Testimony of Thomas P. D'Agostino,
Acting Administrator,
National Nuclear Security Administration
to the Defense Nuclear Facilities Safety Board
March 22, 2007

Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board:

Thank you for the opportunity to speak to you about the National Nuclear Security Administration's (NNSA's) approach to integrating safety into the execution of our nuclear projects, especially how we integrate safety early in our projects' lifecycles. This is the third public meeting on this topic. At the Board's request, I will focus on the management processes for overseeing the integration of safety and design in relation to identifying, tracking and managing emergent safety issues for projects in a conscious, deliberate way to assure that issues are raised in a timely way and to assure that they are managed at appropriate levels. However, before addressing the specific issues that are the focus of our discussions today, I would take a moment to provide an overview of what the NNSA has done to address safety in design. On this point, I am happy to report that NNSA has been proactive in addressing "Safety-in-Design" issues, as evidenced by the accomplishment of many of the commitments that were identified in Linton Brooks' Memorandum on February 6, 2006 as well as the actions that are described below.

As the Deputy Secretary stated in his public remarks before this body on December 7, 2005:

> "We will not design and build facilities unless we are confident that we can operate them safely."

He went on to say at the meeting that these words are not just platitudes, but that they are truly "core values" and are just as much good project management and good business as they are good safety management practices. Of course, the Department's processes to integrate safety into nuclear projects did not originate on December 7, 2005, but the meeting and the direction from the Deputy Secretary two days earlier initiated a series of actions to heighten NNSA's cognizance of these matters. The following items represent examples in which the NNSA has made progress in institutionalizing the Deputy Secretary's policies laid out on December 7, 2005. These examples follow on the commitments I made in the last public meeting on this subject on July 19, 2006. I will restrict my commentary to NNSA initiatives.

- Safety expectations for projects are being institutionalized. DOE Order 413.3A was issued in July 2006, DOE-STD-1189 is soon to be issued, and the NNSA Energy Systems Acquisition Advisory Board-equivalent

processes have been updated to embed integration of safety in nuclear projects at the highest levels of NNSA.

- New requirements have been promulgated to assure that well qualified federal personnel are assigned and trained to perform the safety review and acceptance processes on behalf of the Department. The credentials of these individuals are certified by the Chief, Defense Nuclear Safety (CDNS) for major projects. This demonstrates my earlier commitment last July to "improve and re-energize the Integrated Project Teams."
- The CDNS and his staff have specific responsibilities to oversee the safety bases of nuclear facilities. The CDNS is applying its oversight function over DOE projects now.
- The facilities management function within Defense Programs has been consolidated into one organization such that the attendant programmatic issues can be addressed across the suite of nuclear projects from one point in the management structure.
- Communications between the Board and NNSA, from the staff to the organizational levels, have been opened up to provide multiple paths to communicate relevant safety issues between the organizations at all applicable levels.

Notwithstanding the important accomplishments I just mentioned, the safety-in-design efforts continue to develop. Many milestones and accomplishments have been realized, but more work needs to be done to fully meet the expectations in the Deputy Secretary's December 5, 2005, memorandum. One set of items to work, both within DOE and between DOE and the Board, is the early identification and tracking of safety issues. The discussion is timely because our two organizations owe Congress a report this summer on how the organizations will work jointly to communicate and track safety issues on nuclear projects as they mature through their acquisition cycles.

NNSA has a number of nuclear projects that are in different phases of their acquisition cycles. Some are very deep in their design cycles, such as the Pit Disassembly and Conversion Facility. Some are in construction, such as the Highly Enriched Uranium Materials Facility. Some are in their infancy. Others are on the horizon, such as the prospective set of facilities being contemplated for Complex 2030. My comments, though of general applicability, will tend to be reflective of two specific NNSA projects to which the safety-in-design topic is particularly timely. They are the nuclear portion of the Chemistry and Metallurgy Research Building Replacement (CMRR) Project at Los Alamos National Laboratory and the Uranium Processing Facility (UPF) at the Y-12 National Security Complex. These two projects are focusing lenses because they are large nuclear facilities to which the Safety-in-Design initiatives are specifically meant to address and because these projects are in points in their lifecycles where the safety-in-design initiatives can be observed most plainly.

CMRR will be discussed more thoroughly in a few minutes by the Federal Project Director (FPD). However, let me state that CMRR is a good news story in how to identify and work safety issues early in the project cycle. Actually, the CMRR safety initiatives pre-date the Deputy Secretary's direction. Very early in the project's life, the project team planned the project's execution to assure that safety issues would be identified, vetted, and resolved as early as practical. The project made timely resolution of safety issues a focus to minimize the time that would be required in the future to get authorization basis approval for the project. The project realized that resolving safety issues early was central to mitigating schedule risks associated with the project. The measures from the team evidence the Deputy Secretary's statement from December 2005, where he noted that proactive safety management is also good project management and good business as well. Associated with the strategies to identify and resolve issues early, the CMRR project team has engaged with the Board and its staff on many issues and at many times, going back to at least June 2004 and continuing via regular briefings and discussions since then. The CMRR project has hosted dialogues and briefings in Washington and in New Mexico on a variety of issues, including the acquisition approach, seismic design criteria and geotechnical investigations, the radiological laboratory, the overall safety strategy, confinement, and fire protection, as examples.

CMRR now approaches the completion of its preliminary design. With respect to safety integration for this project, several points are clear:

-The commitment to integrate safety exists at all levels, from the sub-contractors all the way up to senior management.
-Communications on safety issues has been open, frequent, and frank.
-An overall safety strategy was adopted early in the project. It has become normative for project execution.
-The project has adopted conservative design approaches and manages safety issues on an ongoing basis.

The Uranium Processing Facility is earlier in its lifecycle than CMRR. UPF awaits approval of its conceptual design, which was completed more than a year ago. During the year, the expectations for safety implementation have evolved. The UPF project team has attempted to keep apace of the changes and has been proactively attempting to comply with the intentions of DOE-STD-1189, a standard that is presently in draft. During this year, the project team also developed a comprehensive set of design criteria, including criteria for safety, to set the design expectations for one or more architect-engineers to design UPF. Following on the CMRR example, I expect that UPF will also commit to personal responsibility for safety up and down the chain-of-command and to communicate safety issues in an open, frank, and frequent manner. The UPF project team has already published a safety design strategy, which is a key tool included in the draft standard. In furtherance of our commitments to early identification of issues

and early engagement with the Board, the UPF project team hosted a Technical Independent Project Review during the week of March 5; the Board staff was invited and participated in the review in an observational role. The report from the very senior team that led the review at Y-12 has not been finalized, but, I understand, the technical issues are being resolved and should not stand in the way of progressing into the preliminary design phase. Lastly, the UPF project team has also addressed project management issues that emanated from the Highly Enriched Uranium Materials Facility such that confidence in the team to execute the project successfully has been earned.

As relates to identification of issues, NNSA has multiple mechanisms to assure safety issues are identified early. The mechanisms include: oversight of the subcontractors by the Management and Operating contractors; oversight and acceptance of safety products by the Site Offices; project reviews by the program office and the Office of Engineering and Construction Management; the Board and staff reviews; and oversight by Headquarters personnel in the program office, the CDNS, and the Office of Health, Safety and Security. As an example of how issues are being worked proactively with engagement with the Board and its staff, the UPF project will undertake an action to locate the shear walls in the UPF conceptual design. The addition of these details to the conceptual design will effectively resolve a primary concern expressed by the Board's staff.

Issues tracking is done at the project level. This generally has worked well. In the case of UPF, the issues management tracking system will be the same as the one the project inherits from HEUMF, which has proven to be successful. The CMRR example can be discussed in a few minutes in the FPD's presentation.

In NNSA, issues are effectively communicated up the management chain. The vast majority of safety issues are vetted and resolved appropriately at the staff level. Those that are not resolved are raised at progressively higher levels of management. Significant issues that have not been previously resolved would be addressed as part of the normal deliberations at the NNSA Energy Systems Acquisition Advisory Board, which I chair for large projects. Although I am not aware of any significant breakdown in the issues communications protocols within NNSA or between NNSA and the Board, we will continue to seek ways to improve communication both within and external to our organization.

Whereas I do believe the safety-in-design initiative is indeed making great progress, I understand that there are additional improvements to be pursued. These include:

1. The safety expectations for attaining Critical Decisions are not uniformly understood. I look forward to our staffs working these issues

out as we continue to collaborate on the Joint Report to Congress. We ought to look jointly at the safety expectations for projects and come to agreements on how to communicate them. We should be open to the prospect of revising the Order, if necessary, to capture the expectations.

2. When the DOE-STD-1189 and the Guides that accompany DOE Order 413.3 have been finalized and issued for implementation, we will begin to gain actual experience in applying them to real projects. I would then expect that the Department would review all three sets of documents (the DOE-STD-1189, DOE O 413.3 and the Guides pertaining to safety, design, and construction) to ensure that they are internally consistent with one another, that they are properly integrated, that the requirements they impose on projects are appropriate, and that they can be readily implemented on actual nuclear projects. As part of this, the NNSA will work closely with the Department to develop a comprehensive path forward on how we will integrate the documents into a working whole. In the meantime, the NNSA will continue to implement the intent of draft DOE-STD-1189 for projects already in their execution cycles (such as CMRR and UPF). I also plan to invoke DOE-STD-1189, when issued, as a basis for execution for nuclear projects in NNSA's Program Requirements Documents.

In summary, NNSA has made significant strides to improve its processes for integrating safety into the designs of its nuclear projects. Work remains to be done. My staff and I look forward to working collaboratively with the Board and its staff to make the future work tasking as efficacious as practical.

I am now open to your questions.

Defense Nuclear Facilities Safety Board Public Meeting on Incorporation of Safety into Design and Construction

Statement of Dr. Ines Triay
Chief Operating Officer, DOE Office of Environmental Management
March 22, 2007

Good morning Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board. Our Assistant Secretary, Mr. Rispoli, had another commitment and could not attend, but he sends his regrets. I appreciate the opportunity to be here today to represent the Department of Energy's Office of Environmental Management and address the actions our office has taken since the last public meeting with regard to integrating safety into all aspects of our projects, including design.

Safe operations, including safety of the public, safety of our workers, and protection of the environment, are paramount to EM. While the cleanup work we accomplish is important, it is more important that all of our workers are able to go home at the end of each day as healthy as they were when they arrived for work at the beginning of the day.

EM Project Management

We believe that we are developing a culture in which safety is fundamental to all aspects of project management. As part of EM's goal to improve its overall effectiveness, the Assistant Secretary has implemented a process to apply project management principles to the entire environmental cleanup effort, not just capital asset projects. This focus has included emphasis on certification of Federal Project Directors (FPDs) in accordance with the requirements of DOE O 361.1A, *Acquisition Career Management Program* (currently EM has over 60 certified FPDs) and more federal oversight of projects, entailing contractor monthly status reports and quarterly project reviews with the Assistant Secretary.

Additionally, the Assistant Secretary has instituted the EM Acquisition Advisory Board (EMAAB) review process, to conduct a review analogous to that required for large capital projects for critical decisions of all projects, both capital and operational cleanup projects. Project attributes addressed during this review include safety and process technical issues requiring resolution, as well as project risks. These reviews are performed for critical decisions following approval of CD-0, beginning with conceptual design.

