# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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April 15, 2010

The Honorable Steven Chu
Secretary of Energy
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Secretary Chu,

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose a copy of our Quarterly Report to Congress on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects (dated April 15, 2010). In the Conference Report accompanying the FY 2007 National Defense Authorization Act, the conferees directed the Board to provide quarterly reports until the Department of Energy (DOE) and the Board submit a joint report "on their efforts to improve the timeliness of issue resolution, including recommendations, if any, for legislation that would strengthen and improve technical oversight of the Department's nuclear design and operational activities." The joint report was submitted to the congressional defense committees on July 19, 2007. While the conferees did not require the Board to continue providing quarterly reports, the Board believes these reports provide an appropriate means to keep all parties apprised of the Board's concerns with new designs for DOE defense nuclear facilities. The Board has received encouraging feedback from Congress. As such, the Board intends to continue issuing quarterly reports to Congress and DOE.

Sincerely,

Peter S. Winokur, Ph.D.
Chairman

Enclosure: as stated

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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April 15, 2010

To the Congress of the United States:

The Defense Nuclear Facilities Safety Board (Board) provides periodic reports to Congress and the Department of Energy (DOE) on the status of significant unresolved technical differences between the Board and DOE on issues concerning the design and construction of DOE's defense nuclear facilities. This periodic report builds on earlier reports to summarize the status of issues raised through the end of March 2010 and identifies new issues associated with the relevant projects. The status of many issues has not changed significantly during the reporting period; however, the fact that an issue has not been resolved does not necessarily imply a lack of progress.

In this report, the phrase "unresolved issue" does not necessarily mean that the Board has a disagreement with DOE or believes DOE's path forward to resolution is inappropriate. Some of the issues noted in these reports simply await final resolution through further development of the facility design. All of the significant unresolved issues discussed herein have been communicated to DOE. Lesser issues that the Board believes can be resolved easily and for which an agreed-upon path forward exists are not included. The Board will follow these items as part of its normal design review process.

It is important to note that the Board may identify additional issues in the course of its continuing design reviews. New issues identified since the previous reports are noted below, as well as those issues the Board believes have been resolved. For this reporting period, the Board determined one issue to be no longer relevant because of a change in project status and identified four new issues. The enclosure to this report provides a concise summary of significant unresolved issues.

## PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES

The Board is highlighting (1) the adequacy of the safety strategy for a seismically induced large fire in the Los Alamos National Laboratory Plutonium Facility and (2) several issues concerning the design of the Hanford Waste Treatment and Immobilization Plant (WTP) that affect the facility's safety basis.

***Los Alamos National Laboratory, Technical Area 55/Plutonium Facility.*** On October 26, 2009, the Board issued Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, which addresses the need to reduce the potential consequences to the public from a seismic event at the Plutonium Facility. The National Nuclear Security Administration (NNSA) approved the Documented Safety Analysis for this facility even though the mitigated consequences to the public of a seismically induced large fire exceed DOE's evaluation guideline by more than two orders of magnitude.

The Board recommended that DOE implement near-term actions and compensatory measures to achieve a significant reduction in the potential consequences to the public from seismically induced events. The Board further recommended that DOE develop and implement a safety strategy for these events that would include the following elements:

- A technically justifiable decision logic and criteria for evaluating and selecting safety-class structures, systems, and components that can effectively prevent or mitigate the consequences to the public to acceptably low values.

- The seismic approach for structures, systems, and components required to implement the seismic safety strategy.

- A prioritized plan and schedule for seismic analyses, necessary upgrades, and other actions to implement the seismic safety strategy.

DOE accepted the Board's Recommendation on February 2, 2010. NNSA has begun taking actions to address seismic safety at the Plutonium Facility, including better characterization and control of material at risk, and implementation of enhanced combustible loading controls. These improvements, when implemented, will reduce the bounding dose consequence by at least a factor of 15. DOE is expected to deliver the associated implementation plan by June 1, 2010.

