# Independent Oversight Review of the Uranium Processing Facility Design Requirements and Configuration Management Program


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**Office of Safety and Emergency Management Evaluations**
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## Acronyms

| | |
|---|---|
| B&W Y-12 | Babcock & Wilcox Technical Services Y-12, LLC |
| CD | Critical Decision |
| CM | Configuration Management |
| CRAD | Criteria, Review and Approach Document |
| DAC | Design Analyses and Calculations |
| DCN | Document Change Notice |
| DOE | U.S. Department of Energy |
| ECN | Engineering Change Notice |
| EU | Enriched Uranium |
| FCR | Field Change Request |
| FY | Fiscal Year |
| HSS | Office of Health, Safety and Security |
| IAS | Integrated Assessment Schedule |
| IMS | Issues Management System |
| LWA | Limited Work Authorization |
| NCR | Nonconformance Report |
| NNSA | National Nuclear Security Administration |
| NPO | NNSA Production Office |
| OFI | Opportunity for Improvement |
| PAA | Preliminary Accident Analysis |
| PCR | Project Change Request |
| PDSA | Preliminary Documented Safety Analysis |
| PFHA | Preliminary Fire Hazards Analysis |
| PHES | Preliminary Hazard Evaluation Study |
| PMSO | Project Management Support Office |
| PSDR | Preliminary Safety Design Report |
| PSR | Process Safety Report |
| PSVR | Preliminary Safety Validation Report |
| SDS | Safety Design Strategy |
| SSC | Structures, Systems, and Components |
| TBIS | Technical Basis Index Summary |
| TIMS | Technical Issue Management System |
| UPF | Uranium Processing Facility |
| UPO | UPF Project Office |

# Independent Oversight Review of the Uranium Processing Facility Design Requirements and Configuration Management Program

## 1.0 PURPOSE

This review examined the processes used by the Uranium Processing Facility (UPF) project contractor to control safety basis development and engineering design to ensure that requirements and commitments in the safety basis are adequately identified, captured, and implemented. It also assessed processes for maintaining configuration and change control of the related documents.

The review was conducted by the U.S. Department of Energy (DOE) Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security (HSS), as part of a broader ongoing program of oversight reviews of the design and construction of high-hazard nuclear facilities. These reviews focus on the processes used to integrate nuclear safety into the facility design from the conceptual stage through the final design stage and completion of construction.

Independent Oversight used the requirements and processes established in DOE Order 420.1B, *Facility Safety*; DOE-STD-1189, 2008, *Integration of Safety into the Design Process*; DOE-STD-3009, 2006, *Preparation Guide for U.S. Department of Energy Non-reactor Nuclear Facility Documented Safety Analyses*; DOE-STD-1073, 2003, *Configuration Management*; and other documents specific to the individual project to review the project's effectiveness in implementing the commitments and requirements documented in the project safety basis.

## 2.0 BACKGROUND

The DOE independent oversight program is implemented by the HSS Office of Enforcement and Oversight, which has no line management or policy-making responsibilities or authorities. The independent oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, and the effectiveness of DOE and contractor line management performance in safety, security, and other critical functions as directed by the Secretary. The independent oversight program is described in and governed by DOE Order 227.1, *Independent Oversight Program*, and a comprehensive set of internal protocols, operating practices, inspector guides, and process guides.

Design and construction planning of the UPF are the responsibility of Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12), under the direction of the National Nuclear Security Administration (NNSA) Uranium Processing Facility Project Office (UPO). The overall mission of the UPF is to consolidate all enriched uranium (EU) and EU-containing components and subassembly processing and manufacturing functions at the Y-12 National Security Complex. As noted in the UPF Safety Design Strategy (SDS), RP-FS-801768-A003, the UPF project has completed Critical Decision (CD) points CD-0 and CD-1, and preliminary engineering is under way. The UPF preliminary safety design report (PSDR), issued in September 2012, describe the safety design basis for the UPF through the time it was submitted. The PSDR was approved, and the supporting preliminary safety validation report (PSVR) was issued in February 2013. No construction has been performed other than preparatory groundwork. Through the SDS, the UPF project has identified supplemental measures to ensure that the safety design basis is kept current as preliminary design efforts and technical issue resolutions proceed.

Engineering design for the project must be accomplished in a manner that implements the commitments and requirements established in the safety design basis. Individual components and systems must have

defined functional and performance requirements that align with those commitments and requirements. Requirements established in upper tier engineering design documents must then be carried forward into analyses and design output documents. This review examined the processes in place to achieve these goals by managing the project configuration and controlling both the design process and the design change process.

## 3.0 SCOPE

The Independent Oversight review focused on the implementation of the facility's safety basis (PSDR) as it relates to selected structures, systems, and components (SSCs), specifically the near-term analysis and design relating to the building structure and supporting foundation. The review assessed the controls in place to ensure that the UPF design for the selected SSCs remains compliant with the safety functions, functional requirements, and performance criteria established in the safety design basis and that configuration management (CM) processes are in place to control design changes as the safety basis progresses. The Independent Oversight review identified several opportunities for improvement (OFIs) for site management consideration.

## 4.0 METHODOLOGY

Independent Oversight reviewed procedure-based design and design change processes and a sample of issued design documents for safety design basis compliance, and tracked a few selected document changes through the change process. Independent Oversight conducted onsite interviews with key project personnel to better understand the processes and procedures and the project's perspective on potential issues identified during the review.

Independent Oversight based the review on sections of HSS Criteria, Review and Approach Document (CRAD) 45-11, *Safety Systems Inspection Criteria, Approach, and Lines of Inquiry*, that govern the criteria for the design and CM of SSCs. Specific review criteria included:

- Documents identify and describe the system safety functions, and the functional and performance criteria are translated into design calculations and design output documents.
- CM processes adequately integrate the elements of system requirements and performance criteria, systems assessments, change control, and documentation control, as required by DOE Order 420.1B.
- CM is used to develop and maintain consistency among system requirements and the performance criteria and documentation for the SSCs within the scope of the program.
- System design basis documentation and supporting documents are kept current using formal change control processes.
- Changes to system requirements and documents are formally designed, reviewed, approved, implemented, and documented.
- Line management has established and implemented effective processes for monitoring and assessing contractor programs for ensuring effective design and CM.

Configuration management is defined in DOE-STD-1073, *Configuration Management*. The UPF project is committed to compliance with DOE-STD-1073 for both engineering and construction as a means of meeting the requirements of DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*. The standard states that the objectives of CM are to establish consistency among design requirements, physical configuration, and documentation (including analysis, drawings, and procedures) for the activity, and to maintain this consistency throughout the life of the facility or activity, particularly

as changes are made. To accomplish these objectives, the standard indicates that a CM program should ensure that:

- Commitments and requirements of the safety basis are captured in the design basis.
- Requirements in upper tier design basis documents are captured in lower tier implementing documents.
- Changes to the safety basis are subsequently reflected in changes to all affected design documents.
- Changes to upper tier design documents are appropriately rolled down into all affected lower tier documents.
- Changes to the design resulting from design evolution or technical issue resolution are reflected back into the safety basis.

The CM review focused on B&W Y-12 activities, and the review of the project's safety system feedback and improvement processes considered the activities of the UPO.

## 5.0 RESULTS

The criteria noted above from CRAD 45-11, Section I, Engineering Design and Safety Basis; Section III, Configuration Management; and Section VIII, Safety System Feedback and Improvement, are addressed in Sections 5.1, 5.2, and 5.3, respectively.