We are teaming with the Army Corps of Engineers and an experienced project management contractor to develop a best-in-class project management structure

within the EM program. This effort will focus on the following activities: 1) site assessments; 2) development of site five-year baselines; 3) project controls; 4) project risk management plans; and 5) assessment of identified specific projects. Pending contractual arrangements, this activity will begin this month and continue for approximately one year.

EM Project Management and Operations Lessons Learned Program

A key element of disciplined project management is the use of lessons learned to systematically improve safety, cost-effectiveness, and efficiency. Organizations within EM, as well as other DOE offices, have been using the DOE corporate-level Lessons Learned Database to submit and disseminate lessons learned reports. The DOE Lessons Learned Database is maintained by the Office of Health, Safety, and Security (HSS). The EM Office of Acquisition and Project Management (EM-50) coordinates EM utilization of the database.

Last year Assistant Secretary Rispoli asked me to lead the development and implementation of a formalized, EM-specific lessons learned program to identify and share operational experiences in managing construction, cleanup, and closure projects throughout the EM complex. The EM Operations Lessons Learned Program involves FPDs, Field Managers, and HQ personnel to ensure that: 1) EM managers and FPDs are actively engaged in and support the program; 2) lessons learned are presented in an executive-level, prioritized manner; and 3) lessons learned are reported and presented in a consistent, structured format.

Based on the complexity and challenges, nine (9) projects have been selected for inclusion in the EM Operations Lessons Learned Program: the Rock Flats Closure Project, the River Corridor Cleanup Project, Ohio Closure Projects, Savannah River Construction Projects, the Idaho Sodium-Bearing Waste Treatment, the Waste Treatment Facility, the Salt Waste Processing Facility, the K-Basin Closure Project, and the DUF6 Conversion Project. The Lessons Learned Program addresses the challenges and experiences gained during applicable critical decision stages (CD-0 to CD-4) for the following focus areas:

- Safety
- Acquisition Strategy & Contract Management
- Regulatory Compliance
- Technology
- Engineering Design & Construction
- Funding & Resources
- Communication

Since the inception of the program, four projects have completed lessons learned and presented the results at the EM Monthly Field Managers Video

Teleconference. All presentations are posted on the EM Communications Portal. The remaining projects are scheduled to complete their lessons learned in FY-07.

DNFSB Expectations for Incorporating Safety Early into Design

One topic which DOE and the Board have agreed to jointly address is the achievement of common expectations for CD-1, as there are some differences that currently exist. DOE O 413.3A defines CD-1 as the end of the Project Definition phase for purposes of alternative selection and identifies limits on design activities because of statutory requirements regarding use of capital funds. Approval of CD-1 provides the authorization to begin the project Execution Phase and allows Project Engineering and Design funds to be used.

That being said, the expectations EM has laid out in its Interim Design Guidance provide a reasonable level of project specificity to establish an overall safety strategy. In addition the Board should have access to the full suite of products that DOE O 413.3A requires prior to approval of CD-1, as well as the results of reviews performed by EM and the Chief of Nuclear Safety (CNS).

Within the context of the required documentation and reviews identified by DOE O 413.3A, the scope of hazards is addressed and an overall safety strategy is developed by a contractor and reviewed by DOE. However, until CD-1 is approved the use of Project Engineering and Design funds for a more detailed level of design, such as design of major safety systems, is limited. Specifically, until the approval of CD-1, there is no authority to expend capital funds for the project (i.e., all funds expended will be operating funds).

DOE Management Expectations for Incorporating Safety Early into Design

In December 2005, the Deputy Secretary issued a memorandum to the Under Secretary for Energy, Science and Environment and other key DOE managers communicating his expectations regarding integrating safety into design and construction. My colleague from NNSA has also mentioned this message. Key aspects of the Deputy Secretary's message included: 1) the need to clarify and strengthen DOE's project management order; 2) better staffing of project teams with the necessary design engineering and safety expertise; and 3) implementation of Chiefs of Nuclear Safety responsibilities regarding safety requirements.

From a Departmental perspective, a key activity in this regard was the July 2006 revision to the DOE directive for project management (DOE O 413.3A), which provides expectations to DOE and its contractors regarding integration of safety early in the design process. My colleague from the Department's Office of

Engineering and Construction Management will address this and the associated standard, DOE-STD-1189 being prepared to provide further details regarding these expectations. This order identifies the following design and safety-related documents and reviews to be completed during the period following CD-0 and prior to CD-1, which facilitate identification of safety issues early in the design process:

- Conceptual Design Report
- Design Review
- Conceptual Safety Design Report
- Preliminary Safety Validation Report
- Preliminary Hazard Analysis Report and DOE approval
- Quality Assurance Plan
- Technical Independent Project Review

To institutionalize some of the integration of design into expectations within the EM program, prior to issuance of DOE-STD-1189, I signed a memorandum to field managers in July 2006 directing them to implement specific interim guidance to ensure that safety is fully integrated in the early phases of design. The guidance also provided consistency among EM projects in implementing certain safety design criteria that stem from existing directives. The memorandum included interim guidance that served the following purposes:

- Input for preparation of DOE-STD-1189
- Encourages additional emphasis and focus on safety during early stages of design, particularly at CD-1
- Recommends more prescriptive approach on design of safety systems for Hazard Category 2 and 3 facilities

The interim guidance also is focused on providing a basis for determining the design pedigree of initially selected structures, systems, and components (SSCs) prior to CD-1, including designation of initial safety-class SSCs based on use of DOE-STD-3009-94, and designation of safety-significant SSCs based upon standardized evaluation points.

This interim guidance is essentially forming the basis for evaluation guidelines for accidents resulting from natural phenomena hazard that are currently being considered in Appendix A of draft DOE-STD-1189. EM intends to issue direction to its field organizations to include DOE-STD-1189 in existing contracts upon its issuance.

To ensure that our project contracts require the consideration of safety sufficiently early in the design process, EM has instituted a more rigorous process to review Requests for Proposals. This review ensures that appropriate standards are included in contracts involving nuclear or radiological work and that design products will address the necessary level of detail regarding a safety strategy and design for safety.

Evaluation/Review of Projects for Early Incorporation of Safety

Within EM there is a tiered “defense-in-depth” type approach to ensuring implementation of early consideration of safety in design. At the field level the FPD and the Integrated Project Teams provide specific review and oversight functions of projects from project formulation through start of operations. This field review and oversight is augmented by EM Headquarters-led design reviews as well as external technical reviews in the form of Independent Technical Reviews (ITR) or external technical reviews (so-called “Best and Brightest”). The first ITR was performed of the preliminary design of the Salt Waste Processing Facility and identified a number of weaknesses. Examples of Best and Brightest reviews include: 1) review of the Waste Treatment Plant to determine whether the plant could meet contract processing requirements; 2) review of Savannah River Site Tank 48 treatment approaches; and 3) review of Hanford Demonstration Project Bulk Vitrification System to identify technical and safety vulnerabilities. EM is in the process of working to better integrate vulnerabilities identified by these reviews into its risk assessment process to ensure they are acceptable prior to proceeding with the next step in the project process. The CNS is preparing processes to perform reviews for safety considerations for capital project critical decision approvals. In this framework the CNS intends to conduct reviews and focus on the products and reviews specified in DOE O 413.3A for each project phase. For CD-1 it is the documents and reviews I previously mentioned, using a set of Lines of Inquiry developed for each review. Upon completion of the CNS review for each CD, the site lead will prepare a report for the CNS that documents the results of the review, including a recommendation whether to proceed with the next CD, based upon safety considerations.

Another initiative that EM has undertaken is the conduct of a series of Quality Assurance (QA) Evaluations to proactively identify and resolve QA concerns/issues within EM. The scope of these evaluations is not limited to the federal identification and implementation of QA requirements, but also includes all contractor organizations that perform work on site (and off site, e.g., vendors) in support of the EM site mission. This effort will examine both line item capital projects, as well as operational projects. The reviews will ensure that capital projects incorporate QA plans and QA management systems early in the design phase to avoid very costly project miscues later in construction as well as unsafe conditions during eventual operations. The scope of evaluations will take into account the level of maturity appropriate for each CD. The evaluation approach will identify, at the project level, the existence of an acceptable Project QA program and its relationship to the overall implementation of DOE Order 413.3A within the project. Our goal is to develop a QA program evaluation improvement approach to meet the requirements of DOE O 413.3A and DOE’s quality assurance requirements.

EM Project Management Teams

DOE O 413.3A calls for the formation and implementation of Integrated Project Teams (IPTs) to assist the Federal Project Director in the management of projects. These IPTs typically consist of personnel with project management and technical discipline expertise to review specific aspects of a project.

Recently, EM identified nominal capabilities for IPTs for various phases of capital projects (planning [through CD-0], design [CD-1, CD-2 up to CD-3], construction [CD-3] and commissioning [pre-CD-4]) and requested its Federal Project Directors to identify whether these capabilities were available. EM is in the process of synthesizing the input and will use the results as a mechanism to support providing the necessary IPT resources (either through direct federal support or staff augmentation) particularly in the technical areas such as geotechnical engineering, seismic design, and process engineering. A specific example is the Salt Waste Processing Facility project in which EM and CNS have made available to the team the services of an expert structural engineer for purposes of oversight of the contractor's path forward to address loads from static geotechnical considerations as well as dynamic considerations from seismic events. EM will continue to work with FPDs and field managers to identify functional capabilities and provide additional resources where needed.

Expeditious Resolution of DNFSB-identified Issues Related to Incorporating Safety into Design

Finally, EM considers Board-identified issues seriously, and addresses them at several different levels. Some of the attributes of successful issue resolution on the Idaho Sodium Bearing Waste Treatment Project, for example, have been early indications of potential issues, open dialogue with DNFSB staff on these issues, and prompt attention to the issue by the project team with an appropriate level of guidance and oversight from EM. EM and DNFSB consider the SBW project as a 'pilot' approach for expeditiously addressing Board issues.

The primary DOE organizations (NNSA, EM, MA and HS) that interact with the Board are currently working with the Board staff on a joint DOE/DNFSB report requested in the FY2007 National Defense Authorization Act Conference Report to address issue resolution primarily focused on integrating safety into design. The methodology for issue identification, communication, management and closure is a key topic that will be addressed in that report.

Summary

In summary, since the last public meeting, the Department of Energy's Office of Environmental Management has taken a number of important steps with regard to integrating safety into all aspects of our projects, including design. We will continue to pursue these and other steps to ensure the safety and protection of the public, our workers, and the environment.

I look forward to your comments and questions. Thank you.

Statement by the

Director of the Office Management,

U. S. Department of Energy

to the Defense Nuclear Facilities Safety Board

March 22, 2007

Good morning, Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board. I am Ingrid Kolb, Director, Office of Management. I appreciate this opportunity to present testimony on the status of our efforts to improve project management, including the integration of safety early into the design and construction process. Our newly-appointed Director of the Office of Engineering and Construction Management, Paul Bosco, will provide additional detail on our efforts to implement DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and to update the accompanying manual.

