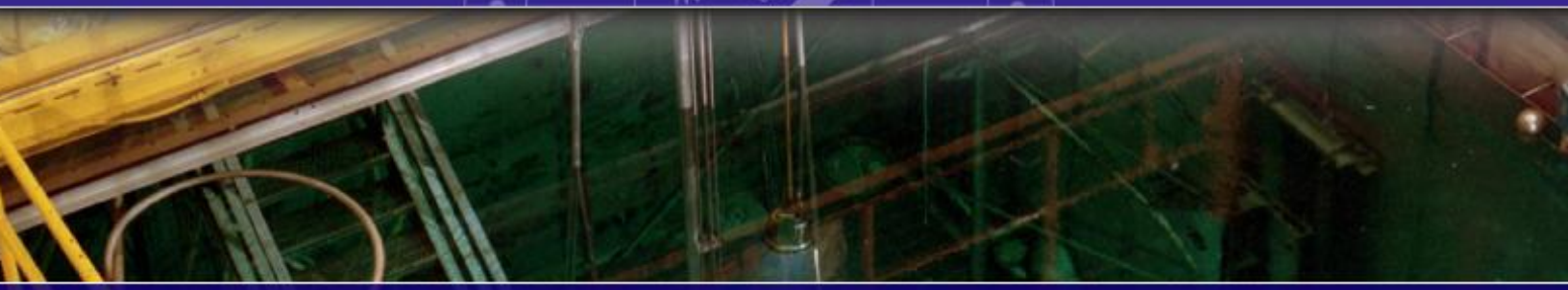
CNS

OFFICE OF THE UNDER SECRETARY



Strengthening Line Management Oversight and Federal Monitoring of Nuclear Facilities

Standard Review Plan

Volume 3 - Nuclear Safety Basis Program Review During Facility Operations and Transitions

February 2015

Standard Review Plan

Volume 3

Nuclear Safety Basis Program Review during

Facility Operations and Transitions

Facility Life Cycle Applicability					
CD-1	CD-2	CD-3	CD-4	Operations and Transitions	Decommissioning & Environmental Restoration
				✓	

February 2015

Table of Contents

Acronyms

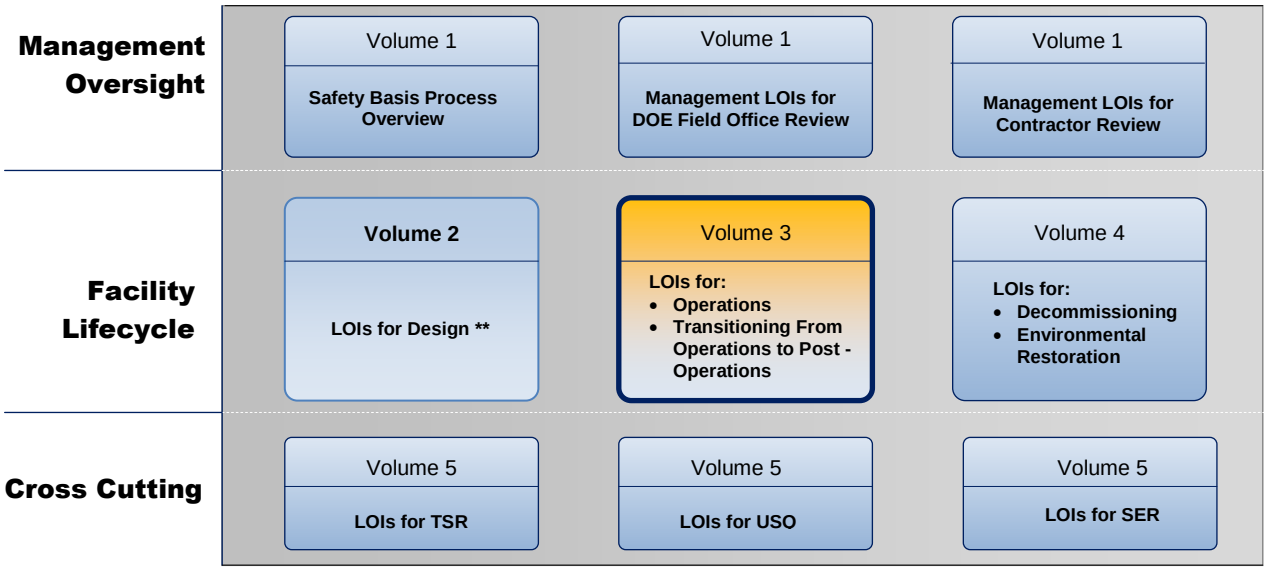
ALARA	As Low As Reasonably Achievable
ARF	Airborne Release Fraction
CSDR	Conceptual Safety Design Report
CSVR	Conceptual Safety Validation Report
DBA	Design Basis Accident
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DR	Damage Ratio
DSA	Documented Safety Analysis
D&D	Decontamination and Decommissioning
EG	Evaluation Guideline
EPHA	Emergency Planning Hazards Assessment
EPP	Emergency Preparedness Plan
FHA	Fire Hazard Analysis
HA	Hazard Analysis
ICRP	International Commission on Radiological Protection
ISM	Integrated Safety Management
IVR	Independent Implementation Verification Review
JCO	Justification for Continued Operation
LCO	Limiting Conditions of Operation
LCS	Limiting Control Settings
LPF	Leak Path Factor
LOI	Line of Inquiry
MAR	Material At Risk
MOI	Maximum Exposed Offsite Individual
PAAA	Price Anderson Amendments Act
PDSA	Preliminary Documented Safety Analysis

PHA	Preliminary Hazards Analysis
PSDR	Preliminary Safety Design Report
PSVR	Preliminary Safety Validation Report
QA	Quality Assurance
RF	Respirable Fraction
SAC	Specific Administrative Control
SBAA	Safety Basis Approval Authority
SDS	Safety Design Strategy
SER	Safety Evaluation Report
SL	Safety Limit
SRP	Standard Review Plan
SSC	Structures, Systems and Components
ST	Source Term
TEDE	Total Effective Dose Equivalent
TSR	Technical Safety Requirements
TRU	Transuranic
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination

Introduction

Subpart B of the DOE Nuclear Safety Management regulation (10 CFR Part 830) establishes safety basis requirements for DOE nuclear facilities. This SRP, *Safety Basis Program Review*, contains five volumes to help strengthen the technical rigor of line management oversight and federal monitoring of DOE nuclear facilities during the entire facility life cycle[1]. The SRP provides a set of LOIs for the review of safety basis programs and documents of nuclear facilities at various stages of the facility life cycle. These LOIs were developed based on the review of the DOE safety basis directives and technical standards, as well as from best management practices. These LOIs provide consistency in the safety basis review process and using the graded approach, they can be tailored to specific circumstances. Additional and specific LOIs can also be developed beyond these LOIs.