Supplemental information on the review, including the members of the Independent Oversight team, the Quality Review Board, and HSS management is provided in Appendix A. The documents reviewed, personnel interviewed, and meetings and observations are listed in Appendix B.

### 5.1 Engineering Design and Safety Basis

Establishing the safety functions to support engineering design, procurement, and construction is an important aspect of a high hazard nuclear facility project. Independent Oversight found that the safety functions and functional requirements for the current stage of design are adequately described in the updated SDS and incorporated in the facility safety design criteria. The SDS prescribes a reasonable path forward for continued development of safety basis documents to refine the safety functions, functional requirements, and performance criteria through development of a set of process safety reports (PSRs). The SDS establishes a reasonable approach to screening potential design changes to identify those requiring UPO approval; however, the steps have yet to be incorporated in the governing change procedures, the screening may not address all safety-related design criteria, and the SDS does not address a screening process for changes that could affect the limited work authorization (LWA).

*Review/Inspection Criteria:*

*Documents identify and describe the system safety functions and the functional and performance criteria are translated into design calculations and design output documents, as required by DOE Order 420.1B, DOE-STD-3009, and DOE-STD-1189.*

#### 5.1.1 Safety Design Strategy

Safety functions and functional requirements for the current engineering design and safety basis are adequately described in the current revision of the SDS, which has been updated to reflect the approved PSDR. The PSDR contains safety functions, functional requirements, and performance criteria for safety

SSCs for an early stage of the facility design and provides a list of updated codes and standards in an appendix. The UPO approval memorandum for the PSDR contains direction to design the structure and fire barriers so as not to preclude their designation as safety class. In addition, the PSVR attached to that memorandum includes a set of 11 conditions for proceeding to the next stage of design, some of which will be incorporated in the preliminary documented safety analysis (PDSA).

B&W Y-12 also prepared and submitted two revisions to the SDS in 2013; the most recent revision (Revision 8) was approved by NNSA in early October. The UPO approval memorandum for SDS Revision 8 contains one condition of approval specifying that the x-ray units shall comply with DOE Order 420.1B, *Facility Safety*. Notably, the memorandum includes a detailed status of the previously documented conditions of approval and closes several outstanding conditions. The evaluation report attached to the memorandum provides the details of the review and closure of open items and includes a summary of the changes made to Appendix C of the SDS to reflect Revision 1 of the PSDR.

The SDS establishes a reasonable set of safety functions and functional requirements and an appropriate path forward to refine the safety functions and functional requirements and to further define the performance criteria for the safety SSCs to support continuing design. One section of the recent SDS revision addresses the safety control strategy and safety-in-design, and an appendix provides an updated safety control set "resulting from the safety design strategies defined in the SDS." A subsection of the safety control strategy discusses in detail the "Safety SSC Table," which identifies the safety function, functional classification, and natural phenomena hazard rating for each safety system and is also incorporated in the UPF Facility Safety Design Criteria (DE-PE-801768-A007), as discussed further in subsection 5.1.3 on engineering design basis. The SDS also contains an overall plan to align safety basis documents with the critical decision schedule. This phased approach includes completing a CD-3A submittal for site preparatory work, an initial PDSA to support building construction, updated PDSAs to support process system construction, and a final PDSA. A number of PSRs are scheduled as interim deliverables.

### 5.1.2 Process Safety Reports

The SDS requires preparation of PSRs because of the significant time interval between PSDR submittal and the initial PDSA submittal. Following the SDS plan, PSRs are to be prepared addressing seven processes and the general building. Each PSR is intended to provide most of the input to the PDSA for that process, including hazard evaluation, accident analyses, safety functions, functional requirements, performance criteria, controls, and defense-in-depth measures. These one-time deliverables are to be supported by revised preliminary hazard evaluation studies (PHESs) and preliminary accident analyses (PAAs) that are based on updated (Revision 1 or later[1]) process and instrumentation drawings. In discussions, B&W Y-12 personnel indicated that the PSR contents (process description, control identification, proposed defense-in-depth, and discussion of effectiveness of control suite) will follow some parts of the structure provided in DOE-STD-1189 (mainly the process descriptive information of Chapter 2) for the PDSA, so as to facilitate preparation of the PDSA. Other parts of the PSRs will be roll-up summary information from the PHES and PAA documents. The PSRs will also be used to document the resolution of several process-related safety risks. The PSRs, therefore, represent a proactive means of limiting the risk of costly changes late in the project design phase by ensuring that safety basis development does not significantly lag the design process during the time between PSDR submittal and PDSA submittal; however, the procedure for developing, reviewing, approving, and implementing the PSRs had not been developed at the time of the review. (See **OFI-B&W Y-12-1**.)

[1] Reference to use of updated P&IDs is per SDS Section A.5.4.

### 5.1.3 Engineering Design Basis

Site procedure Y17-69-301, *Identification and Control of System Requirements*, includes instructions for development, approval, and maintenance of system requirements documents as the primary vehicles for identifying and controlling system requirements. Once completed and approved, revisions to these documents are implemented using a UPF project-specific procedure, Y15-95-005, *Technical Change Control Program*, which supersedes the governing site procedure. The system requirements for UPF are contained in two documents: one a classified version, and the other a redacted, unclassified version of the full document. Independent Oversight's review of the unclassified document revealed that it generally contains high level system capabilities and requirements.

The site procedure for design criteria (Y17-69-304, *Design Criteria*) describes requirements for the development of design criteria as the primary source of design requirements for the project design process. The procedure addresses safety controls and functions of safety-class and safety-significant SSCs, and includes adequate instructions for preparing, reviewing, approving, and revising the design criteria. Once approved, technical changes to the design criteria can be made only through the project change request (PCR) process of Y15-95-005 (as delineated in an approved procedure deviation). B&W Y-12 has prepared design criteria for UPF and published them in a series of design criteria chapters and subchapters. DE-PE-801768-A001, *UPF Project Design Criteria Basis*, provides an index to the design criteria chapters and subchapters and explains the organization of the criteria.

The nuclear safety design criteria are included in DE-PE-801768-A007, *UPF Facility Safety Design Criteria*, and are described as the primary communication tool between the Facility Safety Group and Engineering for defining the safety functions, functional requirements, and performance criteria in the facility design. The design criteria begin with a set of general criteria; some are generic, but others, such as instrumentation, electrical, and structural, are specific to disciplines. Table 2-602 lists the safety criteria by process, safety systems, structures, and criticality controls. The table states the safety function and then lists individual design requirements, including the seismic design criteria, performance category, functional requirements, support SSCs, and performance criteria supporting the safety function. The performance criteria from the PSDR have been transferred to the table and the table has been updated as the design has matured.

The UPO team described Table 2-602 as the principal method for keeping track of updates to the safety design basis as the overall project design progresses prior to submittal of the PDSA. The information contained in this table is basic and may be insufficient to provide in-depth understanding of safety or functionality requirements without further revision to supplement and refine the required performance criteria as the design and safety basis development mature. Additionally, the table does not address defense in depth.

The *UPF Natural Phenomena Design Criteria* are organized similarly to the safety design criteria, with sections for each natural phenomenon hazard. Although this section contains safety design criteria related to natural phenomena, especially earthquakes, there is no indication in the "philosophy" section that these criteria are related to the facility's safety basis, and changes do not require review by the UPO. The *UPF Structural Design Criteria* document incorporates the natural phenomena and safety design criteria and includes design criteria for the mass fill concrete. (See **OFI-UPO-1**.)