As the Director of Management, I have overall responsibility through the Office of Engineering and Construction Management to develop and oversee implementation of policies and procedures to ensure the Department's $63.31 billion on-going capital asset project portfolio meets cost, schedule and performance targets. The Director, OECM and I regularly report to the Deputy Secretary on the status of the Department's major capital asset projects, provide him with objective analysis of project performance and advise him on whether

projects are ready to advance to the next phase. We work collaboratively with the Department's program offices to promote sound project execution. OECM conducts External Independent Reviews to determine whether a project can be successfully executed and that all requisite safety planning and associated documents have been completed. They also provide professional development for project directors and procurement professionals, and certify contractor Earned Value Management Systems to ensure the accuracy of performance data.

Overall, the Department has done a good job in managing its projects, certainly better than is often portrayed. I'm pleased to report that last month, 88 percent of the Department's projects were on cost and schedule. However, improvements are needed, especially for riskier, high dollar projects, where we have tended to be less successful.

The Government Accountability Office (GAO) recently issued its annual report on high risk activities. For the seventeenth year in a row, GAO identified the Department's contract and project management as being at high risk for fraud, waste, abuse and mismanagement, especially for our major capital asset projects. Significant progress has been made in such areas as certifying all Federal project directors, strengthening External Independent Reviews to validate project baselines, and certifying 42 percent of contractor earned value management system; however, continuing inconsistency in the rigor of project

management is of grave concern to the Secretary, Deputy Secretary and the Department's senior leaders.

To make further improvements, the Department's senior leadership team is engaging in a renewed effort to work together to strengthen the policies and processes used to manage projects, instill greater discipline in the use of those processes, ensure that adequate resources and qualified staff are dedicated to projects and break down stovepipes that hinder overall performance of the project portfolio. The goal of this effort is to improve project performance by consistently delivering capital asset projects within budget and on schedule that meet environmental, safety, and health standards.

Adherence to safety standards and requirements, especially early in the design and construction phases, is central to ensuring our projects meet cost, schedule and performance targets. The inclusion of safety considerations early into the design process, as advocated by the DNFSB in Recommendation 2004-1, was an important improvement to DOE Order 413.3A that will help prevent costly delays and, most importantly, protect our workforce and surrounding communities. It's the right thing to do and it makes good business sense.

Now, we have embarked upon the process of implementing the Order throughout the organization. Of course, this is a large task that won't be accomplished over night. We are advancing this effort by: 1) *educating* the line organizations about

the new requirements; 2) *incorporating* the Order into contracts, and 3) *validating* that the requirements are being followed.

Last November the Department hosted a Project Management Workshop for Federal senior project and program managers to discuss the revised Order and to stress the importance of safety. We also updated the Project Management Career Development Program and added professional development requirements for safety.

We have been working with the contractor community to incorporate the updated Order into all of our contracts. Finally, we are taking advantage of several methodologies to validate the Department's full compliance with our project management directives. Using already existing checkpoints such as External Independent Reviews, Independent Project Reviews, and Earned Value Management System certifications, we believe the Department will be able to further strengthen its safety oversight and better ensure that we are able to execute to our approved baselines.

Mr. Chairman and Members of the Board, I am pleased to introduce to you our new Director of the Office of Engineering and Construction Management, Mr. Paul Bosco. Coming to us from many years with the Naval Facilities Engineering Command, Paul is well versed in the challenges DOE is currently facing and brings a significant amount of relevant experience to the job. The Deputy

Secretary and I have complete confidence that he has the knowledge, skills and education necessary to lead the Department's project management policy and oversight functions.

Thank you.

Statement by the Director of the

Office of Engineering and Construction Management,

U. S. Department of Energy,

to the Defense Nuclear Facilities Safety Board

March 22, 2007

Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board, good morning. For the record, I am Paul Bosco, the new Director of the Office of Engineering and Construction Management. I am pleased to be here today to report the progress the Office of Engineering and Construction Management has made with implementing the revised DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and to outline our strategy for updating the associated DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*.

DOE Federal Project Directors and Program Managers are accountable for the planning, programming, budgeting, and acquisition of capital assets. The principal DOE goal is to deliver capital assets on schedule, within budget, and fully capable of meeting mission performance and environmental, safety, and health standards. A fundamental element that is necessary to achieve DOE's goals is the integration of safety throughout the DOE Acquisition Management

System. DOE Order 413.3 and DOE Manual 413.3-1 are critical parts of this system.

In January 2006, the Department of Energy began the challenging task of updating DOE Order 413.3 to clarify and strengthen project management within the Department and, specifically, to more clearly integrate safety into design and construction. The goals included:

- More completely describing safety requirements for design and construction;
- Identifying references to the required safety directives and standards; and
- Improving the roles, responsibilities and oversight related to safety.

The Office of Engineering and Construction Management has worked closely with the Office of Health, Safety and Security to incorporate safety requirements into the revised Order. Order 413.3A now identifies the safety requirements for each Critical Decision point. As you are aware, the Office of Health, Safety and Security plans to publish DOE Standard 1189 later this year. This Standard will provide implementation guidance for the nuclear facilities safety requirements mandated in the Order.

After an extensive review and coordination process, DOE Order 413.3A was published on July 28, 2006. The requirements in DOE Order 413.3A are founded upon the key principles of line management accountability, effective up front

planning, early integration of safety into design, management of risk, accurate performance measurement, and communication with stakeholders. As suggested by the Defense Nuclear Facilities Safety Board staff, implementation of the order for Hazard Category 1, 2, and 3 nuclear was delayed until six months after issuance of DOE Standard 1189. That is still the plan.

The Department is currently in the process of implementing the Order throughout the organization, and the contractors that support us are doing the same thing. This is a Herculean effort, and one that won't happen overnight. However, the Department has already taken some major steps. We are addressing this challenge via three paths: 1) *educate* the line organizations about the new requirements; 2) *incorporate* the Order into existing and future contracts, and 3) *validate* that the requirements are being followed.

We are taking actions necessary to ensure that line organizations understand their roles and responsibilities. Shortly after release of the Order, the Department hosted a two-day Project Management Workshop for Federal Project Directors, senior program managers, and key contractor personnel to discuss the significant changes to the Order and to stress the importance of integrating safety early into design and construction. Senior DOE leaders including Secretary Bodman and Deputy Secretary Sell presented keynote speeches on these subjects.

In addition to these overarching topics, other sessions included: Cost Estimating; Contract Management; the External Independent Review Process; and Risk Management. Speakers for these topics came from across the Department of Energy and also from external organizations such as the Department of Defense and the Project Management Institute.

Finally, a distinguished group of the Department's Federal Project Directors and Program Managers participated in interactive panels focusing on the subjects of: Lessons Learned; Program Best Practices; and Earned Value Management. Feedback from the attendees was very positive. I plan to host such conferences annually to ensure continuous dialogue and to share best practices.

In addition to hosting this workshop, the Office of Engineering and Construction Management has updated the Project Management Career Development Program and the Program Management Career Development Curriculum. Fourteen of these courses which directly provide instruction on the order and its requirements have been updated to take into consideration the changes to the Order.

Finally, a Project Management Career Development Program safety course was developed and made mandatory beginning in 2008 for all Federal Project Directors coming forward for Level 1 certification. Federal Project Directors already certified have two years to complete this course as part of their

continuing education requirement. This course will help Federal Project Directors ensure the early identification and resolution of safety issues in their projects.

In addition to training and education opportunities, the Department has been aggressive in working with the Programs to incorporate the updated Order into existing contracts and new delivery orders. OECM continues to monitor 413.3A compliance from a contractual standpoint, and will gather full statistics when DOE Standard 1189 is published and Order 413.3A is modified to require its implementation.

The final path of implementing the Order is to monitor and validate that the requirements of the Order, especially safety-in-design aspects, are being scrupulously followed. The office of Engineering and Construction Management is taking advantage of multiple oversight methodologies. Rather than a reliance on metrics, we have opted for proactive controls. First, we are evaluating compliance with the Order during External Independent Reviews. During an EIR, one of the tasks is to ensure that the project is ready to proceed to the next Critical Decision point. For example, prior to gaining “Performance Baseline Approval” at CD-2, the EIR team checks to ensure all of the (16) items as delineated in the Order have been completed. This would include, as applicable, four safety items, to include a Hazard Analysis Report and a Preliminary Safety Design Report. In addition, we plan to adjust our EIR methodology to include more emphasis on the composition, qualifications and skill set of the personnel

on our Integrated Project Teams. We believe this will further strengthen safety oversight throughout the process and better ensure we are able to execute to our baseline as advertised.

The Office of Engineering and Construction Management has another control point to ensure compliance with the Order -- my office has budget control over projects. We work closely with the Department's Chief Financial Officer to ensure that projects are following DOE Order 413.3A before approving any project funds. Projects must have a CD-0 approval prior to requesting PED funds to start design. Likewise, projects must have a CD-2 approval or approved exceptions prior to requesting construction funds. Without OECM's endorsement, lacking the appropriate critical decision milestone approvals, or an exception approval, dollars cannot be requested. Also, we are casting a critical eye on all future budget exception memos and are actively working to reduce the number of budget exceptions. Our principal goal is the delivery of projects on schedule, within budget, with the required performance capability, and compliant with quality, environmental, safety, and health standards. We believe granting exceptions may detract from this goal. At each milestone, the appropriate safety review and documentation must be completed.

There are other control points throughout the process to ensure Order 413.3A is being implemented. The Energy Systems Acquisition Advisory Board evaluates compliance during Critical Decision points. Earned Value Management System

certification review teams do the same. Independent Project Reviews and Technical Independent Project Reviews also provide opportunities to ensure compliance with the Order.

When published, DOE Order 413.3A cancelled Chapters 1 through 3 of the existing DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*. These chapters contained requirements that are now included in the revised Order. Currently, the Department has begun the process of updating the remainder of the Manual, to synchronize it with the requirements in the new Order. The Department's projects run the gamut from one-of-a-kind scientific research programs to environmental cleanup projects spanning many years. No single approach could be developed to satisfy the needs of all these projects. Instead of updating the Manual, the Department has set upon a course to provide the Departments' Federal Project Directors with a series of guides, allowing subject matter topics to be issued based upon the Department's priorities. Guides, unlike Orders and Manuals, are not mandatory – in this case, the 413.3 Order directs ***what must be done*** and the 413.3 Guides will provide assistance on ***how it can be done***. As such, the guides will provide a valuable project management resource, while at the same time giving Programs the flexibility to determine the best course of action for each of their unique projects. During the development of the guides, however, the writing teams will capture all issues that they believe should be made mandatory. These candidate requirements will later

be evaluated by the Department for incorporation into future updates of DOE Order 413.3.

This series of guides will expand upon the DOE requirements related to the acquisition of capital assets and will present a common framework for implementing the requirements. The intent of the guides is not to impose additional requirements, but rather to place existing requirements outlined in the Order in the proper context. The target audience of these guides includes Federal Project Directors, Program Managers, Acquisition Executives, and others involved in the DOE capital asset acquisition process.

The guide topics were developed from two sources: 1) the Chapters in the existing Manual, and 2) additional topics necessary to support the new Order. In the interest of time, I will not list the titles of all (18) of the guides now, but will provide them to the Board as an attachment to my written testimony. One new guide, however, is worthy of comment and is very important. Titled “Management of Design and Construction,” this guide topic was suggested by the Board staff and was approved by the Department as a new guide. It is envisioned to serve at the procedural “glue” holding the full suite of guides together in a comprehensive design and construction toolset. Currently, there exists incomplete agreement between the Department and some members of the Board staff regarding the content of this guide – the Board staff looking for a step-by-step guide for constructing nuclear facilities, and the Department staff looking for more of a

systems approach for design and construction. During the writing process, however, the DOE team responsible for this guide will be consulting with the Board staff to ensure that, in the end, a useful product is developed for the Federal Project Managers in the field.