The contents of the five SRP volumes are described below. Volume 3 contains LOIs for the review of the safety basis activities during facility operations and transitions.



** The review of the Safety Design Strategy (SDS) and the Code of Record (COR) is an important part of the safety-in-design review process. The LOIs for SDS and COR are contained in two stand-alone SRPs.

[1] Facility life cycle includes design, construction, commissioning, operations, transitions, decommissioning and environmental restoration.

References

The following references were used to develop the LOIs contained in this volume for safety basis review during operations and transitions. If there are LOIs developed from best management practices from field implementation, they are italicized.

1. 10 CFR 830, Subpart B, *Safety Basis Requirements*
2. 10 CFR 830, Subpart B, § 830.203, *Unreviewed Safety Question Process*
3. 10 CFR 830, Subpart B, § 830.204, *Documented Safety Analysis*
4. 10 CFR 830, Subpart B, § 830.205, *Technical Safety Requirements*
5. 10 CFR 830, Subpart B, § 830.207, *DOE Approval of Safety Basis*
6. DOE O 151.1C, *Comprehensive Emergency Management System*, November 2005
7. DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, November 2010
8. DOE O 414.1D, *Quality Assurance*, Admin Chg 1, May 2013
9. DOE O 420.1C, *Facility Safety*, December 2012
10. DOE-O-422.1, *Conduct of Operations*, Chg 2, December 2014
11. DOE-O-426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, Chg 1, July 2013
12. DOE O 430.1B, Chg 2, *Real Property and Asset Management*, September 2003
13. DOE G 421.1-2A, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*, December 2011
14. DOE G 423.1-1A, *Implementation Guide for Use in Developing Technical Safety Requirements*, November 2010
15. DOE G 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*, Chg 2, June 2013
16. DOE G 430.1-2, *Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition*, September 1999
17. DOE G 430.1-5, *Transition Implementation Guide*, April 2001
18. DOE-STD-1027, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, Change Notice 1, September 1997
19. DOE-STD-1066, *Fire Protection*, December 2012
20. DOE-STD-1073, *Configuration Management*, October 2003
21. DOE-STD-1104, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, May 2009[2]
22. DOE-STD-1120, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, April 2005
23. DOE-STD-1186, *Specific Administrative Controls*, March 2004
24. DOE-STD-3007, *Guidelines for Preparing Criticality Safety Evaluation at the Department of Energy Non-reactor Nuclear Facilities*, February 2007
25. DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, Change Notice 3, March 2006[3]

[2] DOE-STD-1104-2014, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, was released in December 2014 and will be used for the update of the next version of the SRP.

[3] DOE-STD-3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, was released in November 2014 and will be used for the update of the next version of the SRP.

26. DOE-STD-5506, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*, May 2007

Safety Basis Program Review LOIs for Facility Operations and Transitions

The following three Attachments contain LOIs for the review of safety basis process and documentation during operations and transitions. Attachment 2 contains LOIs specific for DSA review of TRU waste facilities[4]. Volume 5 contains LOIs for SER, TSR and USQ and they are also applicable to these facility lifecycle phases.

[4] Transuranic (TRU) waste is typically waste that is contaminated with man-made radioactive elements which are heavier than uranium (meaning the elements have higher atomic numbers than uranium on the Periodic Table of the Elements). Since they come after uranium on the periodic table, they are referred to as "transuranic". The concentration of these transuranic elements in the waste determines whether it is transuranic waste or low-level waste. Major DOE TRU waste facilities include the Waste Isolation Pilot Plant at Carlsbad, NM. and the TRU Waste Processing Center at Oak Ridge, TN.

Attachment 1 - LOIs for Review of DSAs during Operations

LOIs[5]	Yes	No
Site Characteristics		
Does the DSA identify: 1) the location of the site; 2) the location of the facility within the site; 3) its proximity to the public and to other facilities; and 4) the point where the evaluation guideline is applied (i.e., the location of the maximally exposed off-site individual)?		
Does the DSA identify: 1) population sheltering; 2) population location and density; and 3) other aspects of the area surrounding the site that relate to assessing the protection of the health and safety of the public?		
Does the DSA provide, or reference, the historical databases for site characteristics in meteorology, hydrology, geology, seismology, volcanology, and other natural phenomena to the extent needed for hazard and accident analyses?		
Have design basis or evaluation basis natural phenomena criteria been identified based on proven and accepted methods?		
Have sources of external accidents (e.g., nearby airports, railroads, or utilities such as natural gas lines) been identified?		
Have nearby facilities impacting or impacted by the facility under evaluation been identified?		
Have the site characteristic assumptions that were used in prior studies, such as environmental analyses and impact statements, been validated?		
Are all the design codes, standards, regulations, and DOE Orders listed specific to site characteristics for establishing the safety basis of the facility as required by DOE-STD-3009?		
Facility Description		
Does the DSA include discussion of the facility information, such as inventory inputs and outputs, mission, scope of operations, life cycle stage, history, and projected future uses?		
Does the DSA provide a description of the facility structure and design basis or evaluation basis, including construction details, materials, dimensions, and layouts? Is the information in sufficient detail to support the hazards and accident analyses?		

