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Review of Nuclear Facility Safety Design Basis Development Criteria and Review Approach Document		
Authorization and Approval	C.E. (Gene Carpenter, Jr. Director, Office of Nuclear Safety and Environmental Assessments Date: 2/12/2018	Lead, James O. Low Nuclear Engineer Date: 2/12/2018

1.0 PURPOSE

The mission of the U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments (EA-30) is to assess the effectiveness of safety and emergency management systems and practices used by line and contractor organizations and to provide clear, concise, rigorous, and independent evaluation reports of performance in protecting workers, the public, and the environment from the hazards associated with DOE activities.

In addition to the general independent oversight requirements and responsibilities specified in DOE Order 227.1A, *Independent Oversight Program*, this criteria and review approach document (CRAD) will assist EA-30 in determining the effectiveness of the line and contractor organization in implementing DOE-STD-1189-2016 for high hazard nuclear project safety design basis development, review and approval.

The CRADs are available to DOE line and contractor assessment personnel to aid them in developing effective DOE oversight, contractor self-assessment, and corrective action processes. The current revision of EA's CRADs are available at http://www.energy.gov/ea/criteria-and-review-approach-documents.

2.0 APPLICABILITY

The following CRAD is approved for use by the Office of Nuclear Safety and Environmental Assessments, EA-31, for use on DOE Hazard Category 1, 2, and 3 nuclear facilities.

3.0 FEEDBACK

Comments and suggestions for improvements on this CRAD can be directed to the Director, Office of Environment, Safety and Health Assessments.

4.0 CRITERIA AND REVIEW APPROACH

This CRAD focuses on reviewing the safety design basis documents for DOE's Hazard Category 1, 2, and 3 nuclear facilities to ensure the integration of safety into the design process. Integration of safety into the early stages of design development is critical in order to comply with the requirements of 10 CFR Part 830, *Nuclear Safety Management*, and DOE Order 420.1C, Chg 1, *Facility Safety*, dated February 2, 2015 (DOE O 420.1C), in order to develop safe and cost-effective nuclear facility designs. Requirements are primarily from DOE-STD-1189-2016, *Integration of Safety into the Design Process*, dated December 2016 (DOE-STD-1189-2016), and DOE-STD-1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, dated December 2016, and concentrate on the Conceptual Safety Design Report (CSDR) and the Preliminary Documented Safety Analysis (PDSA) and DOE approval of these documents.

OBJECTIVES

10 CFR 830.206, *Preliminary documented safety analysis*, identifies the following requirements:

1: The contractor responsible for a hazard category 1, 2, or 3 new DOE nuclear facility or a major modification to a hazard category 1, 2, or 3 DOE nuclear facility must prepare a preliminary documented safety analysis (PDSA[1]) for the facility. (10 CFR 830.206.a)

2: The contractor responsible for a hazard category 1, 2, or 3 new DOE nuclear facility or a major modification to a hazard category 1, 2, or 3 DOE nuclear facility must obtain DOE approval of the nuclear safety design criteria to be used in preparing the PDSA unless the contractor uses the design criteria in DOE Order 420.1C (or successor). (10 CFR 830.206.b.1)

3: The contractor responsible for a hazard category 1, 2, or 3 new DOE nuclear facility or a major modification to a hazard category 1, 2, or 3 DOE nuclear facility must obtain DOE approval of the PDSA before the contractor can procure materials or components or begin construction; provided that DOE may authorize the contractor to perform limited procurement and construction activities without approval of a PDSA if DOE determines that the activities are not detrimental to public health and safety and are in the best interests of DOE. (10 CFR 830.206.b.2)

CSDR Criteria:

The content of a Conceptual Safety Design Report (CSDR) or Preliminary Documented Safety Analysis (PDSA) should be commensurate with the design development stage of Safety-in-Design process, as

[1] PDSA means documentation prepared in connection with the design and construction of a new DOE nuclear facility or a major modification to a DOE nuclear facility that provides a reasonable basis for the preliminary conclusion that the nuclear facility can be operated safely through the consideration of factors such as a safety analysis that derives aspects of design that are necessary to satisfy the nuclear safety design criteria. (10 CFR 830.3)

discussed in DOE Standard 1189. For example, hazards analyses that are documented in a CSDR would be expected to include facility hazards and facility-level hazard controls. The PDSA would be expected to include a summary of the hazard analysis, accident analysis, and fire hazards analysis along with activity level hazard controls.