Safety-in-design objectives are being factored into the Guides' revision strategy in two ways. First, there are representatives from the DOE Standard 1189 development team on most of the Guide teams to ensure that safety-in-design is factored into the writing process and that the verbiage within the Guides is consistent with the Standard. Second, the Management of Design & Construction guide under development will factor in safety throughout the project management process.

While the overall guide development effort is being led by the Office of Engineering and Construction Management, the Department has distributed the responsibly for writing the Guides to various DOE Programs and Staff offices. In other words, the responsibility of developing the Guides is shared across the Department with different Programs and Offices taking the lead on a specific Guide. For example, the Office of Environmental Management is responsible for writing the guides for Risk Management and Environmental Management Clean-up Projects. This approach will afford the various components of DOE the opportunity to fully participate in its development.

To oversee and assist the DOE/NNSA teams in writing their assigned guides, Department has established an executive core group. This core team has representatives from NNSA, EM, Science, HSS and OECM. This core team has recently provided each Guide team with a list of “guiding principles.” These guiding principles are concise and clear, with an eye towards safety and past lessons learned. Some principles include:

- Refer to existing valid materials – don’t restate them.
- Don’t stovepipe – interact with the appropriate, interrelated guide teams.
- Ensure safety is always early into the design and construction process.
- Elevate any issues early – don’t wait until the final review process.

It is hoped these principles, the skills of our entire DOE and NNSA staff and contractors, and the oversight of the Office of Engineering and Construction Management, will facilitate the development of a useful, timely products. The Department’s goal is to develop and publish all Guides by the end of Fiscal Year 2008.

The Department will implement the Guides using the same methodology as the Order: Educate, Incorporate, and Validate. Training topics will be added to the agenda for future DOE Project Management workshops, the Project Management Career Development Program and Program Management Career Development Curriculum will be updated as necessary. Existing and new contracts will be updated to include the new Guides. And, ongoing monitoring

processes and control measures will be continued and adjusted accordingly. By having the various Programs participate in writing the guides, we believe we will have a significant head start gaining acceptance and implementing them throughout the organization.

At this time, nothing has been identified that requires modification of DOE Order 413.3A to meet safety-in-design objectives. Once Standard 1189 is released, followed by the Guides, we anticipate there will be a need to update Order 413.3A to accommodate 1189 and other requirements identified during the Guide development process. We will take on that effort as soon as practical, but we expect that would occur during fiscal year 2009.

In closing, we believe the Department has a solid foundation and is moving in the right direction in improving its project management practices. It is my belief that our efforts for improvement in project management and safety should never end. We must continue to make improvements to effectively incorporate safety into design and construction so that our projects are more likely to be completed on time and on budget with all mission and safety objectives satisfied.

Thank you, Mr. Chairman and Members of the Defense Nuclear Facilities Safety Board. I now welcome any questions that you may have.

413.3 Guides

Guide	Guide Topic	Lead Program
DOE G 413.3-1	Management of Design and Construction	NA
DOE G 413.3-2	Quality Assurance	HS
DOE G 413.3-3	Safeguards & Security	HS
DOE G 413.3-4	Tailoring	NA
DOE G 413.3-5	Performance Baselines & Baseline Management	SC
DOE G 413.3-6	High Performance Sustainable Building	HS
DOE G 413.3-7	Risk Management	EM
DOE G 413.3-8	EM Clean-up Projects	EM
DOE G 413.3-9	Project Reviews	MA
DOE G 413.3-10	Earned Value Management	MA
DOE G 413.3-11	Project Management Lessons Learned Process	NA
DOE G 413.3-12	Cost Estimating	NA
DOE G 413.3-13	Acquisition Strategies	MA
DOE G 413.3-14	IT Projects	IM
DOE G 413.3-15	Project Execution Plans	NA
DOE G 413.3-16	CD-4	NA
DOE G 413.3-17	Mission Need Statement	CF
DOE G 413.3-18	Integrated Project Teams	NA

Testimony of Glenn S. Podonsky
Chief Health, Safety and Security Officer
U.S. Department of Energy
Before the
Defense Nuclear Facilities Safety Board

March 22, 2007

Introduction.

Mr. Chairman and members of the Defense Nuclear Facilities Safety Board; I want to begin by reiterating the Energy Department's commitment to safety—a commitment that is a departmental "core value" shared by Secretary Bodman and the entire senior leadership team. The Secretary has continually emphasized the need to have a safe and secure work environment for all Federal and contractor employees. As you know, he determined that further strengthening of worker health, safety, and security could be accomplished by creating a new office—the Office of Health, Safety and Security—HSS in October 2006. This required the refocusing and merging of most of the personnel, missions, functions, and organizational elements of the Office of Environment, Safety and Health, the Office of Security and Safety Performance Assurance, and the Departmental Representative to the Defense Nuclear Facilities Safety Board. While the responsibility for implementing health, safety, environmental protection, and security programs continues to reside with the Department's line managers, the HSS mission is to enhance the effectiveness and efficiency of these programs by providing program offices and their sites with more effective and consistent policy, assistance, independent oversight, training, and enforcement.

Since its creation in October 2006, HSS has focused on improving the Department's interface with the DNFSB, which has been one of my top management priorities. As indicated during our recent visits, I intend to establish a close working relationship between HSS and the Board and its staff – one that will facilitate better communication and provide for a definitive process for the timely resolution of Board issues. Our office has already taken a number of steps toward fulfilling this goal, including: (1) development of the new Interface Order 140.1 that specifies the DOE process for interfacing with the Board and its staff; (2) revision of DOE Order 470.4, *Safeguards and Security Program*, to address a Board concern that the interface between safety and security be adequately identified; (3) reduction of overdue commitments to the Board with the goal of zero overdue commitments; and (4) identification of a plan to conduct an Interface Workshop to train Federal and contractor personnel on the new expectations regarding interface with the Board on major safety issues.

HSS is also leading the Department team working on the joint DOE-Board report to Congress regarding improving the timeliness of identification and resolution of safety in design issues. Key topics being addressed in that effort is improved staff-to-staff communications and issue management.

Additionally, the Department is taking action to integrate safety into design and construction, the subject of today's meeting. In December 2005, Deputy Secretary of Energy, Clay Sell, challenged his senior managers to build upon the strengths of the

Department's project management program to better integrate safety into the design of projects early in their life cycle. Responding to that challenge, the Department embarked on a DOE-wide effort to make safety an integral part of the design process. Responsible for safety policy, elements of the current HSS organization began work on making sure the Department's safety policy requirements in this area are complete and clear. A key element of that effort is the development of a new DOE technical standard, DOE Standard 1189, "Integration of Safety into the Design Process," which will provide the Department's expectations and acceptable methods for identifying, preventing, and mitigating both radiological and chemical hazards in the design of DOE hazard category 1, 2, and 3 nuclear facilities. The standard also provides expectations on the format and content of key safety design reports. In addition, it identifies critical inputs to and intersections with project management activities, tools, and reports. This standard fits with two other key DOE directives to provide the Department's framework for ensuring effective integration of safety into design for DOE hazard categories 1, 2, and 3 nuclear facilities. These two directives are the project management order (DOE Order 413.3) and the facility safety order (DOE Order 420.1B), both of which have or will have implementation guides. The Department's project management order (Order 413.3) provides the overall project management structure that requires the preparation of safety design reports that are to be reviewed and approved by DOE as part of the process of moving from conceptual through preliminary to the final design stage. The facility safety order (Order 420.1B) provides specific design requirements and expectations for systems that are important in safety.

In my talk today, I want to address three main topics: (1) the status of our efforts to develop safety-in-design standard (STD-1189), (2) the key attributes of the approach described in the standard, and (3) the path forward for effective implementation of the standard.

Status of the Standard.

The first item is an easy one. I am pleased to announce that we are nearing the end of the development effort. The development team has produced a complete draft standard that is now ready for broader review and refinement. Standard 1189 is in final review and editing, and will be released for DOE-wide review on March 30, 2007. As is our normal practice, the Board will be provided with an opportunity to review the draft standard during this time and we welcome the Board's comments to make it better. Typically, two to three months will be required to accomplish the concurrence review and finalize the standard, depending on the quantity and content of the comments.

Key Attributes of the Standard.

Standard 1189 was designed with guiding principles that support the requirements of Order 413.3, focusing on an aggressive process to ensure uniform application of the safety in design process. It provides expectations that early project decisions should be conservative so as to provide development of appropriate project cost and schedule baselines. Projects' Critical Decision (CD) packages must portray safety item

selections, basis, risks and opportunities along with proposed mitigation strategies. They also must include cost and contingencies to enable risk informed decision making by the project approval authorities regarding the project technical basis and cost. Safety personnel must be utilized from the onset of project planning to help ensure appropriate hazards and techniques for hazard management are considered such as material-at-risk limitation, high hazard prevention techniques, and operationally effective design solutions to identified safety issues. Through implementation of DOE O 413.3 in conjunction with Standard 1189, important safety functions such as facility building confinement, confinement ventilation approach and systems, fire protection strategies and systems, security requirements, life safety considerations, emergency power systems, and associated seismic design criteria will be addressed as early as possible in the project. Finally, to assure that the project and/or facility configuration can be managed appropriately, the basis for decisions related to safety will be clearly documented. This includes controls selection, material-at-risk, process options, inputs, and assumptions.

In addition to being used in support of the requirements contained in Order 413.3, Standard 1189 also builds upon and augments the facility safety criteria documented in Order 420.1B, *Facility Safety*. Standard 1189 provides expectations on the interactions among safety, design, and project management activities and on the development of the required safety documents as design proceeds from conceptual through final design. In the development of the safety basis of the design, the project must show compliance with the safety design criteria of Order 420.1B or alternate criteria, if

proposed and approved by DOE. The Safety Design Integration Team (SDIT), as defined in Standard 1189, is the focal point of this activity, involving both safety subject matter experts and designers. The criteria for classifying safety systems that are identified through implementation of Order 420.1B are provided in the Appendices of Standard 1189. The Implementation Guides for Order 420.1B and the seismic design national consensus standards (ANS 2.26 and ASCE 43-05) as interpreted through Standard 1189 provide more detailed design expectations that result from those safety classifications.

The writing group for DOE Standard 1189 worked closely with project management personnel to ensure that its project management-related content is consistent with Order 413.3. The safety-related approach called for in Order 413.3 involves not only Standard 1189, but also the guides for the Order that are being developed under Office of Engineering and Construction Management (OECM) sponsorship. The Standard 1189 working group continues to work with project management personnel to assure that the OECM-led groups that are developing the guides are aware of those intersections and the content of Standard 1189 in those areas. The approaches to be provided in these guides and the expectations in this Standard are intended to ensure identification of hazards early in the project and that an integrated team approach is used to design safety into the facility. The basic safety-in-design precepts of this process are that:

- appropriate and reasonably conservative safety structures, systems, and

components are included early in project designs;

- project cost estimates include these structures, systems, and components; and
- project risks associated with the selections are specified for informed risk decision making by both the Federal and Contract Project Approval Authorities.