### 5.1.4 Project Technical Basis

The project technical basis has been established through the UPF Technical Basis Index Summary (TBIS) and is maintained in accordance with a site procedure (Y17-009, *Establishing and Maintaining the Technical Basis*). The TBIS was most recently revised in September 2013. It identifies a number of

safety basis documents in the technical baseline, including the SDS, PSDR, PHESs, PAAs, and the preliminary fire hazards analysis (PFHA). The technical basis also includes a number of design input and output documents, such as the system requirements document, design criteria, design analyses and calculations (DACs), miscellaneous construction documents, and engineering drawings. The listing also indicates whether a document is "Issued for Use (Design)" and/or "Issued for Construction." A number of drawings, including all the structural drawings and a number of fire protection system drawings, are appropriately marked with a "HOLD" pending resolution of the space fit issue. Proposed changes to the technical baseline in the TBIS are to be reviewed and approved using the project-specific change procedure, Y15-95-005.

### 5.1.5 Limited Work Authorization

The project established the engineering design and safety basis for site preparatory work through an LWA (OT-EF-801768-A001 LWA), which B&W Y-12 submitted to NNSA for review in late Spring 2013. The requested activities include mass excavation and mass fill for the building structure. The mass fill is to be designed as safety class, though it is functionally classified as safety significant. The request includes a discussion of safety-in-design that identifies the Main Building and auxiliary structures that must meet the seismic design criteria. It also states that the fire pump house must meet these criteria based on the seismic requirement to eliminate potential interactions between this structure and any seismically qualified SSCs during a seismic event (two-over-one design), although the fire pump house is not listed in either Table 2-602 or the PSDR. The safety function, functional classification, seismic design criteria and performance criteria rating, functional requirements, and performance criteria (per appropriate DOE documents) are appropriately identified for each of the elements. Section 4.4 of the LWA identifies the risk that the space fit changes can affect the calculation of the stresses from the Main Building and indicates that this risk is being mitigated by conservative design and by planning to ensure that the building design is complete before commencing fill. Independent Oversight observed that the LWA does not categorize the final excavation as a safety-related element, though the discussion appropriately addresses the quality-related activities to confirm the presence of adequate foundational material.

In July 2013, UPO completed an evaluation report which concluded that the request properly identified the safety classifications and nuclear safety design criteria for the safety SSCs, and approved the LWA request. The evaluation report (ER-9226LWA) includes the assumptions and "conditions to be maintained" during the LWA. Although the approval contains an assumption that "risk is being mitigated by project planning to complete the final UPF design prior to the installation of the mass concrete fill," this condition has not been identified as a condition of approval. During Independent Oversight's onsite review, discussions with both B&W Y-12 and UPO revealed a need to establish their mutual understanding of the required state of design and the need for UPO review of the final design before completing the excavation and starting the mass fill. Although the SDS addresses the transition from the PSDR to a PDSA, it does not discuss management of the LWA for site preparation and the screening criteria for changes associated with implementation of the LWA – i.e., potential changes during final design and construction. (See **OFI-UPO-2**.)

## 5.2 Configuration Management

Design change control is a key part of any CM program. As the design progresses on a large, multi-faceted project, iterations to existing design will routinely occur and those changes must be handled in a controlled manner. The complexity of the UPF project means that changes in any one area may impact other areas. The likelihood of such impacts varies with the type of document being revised.

Independent Oversight reviewed 29 UPF contractor procedures and over 50 other project documents as part of the configuration management assessment. These included plans and procedures directly pertaining to processes for CM and design control, as well as to ancillary processes such as safety basis development, design development, and records management. The project generally has procedures in place to address the relevant aspects of CM, but those procedures are not, in all cases, well suited for their intended functions. UPF currently uses a mix of project-specific procedures and procedures common to the Y-12 site. The Y-12 site procedures are more oriented toward modifications to an operating facility and often are not well suited for use on a large engineering, procurement, and construction project.

As a result of a number of UPO assessments (see Section 5.3) and internal reviews, B&W Y-12 used deviation requests to modify some site procedures to reflect project needs and developed some project-specific procedures for use by project engineering staff. Subsequent reviews have shown that efforts to date have not led to fully integrated processes or fully resolved the procedural discrepancies, such as references to incorrect procedures and incorrect revision levels. Independent Oversight's review of the plans and procedures also identified a number of procedural discrepancies and disconnects that were similar to those identified by other reviews, indicating the problems have not been fully addressed. The problems identified by Independent Oversight were individually minor but are collectively worthy of concern; specific details were provided directly to B&W Y-12 personnel for evaluation and action as appropriate.

B&W Y-12 and UPO are working jointly to evaluate the engineering, procurement, and construction plans and procedures, including review of plans and procedures used by other contractors managing these types of projects, and UPF recently received approval to replace more of the Y-12 site procedures with procedures specific to the project. The effort to identify an appropriate set of plans and procedures is ongoing and is expected to be completed by mid-2014.

*Review/Inspection Criteria:*

*Configuration management processes adequately integrate the elements of system requirements and performance criteria, systems assessments, change control, and documentation control, as required by DOE Order 420.1B.*

*Configuration management is used to develop and maintain consistency among system requirements and the performance criteria and documentation for the SSCs within the scope of the program.*

*System design basis documentation and supporting documents are kept current using formal change control processes.*

*Changes to system requirements and documents are formally designed, reviewed, approved, implemented, and documented.*

### 5.2.1 Design Completion Plan

The overall project design process is governed by procedure Y17-95-69-321, *Design Process for the UPF Project*, which describes the high-level design process from preliminary to final and includes major sections on preliminary and final design. Primary design inputs for the preliminary design consist of the program requirements document, system requirements document, design criteria, the preliminary hazards analysis, and the SDS. The process was intended to lead to approval of the preliminary design in conjunction with approval of the PSDR. During final design, the technical basis documents needed for the project are developed or revised using the preliminary discipline design and technical basis documents. During this process, unverified portions of the preliminary design must be identified, a

PDSA prepared, and the SDS updated as necessary. This procedure does not reflect the significant amount of re-design that is ongoing to accommodate fit issues and the phased design and construction of the facility processes. (See **OFI-B&W Y-12-1**)

B&W Y-12 and the UPO jointly prepared a *Design Completion Plan* (COR-PS-9.10.2013-534312) that establishes the level of completion of design for the performance baseline, start of mass excavation, and approval of CD-3. The plan includes direction to incorporate the requirements from the plan into the CD-3A activities (long lead/bulk procurements and site preparation). Two tables in the plan identify the design completion objectives and design deliverables for three milestones: mass excavation, CD-2/3 submission, and CD-2/3 approval. Table 1 identifies the safety basis for the milestones (e.g., issuing design criteria and PHES and PAA DACs for mass excavation), and Table 2 identifies the deliverables. For mass excavation, the deliverables include issuing the SDS, design criteria, PHES, and PAA for the initial set of processes and completing preliminary versions of the general building PHES and PAA and the criticality safety process studies.

Independent Oversight identified several potential weaknesses in the design completion plan. The meaning of the term "issued" with respect to some of the safety basis documents is not addressed in the plan, although the term implies that "issued" deliverables have been reviewed and approved in accordance with project procedures. Also, the plan does not address the establishment of the safety designation for SSCs (which can affect the design code) and the preparation of PSRs as precursors to the PDSA, nor does it establish when the preliminary DACs for estimating radiological and toxicological exposures are to be delivered in committed or confirmed status. Further, Table 2 requires duct support and pipe support drawings to be in at least intermediate status, but does not mention cable trays (assuming UPF will have cable trays) and does not mention the stress analyses or qualification calculations necessary to support those drawings. Finally, although the body of the plan defines various status categories for drawings and DACs, Table 1 uses other undefined categories, such as "Final Review" and "Complete."