[5] Sources of these LOIs include DOE-STD-3009, 10 CFR 830, Subpart B, § 830.204, DOE G 421.1-2A; DOE-STD-1027, and Best Management Practices (italicized). They provide a starting point for a set of corporate Performance Expectations and Criteria. Review teams are expected to build on these and develop additional project-specific LOIs, as needed.

LOIs[5]	Yes	No
Does the DSA describe the facility process systems, components, instrumentation, controls, operating parameters, and relationships of the SSCs? Does it provide a summary of the types and quantities of hazardous materials?		
Is a description of the facility confinement systems provided?		
Is a description of the facility safety support systems provided, including the purpose and a general overview of each system?		
Is a description of the facility utilities provided?		
Is a description of the facility auxiliary systems and support facilities provided?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the facility description chapter that are required for establishing the safety basis?		
Hazard and Accident Analyses		
Does the DSA describe the hazard identification and categorization methodology with regard to how the hazardous materials and energy sources were identified and inventoried, including the use of referenced information?		
Is a summary table provided that systematically identifies the hazards by type, quantity, form, and location, including a brief summary of the major accidents or hazardous situations that have actually occurred at the facility?		
Do the identified hazards and quantities cover all operations described in *Facility Description*, including all modes of operation (startup, normal operation, shutdown, abnormal testing, or maintenance configurations, etc.)?		
Are the hazards and quantities identified consistent with the statements and assumptions made in the hazard and accident analyses?		
Are the hazards and quantities identified consistent with the statements and assumptions made in the FHA for the facility in accordance with DOE-STD-1066?		
Is the hazard analysis organized in such a way that it can be judged to be comprehensive, and is the hazard analysis adequate as a basis for TSR development?		
Is the hazard analysis tool used adequate with respect to the complexity of the process, the activities in the facility, and the facility's history (e.g., new versus existing)?		
Does the hazard analysis identify consequences, likelihood, and mitigators/preventers for determination of the TSR controls?		
Are all of the items in the hazard and accident analyses relied upon for public protection, worker protection, and defense in depth covered by the TSR controls?		
Are the hazards and quantities reviewed with respect to the EPHA in accordance to DOE O151.1C?		

LOIs[5]	Yes	No
Are the quantities specified derived from credible bases (e.g., flow sheets, historical data, and operational limits) in a reasonably conservative manner?		
Are the initial and final hazard categories assigned for the facility consistent with the methodology of DOE-STD-1027-92, including segmentation, if used?		
Is the hazard evaluation methodology: 1) stated explicitly; 2) consistent with the safe harbor analysis methods chosen for the DSA; and 3) reasonably tailored (graded approach) to the type and complexity of the operations examined?		
Were facility operating personnel involved in the hazard evaluation?		
Was available information used for the analysis (e.g., procedures, process and equipment descriptions, flowcharts) consistent with that reasonably available from the facility?		
Was existing information (e.g., summary descriptions, drawings, and flowcharts) sufficient to provide a basic understanding of the significant operations, key parameters, and controls?		
Is a complete set of hazard evaluation worksheets/tables available to inspect?		
Do the cumulative hazard evaluation worksheets address every hazard identified in the hazard identification summary table as well as each operation/activity described in the Facility Description Section of the DSA? Are initiating events also identified?		
Is the FHA consistent with the DSA hazard analysis?		
Is the DSA hazard criticality analysis consistent with the methodology described in DOE-STD-3007?		
Have the required worksheet entry columns been treated appropriately (i.e., there are no vague hazards or causes, no generic or incomplete control listings, and no comments or recommended action items)?		
Are the bases for consequence and likelihood binning qualitatively defined?		
Is the scenario binning technique applied consistently throughout the evaluation? Are consequences qualitatively assessed with and without the controls?		
Are all of the significant aspects of the facility's operations known to the reviewer(s) and/or noted in the facility walk downs covered by the hazard evaluation?		
Are the hazard analysis assumptions clearly presented and justified?		
Is there evidence, documented in the DSA or separately, that the hazard analysis generated action items and recommendations were assessed by facility and operations management?		

LOIs[5]	Yes	No
Have appropriate interim operational control commitments been made when issues require further study, a significant concern cannot be fully addressed at present, or major upgrades are planned?		
Is the information captured in the hazard analysis adequately summarized and presented in an organized manner (from hazard source to outer layers of defense) such that it identifies those design and administrative features most important to achieving the overall safety principles (defense in depth) and the major principles of worker protection (worker safety) for a given facility or operation?		
Is the identification of major controls in the defense-in-depth and worker safety discussions consistent with those identified in the hazard evaluation worksheets?		
Does the DSA demonstrate a coherent thought process leading to the selection of safety significant SSC and TSR commitments? Does that process focus on determining (a) the defense-in-depth items most important to avoiding uncontrolled releases of hazardous material, (b) those features most critical to avoiding worker fatalities or serious injuries or significant radiological or chemical exposures to workers, and (c) the associated TSRs most appropriate to ensure that these items and features are not seriously challenged and/or will likely maintain their functionality?		
Based on the defense-in-depth and worker safety information presented in the DSA, is the set of safety significant SSC designations and associated TSR commitments considered to be adequate?		
Are all of the pathways identified for uncontrolled release of large amounts of hazardous materials to the environment?		
Do the defense-in-depth measures identified provide reasonable and prudent prevention and mitigation for the potential environmental releases?		
Is the accident selection consistent with the hazard evaluation, its definitions of defense-in-depth and worker safety, and the associated scenario binning?		
Is the selection of internally initiated accidents for the accident analysis based on consequence? Note: Dismissing such events based on low frequency or risk arguments related to the controls is inappropriate.		
Is the selection of natural phenomena and externally initiated events in accordance with DOE Standards? Note: Initiator frequency is used to define these events.		
Does the selection of accidents for the accident analysis appropriately consider the Fire Hazard Analysis?		
Do the accidents selected cover all of the controls associated with the unique and representative accidents that could challenge the Evaluation Guidelines for the maximally exposed off-site individual? Note: Refer to DOE-STD-3009, Appendix A.		
Was the five factor formula (MAR x ARF x RF x DR x LPF=ST) used to determine source term of the accident(s)?		