As part of our systematic approach to implementation of Standard 1189 and its integration with the proposed guides for Order 413.3, it is our intent to work with OECM to support a revision of Order 413.3 once Standard 1189 and Order 413.3 guides are published. This revision will capture lessons learned during the implementation of Standard 1189 and the development of Order 413.3 guides, with the intent of including items from both Standard 1189 and the Order 413.3 guides that should more appropriately be requirements contained in Order 413.3.

Standard 1189 is to be a fundamental element guiding the integration of safety in design and is key to the timely identification, evaluation and closure of safety issues early in the design phase of project life. Standard 1189 provides an acceptable technical approach to the safety requirements of Order 413.3 for hazard category 1, 2, and 3 nuclear facilities. I would like to give you an overview of how Standard 1189 works hand-in-hand with Order 413.3 to support a uniform application of the incorporation of safety-in-design. Some of the key attributes reflecting this include:

- The importance of establishing a Safety Design Integration Team (SDIT) in support of the Integrated Project Team (IPT) called for in Order 413.3. This

Safety Design Integration Team is made up of the safety and design subject matter experts, and is the heart of the safety and design integration effort. The formalization of a Safety Design Integration Team as a recognized team involving both safety subject matter experts and the design discipline leads is a key element introduced in Standard 1189, although it has been used on some very successful projects such as the Spallation Neutron Source.

- The development of a Safety Design Strategy (SDS) that provides a roadmap for how important safety issues will be addressed as the project progresses and for the development of key safety documentation. This Safety Design Strategy should be initiated during the pre-conceptual design stage and be updated and refined through the conceptual design stage. It becomes part of the Project Execution Plan called for in Order 413.3. The formalization of a Safety Design Strategy is also new with Standard 1189. It is intended to be the vehicle by which DOE and the design contractor can agree early-on about how safety aspects of design will be handled during the project.

- The development, in the conceptual design stage, of facility-level Design Basis Accidents (DBAs) and specific hazardous material (radiological and chemical) exposure expectations for safety and design classification of structures, systems and components (SSCs) called for in Order 413. These classifications (safety class, safety significant, seismic design classifications) provide design expectations for safety structures, systems, and components. The specific

hazardous material criteria established relate to both the public and collocated worker safety design considerations for classification of structures, systems and components. DBAs and specific safety criteria provide the means by which, at the conceptual and preliminary design phases, decisions can be made on important safety design systems and their design requirements at an early stage. Experience has shown that these design decisions, if left to later stages of design, can have significant cost and schedule implications that may not have been recognized in funding requests. These specific criteria are intended to have the effect that safety design classifications and bases will be on a consistent basis throughout the DOE complex.

- Standard 1189 provides substantial description of acceptable format and content for the preparation of the Conceptual Safety Design Report (CSDR), a Preliminary Safety Design Report (PSDR), and the Preliminary Documented Safety Analysis (PDSA) that are required by Order 413.3. These reports are intended to lay out the key safety decisions such as hazard categorization and identification of type and safety classification including seismic design classification of important structures, systems and components at the conceptual design stage. These reports must be reviewed and approved by DOE as part of the combined 413.3 / 1189 process to proceed to the next design stage. It is intended by this process to achieve early agreement on important safety design issues by all federal and contractor participants involved at these stages. The standard also includes acceptable methods for the analyses and processes

necessary to support these decisions and on the format and content of the safety reports. This process is intended to standardize the analytical approach taken and help reduce the likelihood of costly late reversals of design decisions involving safety.

- Standard 1189 calls for a Risk and Opportunities document as input to, or referenced from the DOE O 413.3 Risk Management Plan. Because Standard 1189 promotes making design and safety decisions at the conceptual design stage, and because these decisions may have to be made on the basis of incomplete information and on assumptions, the standard contains expectations for the development of a Risk and Opportunities input to the Risk Management Plan, which could also result in identifying the need for additional studies. The results of these additional studies, including their evaluation of risk and opportunities are also factored into the project cost estimates. As the preliminary design stage progresses, technical study results will provide data to resolve uncertainties that previously required assumptions to be made and thus provide the bases for progressing into final design.

Path Forward for Effective Implementation.

Regarding implementation of Standard 1189, let me assure you that we have not developed this standard with the view that the line programs could take it or leave it at their own discretion and without an accounting. Our view is that Standard 1189

provides important methods for effectively incorporating safety into design and these methods need to be used unless there is a very good reason not to. Having said that, we also recognize that our new standard will not be perfect upon issuance; we recognize the value of experience and feedback regarding this standard before finalizing our implementation policy requirements. Since the Deputy Secretary initiated these Department-wide efforts, we have participated fully in the Department-wide team that is implementing the overall effort to improve our ability to integrate safety early and effectively in the design and construction process. On behalf of the Department and the entire team working this issue, we commit to provide to the Board by June 1, 2007 a summary of the Department's path forward. I personally want to commit to you, as HS-1, that I will engage my senior staff to ensure that this path forward will identify key milestones and responsible managers. It also will address such key issues as: (1) our schedule for completing Standard 1189, the 413 guides, and the subsequent 413 order revision; (2) how the line programs will implement Standard 1189 on current and emerging projects; and (3) how the Department will ultimately invoke the expectations in Standard 1189.

Effective implementation of the 1189 standard will require adjustments to other existing and planned standards and directives. For example, the draft standard does not address the project management strategies of combining design phases. Order 413.3 Guide 1 is expected to address this topic. The Standard 1189 working group is working with the OECM guide development effort to assure that the common topics between Standard 1189 and the guides are coordinated and/or cross referenced. We intend to

continue to work closely with the developers of the Order 413.3 guides to ensure consistency between Standard 1189 and the 413 guides where they intersect.

As part of the development effort, the Standard 1189 working group has prepared a matrix of the proposed Order 413.3 guides and other DOE directives and standards that might require updating to assure consistency with Standard 1189. The matrix identifies the Order 413.3 guides that should be coordinated with Standard 1189 and identifies other directives and standards that would need updating, and what priority these should be updated in. Among those that should receive priority are DOE Standard 1104 on review and approval of safety basis documents, DOE Standards 1020 and 1021 for seismic design considerations, DOE Guide 420.1-1 on nuclear safety design criteria, DOE Guide 420.1-2 on natural phenomena hazards, DOE Guide 421.1-2 on Documented Safety Analysis, and DOE-Standard 3009 on Documented Safety Analysis for existing facilities. The most critical standard to be revised is Standard 1104 on review and approval of safety basis documents. This needs to be updated to address review and approval of early design reports. The urgency for revising the remaining standards and directives is less critical, since Standard 1189 is clear on the expectations in the areas covered. We will follow-up on all necessary changes and adjustments to existing standards and directives to make sure they are consistent with the Standard 1189 methods and expectations.

Conclusion.

In conclusion, I have provided you the status of our Standard 1189 development efforts, some key attributes of the standard, and our implementation strategy, including a commitment to share a more complete path forward by early June. The implementation of Standard 1189, *Integration of Safety into the Design Process* is expected to result in timely the identification, evaluation and closure of design issues early in project life. Building on the structure provided by the project management process (described in DOE O 413.3), Standard 1189 is very aggressive in developing design and safety approaches in the conceptual design stage. The processes outlined in the standard are focused on the early identification of appropriate structures, systems, and components, including their associated safety functions and design criteria, for a project design. This is expected to result in improved accuracy of cost estimates along with ensuring protection for the worker and public. We believe that Standard 1189 provides a detailed roadmap by which the integration of safety into the design of DOE projects can be improved. We are encouraged by early results to date in application of its principles and we are also gratified by the DOE-wide cooperation in helping to develop a useful and implement-able standard.

Office of River Protection Statement to
Defense Nuclear Facilities Safety Board
March 22, 2007 Public Meeting: - Safety in Design

Good morning, Mr. Chairman and members of the Defense Nuclear Facilities Safety Board. My name is John Eschenberg, and I am the Federal Project Director of the Waste Treatment and Immobilization Plant Project. I appreciate the opportunity to be here today to address the actions our office has taken since the last public meeting with regard to initiatives and actions we have taken on the Waste Treatment and Immobilization Plant (WTP) being constructed on the Hanford Site near Richland, Washington.

To provide some background, the WTP will be one of the largest radioactive waste treatment complexes in the world. It will be capable of pretreating up to 53 million gallons of waste stored in 172 tanks (waste from 5 tanks has already been retrieved), treating all the high-level waste and treating approximately 50% of the low-activity waste. The WTP is comprised of 5 major facilities: (1) High-Level Waste Vitrification Facility; (2) Low-Activity Waste Vitrification Facility; (3) Pretreatment Facility; (4) Analytical Laboratory; and (5) miscellaneous infrastructure facilities that we call Balance of Facilities.

The Waste Treatment Plant project is being executed in accordance with the project management requirements in DOE Order 413.3A and DOE M 413.3-1. The original procurement strategy was for the contractor to design, build, finance, and operate the facility for 10 years and DOE would pay for waste processed. In May 2000, the Secretary of Energy terminated the contract for this approach due to significant cost increases submitted to complete the project. DOE then decided to issue a Request for Proposal for the design, construction, and commissioning of the WTP. The following Critical Decisions (CD) were approved after the subsequent December 2000 award to Bechtel National, Inc.

- Critical Decision 3A: Approved Limited Construction - October 2001
- Critical Decision 3B: Approved Preliminary Construction - May 2002
- Critical Decision 3C: Approved Full Construction - April 2003
- Approval of Revised Cost and Schedule Baseline – December 2006

The following critical decision is planned for the future:

- Critical Decision 4: Approved Start of Operation - 4Q FY 2018 (based on one Operational Readiness Review for the WTP Project, prior to hot commissioning of the PT Facility.)

The Preliminary Safety Analysis Report (known generically as the preliminary documented safety analysis) was incrementally approved from 2001-2003, in conjunction with the CD-3 approvals, above. This series of approvals established the safety requirements and authorization basis for the WTP. The authorization basis is the safety envelope within which the facility must be designed, constructed, and tested. It is based on the preliminary hazard analysis

and design at this time (which was approximately 15-20% complete) and has been updated periodically to reflect design maturation. A Documented Safety Analysis will be submitted by the contractor and approved prior to CD-4.

I would like to discuss today a few specific examples of safety issues identified after construction authorization at the WTP, and lessons-learned from these issues. The significant cost and schedule impact of these issues would have been reduced if they had been identified earlier, if more effective contractor performance and federal oversight had occurred, and if more extensive prototypical testing had occurred. Many corrective actions are in progress for each of these issues. These will be discussed later in my presentation, but one I wish to emphasize now is the importance of early Technology Readiness Level Assessments (TRA) to define the scope of prototypical testing. These TRAs are now underway at the WTP based on assessment methodology developed by the U.S. Department of Defense (DOD), and recommended for DOD and National Aeronautics and Space Administration (NASA) use by the General Accounting Office (GAO). Their earlier use on the project would have been quite beneficial.

The safety issues identified after construction authorization and CD-3 are:

Significant Changes in the Seismic Design Basis after Structural Design Was Advanced

The change to the seismic design basis in 2005 had a major cost and schedule impact on the WTP. Identification of this concern at least 12 months before initial construction authorization—i.e., 2000—would have been necessary to eliminate any significant impact. However, the concern that led to the change was not identified until 2004.

