status of Facility: Critical Decision-1 has been approved. Critical Decision-2A/3A approval, authorizing dismantlement and removal of unneeded hardware from previous operations, is expected in early 2007. The design is about 30 percent complete. The facility is expected to be operational in 2010.

Status of Significant Board Issues:

Fire Protection Strategy

Issue—Project personnel proposed a safety-class fire detection and gaseous suppression system to prevent a release of material during a fire. Material containers need to be protected during the interval between fire initiation and suppression system actuation. The exact duration of this interval is unknown and depends on many factors (e.g., fire intensity, smoke properties, detection sensitivity). Project personnel are considering one proposal that would prevent direct flame impingement on the containers. Design effort is currently under way to implement this criterion.

Safety Significance—Adequate protection of containers from fire will ensure safe storage, which protects the public and workers.

Expectation—DOE will demonstrate that its fire protection strategy protects material containers during a fire. This strategy will include facility design features that provide for timely detection of a fire and actuation of the suppression system and will protect containers during a fire before the suppression system actuates.

When—Design of the safety-class fire detection and suppression system and facility features to prevent direct flame impingement is under way. The design should reach an appropriate level of maturity for review in mid-2007.

Updated Status (2)—DOE has directed that the fire detection and suppression system not be designated as a safety-class based on their belief that the hazard presented by the activity did not warrant a higher safety classification. The Board is currently evaluating the significance of this change.

Preliminary Hazards Analysis

Issue—The Preliminary Hazards Analysis was recently revised to support the recommended design of the fire protection and ventilation systems. The Board identified several deficiencies in this document, including failure to address all facility hazards (e.g., loss of rack storage cooling, toxicological hazards from process gasses) and failure to incorporate DOE guidance on preliminary consequence calculations supporting the early identification of safety systems.

Safety Significance—The identification of controls derived from a properly developed hazards analysis will provide adequate protection for the public and workers.

Expectation—Project personnel will complete the next revision of the Preliminary Hazards Analysis, which should correct these deficiencies.

When—The next revision of the Preliminary Hazards Analysis should be available in early 2007.

Updated Status (2)—No significant changes.

Criticality Safety

Issue—Project personnel are requesting an exemption from the requirement to provide nuclear incident monitors for the Container Surveillance and Storage Capability project. The justification is based on implementing criticality safety controls that are believed to make a criticality event incredible. Reliance on administrative controls as part of the justification for not providing nuclear incident monitors is inconsistent with the specified industry criticality standards. This exemption request has not yet been approved by DOE.

Safety Significance—A robust set of controls are needed to prevent inadvertent criticality, which has the potential to result in worker fatalities. Compliance with established standards is an accepted means of demonstrating that controls are adequate.

Expectation—Project personnel will demonstrate that nuclear criticality is not a significant risk with less reliance on administrative controls or will consider including some type of incident detection system (e.g., portable monitors). Relying on administrative controls is not considered prudent. Further, some of the proposed administrative controls would be difficult to implement or have little value.

When—The criticality safety evaluation will be available for review in early 2007.

Updated Status (2)—The Board has been told informally that project personnel have decided to include nuclear incident monitors into the design. This action would resolve the Board's issue when formally documented.

Design Process Control

Issue—Preliminary design is under way. Major inputs and assumptions being made in the preliminary design are included throughout multiple safety and design documents. There is no systematic program to ensure that these items can be tracked and implemented.

Safety Significance—Appropriate tracking of design inputs and assumptions ensures that safety-related systems, structures, and components are designed and fabricated properly and will perform their intended safety functions when required.

Expectation—DOE will demonstrate that there is a formal, systematic program in place to maintain inputs and assumptions, document their origin, and track them through completion of the design.

When—No commitment has been made yet by DOE to address this issue.

Updated Status (2)—Project personnel committed to maintain inputs and assumptions, document their origin, and track them through completion of the design in a database as part of the facility design and system design descriptions. This should be adequate. The Board considers this issue closed.

4.7.4 Plutonium Disposition Project

Description: The Plutonium Disposition Project will dispose of up to 13 metric tons of surplus weapons-grade plutonium that does not have a disposition path and is not considered by DOE to be suitable for the Mixed Oxide Fuel Fabrication Facility. DOE plans to locate the process in the subbasement of the K-Reactor facility and will vitrify the plutonium. The plan is to transfer the vitrified plutonium cans to the Defense Waste Processing Facility. There, the plutonium is to be surrounded by high-level waste glass and stored onsite awaiting shipment to a monitored geologic repository for final disposition.

Status of Facility: The Critical Decision-0 mission need was approved in September 2005. Critical Decision-1A, approved in August 2006, authorized moving forward with the conceptual design using the can-in-canister (vitrified) alternative. Critical Decision-1 approval is expected in July 2007. The facility is expected to be operational in 2013.