***Hanford Site, Waste Treatment and Immobilization Plant.*** The Board is concerned that many changes to the design of WTP are being approved by the Department of Energy-Office of River Protection (DOE-ORP) prior to the resolution of numerous outstanding technical issues. Additional cost and schedule delays could occur if technical analyses being performed by DOE to justify their "success driven" strategy yield results that are not favorable to the project's safety strategy.

Since late 2008, when DOE began its initiatives to modify the facility design based on a revised safety strategy for WTP changing radiological inventory and control of hydrogen in pipes, the Board has endeavored to work with and advise DOE on potential safety issues associated with these proposals. The Board made its reviews a priority so issues would be resolved expeditiously (with minimal cost and schedule impact to the project). However, DOE has continued to approve changes related to the classification and design of safety-related systems and components without fully resolving key technical issues, preferring to grant conditional approval in areas involving significant technical uncertainty. In its approval of the safety design strategy for hydrogen in pipes, DOE-ORP assessed the uncertainties associated with the unresolved issues outlined below and concluded that design and procurement could proceed. The Board does not share DOE-ORP's confidence that these technical issues will be readily resolved without impact to the facility's design.

On February 15, 2010, DOE-ORP approved the request of its engineering and construction contractor (Bechtel National, Incorporated [BNI]) to modify the safety design strategy for control of hydrogen in pipes in the Pretreatment facility. The approval included direction for BNI to similarly revise the safety strategy for the High-Level Waste facility. Prior to 2009, the original design approach focused on preventing the occurrence of explosions resulting from the accumulation of hydrogen in nearly all circumstances; for the limited number of situations in which an explosion would occur, the primary confinement barrier would contain the explosion without permanent deformation of the barrier.

The newly approved design approach allows hot cell piping to undergo permanent deformation from an explosion. In allowing permanent deformation, DOE-ORP established multiple criteria intended to ensure that a breach of the primary confinement barrier will not occur. DOE-ORP's revised approach is more complex and less conservative than the original design approach, and is heavily reliant on the engineering judgment of BNI. The Board has conducted a preliminary review of this new strategy, and is concerned that it lacks sufficient specificity to ensure that the design will maintain the integrity of the primary confinement boundary as intended by DOE Order 420.1B, *Facility Safety*. The following is a summary of the primary issues:

- BNI's request summarized the testing conducted at various subcontractor locations and provided a general overview of the analysis methodology, but lacked the detail necessary to implement the design. BNI is revising the documentation, but cannot complete this activity until its subcontractors perform additional testing and analysis to confirm the validity of analytical models and other technical assumptions used in support of the revised piping design approach.

- DOE design guidance refers to consensus design codes because they are developed by expert organizations, such as the American Society of Mechanical Engineers (ASME), using a broad spectrum of engineering judgment and experience. ASME design codes for process piping do not provide specific guidance for the revised approach for WTP, which allows explosions that cause impulse loading of the piping. Consequently, DOE-ORP is invoking the provision in the code that permits the facility owner to approve alternative methods for piping system design by "a designer [who is] capable of providing a more rigorous analysis"; consequently, the method approved by DOE-ORP is heavily reliant on the technical expertise of BNI. Although this latitude exists, the alternative methods approved by DOE-ORP and their implementation must be consistent with existing DOE directives for the design of defense nuclear facilities (e.g., DOE Order 420.1B).

- The proposed strategy will use quantitative risk assessment to determine the peak pressure and frequency of explosions. DOE has no standard governing the application of quantitative risk assessment.[1] DOE-ORP approved the revised piping design criteria before BNI had defined the quantitative risk assessment methodology. DOE initiated an external review of the quantitative risk assessment methodology by an independent panel of experts as part of the implementation of the Board's Recommendation 2009-1. The Board will assess the outcome of the external review once it has been completed.

- In-line components (e.g., valves, pumps) form a continuous part of the piping system, but the revised approach does not evaluate these components according to the same methods and criteria used for pipe. BNI intends to test these components but did not identify the specific methods and criteria for the qualification of in-line components in its request to modify the design criteria.