LOIs[5]	Yes	No
Does each scenario, whose unmitigated (or uncontrolled) consequences challenge the Evaluation Guidelines, document a coherent thought process for the selection of safety class SSCs from a candidate pool, as well as any additional TSR commitments?		
Does review of the basis for safety class designation indicate that all appropriate designations and associated TSR commitments have been made?		
Has consideration been given to the need for an analysis of accidents beyond the design basis of the facility for outside the DSA cost benefit considerations if the consequences challenging the Evaluation Guidelines are identified in the beyond design basis accident range? Are any such analyses sufficient to provide a perspective on potential facility vulnerabilities?		
Are the accident analysis assumptions clearly presented and justified?		
Are the DSA accident analyses results (identification of the required hazard controls, such as the safety class SSCs) consistent with the Fire Hazard Analysis and Emergency Planning Hazards Assessment conclusions?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the hazard and accident analyses chapter that are required for establishing the safety basis?		
Safety Structures, Systems, and Components (SSCs)[6]		
Does the DSA, preferably in a summary table, provide: 1) identification of the safety class, safety significant, and important-to-safety SSCs; 2) bases for identifying these SSCs; 3) their safety functions; 4) their functional requirements; 5) their performance requirements; and 6) provisions for requiring TSR coverage for safety class and safety significant SSCs?		
For each safety class and safety significant SSC identified, is a clear and concise description of the safety function provided, including identification of the specific accidents that the safety SSC impacts?		
For each safety class and safety significant SSC identified, is a detailed description provided that specifies the basic principles by which it performs its		

[6] **Safety Controls Hierarchy**: Items that perform a safety function in DOE facilities include safety class SSCs, safety significant SSCs, and other SSCs that perform a safety function, sometimes known as "items important to safety" or "defense-in-depth items" that are not safety significant. The safety class SSC classification was instituted to deal with SSCs that have special importance with regard to protection of the public and are required to meet siting criteria. The safety significant SSC classification was instituted to provide additional public protection by providing multiple means of dealing with accidents (defense in depth) and to provide protection for onsite personnel who may not be protected by distance factors, as the public is, because of large DOE sites. The term "safety SSC" is used to refer to both safety class and safety significant SSCs. The significance of either of these categories is in the expectation that safety SSCs will be designed, qualified, procured, installed, and maintained so that they will perform their safety function when called upon to do so during normal, abnormal, and accident conditions. Additional defense-in-depth measures or compensatory measures such as enhanced surveillance and maintenance may be necessary to support the criterion of assurance that they can perform their safety function when called upon. Not all SSCs are classified as safety class or safety significant. These lesser SSCs are called "defense-in-depth SSCs" or "SSCs important to safety." These are items that perform a safety function, but do not rise to the level of importance of safety class or safety significant SSCs. Changes to SSCs that are not explicitly discussed in the safety analyses should not be excluded from the USQ process because changes to these SSCs may have potential to alter the function of an SSC explicitly described in the safety analysis. Also, a change to an SSC that does not involve equipment important to safety could initiate an accident or affect the course of an accident.

LOIs[5]	Yes	No
safety function?		
For each safety class and safety significant SSC identified, is a description provided of its boundaries and interface points with other SSCs relevant to its safety function?		
For each safety class and safety significant SSC identified, is a clear discussion provided of the failure modes and the actions needed to prevent failure?		
For each safety class and safety significant SSC identified, are the functional requirements clearly and concisely provided (i.e., limited to those requirements necessary for the safety function)?		
For each safety class and safety significant SSC identified, do the functional requirements specifically address the pertinent response parameters or non-ambient environmental stresses related to each specific accident for which the SSC has a safety function?		
For each safety class and safety significant SSC identified, are the performance requirements clearly based on the accident parameters and concisely articulated?		
For those cases where the design basis of the safety SSC is not known, has a comparison been performed against traditional design criteria (e.g., single failure)?		
For each safety class and safety significant SSC identified, have the potential TSRs needed to ensure the safety function of the SSC been identified?		
Have support SSCs (including auxiliaries, utilities, instrumentation, and control systems) on which important to safety, safety significant, and safety class SSCs rely to perform their safety functions been identified and designated as important to safety, safety significant, and safety class SSCs, respectively (i.e., the support SSCs are designated at the same level as the supported SSCs)?		
If there are SACs specified in the DSA, are the descriptions for each SAC adequate for safety analysis inputs and assumptions?		
Is there a summary list of the SACs? Does the summary list, in tabular form, identify the following: 1) SACs; 2) accidents for which the SAC is a designated control; 3) safety functions; 4) functional requirements; and 5) performance criteria required for TSR coverage?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the SCCs chapter that are required for establishing the safety basis?		
Derivation of Technical Safety Requirements (TSRs)		
Is the content of the discussion on derivation of the TSRs commensurate with the hazard categorization?		
Does the DSA contain sufficient basis to derive SACs indentified in the hazard analysis?		
Does the TSR derivation identify all safety SSCs (passive and active) identified in the DSA's hazard and accident analyses?		
Does the TSR derivational basis include all attributes necessary to develop LCO		

LOIs[5]	Yes	No
for active safety SSCs (e.g., LCO statements, modes of operation, actions, and surveillance and associated frequencies)?		
Does the DSA address whether TSRs from other facilities could affect the facility's safety basis? Note: Where applicable, those TSR provisions, their associated impacts, and interfaces with the facility should be described.		
Do the facility modes reflect the actual cycles of operations/ activities conducted in the facility? Note: If any facility modes are derived from accident scenarios, this derivation should be presented.		
Are facility modes established in such a way that the status of safety systems can be distinctively defined?		
Are staffing level requirements or other administrative limits considered in the facility modes?		
If the facility contains several structural segments or multiple activities, are facility modes established to accommodate this situation?		
The TSR controls are generally derived from preventive or mitigative features identified in the hazard analysis. Is this derivation clearly shown?		
Are the criteria provided for selecting the SLs, LCSs, and LCOs? Is the evaluation guide from DOE-STD-3009, used? If so, is it described?		
Are the controls that support front-line safety systems identified and included as needed?		
Does the DSA provide the basis and identify information necessary to derive surveillance requirements which address testing, calibration, or inspection requirements?		
Are vendors' specifications identified and included, as needed, for establishing the surveillance requirements?		
Does the Administrative Controls Section include all of the administrative controls identified in the hazard analysis?		
Are the administrative controls covering the safety management program tailored for any facility- or activity-specific situations?		
Does the Design Features Section identify passive design features and provide the rationale for their selection?		
Are all controls from other facilities and activities whose operations can impact this facility identified?		