### 5.2.2 Configuration Management Plan

The *Technical Configuration Management Plan for the Uranium Processing Facility*, PL-EG-801768-A007, is based primarily on the site CM program document (Y15-004PD). It contains a general discussion of the safety and design requirements for the project and an overview of the CM requirements and strategy used for each of the project's phases: design, procurement/construction, startup testing, and transition to operations. The plan indicates that change control, which is governed by the PCR process (Y15-95-005), is invoked when the document is approved for its first numerical revision and included in the TBIS. The CM processes for the nuclear safety requirements are not described well in this plan, and in some cases the plan does not fully address the configuration elements necessary to implement a complex, high-hazard nuclear project. For example, the plan discusses change control during procurement and construction activities but omits significant details and does not address the process for specifying commercial grade dedication requirements in procurements. As discussed above, UPO has provided critical comments on the plan, and B&W Y-12 is developing and implementing plans for revising or replacing the existing CM plan to make it project-specific including development/revision of implementing procedures.

### 5.2.3 Safety Basis Configuration Management

B&W Y-12 has an integrated set of procedures that govern the development and revision of the safety basis documents for its nuclear facilities and for maintaining the engineering basis. With deviations and waivers to adapt some of the site procedures for use on the project, these Y-12 procedures are being used

to govern the safety basis activities. Y74-802, *Safety Basis Documents for Nuclear and PSM/RSM*[2] *Facilities*, delineates the requirements for preparing, approving, revising, and implementing safety basis documents, including preliminary safety basis documents for new and existing facilities; although the requirements table indicates that the process for a new facility begins at the PDSA, and the procedure does not address the SDS or the PSRs.

The Y-12 site procedures appropriately govern hazard material identification and screening processes. Y74-801, *Hazardous Material Identification*, includes a process for hazardous material identification and documentation and steps for approval and revision of hazardous material identification documents. The hazardous material identification document is revised through Y15-005, *Technical Change Control Process for Projects* using a document change notice (DCN). A second site procedure, Y74-48-007, *Hazard Identification and Screening to Support Development of a Hazard Evaluation Study*, provides instructions for further screening of hazardous materials in the facility, with the results documented as a DAC. Changes to the screening documents are processed in accordance with an internal Facility Safety procedure (Y74-48-003, *Facility Safety Analysis and Calculations*).

Site procedures also govern the preparation of hazard evaluation studies, accident analyses, and safety basis documents. Y74-48-008, *Hazard Evaluation Study*, covers planning, documentation, and review of the initial hazard studies. Completion of accident analyses, whose purpose is to define the safety functions and functional requirements, is governed by Y74-48-009, *Accident Analysis*.

In addition, PHESs and PAAs for the UPF project are revised using a project-specific procedure, Y17-95-69-307, *UPF Design Analyses and Calculations*, which replaced the site procedure Y74-48-003, *Facility Safety Analysis and Calculations*, through an approved deviation request. Y17-95-69-307 establishes step-by-step direction for the preparation, verification, approval, and revision of UPF DACs and states that it applies to all disciplines except Nuclear Criticality Safety, which will use its own UPF-specific procedure (when complete), and Facility Safety, which will use its organizational procedure. Revisions to a numbered DAC, such as a numbered revision to a PHES or PAA, require an evaluation of the need for a PCR, a DCN, or a field change document. It appears that the intention is to use the UPF-specific procedure to control revisions to the PHESs and PAAs, making the PCR the managing document for any resulting configuration change. However, the instructions (through the deviation) include confusing, circular references to each other.

The SDS includes a reasonable, detailed process to screen changes to identify those changes that may require approval by the NNSA Production Office (NPO) and the UPO Federal Project Director. Changes beyond the strategies in the SDS or boundaries established in the Safety SSC Table require NNSA approval. The process and criteria for determining whether NNSA needs to approve a given design change are described in Appendix B, Safety Design Strategy/Safety SSC Table Change Control Checklist. The appendix includes an acceptable process and set of questions to perform the evaluation using Appendix C and the safety strategies in Section 3 as the basis for the screening. The screening questions explore whether the change affects the SDS, revises (or adds) an identified safety function, lowers the functional classification of a safety control, results in a new safety class safety design control, lowers the natural phenomena hazard rating of a safety control, or employs a mitigating control for a subsonic deflagration event. The screening process is to be incorporated in the PCR procedure, but at the time of the review this action had not been completed.

[2] PSM/RPM is a facility classification which is a composite of the process safety management (PSM) and risk management program (RMP) acronyms; in accordance with B&W Y-12 conventions, the individual acronym meanings are not spelled out when used in this manner.

### 5.2.4 Design Change Processes

Independent Oversight found that UPF has a number of ways to implement changes to the design that could affect the performance of safety functions:

- PCRs are generally used to gain approval to make a change, which is then implemented by revising the affected documents using one of the processes below.
- The UPF document management procedure defines the requirements for issuing and revising controlled documents. Additional requirements for revision of specific document types are also included in procedures specific to development of those types of documents.
- The DCN process, which is used to revise a single document, is governed by a chapter of the Y-12 document management procedure and provides a method for revising a document without issuing a full document revision.
- The engineering change notice (ECN) process is defined in a project-specific procedure and provides a vehicle for issuing changes to multiple documents without going through the full revision process for those documents.
- Drawing changes are made in accordance with a project-specific procedure.
- Field change requests (FCRs) are used to identify and resolve design problems that arise during construction.
- The nonconformance report (NCR) process provides for the disposition of SSCs that do not fully meet the specified design requirements and includes engineering analysis of the proposed change.

The PCR process, which uses a recently developed, project-specific procedure (Y15-95-005), provides a means of: (1) controlling changes to the design that might have a significant impact, or an impact that crosses discipline boundaries; and (2) reviewing proposed changes against the safety basis commitments and requirements, except for the concerns discussed below. The procedure applies both to a specific set of documents (including the design criteria and SDS) and to the documents listed on the TBIS, and it includes steps governing initiation, review, approval, implementation, and closeout of the PCR. PCRs affecting the system requirements document, design criteria, or SDS (but not safety basis supporting documents, such as the PFHA, PHES, and PAA) are reviewed by both a Technical Change Control Board and the Safety-in-Design Integration Team prior to implementation. The procedure appropriately addresses whether UPO approval is required; however, as noted previously, it does not yet incorporate the new screening criteria from the SDS, and the evaluation to determine whether to obtain approval is completed before development of the change (during the initial decision to proceed) rather than after the change has been fully developed.

Following approval of the PCR, the affected documents may then be changed through a full revision, a DCN, or an ECN. Implementation of the DCN (UCN-20991) is governed by Chapter 4 of site procedure Y15-101, *Records and Controlled Documents*, which allows DCNs for only a single document at a time. The procedure specifies that each user has the responsibility to investigate whether safety basis documents will be impacted by the DCN. The "change document" (e.g. PCR, NCR, equivalency evaluation) is to be listed on the DCN, but if none of the "change document choices" on the form are applicable, then "not applicable" may be entered. The review and approval process requires consideration of whether the document is in "configuration management" and requires approval of the change request before it is effective. When the DCN is not initiated by a PCR, there is no supporting procedural instruction and no block on the form to record completion of a review to determine the need for a PCR.