- BNI has performed testing to support the use of the new design criteria for piping up to 4 inches in diameter. However, DOE-ORP's approval allows BNI to apply the new design criteria to piping with diameters greater than 4 inches. There are no data available to justify the use of the new design criteria for piping greater than 4 inches in diameter, nor is testing planned.

- BNI has published test data for piping up to 2 inches in diameter. These tests used simplified geometries that generally tested a single variable (e.g., a single bend) and a limited number and types of components, and did not represent the more complex configuration in the facility. For example, the facility will have multiple pipe bends, elbows of varying radii, changes in pipe diameter, changes in hydraulic head, and numerous component types (e.g., valves, pumps, heat exchangers) and jumper designs. Furthermore, BNI did not establish clear test objectives or invoke the requirements of DOE Order 414.1C, *Quality Assurance*, for these tests.

- The new design criteria allow varying degrees of permanent deformation of piping in the hot cells of the facility. DOE's justification for allowing this deformation is that operators can inspect hot cell piping, observe leaks, and repair failed components. However, the facility design does not include the capability to readily detect an explosion in process piping or to measure permanent deformation from individual or successive events. If an explosion in a hot cell piping system were to result in significant permanent deformation, assessment of the significance of the deformation would be complex and costly. If repair or replacement of the piping were required, this work would be time-consuming, cause significant disruption of plant operation, and potentially result in considerable risk to the workers performing the work.

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[1] The Board's Recommendation 2009-1, *Risk Assessment Methodologies at Defense Nuclear Facilities*, issued July 30, 2009, recommended that DOE establish a policy for the use of quantitative risk assessment.

In an effort to resolve these technical issues, the Board suggested that DOE undertake a comprehensive, independent, expert-based review of the safety design strategy for control of hydrogen in pipes, similar in scope to the external flowsheet review completed in 2006. DOE has agreed to conduct such a review. The Board continues to work with DOE to resolve these outstanding technical issues and determine whether the new design approach and the eventual changes in the safety strategy are justified.

DOE-ORP is continuing to evaluate changes to the safety basis of the Pretreatment facility based on a reduced radiological inventory. The lower inventory will be a result of administrative control of the concentration of radionuclides in the waste material transferred to WTP.[2] The revised inventory forms the basis for calculations demonstrating that the consequences to the public are below the evaluation guideline of 25 rem specified in DOE Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, which determines the need for safety-class controls. The Board does not question reducing the inventory in the Pretreatment facility that is assumed in accident calculations, based on an administrative control. However, the Board's review of the accident analyses revealed questionable assumptions and methodologies, including the assumed deposition rate of radionuclides following a postulated accidental release and the analysis of accidental releases resulting from leaks and spills. These analyses are a key factor in determining which structures, systems, and components would remain categorized as safety-class after accounting for the reduced radiological inventory.

As discussed in its report of December 7, 2009, the Board believes that as the WTP project proceeds toward implementing a revised safety design strategy resulting from the reduced material-at-risk, the current seismic design specification for piping and vessels should not be downgraded from its higher (PC-3) designation without full consideration of the need to protect the workers. Further, for those piping systems and vessels that are currently designated with a lower seismic design requirement, appropriate consideration should be given to revising the seismic design requirement to be consistent with DOE's stated expectations (i.e., a higher seismic design requirement when needed for worker protection).

DOE continues to address long-standing technical issues related to pulse jet mixing. The Board became concerned about DOE's adoption of an approach to resolving these issues that (1) bases the functional requirements for mixing on average instead of bounding properties of the waste to be processed, and (2) relies on mathematical models that are not appropriately validated through testing for this application. In a letter dated January 6, 2010, the Board expressed its concern regarding the project's plans for resolving these problems, and highlighted the safety issues that could arise from inadequate mixing.

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[2] The administrative control will be invoked within the Tank Farms. The specific steps necessary to invoke this control have not been defined.