Status of Significant Board Issues: The Board has identified no outstanding issues with this project at this time.

Updated Status (2)—In mid-April 2007, the contractor informed DOE that as the conceptual design developed, it became apparent that the current project strategy would result in a substantially higher cost estimate for the project. The contractor proposed deferring Critical Decision-1 approval for the project and developing a new conceptual design plan. The contractor believes a more cost-effective approach can be devised. The date for the new conceptual design report has not yet been determined.

4.8 Y-12 NATIONAL SECURITY COMPLEX

4.8.1 Highly Enriched Uranium Materials Facility

Description: The Highly Enriched Uranium Materials Facility is a new uranium storage facility that will replace multiple aging facilities at the Y-12 National Security Complex.

The facility will also permit consolidation of storage locations for uranium to reduce the safeguards and security footprint at the site.

Status of Facility: The facility design is essentially complete. Critical Decision-3 has been approved, and construction of the facility is ongoing. Construction is about 40 percent complete. The facility is expected to be operational in 2009.

Status of Significant Board Issues: Previous issues have been resolved. The Board has identified no new issues with this project at this time.

Updated Status (2)—No significant changes.

4.8.2 Uranium Processing Facility

Description: The Uranium Processing Facility is a new facility proposed to replace many of the aging uranium processing facilities at the Y-12 National Security Complex. The facility will also permit consolidation of processing facilities to reduce the safeguards and security footprint at the site.

Status of Facility: Critical Decision-0 has been approved. Critical Decision-1 approval is expected in mid-2007. The facility is expected to be operational in 2017.

Status of Significant Board Issues:

Preliminary Hazards Analysis Development

Issue—The draft Preliminary Hazards Analysis does not provide the evaluations necessary to develop the more mature design that would normally be expected. The Board is encouraging those responsible for this project to satisfy more mature design principles to meet the new expectations for incorporating safety early in the design. Unmitigated consequences for identified hazards and the safety controls needed to mitigate those hazards have not been specified. Safety controls are not derived from an analysis of the hazards involved. Design requirements have not been established with the completeness or formality necessary to support the new expectations for safety systems.

Safety Significance—The material at risk in the Uranium Processing Facility has the potential for significant health consequences to workers and the public. The identification of controls derived from a properly developed hazards analysis is necessary to provide adequate protection for workers and the public.

Expectation—The revised Preliminary Hazards Analysis will adequately derive safety controls for the hazards posed by the facility.

When—The Preliminary Hazards Analysis is expected to be issued in early 2007.

Updated Status (2)—DOE developed a draft safety evaluation report for approval of the Preliminary Hazards Analysis. The safety evaluation report contains an analysis that derived safety controls from the hazards posed by the facility and identified additional safety controls to be credited for mitigating those hazards. The Board believes the safety controls identified in the safety evaluation report provide an adequate safety control set for the Uranium Processing Facility at this point in the design process. This issue is therefore considered closed.

Nonconservative Values for Airborne Release Fraction and Respirable Fraction

Issue—In developing the Preliminary Hazards Analysis, the project is using an airborne release fraction and respirable fraction for bulk uranium metal that are not consistent with DOE-HDBK-3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. Use of the DOE-HDBK-3010 values would require additional safety controls not reflected in the safety basis.

Safety Significance—The material at risk in the Uranium Processing Facility has the potential for significant health consequences for workers and the public. The identification of controls derived from a properly developed hazards analysis is necessary to provide adequate protection for workers and the public.

Expectation—The airborne release and respirable fraction values used in the Preliminary Hazards Analysis will be revised or justified using a methodology commensurate with deviation from a consensus standard.

When—The Preliminary Hazards Analysis is expected to be issued in early 2007.

Updated Status (2)—The Board identified an additional test report that was provided to DOE for further evaluation of the airborne release fraction and respirable fraction values. DOE has enlisted an outside expert (who is one of the primary authors of DOE-HDBK-3010) to evaluate the new test report, review the existing data, and recommend appropriate values to be used in the hazards analysis. The Board has reviewed the bounding accident analysis supporting the Preliminary Hazards Analysis and believes there are sufficient areas of conservatism to account for potential increases in the values to be used. Further, the project has identified this issue in its risk analysis and management plan. Accordingly, the Board believes the identified safety controls for mitigation of the hazards in the facility are adequate for this phase of the design process.