LOIs[5]	Yes	No
Are the developed TSR controls practical to implement?		
Have IVRs been conducted to confirm the proper implementation of new or revised safety controls based on guidance provided in DOE G 423.1-1A?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the derivation of TSRs chapter that are required for establishing the safety basis?		
Prevention of Inadvertent Criticality		
Has a criticality safety program been defined that: (1) ensures that operations with fissionable material remain subcritical under all normal and credible abnormal conditions; (2) identifies applicable nuclear criticality safety standards; and (3) describes how the program meets applicable nuclear criticality standards?		
Has the basis and analytical approach been established for deriving operational criticality limits?		
Does the DSA provide a summary of design and administrative controls used by the criticality safety program?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the prevention of inadvertent criticality chapter that are required for establishing the safety basis?		
Radiation Protection		
Is the overall radiation protection program and organization described in the DSA?		
Does the DSA describe the radiological ALARA policy and program?		
Does the DSA describe the methods of radiation exposure control, including administrative limits, radiological practices, dosimetry, and respiratory protection?		
Is the radiological monitoring to protect workers, the public, and the environment identified?		
Is there discussion of radiological protection instrumentation?		
Is there description of the plans and procedures for maintaining records of radiation sources, releases, and occupational exposures?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the radiation protection chapter that are required for establishing the safety basis?		
Hazardous Material Protection		
Does the DSA describe the overall hazardous material protection program and organization?		
Is the hazardous material ALARA policy and program described?		
Does the DSA describe the methods of hazardous material exposure control including identification of hazardous material, administrative limits, occupational		

LOIs[5]	Yes	No
medical programs, and respiratory protection?		
Is hazardous material monitoring to protect workers, the public, and the environment identified?		
Is there discussion of hazardous material protection instrumentation?		
Is there description of the plans and procedures for maintaining hazardous material records, hazard communications, and occupational exposures?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the hazardous material protection chapter that are required for establishing the safety basis?		
Radioactive and Hazardous Waste Management		
Does the DSA describe the overall radioactive and hazardous waste management program and organization?		
Is there description of the site-specific radioactive, mixed, and hazardous material waste management policy, objectives, and philosophy?		
Are the hazardous waste streams, including types, sources, and quantities identified?		
Is there description of the waste management process, and waste treatment and disposal systems, including design and administrative controls?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the radioactive and hazardous waste management chapter that are required for establishing the safety basis?		
Initial Testing, In-Service Surveillance, and Maintenance		
Does the DSA describe the facility initial testing program?		
Is there description of the facility in-service surveillance program?		
Is there description of the planned, predictive, preventive, and corrective facility maintenance programs?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the initial testing, in-service surveillance and maintenance chapter that are required for establishing the safety basis?		
Operational Safety		
Does the DSA identify the aspects of Conduct of Operations directly applicable to the facility?		
Is there an integrated summary of the main features of the facility Conduct of Operations program? Is this consistent with the Conduct of Operation Matrix as required by DOE O 422.1?		
Is there description of facility Fire Protection Program as required by DOE O 420.1C?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the operational safety chapter that are required for establishing the safety basis?		

LOIs[5]	Yes	No
Procedures and Training		
Does the DSA provide a summary of the overall facility procedures and training programs?		
Is there description of the processes by which the form and content of procedures and training materials are developed, verified and validated for normal, abnormal, and emergency operations; surveillance testing and maintenance consistent with DOEO 426.2?		
Is a summary provided on the processes for maintaining written procedures, training materials, and training records?		
Is a summary provided on the processes for modifying procedures and training materials?		
Is a summary provided on methods used to feed back operations experience, new analyses, other DSA changes, etc., to the procedures and training programs?		
Is there a description of the mechanisms to identify and correct technical or human factors deficiencies?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the procedures and training chapter that are required for establishing the safety basis?		
Human Factors		
Does the DSA describe the human factors engineering that focuses on designing facilities, systems, equipment, and tools so they are sensitive to the capabilities, limitations, and needs of humans?		
Is there description of the human reliability analysis that quantifies the contribution of human error to the facility risk?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the human factors chapter that are required for establishing the safety basis?		
Quality Assurance		
Does the DSA describe the facility quality assurance program and organization consistent with the 10 CFR 830, Subpart A and DOE O 414.1D?		
Is there description of document control and records management?		
Is there description of the quality assurance process ensuring that performed safety related work meets requirements?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the quality assurance chapter that are required for establishing the safety basis?		
Emergency Preparedness Program		
Does the DSA describe the scope of the facility EPP in accordance with DOE-O-151.1C?		
Is there description of the philosophy, objectives, organization, and emergency response of facility emergency preparedness?		

LOIs[5]	Yes	No
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the emergency preparedness program chapter that are required for establishing the safety basis?		
Provision for Decontamination and Decommissioning (D&D)		
Does the DSA describe the design features incorporated in major modifications of an existing facility to facilitate future D&D of the facility?		
Is there description of operational considerations to facilitate future D&D?		
Is there description of conceptual D&D plan?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the provision for D&D chapter that are required for establishing the safety basis?		
Management, Organization, and Industrial Safety Provisions		
Does the DSA describe the overall structure of the organizations and personnel with responsibilities for facility safety and interfaces between those organizations?		
Is there a description of the programs that promote safety consciousness and morale including safety culture, performance assessment, configuration and document control, occurrence reporting, and staffing and qualification?		
As required by DOE-STD-3009, are all the applicable design codes, standards, regulations, and DOE Orders listed in the management, organization, and industrial safety provisions chapter that are required for establishing the safety basis?		