In 1999, ORP approved the seismic design basis for the WTP Project in the 200 East Area on the Hanford Site. The seismic design was based on an extensive 1996 study for the Hanford Site. This study was discussed at several meetings with the Defense Nuclear Facilities Safety Board (DNFSB) and staff beginning in 1993 and continuing to a final meeting on December 16, 1995. That study subsequently underwent revalidation reviews by BNFL, the initial WTP contractor, and independent review by seismologists from the U.S. Army Corps of Engineers and Lawrence Livermore National Laboratory in 1999, prior to ORP acceptance.

Based on ORP's determination that that an adequately safe seismic design basis for the facility existed, DOE sequentially authorized construction of the WTP (CD-3A) beginning on December 10, 2001, which included the following scope: installation of forms, rebar, and structural embedments for the HLW and LAW Facilities; installation of walls to grade for HLW and LAW on August 21, 2002; completion of all HLW and LAW construction by November 13, 2002; and completion of the Pretreatment (PT) Facility by March 17, 2003.

In March 2002, the DNFSB began to question the assumptions used in developing the seismic design basis, particularly the adequacy of the 1996 site

geotechnical surveys. These questions were largely resolved over the next few months; but in 2004, new questions were raised about the effect of four soil/basalt interbeds in the top 1,000 feet of ground directly underneath the WTP. DOE developed a plan to re-analyze existing data to address this new concern in late 2004. In February 2005, this effort resulted in an increase in the seismic design basis for the WTP to accommodate uncertainty in the effect of the interbeds in dampening earthquakes. No new information was available for this effort other than the information that was used in 1995 to develop the Hanford Site seismic design basis. However, to satisfy the new questions regarding the effect of the interbeds, more rigorous computations were performed of the effect of uncertainty on the limited interbed data available. These computations found a significant increase in the seismic design basis was appropriate to accommodate the 85th percentile of credible soil and rock data sensitivity cases. The 1996 design basis was based on a median prediction, with limited analysis of the effect of uncertainty on the limited site-specific data.

In 2006, DOE conducted an extensive geophysical drilling program to acquire data to characterize the site's geophysical properties in detail, and potentially reduce this uncertainty. That data is currently being analyzed, and will be used to assess the margins in the current seismic design basis adopted in February 2005. This reassessment is expected to be completed by May 2007.

This issue has resulted in changes to the seismic criteria after the civil and architectural designs were well advanced. The issue could have been avoided or mitigated by earlier recognition and resolution of the potential technical concern. DOE technical staffing in this area was not consistently maintained and, during periods it existed, was not consistently made available to the project due to higher priorities in other parts of DOE. DOE attainment and maintenance of competent technical staffing in seismology and geotechnical engineering should be a prerequisite for other large high-hazard nuclear facilities to ensure a timelier recognition and mitigation of seismological issues.

<u>High Level Waste (HLW) Facility Structural Load Path Ambiguity</u>

The WTP contract was awarded to the current contractor, with the preliminary design of the facilities (approximately 15% overall design complete) from the previous contractor. The preliminary design detailed the facility layouts based on the design and needs of the process systems, with the basic floor plans and preliminary equipment layouts for HLW driven by process engineering requirements. In-depth structural analyses and designs of the facilities were not performed at that time

The manner in which seismic loads are transmitted through the walls and slabs of the Performance Category (PC) 3 HLW structures to the foundation (known as the "load path") became a concern of the DNFSB in 2002. However, the revision of the facility structural analyses to address this concern required significant resources, and contributed to schedule delays as the facility construction was put on hold until the completion of these new analyses.

The DNFSB's concern about the HLW facility was the unique structural features that made the load path hard to visualize or model. The HLW facility has many areas, where the slabs are not continuous, or the walls between floors were not aligned properly, which created very complex load transfer from the roof to the foundation, and caused additional stresses in many elements. The concern was that these additional stresses were not captured by the computer model used without detailed analyses at the location of these discontinuities. This issue could have been avoided if sufficient time was available in the design-build schedule to thoroughly review the basic structural designs inherited by BNI from the predecessor contractor before establishing the final building footprint.

The load path issue required significant additional parametric studies and reviews by experts to determine that the adequacy of the load path for the overall structure was acceptable. However, concerns remained regarding the acceptability of localized effects on the design of various walls and slabs of the HLW facility. The WTP contract stipulated (with BNI acknowledgement) an aggressive schedule to pursue start of construction as soon as possible. With this charter and background information, the contractor assumed responsibility for structural design of the facilities and aggressively pursued the design of the basemats (foundation) and the connecting walls for the structures at the basemat level. HLW basemat construction began in 2001. The HLW building quickly became the center of attention for the DNFSB in their review of structural designs. Discussions with the DNFSB continued over the next two years, involving several attempts to display the building response in an easily understood model. Due to continued concerns, DOE instituted a review of contractor analyses and designs by a small team of nationally recognized experts, the DOE Peer Review Team (PRT), in 2003. The valuable review by the PRT reiterated similar concerns, and made recommendations for resolution that have been adopted. By November 2004, four main issues remained: (1) developing an adequate description of east-west load distribution mechanisms; (2) quantifying the seismic contribution on primary load carrying member demand/capacity ratios; (3) redistributing lateral loads due to out-of-plane wall cracking; and (4) modeling mesh size effect on wall and slab design.

In April 2005, an interim design criteria (IDC) was approved for continuation of WTP structural design efforts based on bounding increases for seismic acceleration and application of load amplification, which the Board found acceptable as an interim measure. The issues were not completely resolved until mid 2005 when the contractor decided to use a more capable modeling software (SAP 2000) with more detailed elemental mesh to accommodate the complex layout of the facilities, once it became apparent that the dynamic analysis and the design of the facility needed to be redone to accommodate the large increase (40%) in the revised ground motion. This action and the notification of the Board of DOE's intent to issue a revised Structural Design Criteria in June 2006, finally resolved the Board's concerns with the facility design

One lesson learned from this issue was that, although the design-build strategy permitted more rapid construction on the facility than waiting for final design to be completed before initiating construction (in principle), it reduced the available time to recover when a significant design concern surfaced.

Another lesson learned was that the contractor strategy of performing studies to demonstrate the adequacy of the design was not effective, did not timely resolve the concerns to the satisfaction of all reviewers, and delayed the decision to thoroughly correct the design analyses, ultimately impacting the project cost and schedule more than earlier direct corrective action would have. In retrospect, DOE should have instituted the PRT review process much earlier to recognize the design concern earlier; and in addition, DOE could have directed BNI to use a more capable software tool (SAP 2000) when the issues became clear in 2004. This would have resolved the concerns at least one year earlier.

Inadequate Design for Control of Hydrogen in Piping and Ancillary Vessels (HPAV)

In May 2005, the WTP contractor concluded that its conventional, DOE approved strategy of prevention of all hydrogen explosions (stemming from radiolytic and thermolytic effects) could not be achieved without significant plant modifications and redesign. BNI then proposed to permit certain explosions if the consequences could be shown to be acceptable. The contractor working with DOE over the last 22 months, has developed bounding explosion criteria, supported by experimental data acquired from the California Institute of Technology, and independent review by Los Alamos National Laboratory. After agreement on these criteria, BNI has performed a review of over 10,000 potentially affected piping segments that could potentially accumulate hydrogen-producing waste. The review is intended to ensure that the waste will be removed through a combination of active and passive engineered features, or in the event that it is not removed, that the piping response will be elastic in the extremely unlikely event that an explosion occurs.

The cost and schedule impact of these changes has been significant. The contractor's original design did not recognize that piping and ancillary vessels could not be allowed to contain stagnant waste in high radiolytic or thermolytic environments. DOE did not timely respond to the U.S. Nuclear Regulatory Commission (NRC) generic information notification with implementing guidance to its nuclear facilities. No DNFSB recommendations have been made in this area. The Defense Waste Processing Facility is using the information developed at the WTP to reassess the potential hazard at that facility. The criteria and strategies developed at the WTP for slowly developing hazards such as this may have broader application. The issue of potential hazards from accumulation of radiolytic hydrogen in piping systems has been well known for many years. Most recently, explosions at two boiling water reactors (Hamaoka in November 2001 and Brunsbuttel in December, 2001) led the Nuclear Regulatory Commission to remind the commercial nuclear power industry of these hazards. In July, 2002,

as part of the ORP review of the initial Preliminary Safety Analysis Report submitted by BNI, the contractor committed that the potential for piping and ancillary equipment to accumulate hydrogen gas was being evaluated, and control strategies for this potential hazard would be developed; however it was not aggressively followed-up to identify design deficiencies during subsequent design assessments.

In retrospect, conservative design principles were not used by the Contractor in this case; i.e., ensuring all gas generating waste was continuously drained or vented. Quicker recognition that this principle had not been consistently applied in the design by DOE and the Contractor would have mitigated its impact. In the future, more targeted and prioritized DOE follow-up on significant generic communications may reduce the delay in recognizing the significance of such issues. Finally, additional generic research would be valuable to determine the probability of ignition of such flammable mixtures in piping and ancillary vessels, a subject on which there is currently no consensus.

Weaknesses in Waste Slurry Mixing Design

In 2001, the Contractor recognized that the design mixing systems had not been applied to the range of slurry conditions expected in normal and accident conditions projected for the WTP. In order to minimize costs, computational fluid dynamic models were used to try to ascertain whether the proprietary pulse jet mixer (PJM) technology could adequately mix the non-Newtonian slurries. The modeling results initially indicated that the PJMs were underpowered to mix the non-Newtonian slurries. However, the models were deemed immature and unreliable. Therefore, a decision was made in early 2003 to proceed with scaled physical testing. The testing ultimately provided design configurations that were used as the design basis in April 2004.

Because of the increased air supply requirements to fully mix non-Newtonian slurries, the ventilation system design margin was challenged. Therefore, a mixing scheme that cycled the PJMs was developed (2004-2006).

The major change to the waste slurry mixing design basis in 2004 has had a major cost and schedule impact on the WTP. Testing and redesign has taken five years (2002 to 2007) since it was first determined that the original design mixing systems would have been inadequate to mix Hanford's non-Newtonian waste slurries.

Testing of the application of PJMs to non-Newtonian fluids at least five years prior to finalization in 2004 of mixing system design − i.e., in 1999 − would have been necessary to eliminate any significant cost and schedule impacts due to this concern.

The lesson learned here was that complex technologies must be physically tested under conditions comparable to those that will be experienced under the expected range of operations before they are incorporated in final design. If the TRA process currently being applied by DOE had been applied to the

non-Newtonian mixing systems in 1998, the fluidic pumping systems would have been evaluated as an area appropriate for prototypical testing with a range of real waste and simulants.

Critique of Processes Used for Issue Identification and Resolution

The processes for issue identification at the WTP have been varied and extensive, but were not always effective. DOE oversight has consisted of extensive nuclear safety and project reviews, supplemented by facility representative, engineering, vendor and specialist contract assessors, other program reviews (including state Resource Conservation and Recovery Act [RCRA] permit change reviews), and independent technical expert reviews of the process flow sheet and project cost and schedule.