1. The CSDR appropriately and sufficiently summarizes the hazard analysis efforts and Safety-in-Design decisions incorporated into the conceptual design along with any identified project risks associated with the selected strategies. (DOE-STD-1189-2016, Section C.1)

Facility Background and Mission

- Does the facility description adequately present general information on the background of the facility as it relates to its use and the project scope?
- Is the mission clearly described?
- Is relevant information affecting the safety-in-design approaches (e.g., short facility life cycle, anticipated future mission change, approved DOE exemptions) adequately documented?

Site Description

- Does the site information provide an adequate description of the facility location, including the physical and institutional boundaries, relationship and interfaces with nearby facilities?
- Does site information provide an adequate description of the facility layout and significant external structure, system, and component (SSC) interfaces (e.g., utility connections) as they pertain to the hazard analysis?
- If multiple sites are under consideration, does the CSDR adequately describe each of them?

Facility Structure

- Is information provided adequate to perform a facility-level accident analysis?
- Is facility information provided, such as basic floor plans, material-at-risk locations within the structure, general dimensions, and dimensions significant to hazard analysis, adequate for the analysis of hazards in the facility?
- Is the facility information adequate to support an overall understanding of general facility arrangement relative to the analyzed hazards in the CSDR?

Process Description

- Are the facility process descriptions adequate to support understanding of postulated facility-level material-at-risk release events and safety-in-design strategies?
- Are details adequately provided on: basic process parameters, types and quantities of hazardous materials, energy sources, process equipment, basic flow diagrams, operational considerations, major interfaces, and relationships between SSCs?
- Can facility-level material-at-risk release events be adequately determined from the information provided?

Hazard Identification and Material Inventories

- Are total inventories (with associated uncertainties) of radionuclides, hazardous chemicals, and flammable and explosive materials used or potentially generated in the process adequately estimated?
- Are results of hazardous material estimates adequately documented in the CSDR or referenced to the hazard identification data sheets in the hazard analysis?
- Are the attributes of hazards identified, which will be the basis for subsequent hazard evaluation and accident analysis, adequately documented?

Comparison of Inventories to Threshold Quantities for Facility Hazard Categorization

- Are the radionuclide and fissile material inventories compared to the threshold quantities in Table A.1 of DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23,* dated December 12, 1997, and used to provide an adequate preliminary hazard categorization?
- If segments are proposed, do the segment boundaries and hazard inventories adequately justify the independence of the segments?
- Are the individual segment preliminary hazard categorizations adequately identified?
- If adjusted release fractions are credited, are they consistent with the requirements of DOE-STD-1027-92?

Facility-Level Design Basis Accidents (DBAs)

- Are facility level DBAs adequately derived from systematic hazard analysis consistent with DOE Standard 3009, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, dated November 2014 (DOE-STD-3009-2014)?
- Is a summary table provided that adequately identify postulated hazardous material release events? Does the table include events involving risk to both the public and workers?
- Are all the postulated major accidents or hazardous situations (e.g., fires, explosions, loss of confinement) adequately documented?
- Has a fire hazards analysis been developed and adequately summarized for the preferred alternative design?

Unmitigated Accident Analyses

- Are the release categories adequately identified by individual title, category (e.g., operational accidents, natural phenomena, man-made external events) and general type (e.g., fire, explosion, loss of containment)?
- Is the source term determination adequately described for the event category?
- Are all parameters used to derive the source term, including material-at-risk (as derived from hazard categorization), the damage ratio, and the airborne release fraction adequately discussed?
- Is the conservatism in the calculation consistent with DOE-STD-3009-2014?