Attachment 2 - LOIs for Review of DSAs for TRU Waste Facilities

LOIs[7]	Yes	No
Identification and Evaluation of TRU Waste Events		
Is the process for hazard identification and selection of accidents conducted in accordance with DOE-STD-3009?		
Does the hazard identification process use as a starting point the hazards commonly expected for TRU waste operations identified in Table 3.2-1, *Hazard Sources and Potential Events*, of DOE-STD-5506?		
Does the hazard screening process distinguish the hazards between Standard Industrial Hazards (SIH)[8] and those that must be evaluated in the DSA?		
Does the hazard screening process address the following considerations? • Identified hazard has the characteristics of an SIH • Identified hazard has the potential for significant interactions with nuclear hazards[9]		
Does the DSA address the minimum hazard evaluation events listed in Table 3.3-1, *Minimum TRU Waste Activity/Hazard Evaluation Event Matrix*, of DOE-STD-5506?		
If certain accident events are excluded in the DSA, is the basis for exclusion developed and discussed with the local DOE Approval Authority?		
In those cases where DSA documents expected operational events[10], are the following characteristics of such events provided in the DSA? • The event is documented in the facility process description of the DSA • The response actions following occurrence of the expected event are specifically documented in the DSA, although they may be as simple as evaluate and report the event to DOE (where necessary in accordance with DOE O 231.1A) • The event is analyzed in the DSA hazard evaluation • Worker protection measures for the operational event are identified in the DSA		

[7] Sources used for these LOIs include DOE -STD-5506; 10 CFR 830, Subpart B, § 830.204; and DOE-STD-3009. They provide a starting point for a set of corporate Performance Expectations and Criteria. Review teams are expected to build on these and develop additional project-specific LOIs, as needed.

[8] Hazardous materials that are incidental to the process operation, such as those that are found in laboratories, or environmental circumstances such as the presence of insects, hanta virus, etc., can be screened from further consideration in the DSA, but should be considered in the preparation of job hazard analyses. Unique hazards cannot be screened and must be carried forward for further evaluation. In determining whether a hazard is unique, consider any variations from standard practice, the magnitude of the hazard, etc.

[9] Such interactions may not be addressed by consensus standards and require more thorough evaluation than screening would afford (i.e., to verify or determine appropriate controls). Some hazards are adequately controlled, but may still serve as initiators for a nuclear accident. Electrical power is an example.

[10] Expected operational events are defined as planned occurrences encountered during normal operations that result from hazards inherent to the material and activities.

LOIs[7]	Yes	No
TRU Waste Source Term Analysis		
Was the five factor formula described in DOE-HDBK-3010 (MAR x ARF x RF x DR x LPF=ST) used to determine source term of the accidents?		
Is unmitigated[11] analysis performed in accordance with DOE-STD-3009, Appendix A?		
Is the methodology for determining the MAR consistent with Table 4.3.2-1, *Bounding MAR Limits for TRU Waste Operations*, of DOE-STD-5506?		
If an alternative to DOE-STD-5506 MAR methodology is used, are justifications given on any subset of the full facility inventory on the basis that it contains the maximum inventory that could be impacted by an accident?		
Does the selection of DRs support the overall conservative analysis consistent with DOE-STD-3009?[12]		
In developing the DRs for container integrity, are the criteria contained in Table 4.4.1-1, *Payload Container Integrity Checklist*, of DOE-STD-5506 used? If not, are justifications provided?		
In developing the DRs for container deflagration, are the criteria contained Table 4.4.2-1, *Drum Deflagration Damage Ratios*, of DOE-STD-5506 used? If not, are justifications provided?		
In developing the DRs for fires, does the DSA follow the approach outlined in Figure 4.4.3-1, *Fire Damage Ratios (DRs) for Direct-Loaded Drums*, of DOE-STD-5506 for both pool fires and ordinary combustible fires? If not, are justifications provided?		
In developing the DRs for other waste containers, including Standard Waste Box (SWB), Ten Drum Overpack (TDOP), direct-loaded remote handling canisters, and Pipe Overpack Container (POC), does the DSA follow the methodology described in Section 4.4.3.2, *Fire Damage Ratios for Other Containers*, of DOE-STD-5506? If not, are justifications provided?		
In developing the DRs for container drops or impacts, does the DSA follow the criteria in Table 4.4.4-1, *Container Drop and Impact Damage Ratios*, of DOE-STD-5506? If not, are justifications provided?		
In developing the DRs for containers impacted by seismic debris, does the DSA follow the criteria in Table 4.4.5-1, *Damage Ratios for Containers Impacted by Seismic Debris*, of DOE-STD-5506? If not, are justifications provided?		
In developing the ARF and RF[13] values for the various TRU waste forms and accident types, does the DSA follow the criteria in Table 4.5-1, *ARF*RF Value*		

[11] Unmitigated means no credit is given to preventive and mitigative controls to reduce the frequency or consequence of potential accidents. The unmitigated accident scenario is intended to represent a reasonably conservative bounding analysis of potential consequences independent of their likelihood of occurrence.

[12] Damage Ratio is defined in the DOE-HDBK-3010 as the "fraction of the MAR actually impacted by the accident-generated conditions." DRs must be selected in context with the conservatisms of the other parameters in the "five factor formula," i.e., MAR, bounding ARFs and RFs per DOE-HDBK-3010 as required by DOE-STD-3009 Appendix A, and Leak path Factor (only for mitigated analysis).

[13] The ARF and RF are key factors in estimating the amount of airborne materials generated from accidents involving solids, liquids, gases or surface contamination. ARF and RF values are given in DOE-HDBK-3010-94. Pertinent values from DOE-HDBK-3010-94 as applied to TRU waste accidents are clarified in DOE-STD-5506.