APPENDIX

SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES (See Text, Section 4)
			Critical Decision Approved	Design Completion	Construction Completion	
Hanford Site	Waste Treatment Plant	12,200			<i>(Operational 2019)</i>	
	a. Pretreatment Facility		CD-3	70%	25%	1. Seismic ground motion 2. Structural engineering 3. Chemical process safety
	b. High Level Waste Treatment Facility		CD-3	80%	20%	1. Seismic ground motion 2. Structural engineering 3. Fire protection
	c. Low Activity Waste Facility		CD-3	92%	44%	1. Fire protection
	d. Analytical Laboratory Facility		CD-3	86%	37%	1. Fire protection
	Demonstration Bulk Vitrification System Project	190	CD-1	95%	Some site and foundation work <i>(Operational FY 2011)</i>	1. Confinement strategy
	K-Basin Closure Project Sludge Treatment Project	100	being evaluated	90%	Starting <i>(Operational 2008)</i>	1. Completeness of Preliminary Documented Safety Analysis
	Tank Retrieval and Waste Feed Delivery System	250	One subproject is not using the formal critical decision process	Various degrees of completion.	Various degrees of completion and operations	1. Design pressure rating of waste transfer system
	Immobilized High-Level Waste Interim Storage Facility	100	CD-3	90%	Deferred <i>(Operational to be determined)</i>	No issues

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES (See Text, Section 4)
			Critical Decision Approved	Design Completion	Construction Completion	
Idaho National Laboratory	Integrated Waste Treatment Unit project	425	CD-2/3B	75%	Not started <i>(Operational 2009)</i>	<ol style="list-style-type: none"> 1. Pilot plant testing 2. Waste characterization 3. Distributed control system design
Los Alamos National Laboratory	Chemistry and Metallurgy Research Replacement Project	975	CD-1	70% of preliminary design 30% of final design	Some ground work <i>(Operational 2014)</i>	<ol style="list-style-type: none"> 1. Design-build acquisition strategy — <i>resolved (2)</i> 2. Site characterization and seismic design 3. Safety-significant active ventilation system — <i>resolved (2)</i> 4. Safety-class fire suppression system 5. Safety-class and safety-significant container design
	Technical Area-55 Reinvestment Project	72	Phase A: CD- 2 Phase B: CD-0	60%	<i>(Complete 2010)</i> <i>(Complete 2014)</i>	No detailed review completed
	Upgrades to Pit Manufacturing Capability at Technical Area-55	Annual funding	Not formally implementing critical decision process		Work ongoing	1. Lack of adherence to DOE Order 413.3A
	Radioactive Liquid Waste Treatment Facility Upgrade Project	96	CD-1		<i>(Operational 2011)</i>	No detailed review completed
	New Solid Transuranic Waste Facility Project	40	CD-0	60%	<i>(Operational 2011)</i>	No detailed review completed
	Nuclear Material Safeguards and Security Upgrades Project, Phase 2	240	CD-1	30%	<i>(Operational 2013)</i>	No detailed review completed
	Technical Area-55 Radiography Project	38	CD-0	90% on hold	<i>(Operational 2010)</i>	No detailed review completed

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES (See Text, Section 4)
			Critical Decision Approved	Design Completion	Construction Completion	
Nevada Test Site	Device Assembly Facility—Criticality Experiments Facility	150	CD-2	90%	<i>(Operational 2011)</i>	1. Structural cracks
Oak Ridge National Laboratory	Building 3019—Uranium-233 Downblending and Disposition Project	371	CD-1	90%	<i>(Operational 2012)</i>	1. Preliminary Documented Safety Analysis
Pantex Plant	Component Evaluation Facility	112	CD-0		<i>(Operational on hold)</i>	No detailed review completed
Savannah River Site	Pit Disassembly and Conversion Facility	1,700	CD-1	50%	<i>(Operational on hold)</i>	1. Assumption on combustible loading for seismically induced fire
	Salt Waste Processing Facility	660 being reevaluated	CD-1	35%	<i>(Operational 2011)</i>	1. Geotechnical investigation 2. Structural evaluation 3. Quality assurance— <i>resolved (2)</i>
	Container Surveillance and Storage Capability Project	130	CD-1	30%	Building preparations started <i>(Operational 2010)</i>	1. Fire protection strategy 2. Preliminary hazards analysis 3. Criticality safety 4. Design process control— <i>resolved (2)</i>
	Plutonium Disposition Project	500	CD-0	10%	Not started <i>(Operational 2013)</i>	No issues identified
Y-12 National Security Complex	Highly Enriched Uranium Materials Facility	500	CD-3	100%	40% <i>(Operational 2009)</i>	No issues identified
	Uranium Processing Facility	1,500 being reevaluated	CD-0	10%	<i>(Operational 2017)</i>	1. Preliminary hazards analysis development — <i>resolved (2)</i> 2. Nonconservative airborne release fraction and respirable release fraction values

(#) — indicates the Quarterly Report in which issue was considered resolved