- Are the results of the DBA analysis to the facility worker[2], the co-located worker[3], and to the public[4], adequately presented according to the guidance of DOE-STD-3009-2014?
    - Are the DBA results adequately compared to guidance for safety system classification and natural phenomena hazard (NPH) design criteria of DOE Standard 1020, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*, dated January 2017 (DOE-STD-1020-2016) and the criteria for chemical hazards of DOE-STD-3009-2014?

Preliminary Selection and Classification of Safety SSCs

- Does each DBA provide an adequate preliminary identification of facility-level safety functions, and, if proposed, the associated safety class and safety significant SSCs and their necessary support systems?
- Are requirements for the identified safety functions and any proposed associated safety SSCs adequate?
- Is the applicable structural design basis associated with each system (NPH design criteria) adequately identified?
- Is an adequate discussion of safety functions and design criteria for selected safety SSCs, based on the unmitigated facility analyses, provided for candidate preventive and mitigative controls?
- Is there an adequate rationale, from a safety-in-design perspective, included for the following major systems: facility structure, facility hazardous material confinement, fire protection, and emergency power?
- Does the CSDR adequately follow the expectations in the Safety Design Strategy (SDS)?

Nuclear Safety Design Criteria

- Is an adequate list of applicable nuclear safety design criteria from DOE O 420.1C provided along with a brief summary of the implementation approach being taken for each design-related criterion? Note: programmatic criteria are not expected to be discussed.
- Are topics such as ALARA (As Low As Reasonably Achievable) and decontamination/decommissioning plans needed for the final DSA adequately discussed?
- Are any exceptions to the nuclear safety design criteria in DOE O 420.1C adequately identified and any alternative criteria sufficiently justified?
- Does the CSDR adequately document the basis for the preferred alternative design?

Planned Studies or Safety-in Design Risks/Opportunities

- Does the CSDR adequately describe any technical studies essential for development or validation of the safety design basis?

[2] A worker within the facility boundary and located less than 100 meters from the release point.
[3] A co-located worker at a distance of 100 meters from a facility (building perimeter) or estimated release point.
[4] Maximally-exposed Offsite Individual (MOI) - A hypothetical individual defined to allow dose or dosage comparison with numerical criteria for the public. This individual is an adult typically located at the point of maximum exposure on the DOE site boundary nearest to the facility in question (ground level release), or may be located at some farther distance where an elevated or buoyant radioactive plume is expected to cause the highest exposure (airborne release)

- Does the CSDR adequately summarize the safety-in-design risks and opportunities sufficient to support risk informed decisions for progressing to preliminary design?

PDSA Criteria:

2. The PDSA provides site information; facility and process descriptions; the hazard, accident, and fire hazard analysis; functional requirements, performance criteria, and performance evaluations for safety SSCs and specific administrative controls (SACs); measures to prevent inadvertent criticality accidents; and design aspects affecting implementation of safety management plans. (DOE-STD-1189, Section D.1)

PDSA Content

The PDSA updates the information in the CSDR and demonstrates the adequacy of the design from the safety perspective. Demonstrating the design adequacy for final design is focused on demonstrating that the safety design requirements specified at the end of final design have been satisfied and by describing the mitigated condition for hazards and accidents with the hazard controls applied. To provide a baseline understanding of the adequacy of controls, the PDSA accident analysis should describe how the selected controls adequately prevent/mitigate the accidents based on accident frequency and control reliability.

Site Description

- Does the PDSA include adequate site information of the type that can affect safety-in-design, such as location of nearby facilities and external hazards, meteorological information for dispersion analyses, and natural phenomena (e.g., seismic, wind) data?

Facility Description

- Is the facility structure type and layout adequately described?
- Are adequate process descriptions provided (including details on basic process parameters, hazardous materials, and process equipment) adequate to support accident assessment and the safety analysis?
- Are confinement systems and other major systems (along with their support systems) adequately described?

Hazard and Accident Analysis

- Does the PDSA adequately use the methodology, criteria, and guidance of DOE-STD-3009-2014?
- Is an adequate summary of the facility-level hazards and accident analyses, hazard categorization, and the results of hazards evaluation provided?
- Does the hazard analysis include adequate system and component-level details?
- Are hazard evaluation tables provided for each hazard scenario (describing: unmitigated hazard scenario sequence and assumptions; the likelihood of the hazard scenario; the consequences of the hazard scenario; the safety functions and preventive features; mitigated consequences and available controls) adequately documented?
- Are the preliminary hazard analysis (PHA) and the fire hazard analysis (FHA) complete and adequately summarized in the PDSA?