LOIs[7]	Yes	No
Applicable to TRU Waste Accidents, of DOE-STD-5506? If not, are justifications provided?		
Consequence Analysis		
Does the DSA contain qualitative evaluation of unmitigated consequence to the facility worker in accordance with DOE-STD-3009? Notes: Qualitative evaluation of facility worker hazards (with insights from dose consequence calculations at the 100 meter evaluation point) and derivation of associated controls should be addressed within the hazard analysis process rather than defining bounding worker DBAs within the DSA. This represents a more cost-effective approach to reasonable assurance of adequate worker protection.		
Does the DSA use the dispersion attributes for consequence modeling of potential exposure to the co-located worker or the MOI? If alternate dispersion methodologies or attributes were used, are justifications provided? Have they been approved by the DOE Approval Authority?		
Are the χ/Q values used for radiological and chemical consequence analysis generated using the MACCS2 Computer Code? Note: Use of other DOE-approved Toolbox Codes, or site-specific codes that have undergone appropriate validation and verification in accordance with DOE O 414.1D requirements on software quality assurance, must be technically justified.		
Are the worst case meteorological assumptions (i.e., 95th percentile based on local site data) for onsite radiological and chemical releases consistent with DOE- STD-3009, Appendix A, for offsite evaluations?		
Is the dry deposition velocity consistent with the recommendation of the HSS Safety Bulletin 2011-2 “Accident Analysis Parameter Update”?		
Is wet deposition modeled? If yes, are justifications provided since it should not be modeled.		
Is the surface roughness value of 3 cm assumed for radiological and chemical releases? If not, are justifications provided?		
Is building wake effects credited (modeled)? If yes, are justifications given since it should not be modeled, unless shown to yield more conservative or bounding results.		
Is plume buoyancy used when modeling fires that are outdoors or venting through a large breach in the facility? Note: The use of plume buoyancy should not be credited in a non-conservative manner.		
Is the breathing rate value of 3.3 x 10-4 m3/s used, as specified in the DOE Toolbox Codes? If not, are justifications provided? Note: This value corresponds to the light activity breathing rate for adults and must be used in consequence assessment.		
Are the inhalation dose conversion factors for the MOI and the collocated worker consistent with the following ICPR guidance? If not, are justifications provided?		

LOIs[7]	Yes	No
• ICRP 72 , *Age-dependent Dose to Members of the Public from Intake of Radionuclides*: Part 5 Compilation of Ingestion and Inhalation Dose Coefficients • ICRP 68, *Dose Coefficients for Intakes of Radionuclides by Workers*		
TRU Waste Hazard Control Selection and Standardization		
Is a risk ranking process used to bin the results of unmitigated hazard and accident analysis for the MOI, collocated workers onsite, and facility workers as shown in Table 6.2-1, *Consequence Levels and Risk Evaluation Guidelines*, of DOE-STD-5506?		
Are risks ranked in accordance with Table 6.2-2, *Qualitative Risk Ranking Bins*, of DOE-STD-5506? If not, is a similar risk ranking process used in accordance with recommendations of DOE-STD-3009?		
Does the DSA address the uncertainties associated with Source Term and Consequence Analysis Factors (MAR x ARF x RF x DR x LPF=ST) as specified in Table 6.3-1, *Uncertainties Associated with Source Term and Consequence Analysis Factors*, of DOE-STD-5506?		
Does the DSA use the hazard control selection strategy from Table 6.4.1-1, *Hazard Controls*, of DOE-STD-5506? If not, are justifications provided? Note: The ordering of controls in Table 6.4.1-1 is consistent with the hierarchy established by DOE-STD-3009. This table contains both Preferred and Alternate Controls.		
Are there justifications given on the selection of Preferred Controls, Alternative Controls, or combinations of both?		
With respect to TSR controls, if Alternate Controls were selected, is there a sound technical basis that is communicated and agreed upon with the DOE Safety Basis Approval Authority?		
If SACs were selected in place of engineering controls, are their justifications given? Note: SACs should not be proposed to avoid establishing an adequate set of engineered controls where it is possible to do so, and not cost-prohibitive.		
Description of Safety Management Programs[14]		
Does the DSA define the characteristics of the following safety management programs necessary to ensure the safe operation of the facility?[15] • Prevention of Inadvertent Criticality • Radiation Protection • Hazardous Material Protection • Radioactive and Hazardous Waste Management		

[14] 10 CFR Part 830 defines safety management program as a program designed to ensure a facility is operated in a manner that adequately protects workers, the public, and the environment by covering a topic such as: quality assurance; maintenance of safety systems; personnel training; conduct of operations; inadvertent criticality protection; emergency preparedness; fire protection; waste management; or radiological protection of workers, the public, and the environment.

[15] DOE-STD-3009 identifies programmatic chapters to be included in the DSA (typically Chapter 6-17) to provide a summary description of the key features of the various safety programs as they related to the facility being analyzed. These chapters are not meant to be used as the vehicle for the determination of adequacy of these programs.

LOIs[7]	Yes	No
• Initial Testing, In-Service Surveillance, and Maintenance • Operational Safety • Procedures and Training • Human Factors • Quality Assurance • Emergency Preparedness Program • Provisions for Decontamination and Decommissioning • Management, Organization, and Industrial Safety Provisions		
Does the DOE review of the DSA include the bases of approving the safety management program characteristics and determine if any conditions of approval imposed? [16]		

[16] These approval bases do not relate to compliance with regulatory requirements, but to identification of the basic capability and awareness of fundamental provisions needed for maintaining the adequacy of the facility safety basis. This approval simply documents that the basic elements of the institutional safety management programs depended on for ensuring facility safety basis are adequate and that these elements can and will be implemented. A list of these programs briefly noting their general significance to defense in depth, worker safety, and/or dominant accident scenarios is provided, but no summary of the information from each programmatic chapter is needed. Reference is DOE-STD-1104.