A newly approved, project-specific procedure, Y17-95-69-805, *UPF Project Engineering Change Notices*, defines a process for changing multiple engineering documents (such as drawings, specifications, and DACs) whose preparation, review, and approval are specified by other procedures. The procedure

provides appropriate instructions for initiation, review, approval, and cancellation of the ECN using UCN-23148, *UPF Engineering Change Notice.* The procedure requires that an ECN have an approved PCR or an approved NCR. The preparer is also required to provide direction in the document transmittal for the UPF Document Management Center to establish the relationships between the ECN, the PCR (if applicable), and the changed documents. Having both the DCN and ECN processes in place and procedurally allowed, is somewhat redundant.

The preparation, review, and approval of project drawings are governed by a project-specific procedure on drawing control (Y17-95-69-305, *UPF Drawing Control*). Drawing changes are provided to the design engineer or drafter per PCR, DCN, or construction field change, and a revision requires the same review and approval process as the original drawing. A DCN can be used to make changes to a drawing without issuing a formal revision, but no more than five approved DCNs are allowed to be outstanding before revising the drawing. Issued revisions of drawings, including DCNs but excluding preliminary revisions made after revision 0, are recorded in InfoWorks® and maintained by the UPF Document Management Center. The procedure currently does not address using ECNs. The drawing control procedure also illustrates a "Hold" using the need for a calculation as an example, but it does not discuss the relationship between DACs and drawings in any detail.

The requirements for preparation, implementation, and processing of UPF FCRs and UPF field change notices to support construction work processes are defined in Y17-95-64-802, *UPF Construction Field Change Documents*. The field change notice is intended for "minor" changes and the FCR for changes that may alter significant engineering criteria. The FCR cannot be used to change technical basis documentation, such as the design criteria or SDS. An FCR must have Project Engineering approval prior to implementation; however, other than specifying that Project Engineering is responsible to "incorporate design changes into affected design documents," the procedure does not contain instructions to define the role and implement the responsibilities of Project Engineering. For example, the procedure does not include instructions for the project engineer's evaluation of whether the proposed change can be approved and implemented before or after a PCR (or other change document) is prepared and approved. Further, the procedure does not provide instructions for completing the engineering actions on the FCR form, such as the reason or justification for the disposition (approved, approved with changes, or disapproved), identification of the affected design documents, and checking and approval. Finally, the procedure does not address tracking and closure of changes to affected design documents.

The UPF NCR procedure (Y17-95-65-804, *UPF Construction Nonconformance Reporting and Control*) establishes the requirements for identifying, controlling, segregating, dispositioning, classifying, documenting, trending, and implementing actions associated with nonconforming items. The procedure applies to nonconforming items, services, and conditions associated with SSCs identified during UPF construction activities. Project Engineering must approve Use-as-is and Repair dispositions, and the assigned responsible engineer provides the technical justification for accepting these dispositions. The procedure acknowledges that some dispositions may result in a design change and requires the use of the PCR for changes that affect high-level technical basis documents, such as the design criteria and SDS. Nonetheless, the procedure does not straightforwardly address the Use-as-is and Repair dispositions as (by definition) changes in the design output documents, that items identified as Q are safety-related, and that items identified as RS may be defense-in-depth. It is also unclear what "project design change process procedure" would be used for design changes that do not affect documents requiring a PCR or whether the "design change" must be approved before the NCR can be implemented.

### 5.2.5 Applicability of the Change Control Process

Y15-95-800, *UPF Document Management*, establishes instructions for the control of project documents and applies to all documents and drawings issued and received by UPF. A document is initially

designated with an alpha revision designation until approved, when it is marked as a numerical revision. When a document is "issued" in InfoWorks®, the document enters configuration control. After a document is issued as revision 0, a preliminary version showing changes planned for the next full revision would be numbered as "A0," "B0," etc. and would require a note to designate it as a preliminary document (for example, not checked). These preliminary versions are stored in a separate database where they are available for use on the project. The phrases "issued for design," "issued for procurement," or "issued for construction" are not addressed in the procedure. Major corrections or modifications to an "issued record" are made through a DCN using the "guidance" in Y15-101, Chapter 4. Minor changes can be made through "pen and ink" changes to the official record. The PCR process is not mentioned in this procedure.

As discussed in Subsection 5.2.4 above, change control for most technical changes is implemented using procedure Y15-95-005. That procedure requires use of the PCR form and implements a change package approach with review by the Technical Change Control Board. This approach to change control is used for mature projects where changes must be considered for potential impact on procurements or construction; it is not usually implemented on a project in the preliminary design phase, where neither procurement nor construction of the principal SSCs has been approved. The use of this approach appears to be driven by a requirement in the procedure that establishes its applicability to all technical changes to documents with numeric revisions. A review of the applicable document list, TBIS-EG-801768-FAC-A001, indicated that most project engineering documents have been issued as numeric revisions. Independent Oversight's discussions with UPO and B&W Y-12 personnel revealed that the PCR procedure may be revised to constrain its applicability to revisions of engineering documents with the status "Issued for Procurement" or "Issued for Construction."

### 5.2.6 Records Management

The change control process is not complete until changes to each affected document are fully implemented in a controlled manner. Each PCR is required to list all affected documents that must be revised due to the approved change. The process of tracking the PCR to ensure that these documents are revised is controlled by procedure Y15-101, *Records and Controlled Documents*. To examine this process, Independent Oversight reviewed the procedure and interviewed responsible document control personnel, who were found to be very knowledgeable of the procedure requirements and their role in the process.

Per procedure, the PCR form identifies all affected documents, and when the approved PCR is entered into the document control system (InfoWorks®), ties are created to each affected document. The PCR remains in OPEN status until all affected documents are revised to incorporate the change. Document revisions incorporating the change must note that fact in the revision log. Closure of the PCR requires review of all affected documents to verify that the change has been incorporated. Independent Oversight noted two potential concerns during this portion of the review:

- There is no time limit for incorporation of proposed changes into documents, and most document types have no limit on the number of changes that may be outstanding. As a result, many PCRs have not achieved closure. With no incentive to achieve incorporation or closure, the backlog of unincorporated changes could become problematic.
- There is no procedural requirement to incorporate outstanding PCRs in a document revision, so document revisions may occur without incorporation of outstanding PCRs.

### 5.2.7 Design Analyses and Calculations

Y17-95-69-307, *UPF Design Analyses and Calculations*, provides step-by-step direction for the preparation, verification, approval, and revision of DACs. As part of DAC preparation, the procedure calls for review of the safety basis design criteria and requires the identification and tracking of assumptions requiring confirmation, which appropriately are to be entered in a tracking database. By procedure, a DAC must be in committed or confirmed status to be used for design, procurement, or construction. Revising a DAC requires an evaluation of the need for a PCR, a DCN, or a field change document and includes review of the TBIS. The document numbers of any change documents, (e.g., ECN, DCN, or FCR) that are being incorporated into the document as part of the revision are to be included in the Revision Log Description. Independent Oversight noted that if a PCR is not prepared, there is no requirement to identify any documents that may be impacted by the DAC revision. In addition, the procedure contains significant information regarding the permitted use and management of "committed" (and to a lesser degree "confirmed") calculations in the definition section, but not in the procedural steps.

### 5.2.8 Identification of Affected Documents

As part of its review of the structural design elements of the LWA, Independent Oversight reviewed two DACs related to the concrete mass fill. The first, DAC-ES-801768-A201, *Determination of the Adequacy of the Extent of Mass Fill Concrete for the UPF 9212 Re-plan and Fit Study Optimization Configuration (UPF-2)*, is a committed calculation that was completed to confirm the adequacy of the mass concrete fill configuration in compression and shear when loaded by the Main Building, radiography vault, and administrative building connector. The calculation identified that it was based on two unverified assumptions and that the properties of materials used are based on DAC-ES-801768-A034. The first assumption notes that the wall loads are not finalized and the second assumption identifies that the accelerations are based on DAC-ES-801768-A034, which is being updated.