## NEW ISSUES IDENTIFIED DURING THE PERIOD

### 1. Project: Savannah River Site, Salt Waste Processing Facility

***New Issue—Mixing System Controls and Operational Parameters.*** The Board reviewed the design, testing, and controls associated with the air pulse agitators used for mixing the contents of process vessels in the Salt Waste Processing Facility. In a letter dated October 15, 2009, the Board concluded that, given appropriate controls and operational parameters, the air pulse agitators should fulfill the functions assumed in the safety basis. However, the Board identified shortcomings with the testing and modeling performed for these devices that the project team should consider in the selection of controls and operational parameters. The Board also concluded that refinement or elimination of safety controls related to vessel agitation needs to be based on conservative assumptions about the physical properties and associated hydrogen retention and release mechanisms of the mixtures that may be present in the facility's process vessels.

### 2. Project: Hanford Site, Waste Treatment and Immobilization Plant

***New Issue—Structural Steel Analysis and Design.*** In a letter dated December 2, 2009, the Board identified issues related to the adequacy of the structural steel designs for the Pretreatment, High-Level Waste, and Low-Activity Waste facilities. The finite element models used in the structural analyses do not reflect the composite construction of the concrete floor slabs and supporting structural steel beams. Composite construction uses steel studs to transfer loads from the concrete floor slabs to the supporting steel beams and girders to enhance stiffness and reduce floor deflection. This method results in the steel and concrete acting as a single member. Consequently, the actual stress distribution may be significantly different from that assumed by the project team in its evaluation of the design adequacy of the structural steel supporting the floor slabs. Further, the approach used to evaluate the design adequacy of steel members, which approximates seismic loads and neglects the action of secondary beams, may not be conservative. BNI should modify the building analyses and designs to reflect its composite construction and account for the action of secondary beams.

***New Issue—Inadequate Mixing.*** The Board has long been concerned about the capability to mix the fluids and solids in the process vessels in the Pretreatment facility. In prior years, DOE and its contractor had been addressing this issue appropriately. However, mixing of these fluids to adequately suspend solids has proven to be more problematic than was understood several years ago. As currently designed, the pulse jet mixers lack sufficient power to adequately mix the most dense, rapidly settling particles expected to be present in the Hanford waste inventory, precluding their transport out of the process vessels. The Board recently became concerned about BNI (1) basing the functional requirements for mixing on average instead of bounding properties of the waste to be processed, and (2) relying on mathematical models that are not appropriately validated for this application. In a letter dated January 6, 2010, the Board highlighted the safety issues that could arise as a result of inadequate mixing. The inability to adequately

mix particles and transport them out of process vessels will lead to the development of a sediment layer on the bottom of the vessels. This sediment layer could reduce the effectiveness of the pulse jet mixing systems below that assumed in the design, causing the accumulation of an even thicker sediment layer on the bottom of the vessels, with the following implications:

- A thick sediment layer formed of particles rich in plutonium and uranium could have sufficient fissile mass and a favorable geometry for a criticality accident to occur. As a result of poor mixing, samples drawn from the vessels to ensure that such an event does not occur will not be representative.

- A sediment layer could grow sufficiently to retain significant quantities of flammable gas. Gas release events from this sediment layer could exceed the lower flammability limit in a vessel headspace, potentially resulting in an explosion.

- The presence of a thick sediment layer could also have a detrimental effect on the bubbler systems used for measuring level and average density of the process fluid in the vessels. Inaccuracies in these measurements will result in errors in the calculation of the drive time of the pulse jet mixers, potentially causing numerous overblows. The cumulative effect of a large number of overblows could be the material failure of components internal to the process vessels.

**3. Project: Y-12 National Security Complex, Uranium Processing Facility**

***New Issue—Structural and Geotechnical Engineering.*** In a letter dated March 15, 2010, the Board identified several issues related to the geotechnical and structural analysis of the Uranium Processing Facility (UPF). These technical issues need to be resolved early in the design process to enable the project to proceed expeditiously:

- To reduce high-frequency amplification response and simplify analysis methodology, it is advisable to remove all weathered shale below the building basemat. If the weathered shale remains in place as currently planned, the soil–structure interaction analysis model must consider the lateral variation in both soil property stiffness and foundation-level ground motion. If these effects are included in the analysis, the seismic loads that result may exceed those for which the building was designed.

