

PROJECT MANAGEMENT AND EARLY RESOLUTION OF SAFETY ISSUES

**PRESENTED AT THE
ENERGY FACILITY CONTRACTORS GROUP (EFCOG)
2007 ANNUAL EXECUTIVE COUNCIL MEETING
WASHINGTON, DC
FEBRUARY 21, 2007**



**JOSEPH F. BADER
BOARD MEMBER
DEFENSE NUCLEAR FACILITIES SAFETY BOARD
WASHINGTON, DC**

Thank you for the opportunity to speak on project management and early resolution of safety issues. This topic is receiving a great deal of Board attention. The Congressional staff has encouraged the Department of Energy (DOE) and the Board to identify and resolve safety issues early in the design stages of new defense nuclear facilities. This has been brought about by the belief that unresolved safety issues has resulted in significant cost increases and schedule delay in many DOE projects. The Conference Report on the National Authorization Act for Fiscal Year 2007 stated in part:

The conferees believe that the Board and the Department would benefit from a more structured process for issue resolution that would allow issues to be raised, evaluated, and adjudicated at logical points in the design and construction process. . . . The conferees are encouraged by efforts between the Department and the Board to develop a process to provide for more timely identification and resolution of technical differences over design standards and other issues at the Departments' nuclear facilities.

Even before this Congressional encouragement, the Board believed that improvement in the incorporation of safety in design of new defense nuclear facilities was necessary. The Board began a series of public meetings; one in December 2005 and a second in July 2006, concerning the integration of safety in design. During the initial public meeting, the Board focused on the adequacy of DOE's existing directives related to the design of new facilities. As a result of the Board's first public meeting, DOE acknowledged that safety was not being integrated consistently into the early stages of the design of new defense nuclear facilities. During the second public meeting, the Board further explored integration of safety in design and the progress being made in implementing DOE's safety in design initiatives. DOE is working to revise its relevant directives—DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*, and DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*—and to develop a new standard, DOE-STD-1189, *Integration of Safety into the Design Process*. These directives are expected to mandate an appropriate set of requirements designed to better integrate safety into the design of new defense nuclear facilities at the earliest stages of project management.

DOE Order 413.3A has been issued but is not required to be implemented until six months after DOE Standard 1189 has been issued. DOE has decided to eliminate DOE Manual 413.3-1 and will issue sections of the manual as new guides in the next year and half. Development of the standard is going slowly, but so far is generally going in the right direction.

One area that the Board finds questionable and is currently unwilling to accept is an effort to develop a new unmitigated dose acceptance criteria that does not consider latent radiological effects on workers from potential accidents. There is no precedence for this criteria and the criteria when applied to a plutonium facility could result in consequences as much as 10–15 times greater to the co-located worker than the 100 rem 50 year total effective dose equivalent (TEDE) value generally accepted as the evaluation guideline.

The Board will have a third public meeting in March 2007 that will consider early identification of issues, communication of those Board issues to DOE, issue management, and timely issue closure or resolution. This meeting will also help the Board and DOE in our efforts to evaluate any needed improvements in the timeliness of the issue resolution process.

As noted, Order 413.3A has been recently revised to reflect senior DOE management's objective of early integration of safety early into the design process. The Order requires that safety design reports be prepared at the conceptual design and preliminary design stages. This is in addition to preparing the Preliminary Documented Safety Analysis at the final design stage. These reports are envisioned to contain an evaluation of the safety aspects of the design. The Order delineates the need to charter an Integrated Project Team led by the Federal Project Director at the conceptual design stage and further clarifies the safety role of DOE's Central Technical Authority, Chief of Defense Nuclear Safety, and Chief of Nuclear Safety. These are positive changes that will enhance safety in design. The Order, however, will not be implemented until the new Standard is issued. The Standard is under development and is expected to be issued this summer.

As currently drafted, the new Standard 1189 currently requires a Conceptual Safety Design Report that includes:

- *Safety Design Strategy document.*

This document supports Critical Decision-0 and evolves throughout the design process. It provides a single source for the project's safety policies, philosophies, major safety requirements, and safety goals. As such, it will govern all aspects of integration of safety into the design—the approach to develop the overall safety basis, the guiding philosophies or assumptions used to develop the design, and the safety-in-design and safety goal considerations. Such documents have not been required before, but when done properly will be the driver for safety decisions throughout the

design process. If done well, this document will go a long way toward both minimizing and resolving disagreements between the Board and DOE on the safety strategy and safety controls being developed for the project.

The Safety Design Strategy should be supported by the following documentation at CD-1:

- *Preliminary Hazards Analysis (PHA)*. The PHA demonstrates how the hazards are mitigated or controlled. The analysis should include:
 - facility site selection
 - general arrangement drawings
 - sizing of major process system components
 - process flow diagrams or equivalent
 - one-line diagrams for ventilation, electrical power and distribution, mechanical handling, and I&C system architecture
 - process design description and sequence of operation
 - confinement strategy
 - design basis accidents being considered

- *Preliminary Fire Hazards Analysis* supporting the PHA

- *Identification of safety-related Structure, Systems, and Components (SSC)* evolving from the PHA, including:
 - safety function and performance category
 - general design criteria (e.g., as required by DOE Order 420.1)
 - one-line diagrams

Lately, we have seen some DOE projects at CD-1 present a potential suite of safety controls that would be typical for a facility of its type rather than specifically evolving from the PHA. The safety controls designated in the PHA need to demonstrate how the hazards are being mitigated for the specific facility. Otherwise, it is impossible for the Safety Board to independently evaluate the adequacy of the safety controls.