Regarding the rigorous program of nuclear safety reviews, in the conceptual design stage and early preliminary design (in 1997-2000), a series of topical meetings were held at which the Contractor presented its strategy for resolution of potential safety concerns, and was subjected to formal question documentation. ORP required written resolution of its comments. These responses were referred to in subsequent ORP reviews. Specifically, later in preliminary design (in 2001-2003), the Contractor submitted a sequence of preliminary safety analyses for ORP review and approval. These were extensively reviewed by a 60-person DOE team, with over 1,900 pages of questions documented and resolved. Construction was sequentially authorized in 2001-2003, subject to future resolution of 147 conditions of approval (COA). These conditions related to incomplete hazard analysis, or incomplete fulfillment of existing commitments. Follow-on reviews of updated safety analyses were conducted in 2004 and 2006. As of late 2006, approximately 30 COAs remained open, most of these being associated with commitments related to commissioning. Of the significant issues discussed above, only the hydrogen accumulation in piping and ancillary vessels (HPAV) issue, and inadequate systems for mixing of non-Newtonian fluids were identified to be unresolved during the initial PSAR review.

Consistent application of quality assurance throughout the project life cycle is very important. This principle was recognized at the onset of the program. Despite this, in 2002 DOE reduced its oversight of non-nuclear quality assurance areas, as part of an initiative to re-emphasize DOE's role as the contract manager, and not "management of the contractor." This reduction led to some issues in quality assurance application for non important-to-safety items procured by the Contractor. These weaknesses are being corrected as a result of recent DOE oversight findings. In addition, DOE is significantly increasing the amount of resources devoted to quality assurance oversight.

Many engineering and other programmatic reviews have been conducted throughout the project. DOE has found that external reviews are essential to provide independent perspective and where, appropriate, validation of the WTP Project design and performance. Participation by industry experts and the

primary contractor's competitors in these reviews has proven particularly valuable. Of these external reviews, three larger team efforts have been quite helpful in identifying weaknesses in the design, and outlining potential corrective actions:

- The black cell review (cells intended not to require entry for contact or remoted handled maintenance), a joint ORP-Contractor effort in 2004 that systematically reviewed the design of black cells, and led to significant enhancements in the design;
- The External Flowsheet Review Team, a Contractor-led effort closely monitored by ORP, that in 2006 identified a number of concerns for waste processing improvement; and
- The Technical Readiness Assessments (TRA) (in progress), a facility-by-facility ORP-Contractor joint effort begun in late 2006, and still underway, uses the latest DOD guidance to systematically assess whether any aspects of the design have not received adequate prototypical testing.

An early payoff from these assessments has been the identification of the need for further testing of the LAW canister decontamination equipment, and laser ablation sampling equipment, as well as confirmation of the manufacturability of melter bubbler tubes. It seems likely that many of the findings of the External Flowsheet Review Team would have been identified by a TRA, performed earlier in the design process.

The smaller scale engineering and program assessments by individuals and small team efforts have not been consistently insightful. Instead, these have been observations of the status of the design or safety program in the area observed, lacking deeper insights into the technical adequacy of the area observed, or limited scope assessments of the potential for shortcomings in the design that might affect project performance.

ORP also performs routine formal evaluations of the assessment program through the assessment program committee. ORP's processes and desk instructions for conducting assessments need improvement to better reflect the best practices of the nuclear industry.

Site facility representative, vendor, and contract specialist inspectors have focused on the adequacy of construction and construction work practices, and have not identified significant weaknesses in the design. They have identified problems related to the existence of the WTP as one of very few large, nuclear construction projects in the country. The absence of significant nuclear projects has led to a decay of nuclear qualified suppliers and services.

In summary, ORP has conducted wide ranging and extensive assessments of the Contractor throughout the WTP contract, with mixed effectiveness.

To improve its assessments, ORP intends to:

- Develop an effective ORP-wide assessment process, using best practices *(might cite the source of these 'best practices')*
- Train personnel on ORP's expectations for executing this process
- Periodically evaluate the lessons learned from the resulting assessments, including an annual written evaluation
- Use this annual evaluation to plan future assessments, on a fiscal year basis.

How Integrated Safety Management (ISM) is Applied

Implementation of ISM has been embedded in the contract from its inception. ORP has applied integrated safety management to the WTP in a way that protects the workers, the public, and the environment, and is technically sound and cost-effective. It is thoroughly implemented by the Contractor and ORP. That implementation does not ensure that every design or safety issue is identified and resolved before it affects project cost and schedule, as illustrated by the list of significant issues above that all occurred despite the existence of an extensive ISM process. However, the WTP ISM System and related safety initiatives have yielded the following positive results:

- A significant reduction in accidents and injuries at the WTP facilities.
- Enhancing the nuclear safety culture at the project.
- Mitigating inconsistencies in quality levels.
- Eliminating structural steel design deficiencies.
- Mitigating design document and Authorization Basis (AB) inconsistencies.
- Ensuring adequacy of procedures and procedure adherence.
- Training personnel to execute procedures.
- Improving the effectiveness of BNI management oversight and assessment.
- Implementing Human Performance Initiative (HPI) techniques to investigate, identify, and understand latent organizational weaknesses. This is improving the quality of corrective actions and supporting a culture in which freedom to report errors is not punished (just culture).
- Helping to acknowledge continuous improvement in safety performance. ORP and BNI have aggressive, but realistic performance objectives, measures and commitments (POMC) for FY 2007.

Federal Project Oversight

ORP processes were well-established to identify safety issues prior to construction, but there were no processes to ensure they were resolved prior to construction. To the contrary, the emphasis was on enabling construction to an aggressive schedule.

In addition, effective oversight requires a robust staff with technical acumen and communication skills. Whether acquired by direct hiring, or by a highly developed systematic approach to training, acquiring and retaining a highly competent staff, such as I recommend for future large nuclear projects, is a long-term commitment. This commitment must begin very early in the procurement cycle. And it must be sustained throughout design and construction to ensure effective federal oversight.

On this project, initial staffing plans for nuclear safety oversight were never achieved, and overall staffing was capped at a very low level, considering the project's size and complexity. Although dedicated, the DOE staff has not been sufficient to provide a robust oversight capability in all disciplines. The slow nature of the federal hiring process, scarcity of highly qualified personnel, and earlier reluctance of DOE to increase ORP staffing have all contributed to current staffing shortages. Consequently, project staffing has fluctuated year to year and, periodically, as DOE management has changed, reduced the effectiveness of DOE oversight. Currently, efforts are underway to significantly increase capability, and some initial progress has been made.

In addition to acquiring and maintaining a very high-caliber staff, early technological readiness assessments for large DOE nuclear projects are crucial to avoid expensive delays or cancellation of these projects due to unforeseen technical issues, such as the ones discussed above. This concept was recognized very early in the development of the WTP, in the initial request for procurement of two prototypical vitrification facilities. Unfortunately, in hindsight, its importance was not given sufficient weight, when later cost and schedule considerations, and concerns regarding compliance with the Tri-Party Agreement scheduled milestones, were permitted to override the preconceptual vision of what needed to be done. After the decision was made not to proceed with two fully prototypical pilot plants, the omission of extensive prototypical testing (such as might be defined by Technological Readiness Assessments) has been an expensive error for DOE to correct; one that has prolonged the safe disposal of Hanford tank waste.

Finally, as I have stated, early definition of the mission (with great specificity) and vigorous external review of the project at all stages of its development are keys to a successful project.

Thank you, Mr. Chairman, and Board Members for this opportunity. I would be happy to answer any questions you might have.

TESTIMONY

Herman Ledoux, Federal Project Director
Chemistry and Metallurgy Research Facility Replacement (CMRR) Project
Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Before the Defense Nuclear Facilities Safety Board

March 22, 2007

Mr. Chairman, Members of the Defense Nuclear Facilities Safety Board, and public:

Thank you for this opportunity to speak with you concerning the CMRR project's experience and practice in safety issue identification and resolution. As Mr. D'Agostino mentioned earlier, the CMRR Project has and continues to uphold safety design management as a main ingredient for project success. Maintaining and communicating the core safety design strategy and integration process throughout the execution of this project will ensure that we identify, evaluate, and resolve safety issues in a timely and logical manner.

Introductory remarks:

From the CMRR project's early inception, and following DOE project management principles in the DOE 413.3 Directive series, both the Federal Project Directors' office and the contractor have strived to ensure that safety integration is apparent and realized with this project. As a critical investment to the mission of the Los Alamos National Laboratory and the Department, it is important that the CMRR facility become a model of safety to be designed, constructed, and operated in a manner that protects the public, workers, and environment. The integration of safety began during the early mission need and conceptual design phases and continues today in preliminary design. The project is following all of the Code of Federal Regulations (CFR) 10CFR 830 Nuclear Safety Management Rule requirements to evaluate the hazards associated with the facility and reduce the risk of the facility to well below the Evaluation Guidelines. As you will see from my discussion here, the project began its analysis to implement 10 CFR 830 Safety Basis requirements as early as possible in the Critical Decision process. A formal integration process was developed that continues in all day-to-day design activities as well as during periodic formal design and safety meetings. All participants in the CMRR project, including LANL operating contractor, the integrating Architect Engineer, and Design and Safety Basis contractors, follow this process in accordance with the project's quality program. This process is well documented, has been reviewed numerous times by the Board staff and by external and internal reviewers, and is critical to our feedback and improvement program.

Early in the CMRR design process, the project identified the need to develop a process to integrate design and safety. A formal process was developed to review design as it matured and to review safety issues in conjunction with the design. The formal process

is supportive of, and in addition to, the day-to-day interfaces among designers and safety professionals. A monthly formal design meeting is held during which time the design contractor(s) subject matter experts (SME), the nuclear safety basis contractors, LANL project, Federal project, and invited DNFSB staff meet to formally review the design status, present special topics, and explore solutions to design issues paramount to the project. Many side-bar or 'over the shoulder' meetings and reviews are held in conjunction with the monthly design meetings in which engineering and safety disciplinary staff work on specific issues. As an example, during the December 2006 design meeting, held in the Sargent and Lundy's Chicago (our design A/E) office, a major focus of the meeting was reviewing design and safety experience with long term vault storage of plutonium. Safety analysts who performed design and safety calculations and managed prototype testing for the Russian MIAC plutonium facility presented their work and answered numerous questions. Interactions with projects facing technical safety design challenges continues as we implement lessons learned and discuss approaches in solving the challenges. In conjunction with each monthly design meeting, a formal Integrated Safety Committee (ISC) meeting is also held. The status of safety design issues is discussed and an action item list is maintained. Issues are debated and actions assigned as necessary to accelerate or achieve resolution.

As stated above, the CMRR project accelerated the development of its Safety Basis (SB), in compliance with 10CFR830, by as much as a year. The intent of early SB development has been to identify nuclear safety challenges and develop design approaches early in the process as possible to achieve consensus among the design/operating contractors and oversight organizations.

To date, key safety issues have been identified and are actively being pursued, several of which are:

- Confinement Ventilation System (CVS) design and evaluation in accordance with the Departments implementation plan for DNFSB Recommendation 2004-2;
- Design of containers for long term and short term nuclear materials storage; consideration of thermal issues and associated vault design;
- Fire suppression system;
- Seismic design parameters and geologic site characterization;
- Seismic functional and performance requirements for nuclear facility Glove boxes; and
- Issues/comments associated with Draft DOE Standard 1189.