- The spacing between the main UPF building and adjacent structures may have to be increased to accommodate the predicted horizontal seismic motion of the basemat.

- Finite element modeling requirements need to be addressed systematically to ensure the model properly represents the building's response to seismic loads.

- The adequacy of the size of structural members needs to be confirmed by comparing member loads (demands) with member capacities.

- An internal blast is currently a credible design basis accident. If the project cannot eliminate explosions as a design basis accident through engineered or other controls, the structural designer will need to address blast effects in a manner consistent with accepted practice.

## PROJECT COMPLETION

The design and construction of the Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex have been completed. NNSA performed its Operational Readiness Review and authorized startup of the facility. The Board congratulates NNSA on the completion of the Highly Enriched Uranium Materials Facility.

## CHANGE IN PROJECT STATUS

### 1. Project: Savannah River Site, Pit Disassembly and Conversion Project

On November 22, 2009, DOE approved combining the Pit Disassembly and Conversion Facility and the Plutonium Preparation Project into a new project called the Pit Disassembly and Conversion Project. DOE believes combining the projects will save money and eliminate the need for decommissioning another facility in the future. DOE intends to carry out the Pit Disassembly and Conversion Project in the K-Reactor Complex at the Savannah River Site in two phases. The first phase entails installation of two new gloveboxes that prepares existing plutonium oxide and metal to provide early plutonium feed to the Mixed-Oxide Fuel Fabrication Facility (MFFF). The second phase will involve the remainder of the project scope, which includes the additional capability to process pits and prepare the plutonium for feed material for MFFF. Based on the new conceptual design, the Board believes that combustible loading for the Pit Disassembly and Conversion Facility is no longer an issue.

### 2. Project: Los Alamos National Laboratory, Transuranic Waste Facility

The Board previously identified several issues reflecting inadequate integration of safety into the conceptual design for the Transuranic Waste Facility project at Los Alamos National Laboratory. Subsequently, NNSA delayed approval of the conceptual design to further evaluate mission need and reconsider alternatives. As a result of this evaluation, NNSA reduced the scope of this project, thereby necessitating significant revision of the facility's safety strategy. The Board will review the revised safety strategy once it is available to determine whether the previous issues regarding the integration of safety into the design have been resolved.

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

Respectfully submitted,

Peter S. Winokur, Ph.D.
Chairman

John E. Mansfield
Vice Chairman

Joseph F. Bader
Member

Larry W. Brown
Member

Enclosure

## ENCLOSURE

## APRIL 2010 REPORT
## SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES
## WITH NEW DEFENSE NUCLEAR FACILITIES

| SITE | FACILITY | TOTAL PROJECT COST ($M) | STATUS | | | ISSUES[b] |
|---|---|---|---|---|---|---|
| | | | Critical Decision Approved | Design Completion[a] | Construction Completion | |
| **Hanford Site** | **Waste Treatment and Immobilization Plant (WTP)** | 12,263 | | | (*Operational 2019*) | |
| | **a. WTP Pretreatment Facility** | | CD-3 | 77% | 29% | 1. ~~Seismic ground motion~~—***resolved (Feb 08)***<br>2. ~~Structural engineering~~—***resolved (Dec 09)***<br>3. ~~Chemical process safety~~—***resolved (Oct 07)***<br>4. ~~Fire safety design for ventilation systems~~—***resolved (Dec 09)***<br>5. Hydrogen gas control<br>6. Structural steel analysis and design—***new issue (Apr 10)***<br>7. Inadequate mixing—***new issue (Apr 10)*** |
| | **b. WTP High-Level Waste Facility** | | CD-3 | 83% | 25% | 1. ~~Seismic ground motion~~—***resolved (Feb 08)***<br>2. ~~Structural engineering~~—***resolved (Dec 09)***<br>3. ~~Fire protection~~—***resolved (Jun 09)***<br>4. ~~Fire safety design for ventilation systems~~—***resolved (Dec 09)***<br>5. Hydrogen gas control<br>6. Structural steel analysis and design—***new issue (Apr 10)*** |

[a] Percent of design complete is an estimate of completion for the particular stage of design. That is, if CD-0 is approved, the percent represents the completion of conceptual design; if CD-1 is approved, the percent represents the completion of preliminary design; if CD-2 is approved, the percent represents the completion of final design; if CD-3 is approved, the design completion is typically 90 percent or greater of the final design.