During review of the calculation, Independent Oversight identified two areas that are of concern but which do not appear to violate the procedural requirements in Y17-95-69-307. First, even though the DAC was in committed status, unissued working sketches were used as design inputs (DACs in committed status may be used as design input for subsequent drawings.) Second, drawings that were used as design input have been placed on "HOLD" in InfoWorks® but the DAC itself is not on "HOLD." Following discussion of these issues with B&W Y-12 personnel, Independent Oversight learned that UPO had identified issues with the DAC procedure and processes in an early 2013 assessment, and Independent Oversight was given a report from the Issues Management System (IMS) showing that shortcomings in this DAC had previously been identified and were being tracked to resolution.

The discussion of the concerns about the DAC highlighted a potential weakness in the mechanisms available to the engineers to identify impacted documents and track the flowdown of changes to all the affected documents. In this case, the structural drawings for the building are not identified as inputs to the DAC, so there is no direct identification of the interrelationship between those drawings and the calculation. When an engineer revises a document, such as the structural drawings, the engineer is expected to identify all affected documents so that they can be reviewed for impact. For example, the PCR process requires the originating engineer to identify all affected documents. During discussions, engineering personnel indicated that currently there is no database or other formal tool for tracking interrelationships between documents. Thus, the process relies heavily on the knowledge and experience of the individual contributors, without providing tools to ensure the error-free performance of this function. The concern with this process – i.e., that the originating engineer might not be aware of all downstream uses of a document – was exemplified by DAC-ES-801768-A201 above. Drawings prepared by one group were used as design input by another group and not cross-referenced in any manner,

creating an error-likely situation when those drawings are revised again in the future. DOE-STD-1189 requires that in the final design stage, the CM process should be well defined and able to track changes to the design and initiate conforming changes to analyses and documentation as changes are made. In addition, DOE-STD-1073 requires that each document directly affected by a change (such as drawings) or indirectly affected by a change (such as hazard control documents) be identified as part of the design review and change control package. (See **OFI-B&W Y-12-2**.)

The second DAC, DAC-ES-801768-A034, *Updated Site Response Analysis for Building 9226 Including Radiography Vault*, is a UPF-specific calculation that supersedes the site response analysis. The most recent revision of the calculation evaluated whether the original site response analysis for UPF should be revised based on more recent data and concluded that the original surface design response frequency is still acceptable and that no additional engineering review is needed to provide new surface design response spectra, strain compatible properties, or time histories.

Independent Oversight's review of the calculations discussed above also revealed a discrepancy related to design control that was of minimal impact but required correction. DAC-ES-801768-A201 stated in an introductory paragraph that it superseded DAC-ES-801768-A002. However, DAC-ES-801768-A002 remained available for use in the document control system, with no indication that it had been superseded. This item was corrected before the end of the review.

Review of another technical document, RP-ES-801768-A007, *Seismic Analysis and Design Plan for Safety Related Structures*, identified a discrepancy related to seismic spectra peak broadening. Sections 6.2 and 7.4.5 of that document state that peaks in the seismic response spectra will be broadened ±0.15% on either side. The correct response should call for a default broadening of ±15% unless actual broadening is calculated for each peak, in which case a minimum of 10% broadening should be used. When this issue was raised during discussions with the project seismic team, Independent Oversight was told that ±30% broadening is actually used to compensate for variations in strength of the concrete as well as the potential for cracking in the concrete. The seismic team noted that they were aware of the error in this document and that it would be corrected in a future revision; however, this document was issued in 2009, and the action to correct the known error has not been timely. (See **OFI-B&W Y-12-3**.)

### 5.2.9 Structural Design

The *UPF Structural Design Criteria* provides the overall structural design criteria for UPF structures and includes design criteria for the mass fill concrete. Independent Oversight's review of the criteria revealed that Sections 6.15 and 6.16 of the *UPF Structural Design Criteria* are to cover airplane impact loads and external explosions, respectively, but currently state "to be determined." Also, Section 11.2.1.2 of the same document states that final in-structure response spectra for the UPF Main Building are in DAC-ES-810768-A050 and -A055 and notes that these spectra used 30% peak broadening.

RP-ES-801768-A007, *Seismic Analysis and Design Plan for Safety Related Structures*, discusses how the seismic spectra to be used in analyzing the building structure were determined. Soil at the structure location is to be removed down to what is described as "weathered shale," defined as shale with a compactive resistance of 50 blows per foot (no source reference). Backfill will then be installed using non-reinforced concrete (mass fill) up to the elevation of the bottom of the building base mat. This approach, which is contained in the LWA, provides excellent load transfer from the structure to the underlying rock during a seismic event and therefore minimizes amplification of accelerations experienced by the structure and its contents. Section 6.0 of the *Seismic Analysis and Design Plan for Safety Related Structures* states that spectra will be developed at each story for each building; Independent Oversight confirmed in discussions with the seismic team that spectra will also be generated for all walls and floors that are shown by the analysis to be flexible. This document has not been updated

since 2009. Although it is understood that resolution of the ongoing space fit issues associated with fitting all needed equipment into the available space is not expected to result in changes to the size or shape of the building basemat, the potential for impact on the soil-structure interactions should be examined.

### 5.3 Safety System Feedback and Improvement

DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, establishes the requirements for UPO to implement a comprehensive and robust oversight process. An oversight program is expected to ensure that the Department's mission can be accomplished effectively and efficiently while maintaining the highest standard of performance for safety and security. In addition to establishing an oversight process, DOE Order 226.1B requires the implementation of an issues management process to categorize the significance of findings and ensure that problems are evaluated and corrected on a timely basis. Independent Oversight found that UPO had established and implemented an effective oversight process for the CM processes.

*Review/Inspection Criteria:*

*Line management has established and implemented effective processes for monitoring and assessing contractor programs for ensuring effective design and configuration management.*

In compliance with DOE Order 226.1B, UPO has prepared and approved the following procedures to implement a management process for the performance of oversight and resolution of identified issues:

- UPO-95-A003, *UPO Oversight Planning Process*
- UPO-95-A004, *UPO Oversight Execution/Reporting Process*
- UPO-95-A001, *UPF Project Office Issues Management Process*.

Independent Oversight's review of these procedures indicates that UPO utilizes a risk-informed approach to plan the oversight activities to be conducted throughout the fiscal year. The risk-based approach is meant to ensure that Federal oversight resources focus on the risk significant areas first, and are based on an appropriate risk ranking methodology that relates the contractor performance grade in a specific functional area (e.g., safety basis, quality assurance) to the potential impact of the functional area on the success of the UPF project. Once the risk level is determined, UPO-95-A003 requires each UPO Division Manager to prepare an oversight planning worksheet to specify the proposed oversight activities and associated assessment level for the upcoming fiscal year. UPO combines the results of the planning worksheets in an integrated assessment schedule (IAS), which specifies the risk level, assessment type and level, planned dates for the assessment, and the responsible UPO personnel to perform the assessment.

Review of the fiscal year (FY) 2014 oversight planning worksheets and IAS indicated that the UPO staff has properly implemented the expectations of the oversight planning procedure. An example is an FY 2013 UPO assessment that identified several significant weaknesses in B&W Y-12's implementation of a CM program. Review of the planning worksheets and IAS indicated that the weakness in performance in the CM area was included in the determination of risk level to the project, and as a result, several Level 3 assessments were identified in the FY 2014 IAS for B&W Y-12 CM program implementation.