- *Identification of technical risks and required technical studies and/or pilot facilities* involved with processing operations and important safety-related systems that may be cost dominant.
- *Preliminary Risk Management Plan*

Historically, DOE's risk management plans have focused on programmatic and schedule risks particularly in the early stages of design. It was generally assumed that technical aspects of the design such as development of new technologies would be successful. It is imperative that technical risks be addressed early with potential alternatives identified should the desired path not be successful. This includes any impact on safety strategy of a technology failure and mitigating plan on safety impacts. To do otherwise runs the risk of potentially large increases in cost and delays to the project.

The Board has noted that an area that has frequently plagued DOE's new designs is the lack of appropriate site selection information required for the PHA. To be done properly site selection should include:

- Geotechnical site specific characterization
 - geologic mapping
 - boreholes
 - laboratory measurements
 - analysis of data
- Geotechnical design
 - building specific foundation conditions
 - bearing capacity
 - static and dynamic settlement
 - subsurface properties needed for dynamic structural analysis

The intent of these expectations is to identify a reasonable safety strategy that identifies cost dominant safety facility requirements and SSCs in sufficient detail that they can be independently evaluated. When incorporated early, a reasonable set of safety controls are easy to implement.

I would also note that Mr. Gregory Friedman, the Inspector General for the Department of Energy has made similar observations. At the second Board public meeting he stated that “One of the problems we found in the Department of Energy, to hold people accountable, to hold contractors accountable, to hold federal officials accountable, it’s extremely difficult to do so when you have very imprecise, cloudy, amorphous requirements.” He further stated when talking about requirements and guidance: “My inclination would be to say that anything that gives it the stature and makes it mandatory rather than voluntary and takes it out of the guidance mode; which is always soft, seems to me to be a positive step.”

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

In particular for the UPF project, these discussions have attempted to encouraged the UPF Project Team to incorporate more rigorous analysis and detail into the Conceptual Safety Design Report prior to approval of Critical Decision-1. The UPF project is currently attempting to have CD-1 approved by NNSA. During the meeting, the project team acknowledged that the design as it existed did not meet the level of maturity as would be expected by the new set of requirements. The project team agreed with the design expectations but noted that the provided funding did not support achieving the design expectations nor were the expectations levied on the project before design efforts commenced. The National Nuclear Security Administration (NNSA)— Mr. Tom D’Agostino—has been supportive of the Board’s efforts. Senior management support as well as providing needed funding is imperative for the effort to allow early integration of safety in the design.

The Integrated Waste Treatment Unit design was at a level of maturity that allowed the Board to be satisfied with its safety posture. I would note that the project was working toward CD-2 and would be expected to be more mature. The Board believes that part of the success of this project was due to the fact that:

- DOE and the contractor both had technically strong, experienced project teams.

- Conservative assumptions were made early in the project resulting in conservative safety control strategy.
- DOE headquarters personnel were very much involved in the project and in safety decisions.
- DOE supported testing in a full scale pilot plant to answer process/control unknowns.
- The Board was afforded the opportunity to review draft design documents allowing early identification of issues.
- There was good, continuous communication between DOE, the contractor and the Board.

The Integrated Waste Treatment Unit contractor estimated, based on their experience, that between 20–30 % of total project cost would need to be expended on project design work for unique, one-of-a-kind defense nuclear facilities. Further, about 10–15 % of the design funds would need to be expended before CD-1 to meet these new expectations. Typically, DOE has not provided this level of expenditure prior to CD-1 given their current project management approach.

From the pilot efforts; the Board believes that:

- The mission need must be sufficiently developed to allow early development of alternatives without unwarranted project development efforts.
- The critical decision process needs to be modified to allow early identification of the preferred alternative. The modifications to the critical decision process should be consistent with the applicable NEPA regulations.
- The design, including safety strategy, hazards analysis, safety related controls, must be sufficiently developed to allow informed decisions to be made and independently evaluated by the Board.
- Increased funding would be needed to achieve a more mature design at CD-1.

- DOE and the contractor need to have technically strong, experienced project team members that are assigned early in the design process.
- Conservative design assumptions need to be made at the early stages of the project to provide a conservative safety control strategy.
- DOE and NNSA headquarters personnel need to be involved early in the project and in decisions that could effect safety.
- Project risk management plans need to identify technical risks and unknowns. For example, this could include the need to perform a detailed technical review of the process by independent experts (i.e., Best and Brightest reviews), development of a pilot plant or increased laboratory testing. Appropriate contingency plans should be included in the event the desired approach or outcome is not feasible.
- The Board must be afforded the early opportunity to review draft design documents to facilitate early identification of issues.
- Communication between DOE, NNSA, the contractor and the Board must occur early and frequently to discuss the safety basis, safety controls and analyses as they are being developed.

In closing, Congress has tasked the Board and DOE to develop a more robust approach to resolution of Board safety issues raised during the design process. Early resolution of Board safety issues early will help minimize the impact on the project. Clear safety expectations, early Board involvement in the safety-related activities, conservative design assumptions, and more rigorous analysis and detail in the Conceptual Safety Design Report prior to approval of Critical Decision-1 all support meeting the Congressional expectation for DOE and the Board.

Again, the Board intends to have a third public meeting on March 22, 2007, that will consider early issue identification, communication of Board issues to DOE, issue management, and timely issue closure or resolution. This meeting will also help the Board and DOE in its efforts to determine further improvements in the timeliness of issue identification and resolution.