[b] Dates in parentheses indicate the report in which an issue was considered resolved or a new issue was identified.

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| **Hanford Site (continued)** | **c. WTP Low-Activity Waste Facility** | | CD-3 | 90% | 58% | 1. ~~Fire protection~~ ***—resolved (Jun 09)***<br>2. Structural steel analysis and design—***new issue (Apr 10)*** |
| | **d. WTP Analytical Laboratory** | | CD-3 | 79% | 60% | 1. ~~Fire protection~~ ***—resolved (Jun 09)***<br>No open issues remain |
| | **Demonstration Bulk Vitrification System Project** | 224 | CD-1 | 95%<br>***On hold*** | ***On hold*** | 1. ~~Confinement strategy~~ ***—resolved (May 08)***<br>No open issues remain |
| | **Interim Pretreatment System** | 182–310 | CD-0 | <5%<br>***On hold*** | ***On hold*** | No issues identified |
| | **K-Basin Closure Sludge Treatment Project** | Phase 1: 240<br><br>Phase 2: To be determined | Phase 1: CD-0<br><br>Phase 2: CD-0 | Phase 1: 85% of conceptual design<br><br>Phase 2: 0% | (***Operational to be determined***) | 1. ~~Completeness of Preliminary Documented Safety Analysis~~ ***—review terminated; document not relevant to new conceptual design (Oct 07)***<br>2. Adequacy of project management and engineering |
| | **Large Package and Remote Handled Waste Packaging Facility** | 390 | CD-0 | 0% | Deferred (***Operational to be determined***) | No issues identified |
| | **Tank Retrieval and Waste Feed Delivery System** | 1,140 | One subproject not using the formal CD process | Various degrees of completion | Various degrees of completion and operations | 1. ~~Design pressure rating of waste transfer system~~ ***—resolved (Oct 07)***<br>No open issues remain |
| | **Immobilized High-Level Waste Interim Storage Facility** | 100 | CD-3 | 90% | Deferred (***Operational to be determined***) | No issues identified |
| **Idaho National Laboratory** | **Integrated Waste Treatment Unit Project** | 570.9 | CD-3 | >95% | 55% (***Operational 2011***) | 1. ~~Pilot plant testing~~ ***—resolved (Feb 09)***<br>2. ~~Waste characterization~~ ***—resolved (Feb 09)***<br>3. ~~Distributed control system design~~ ***—resolved (Feb 09)***<br>No open issues remain |