All UPO assessments are required to follow the instructions in UPO-95-A004 to plan and conduct the assessment. The execution and reporting procedure only requires an assessment plan and CRAD for Level 3 assessments; however, all assessments must result in a report documenting the results. Interviews with UPO staff who conduct assessments showed that they were knowledgeable of the expectations of the

procedure. During the interviews, the UPO staff provided an in-depth description of the UPO assessment procedure expectations and the field implementing mechanisms; which included preparation of the review plan, documentation of the assessment results, categorization of the significance of issues, and capture of the deficiencies in the UPO issues management system. Further, review of several Level 3 assessments demonstrated that UPO is following the procedural requirements.

To resolve issues identified by UPO oversight activities, UPO has implemented the IMS, which is described in UPO-95-A001. Issues identified in UPO assessment reports are characterized as Management Concerns, Findings, Significant Findings, or Opportunities. In addition, the UPO IMS provides for identification of noteworthy practices as Strengths. Review of the UPO IMS database indicated that in general, the IMS is appropriately populated with assessment issues. Furthermore, as required by UPO-95-A001, UPO assessment issues are formally transmitted to B&W Y-12 for resolution through their system. The UPO IMS establishes a graded approach to the resolution of issues. If the issue is identified as a Management Concern or Significant Finding, the UPO correspondence transmitting the issue requires the identification of immediate compensatory actions, formal causal analysis, a corrective action plan, UPO approval of the corrective action plan, and periodic reporting of the corrective action status to UPO. Lower tier issues require a lesser degree of reporting to UPO on corrective actions.

Interviews with several UPO staff personnel who perform oversight assessments and the UPO IMS Coordinator indicated that they were knowledgeable of the expectations of UPO-95-A001. In addition, the IMS Coordinator provided documentation in the form of spreadsheets listing the status of open issues, and no issues were past due. To ensure that UPO senior management is informed of issues early enough to make timely, informed decisions, the IMS Coordinator briefs UPO senior management on a weekly basis.

Independent Oversight observed that B&W Y-12 has a Technical Issue Management System (TIMS) available to all project staff members. However, the UPO oversight process does not recognize TIMS as a potential database for the UPO staff to capture an issue, potentially bypassing the established UPO IMS processes described in UPO Procedure UPO-95-A001. (See **OFI-UPO-3**.)

Since this Independent Oversight review focused on UPO and B&W Y-12 design control and CM processes, Independent Oversight reviewed the most recent UPO assessment reports for these functional areas to determine their compliance with the UPO assessment processes and adequacy in covering the depth and breadth of a Level 3 assessment. These Level 3 assessment reports were of high quality, fulfilled the format expectations of UPO-95-A004, and provided sufficient discussion of the review results to support the identified issues. The reports demonstrated that the assessments were of sufficient depth and breadth to fulfill the scope described in the assessment plan. The UPO assessment reports for CM and design review effectiveness identified a number of Findings and Opportunities, which have led to ongoing discussions and plans to implement corrective actions aimed at improving these processes. Some of the identified issues include:

- UPF does not have a CM plan adequate to provide CM for a major design and construction project.
- Safety class, safety significant, and defense-in-depth SSCs are not formally identified as items to be managed by a CM program.
- Y74-48-007, *Hazard Identification and Screening to Support Development of a Hazard Evaluation Study*, is not implemented by the UPF project as required.
- The TBIS contains documents that should not be included and omits documents that should be included.

- Y70-68-001, *Criticality Safety Approval/Requirements Development, Review, and Approval*, does not address the use of the Assumptions Requiring Confirmation, Data Needs, and Holds Database system for unverified assumptions and data needs associated with criticality safety process study development.
- Preliminary unverified and unchecked information is being used in final design documents.
- Preliminary unverified and unchecked information is not tracked or controlled on process and instrumentation drawings.
- The documentation of UPF assumptions for unconfirmed design parameters does not meet Nuclear Quality Assurance (NQA)-1 requirements.

## 6.0 CONCLUSIONS

Independent Oversight found that safety functions and functional requirements for the current state of design (and safety analysis) are adequately described in the project's SDS, and that the SDS establishes an appropriate path forward to refine the safety functions and functional requirements and to further define the performance criteria in support of continuing design. PSRs represent a proactive means for limiting the risk of costly changes late in the project by ensuring that safety basis development and the design process remain synchronized during the time between PSDR submittal and PDSA submittal. For these reasons, the PSRs should be issued at the earliest date achievable. The SDS also includes a reasonable process for screening changes to the safety design criteria and strategy to identify those that require NPO and Federal Project Director approval. Independent Oversight identified two OFIs in this area; one related to the scope of UPF design criteria that are included in the screening process for UPO approval, and the other to the management of potential changes related to the LWA.

Independent Oversight found that B&W Y-12 uses a mix of project-specific procedures and other Y-12 site procedures to control the design process and CM, and that the plans and procedures governing CM for the safety and engineering design bases were the subject of an ongoing effort to identify and implement upgrades. As previously identified in UPO assessments and internal B&W Y-12 reviews, Independent Oversight also found that a number of the common Y-12 site procedures are not well-suited for use on an engineering, procurement, and construction project. This situation will evolve in 2014 as the CM processes transition to increased reliance on project-specific procedures in key areas. The CM plan and design change process will be strengthened by reduced reliance on site procedures and continued efforts to improve integration of the processes as procedures. Independent Oversight also noted that the change process relies on individual knowledge on the part of the person originating a document revision to identify all potentially affected downstream documents. Given the many types of documents produced on the project and the sizeable population of individuals who might originate a revision, this approach was found to be a cause for concern. In many instances, the requirements of DOE-STD-1073 can be met through the use of knowledgeable personnel, but this approach increases the risk that the project could fail to identify an impacted document, creating a discrepancy or error that might then propagate into additional downstream documents and increase the risk of rework. The CM process would be strengthened through implementation of a more formal methodology for tracking affected documents and identifying downstream documents that may be impacted by a change. Independent Oversight identified two OFIs for the CM processes: The first is related to improving plans and procedures, and the second addresses the reliance on individual knowledge to identify all potentially affected downstream documents when a change occurs.

Several discrepancies were identified in individual documents, including known errors and superseded documents still available for use. These discrepancies create error-likely conditions for users of the affected documents. Additional attention to document accuracy is recommended. Independent Oversight identified an OFI addressing these discrepancies.

Overall, Independent Oversight found that UPO has prepared and implemented procedures that establish an effective oversight process to monitor and assess the UPF contractor's performance in design and configuration management. UPO procedures adequately describe a DOE Order 226.1B compliant oversight program. In addition, UPO staff demonstrated knowledge of the UPO oversight process, and provided assessment documentation indicating effective implementation of the UPO oversight and issues management processes. Specifically noted during the review were the UPO oversight activities that were instrumental in identifying the need for significant improvements in the UPF CM program. Independent Oversight identified one OFI for the UPO assessment and issues management system related to the methods used to track identified technical issues.

## 7.0 OPPORTUNITIES FOR IMPROVEMENT

As discussed in Section 5.0, this Independent Oversight review identified six opportunities for improvement (OFIs). These potential enhancements are not intended to be prescriptive or mandatory, and do not require formal resolution through the corrective action process. Rather, they represent opportunities to advance the project through positive change in conditions or performance. These suggestions from the Independent Oversight review team may assist site management in implementing best practices or provide potential solutions to minor issues identified during the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. It is expected that responsible line management organizations will evaluate the OFIs and accept, reject, or modify them as appropriate, in accordance with site-specific program objectives and priorities.