Attachment 3 - LOIs for Review of Safety Strategy[17] for Facility Transitioning From Operations to Post-Operations

LOIs[18]	Yes	No
Requirements and Guidance		
Has an inventory of available documents based on existing facilities/sites been identified in the scope of the project to facilitate hazard analysis and project planning?		
Have the potential hazards and their safety and risk implications been identified in the transition development/planning?		
Has a safety strategy[19] been developed and integrated into transition planning documentation?		
Has a set of environmental, safety and health requirements been identified applicable to the facility transition project?		
Does the facility disposition plan demonstrate how environment, safety and health requirements are integrated into facility disposition activities as required by DOE O 431.1B and Integrated System Management Directives?		
Has the safety documentation been assessed against the proposed scope of post transition activities to ensure they are adequate for transition and to determine the applicability to the next phase scope?		
Have qualified safety and health professionals been identified to serve on the Integrated Project Team necessary to support the Federal Project Director?		
Have safety basis documents been developed or updated, reviewed, and approved for the transition and do they address the planned activities in the immediate post transition phase?		
Hazard Characterization		
Is the facility adequately characterized consistent with the requirements for transition and with regard to physical safety and both chemical and radiological inventories and materials to support the planned activities in the immediate post transition phase?		

[17] These LOIs focus mainly on safety related activities of the nuclear facility disposition process. Facility disposition include those activities that follow completion of program missions, including, but not limited to, preparation for reuse, surveillance, maintenance, deactivation, decommissioning, and long-term stewardship. DOE O 430.1B established broad requirements for major DOE real property asset management functional components of planning, real estate, acquisition, maintenance and recapitalization, disposition and long-term stewardship, value engineering, and performance goals and measures. Additional LOIs can be developed from DOE O 430.1B beyond these safety LOIs.

[18] These LOIs are based 10 CFR 830, Subpart B; DOE-STD-3009; DOE-STD-1120; DOE G 430.1-5; and Best Management Practices (italicized). They provide a starting point for a set of corporate Performance Expectations and Criteria. Review teams are expected to build on these and develop additional project-specific LOIs, as needed.

[19] The safety strategy must be consistent with the requirements on Disposition and Long-Term Stewardship and Value Engineering specified in DOE O 430.1B, and the project planning and integrated safety management principles outlined in the DOE 430.1B guides and DOE-STD-1120.

LOIs[18]	Yes	No
Has baseline data been collected and evaluated?		
Have all the relevant information/documents describing the facility and hazards, including deferred maintenance, been collected and reviewed?		
Have the current and past facility workers been interviewed, as appropriate, to gather information not evident from the document reviews?		
Have walk downs been performed using a multidiscipline team to assess and confirm existing facility conditions and inherent hazards?		
Has a determination been made by the integrated transition team regarding the need for additional characterization data?		
Has a hazard characterization plan been developed consistent with the determined need and based on the needs of the transition activities?		
Has characterization been performed in accordance with the plan and the new baseline inventory/characterization data obtained?		
Does the facility characterization information address the uncertainties in the assigned inventory values and the technical basis for these uncertainties?		
Are uncertainties factored in to the determination of the bounding hazardous and radioactive material inventories assigned to the facility?		
Are the uncertainties factored in decisions regarding the need for additional characterization?		
Are hazards related to transition activities adequately characterized/addressed?		
Are hazards related to changing system conditions and configurations identified?		
Are hazards resulting from the transition end-state configuration (e.g. static conditions in processing vessels and piping) identified and addressed?		
Turnover Documentation		
Is turnover documentation available for or has been provided to the receiving organization? Is it adequate?		
Does the turnover documentation include relevant information regarding the past uses of the facility and systems?		
Does the turnover documentation include information regarding the current configurations and conditions of all equipment within the facility?		

LOIs[18]	Yes	No
Does the turnover documentation provide information regarding transition activities performed to reduce hazards and stabilize the facility equipment?		
Does the turnover documentation provide information that supports the inventory values assigned to the facility?		
Does the turnover documentation include the identification, configuration and engineering documents required for all operating systems?		
Does turnover documentation include the required information regarding stabilized or out of service systems such that a determination of the associated hazards can be determined?		
Does turnover documentation include the necessary environmental permits and documents to support activities for the next facility phase?		
Does turnover documentation include outstanding commitments to regulatory authorities, tribal governments, stakeholders, and DOE Organizations that require action?		
Operating Systems		
Have operating systems that are subject to configuration management program been identified in accordance to DOE-STD-1073?		
Have operating/required utilities for the facility minimum safe configurations been identified?		
Have any operating systems that are not utilities but are required for the facility minimum safe configurations been identified?		
Has the necessary documentation associated with the operating systems been provided?		
Have procedures for safe operation of the systems been provided?		
Have engineering documents such as drawings and specifications been provided for all the systems required to maintain minimum safe configurations?		
Have the necessary maintenance procedures for the operating systems been provided?		
Has the technical basis for requiring the operation of operating systems that are subject configuration management program been identified?		
Is there a technical basis for the operation of each identified operating system that details why operation of the system is required?		

LOIs[18]	Yes	No
Does the technical basis for each operating system identify the basis for all parameters recorded as part of surveillances or used in maintenance procedures?		
Safety Basis Documentation		
Is there current approved safety basis documentation for the facility as required by CFR 830 Subpart B?		
Is the disposition plan, as required by DOE O 430.1B, and the DSA consistent so any changes to work plans as defined in the disposition plan may be considered for potential impacts to the DSA?		
Does the safety basis documentation reflect the best available characterization data to determine the bounding inventory and evaluate accident scenarios?		
Does the safety basis documentation authorize the necessary activities for the immediate facility phase?		
Does the safety basis documentation meet the primary requirements for safety basis documents as identified in 10 CFR 830.204? Has it been developed and approved using a recognized safe harbor methodology?		
Does the safety basis clearly identify safety SSCs and associated safety functions and performance requirements?		
Are TSRs appropriate for the planned phase of the facility?		
Does the safety basis documentation include provisions to “step out” of controls as the hazards are reduced or eliminated?		
Has DOE been involved in the identification of the step-out control process to ensure that the process is efficient and meets the requirements and expectations of DOE?		