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| **Los Alamos National Laboratory** | **Chemistry and Metallurgy Research Replacement Project—Nuclear Facility** | >2,000 Being reevaluated | CD-1 | 100% Preliminary design | Some ground work (***Operational to be determined***) | 1. ~~Design-build acquisition strategy~~ —***resolved (Jun 07)***<br>2. ~~Site characterization and seismic design~~ —***resolved (Dec 09)***<br>3. ~~Safety-significant active ventilation system~~ —***resolved (2) reopened due to issue 6 (Oct 07)*** —***resolved (Dec 09)***<br>4. ~~Safety-class fire suppression system~~ —***resolved (Dec 09)***<br>5. ~~Safety-class and safety-significant container design~~ —***resolved (Dec 09)***<br>6. ~~Deficiencies in Draft Preliminary Documented Safety Analysis~~ —***resolved (Dec 09)***<br>No open issues remain |
| | **Technical Area-55 Safety System Upgrades** | Phase 2: 91–100 | Phase 2: CD-2A | Various degrees of completion | ***(Phase 2 Complete 2017)*** | 1. ~~Adequacy of safety systems~~ —***resolved (Sep 08)***<br>2. Inadequate approach to ensure timely improvements to the safety posture |
| | **Upgrades to Pit Manufacturing Capability at Technical Area-55** | Annual funding | Not formally implementing CD process | Various degrees of completion | Work ongoing | 1. ~~Lack of adherence to DOE Order 413.3A~~ —***resolved (Sep 08)***<br>No open issues remain |
| | **Radioactive Liquid Waste Treatment Facility Upgrade Project** | 119–172 | CD-1 | 60% of total design | (***Operational 2014***) | 1. Weak project management and federal project oversight<br>2. Weak integration of safety into the design process |
| | **Transuranic Waste Facility** | 133–199 | CD-0 | 60% ***On hold*** | ***(Operational to be determined)*** | 1. Inadequate integration of safety into the design process |
| | **Nuclear Material Safeguards and Security Upgrades Project, Phase 2** | 245 | CD-3B | 100% | (***Operational 2013***) | No detailed review completed |
| | **Technical Area-55 Radiography Project** | 38 | CD-0 | 90% ***On hold*** | ***On hold*** | No detailed review completed |
| **Nevada Test Site** | **Device Assembly Facility—Criticality Experiments Facility** | 150 | CD-3 | 100% | 100% (***Operational 2010***) | 1. ~~Structural cracks~~ —***resolved (Feb 09)***<br>2. Deficiencies in fire protection system water supply |
| **Oak Ridge National Laboratory** | **Building 3019—Uranium-233 Downblending and Disposition Project** | 477 | CD-2/3A | 60% | (***Operational 2012***) | 1. Deficiencies in Preliminary Documented Safety Analysis |

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|---|---|---|---|---|---|---|
| **Pantex Plant** | **Weapon Surveillance Facility (previously called Component Evaluation Facility)** | 130 | CD-0 | ***On hold*** | ***(Operational on hold)*** | No detailed review completed |
| **Savannah River Site** | **Pit Disassembly and Conversion Project (combines Pit Disassembly and Conversion Facility and Plutonium Preparation Project)** | Under evaluation | CD-0 | < 5% | ***(Operational being evaluated)*** | 1. ~~Assumption on combustible loading for seismically induced fire~~ ***—review terminated; not relevant to new conceptual design (Apr 10)*** |
| | **Salt Waste Processing Facility** | 1,340 | CD-3 | 95% | 17% ***(Operational 2015)*** | 1. ~~Geotechnical investigation~~ ***—resolved (Feb 08)***<br>2. ~~Structural evaluation—~~ ***—resolved (Dec 09)***<br>3. ~~Quality assurance—~~ ***—resolved (Jun 07)***<br>4. ~~Hydrogen generation rate—~~***resolved (Jun 09)***<br>5. Flammable gas control<br>6. Fire protection for final HEPA filters<br>7. Operator actions following a seismic event<br>8. Mixing system controls and operational parameters ***—new issue (Apr 10)*** |
| | **Tank 48 Treatment Process Project** | 156–181 | CD-1 | < 5% | ***(Operational 2014)*** | 1. Project delays |
| | **Waste Solidification Building** | 345 | CD-2/3 | 100% | 12% ***(Operational 2013)*** | 1. ~~Structural design~~ ***—resolved (Jun 09)***<br>2. ~~Deficiencies in Preliminary Documented Safety Analysis~~ ***—resolved (Feb 09)***<br>No open issues remain |
| **Y-12 National Security Complex** | **Uranium Processing Facility** | 1,400–3,500 | CD-1 | 35% | ***(Operational 2018)*** | 1. ~~Preliminary hazards analysis development~~ ***—resolved (Jun 07)***<br>2. ~~Nonconservative values for airborne release fraction and respirable release fraction—~~ ***—resolved (Sep 08)***<br>3. Structural and geotechnical engineering ***—new issue (Apr 10)*** |