### B&W Y-12, LLC

**OFI-B&W Y-12-1:** Ensure that the document governing the development and approval of PSRs addresses the update of the design criteria (safety functions, functional requirements, and performance criteria) as the PHES and PAAs are completed for the initial set of facility processes and the general building. Issuance of this document and development of the PSRs should be expedited to support planned design freezes later in calendar year 2014.

**OFI-B&W Y-12-2:** Develop tools to support the cross-referencing of design documents (for example, drawings and calculations) so that the identification of affected design documents during the revision processes is reliable and less prone to error.

**OFI-B&W Y-12-3:** Apply additional rigor to keeping engineering documents current and free of errors or discrepancies.

### UPF Project Office

**OFI-UPO-1:** Consider whether other criteria, such as the UPF natural phenomena design criteria, the fire protection design criteria, and the structural design criteria, should be subject to the change control screening and evaluation process for safety criteria contained in the SDS, since they include some safety-related design criteria.

**OFI-UPO-2:** Reassess the LWA and its approval memorandum to ensure that the expectations for implementing the conditions of the approval are mutually understood by B&W Y-12 and UPO, and evaluate whether the SDS should be revised to address management of the safety and engineering design basis for the LWA.

**OFI-UPO-3:** Consider revising UPO Procedure UPO-95-A001 to recognize the existence of TIMS and establish the protocols for UPO staff usage.

## 8.0 ITEMS FOR FOLLOW-UP

Independent Oversight will consider further follow-up review of the planned revisions to CM plans and procedures, the development of PSRs and integration of PSRs into design requirements, and the implementation of the PCR process (including potential changes to the applicability of the process) at an appropriate time following completion and approval of the documents. A follow-up review of the implementation of DACs may also be conducted.

## 9.0 REFERENCES


- *Plan for the Independent Oversight Review of the Uranium Processing Facility Design Requirements and Configuration Management Program*, December 2013
- HSS-CRAD 45-11, *Safety Systems Inspection Criteria, Approach and Lines of Inquiry*, Revision 3, December 2012
- DOE Order 420.1B, *Facility Safety*, Chg. 1, April 2010
- DOE-STD-1189, *Integration of Safety into the Design Process*, March 2008
- DOE-STD-1073, *Configuration Management*, October 2003
- DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Non-reactor Nuclear Facility Documented Safety Analyses*, CN-3, March 2006

## Appendix A
## Supplemental Information

**Dates of Review**

December 16-19, 2013

**Office of Health, Safety and Security Management**

Glenn S. Podonsky, Chief Health, Safety and Security Officer
William A. Eckroade, Principal Deputy Chief for Mission Support Operations
John S. Boulden III, Director, Office of Enforcement and Oversight
Thomas R. Staker, Deputy Director for Oversight
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**Independent Oversight Site Lead**

Jimmy S. Dyke

**Independent Oversight Reviewers**

Charles R. Allen – Lead
Jimmy S. Dyke
David J. Odland

## Appendix B
## Key Documents Reviewed, Interviews, and Observations

### Documents Reviewed

- CFN-1023, UPF Field Change Request (9/13)
- COL-NNSA-YSO-PM-801768-A248, Memorandum from John Eschenberg to Carl Strock, Subject: Site Preparation Critical Decision-2/3 Package Sufficiency Review, 6/14/13
- COL-NNSA-YSO-PM-801768-A256, Memorandum from John Eschenberg to Carl Strock, Subject: Approval of Long Lead/Bulk Procurements and Site Preparation, 7/11/13
- COL-NNSA-YSO-PM-801768-A285, Memorandum from John Eschenberg to Carl Strock, Subject: Contract De-AC05-00OR2280 Approval of the Uranium Processing Facility Safety Design Strategy Revision 8, 10/11/13
- COR-PS-9.10.2013-534312, Memorandum from Federal Project Director to UPF Project Director, Subject: Contract DE-AC05-00OR22800, Design Completion Plan, 9/10/13
- COR-Y12-3-7-2013-88813, Memorandum from John Eschenberg to Mark Seely, Subject: Approval of the Preliminary Safety Design Report for the Uranium Processing Facility Project, 3/6/13
- DAC-ES-801768-A034, Updated Site Response Analysis for Building 9226 Including Radiography Vault, Rev. 4, 8/13
- DAC-ES-801768-A201, *Determination of the Adequacy of the Extent of Mass Fill Concrete for the UPF 9212 Re-plan and Fit Study Optimization Configuration (UPF-2)*, Rev. 0, 2/13
- DE-PE-801768-A001, *UPF Project Design Criteria Basis, Chapter 1 of the UPF Design Criteria*, Rev. 3, 9/13
- DE-PE-801768-A007, *UPF Facility Safety Design Criteria (U)*, Chapter 2 Section 600 of the UPF Design Criteria, Rev, 8, 9/13
- DE-PE-801768-A007, *UPF Facility Safety Design Criteria*, Chapter 2 Section 600 of the UPF Design Criteria, Rev. 8, 9/13
- DE-PE-801768-A007, *UPF Facility Safety Design Criteria*, Rev. 8, 9/13
- DE-PE-801768-A012, *UPF Natural Phenomena Design Criteria*, Chapter 2 Section 1200 of the UPF Design Criteria, Rev. 5, 9/13
- DE-PE-801768-A012, *UPF Natural Phenomena Design Criteria*, Chapter 2 Section 1200 of the UPF Design Criteria, Rev. 5, 9/13
- DE-PE-801768-A023, *UPF Structural Design Criteria*, Chapter 3 Section 200 of the UPF Design Criteria, Rev. 7, 9/13
- DI-EG-801768-A018, *UPF Technical Issues Management System (TIMS)*, Revision 1, 7/23/13
- IMA-PM-801768-A183, *UPO Shadow of UPF Effectiveness Review: Recurring Conditions Adverse to Quality*, Revision 0, 1/13
- IMA-PM-801768-A227, *UPO Assessment of Configuration Control of UPF Safety Controls*, Revision 0, 7/13
- IMA-PM-801768-A245, *UPO Assessment of Configuration Control of UPF Safety Controls*, Revision 0, 12/13
- IMA-PM-801768-A246, *Design Review Effectiveness Assessment*, Revision 0, 08/13
- IMA-PM-801768-A248, *UPO Assessment of UPO Issue Review Board*, Revision 0, 09/13
- IMA-PM-801768-A257, *UPO Assessment of UPF Technical Change Control Process Implementation*, Draft, 11/13
- IMA-PM-801768-A263, *UPO Assessment of Control of UPF Assumptions, Data Needs and Holds*, Revision 0, 11/13

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**Interviews**

B&W Y-12

- Manager of Engineering
- Deputy Engineering & Safety Basis Development Manager
- Facilities Design Project Engineer
- Engineering Quality, Processes & Procedures Manager
- Nuclear Safety Manager
- Design Authority Representative
- Facilities Design Project Engineer
- Process Design Project Engineer
- Process Design Engineer
- Seismic Analysis Lead
- Structural Design Lead
- Civil Design Lead
- Document Control Supervisor

UPO

- Division Manager for Nuclear Safety and Operations
- Assessment Coordinator (Project Management Support Office {PMSO})
- Engineering Processes and Procedures Lead (PMSO)
- Project Support Program Manager Issues Management System (PMSO)
- Engineering Design Lead (PMSO)
- TIMS Coordinator

**Observations**

- Structural Design Documentation Package Review
- Process Design Documentation Package Review
- Technical Change Control Board/Safety Design Integration Team Meeting