In conjunction with the early Safety Basis development and design, the project will be performing prototype testing of key safety features over the coming year to validate the design elements against appropriate performance criteria.

To amplify on my introductory remarks, I would like to cover in more detail the experiences to date on CMRR in safety issue identification and resolution:

Safety issues and challenges being managed on CMRR project.

I am aware that DOE is preparing DOE-Std-1189 and am aware, of course, that DOE Order 413.3 was revised last summer to assure that safety is embedded into projects early in their development cycles. For CMRR, the same kinds of prevailing wisdom to assure that safety is embedded in the nuclear project's lifecycle early in its development led the CMRR management team to establish a proactive safety management process into CMRR. The CMRR proactive strategy actually predates the Deputy Secretary's initiatives. The CMRR management team made a decision to manage safety processes aggressively from the earliest conceptions of the CMRR as a project, which was 18 months or more in front of the first public meeting of Safety in Design. This strategy has paid handsome dividends to the project already and, as it turns out, conforms nicely to the provisions in O413.3 and the standard. Of particular note, the CMRR team developed a safety strategy that is normative for the project. This strategy bears significant resemblance to the draft standard's callout of a "Safety Design Strategy" and, indeed, the format and content of the draft Standard's Safety Design Strategy was informed by the CMRR experience.

Notwithstanding the due safety vigilance that our CMRR deploys, changes to safety scenarios do occasionally arise that extend beyond the parameters we have contemplated in our safety planning documents. The recent change in the Los Alamos probabilistic seismic hazard analysis, in part to support establishment of the seismic design ground motion data for the CMRR Project, is a case in point. This ground motion data were anticipated by the project in the July 2006 timeframe to support preliminary design input. To mitigate impacts to the project, we proactively decided that increasing the CMRR seismic design criteria to greater that 0.5 g peak acceleration was a reasonable step to take in the interim. As the Federal Project Director, I took steps to direct the LANL project office to include this increase in seismic performance criteria and apply the initial response spectra data when it became available. When the final LANL site seismic hazard report is released, the CMRR project will be posed to meet the necessary performance criteria without a rework of the existing design and associated calculations. Although managed aggressively during preliminary design, in hindsight if the Update to the Probabilistic Seismic Hazard Analysis (UPSHA) data was made available 6 months earlier we would have seen no impact to design schedule.

In conclusion, the CMRR Project has embraced a safety integration process that is effective in identifying and resolving safety issues from early design stages and throughout final design and procurement/construction activities. As with any project, significant cost and schedule impacts could occur from new issues or changing requirements that are mandated after design is finalized and procurement or construction has begun. Change orders for 'backfit' to accommodate changing safety standards, design codes, or performance criteria can ultimately delay, result in major cost overruns, or in worst case cause project cancellation.

Processes followed by CMRR Project to improve safety issue identification and resolution.

Consistent with Integrated Safety Management, the safety analysis process begins with a very detailed hazard identification followed by analysis. Once all facility hazards are identified, a process is begun to select the appropriate set of controls in consideration to the facility safety design principles outlined in DOE 420.1 guidance. To assist the project, a set of DOE standards and guides provide methods and requirements to address specific safety issues, such as natural phenomena and external event initiators for a facility. For the CMRR project, a team of experienced safety professionals have been integrated into the project staff. Implementation of the Nuclear Safety Design Strategy is the key platform by which safety design integration is communicated between owner, design authority, design agent, and stakeholders. In order to work through implementation details, safety analysts and design engineering groups formed a safety committee, which meets routinely and supports the design review strategy. This committee was established at the onset of preliminary design.

These safety committee meetings have resulted in a very iterative forum where formal processes and guidelines result in safety issues being identified, documented, and tracked to closure. The project uses an action tracking system maintained by the integrating A/E. These processes foster open communications where issues are debated openly amongst all parties, including our stakeholders. Assigning project integration responsibilities to an integrating contractor to coordinate the tracking of multiple safety and design issues among the various design and safety organizations has been very valuable. This integrating contractor keeps identified project challenges on track and assures that safety analysis leads our design development. There is one minor weakness to implementing our approach. The Project team of designers, safety analysts, and management staff is considerable in size. Resolution through consensus and iteration can be time consuming when exercising such a team to assure a consistent design and safety approach is understood by all team members. I consider the time taken to assure ourselves of this consistency to be a worthwhile investment.

How Integrated Safety Management (ISM) is applied to CMRR

There is a formally established ISM Plan that applies to all CMRR activities performed over the life of the project. The CMRR ISM plan was developed and in place at CD-1. This plan documents a formal, organized system whereby worked is planned, performed, assessed, and improved as required by NNSA/LANL policy. This plan provides an integrated statement of how various organizations, procedures, and processes come together as a system that ensures implementation of the ISM guiding principles and core functions. For the design and eventual operation of the CMRR facility, implementing the design and safety integration process (safety design strategy) follows the basic integrated safety management (ISM) principles, leading to the eventual identification of a primary set of engineered controls and to a lesser extent, administrative controls, for work implementation. Implementing ISM in conjunction with the nuclear safety strategy provides the traceability and documentation of how safety is incorporated in the design and is a vehicle to communicate change in project scope development.

The documented safety analysis (DSA) that must be approved by NNSA prior to construction is the Preliminary DSA (PDSA), and approval of the final DSA prior to the operational phase is a documentation of the first four steps of the ISM process. These steps are (1) to define the work, (2) to identify the hazards, (3) to analyze the hazards, and (4) to identify the controls. The iterative design/safety integration is a lengthy process, on the order of 2 or more years for CMRR. The PDSA/DSA is the documentation of the results of that iterative process. As required per 10 CFR 830.204(b) the DSA must address six items. These items are listed below in Table 1, with a reference to the particular ISM process step and the chapter(s) in the PDSA or DSA where these are addressed. Note the consistency of ISM and the safety basis process. This consistency is a particular strength and testament to the requirements that the CMRR project strongly endorses and is following. As noted before, this process was accelerated to provide extra assurance of adequate time to address issues in the design process.

Table 1.

10CFR830.204(b) Requirement	ISM step	PDSA or DSA Chapter
1. Describe the facility (& process)	ISM #1 – Define the work	PDSA Chapter 1 & 2
2. Systematically identify natural and man-made hazards	ISM #2 – Identify the hazards	Chapter 3 & Hazard Analysis
3. Analyze the hazards (normal, abnormal, accident conditions)	ISM #3 – Analyze the hazards	Chapter 3 and the Hazard and Accident Analysis
4. Derive and demonstrate the adequacy of controls to protect the public, workers, and the environment	ISM #4 – Develop controls	Chapter 3, 4, 5 and TSRs
5. Define Safety Management Programs (SMPs)	ISM #4 – Develop controls	Chapter 7-17
6. Define a criticality safety program if applicable.	ISM #4 – Develop controls	Chapter 6

Primary benefits associated with the use of integrated safety management on CMRR.

ISM is a structured process that is engrained into the safety analysis process. The CFR and SB (PDSA and TSR) development process are an implementation of this process. When followed under the oversight of a quality program, the use of a process provides some assurance of a complete and adequate performance to achieve the safety objectives. It also provides the level of traceability needed to show that safety is being integrated with design.

What changes would be recommended to improve ISM processes ?

New nuclear projects must understand ISM safety/design integration is continual and requires aggressive owner, design authority, and design agent debate. ISM is not words in a plan on the shelf but must be a process that must be developed early, followed during the project phases, and result in products that substantiate safety integration.

Use of a design manual for a project like CMRR

Federal Project Directors and contractors may benefit from a design manual as a reference to ensure other design parameters and inputs important to safety are addressed early in a project's lifecycle. Such a manual could help individual projects ensure initial steps were in the right direction on familiar ground. However, such a manual would not be valuable if it imposed additional, restrictive, 'cookie cutter' type of requirements in which they would be imposed upon all projects. A 'one size' fits all approach can defeat the design process and restrict future improvements as technology or operational lessons learned yield new data. Unlike the commercial reactor and other industries where some degree of standardization exists, the myriad set of DOE facilities have a wide range of missions, processes, and resulting hazards that need to be addressed by varying types of engineered features. These controls need to be tailored to the process and hazard in order to be effective for both risk reduction and cost. A pre-defined solution may impose too many hazard controls and not provide the necessary risk reduction and cost effectiveness and serves to defeat the intended safety integration design process.

Federal Project Oversight

The CMRR project team, which includes the AE, Designers, and Safety Analysis Contractor, has the formal and day to day processes in place to identify and resolve safety issues. Open communication is key between all parties. All Federal CMRR team members are senior Federal Project Directors with a wealth of experience in both conventional and nuclear construction design and management. All FPDs are expected to be fully cognizant of all aspects of the Nuclear Safety Strategy and how it is being implemented on the project. Five FPDs are dedicated to the main phases of CMRR which includes one dedicated safety analyst to the safety basis development process. This level of dedicated FPD personnel seems to be working well given the experience and staff levels assigned to safety development and implementation from the LANL project team. Additional Federal experience is captured by the project through the use of an integrated project team and through extended resources available where-ever they may exist in NNSA. The project ensures Federal design review is present on those identified safety SSCs which are important to project success. For instance, we rely heavily on our fire protection engineer out of NNSA's Albuquerque Service Center to review our developing safety class fire protection system design. Of particular benefit, is the attention, involvement, and communication with CDNS at NNSA HQ. Having CDNS understand and support our safety strategy provides much assurance to the FPD that the project approach is well based technically. An even greater benefit is the ability to communicate issues with CDNS and hear opinions on technical matters as they arise.

Some processes have been developed by the Federal CMRR team. One such process is the design review plan utilized to focus design review efforts and address resolution of safety issues during the design review phases. Design review members discuss progress in addressing safety issues and make determinations on design/safety integration as design proceeds. The safety basis documentation is also reviewed in parallel with design products in accordance with a review plan as well. Our approval of updates to the Nuclear Safety Strategy for CMRR is another example of a process that ensures safety issues are identified and a path defined for resolution in the design process. Other CMRR processes that are ongoing and have federal engagement include the risk management watch list and the monthly design safety committee meeting. For CMRR, we have tried to effect early identification and action on safety issues by communicating from top to bottom within the organization. We request formal direction and ask for endorsements on issues and positions from management, as needed. Establishing a design review plan has helped us focus resources on areas that pose the greatest risk to the project. The Federal CMRR director and team assess performance continually and adjust federal oversight levels based on the number of safety issues and ability to take action for resolution. These processes are focused on ensuring that safety design integration can be validated during major steps of the design process. The FPD must manage and enforce the pace at which safety issues are addressed. The ability to manage these processes as the design matures will become more resource intensive.

These processes have substantially matured over the course of preliminary design and staff levels required to implement has stabilized as well. Some lessons learned observed so far include: the positive attributes of establishing a dedicated federal project team with diverse experience and talent to oversee a large project like CMRR, early development of safety basis strategy, having a dedicated safety analyst on the team, and open frequent communication with integrated project team, DNFSB, CDNS, and the NNSA Program Sponsors during design and safety basis review.

Thank you, Mr. Chairman, Members of the Defense Nuclear Facilities Safety Board. I now welcome any questions that you may have.