- Does the hazard analysis include adequate consideration of inherently safer design concepts to remove and reduce hazards where possible?

Description of Safety SSCs and SACs

- Is the control description, with the safety function and its relationship to the hazard and accident analysis, adequately documented?
- Are the functional requirements and performance criteria judged to require technical safety requirements (TSR) coverage adequately documented?
- Are the safety SSCs designed and constructed using applicable industry codes and standards and other DOE directives adequately identified in accordance with Attachment 3 to DOE O 420.1C?
- Is the safety function of SACs adequately defined so that the decision to use an SAC rather than a safety SSC is understood?
- Are the design requirements needed to implement the SACs adequately identified?
- Are the identified SACs adequately described consistent with the logic presented in the hazard and accident analyses?
- Are the SACs adequate to prevent or mitigate the hazards/accidents for which they were identified, and is there adequate rationale for controlling the identified hazard through an SAC instead of an SSC?
- Does the PDSA provide a satisfactory basis for determining the SACs and their required safety functions?
- Are safety functions for SACs adequately defined with clarity and are they consistent with the bases derived in the hazard and accident analyses?
- Do the functional requirements and evaluations of SAC provisions provide adequate evidence that the required safety functions can be performed when called upon?
- Are any SSCs required to perform the actions in the SACs appropriately identified and functionally classified?

Preliminary TSRs

- Does the PDSA adequately develop a set of preliminary TSRs?

Summary of Key Design Activities

- Is an adequate description of any remaining Technology Readiness Level (TRL) activities provided?
- Does the PDSA adequately provide the basis for crediting safety management programs (i.e., the availability and capability of SMPs)?
- Are such SMPs adequately evaluated in light of the proposed design to assure that the design supports program implementation?
- Does the PDSA adequately follow the expectations in the SDS?

Final Design

- Does the design adequately address the nuclear facility design requirements of DOE O 420.1C?

- Is the design integrated with the safety analyses and is a viable design solution (e.g., safety SSCs) identified to provide the safety functions required by the safety analysis?

- Are any exceptions or alternate approaches to DOE O 420.1C (or successor), including analyses performed to meet the safety analysis expectations, identified and included in the SDS?
- Does the facility design adequately address:
  - Multiple layers of protection (i.e. defense-in-depth) to prevent or mitigate the unintended release of radioactive materials?
  - The means to confine the hazardous materials to minimize their potential release during normal operations and during and following accidents?
  - The ability of safety SSCs and safety software to perform their safety functions when called upon?
  - Single point failure for safety class electrical systems?
- Is the description of how the nuclear safety design criteria of DOE O 420.1C (or successor) have been satisfied by the design adequate?
- Are the applicable codes and standards appropriately specified, as necessary, based on SSC safety function?
- Are those codes and standards not included in DOE G 420.1-1A, *Nonreactor Nuclear Safety Design Guide for use with DOE O 420.1C, Facility Safety*, dated December-2012 guidance identified, including a brief description as to why they are appropriate?
- Are seismic design criteria correctly identified?
- Does the fire protection system design include sufficient information for:
  - Complete fire-rated construction and barriers, commensurate with the applicable codes and FHA, to isolate hazardous areas and minimize fire spread and loss potential consistent with limits defined by DOE Standard 1066, *Fire Protection*, dated December 2016 (DOE-STD-1066-2016)?
  - Automatic fire extinguishing systems throughout all significant facilities and in all facilities and areas with potential for loss of safety class systems (other than fire protection systems), significant life safety hazards, unacceptable program interruption, or fire loss potential in excess of limits defined by DOE-STD-1066-2016?
- Does the integrated fire protection program, including design, provide a level of safety sufficient to fulfill requirements for highly protected risk, prevent loss of safety SSC functions as determined by safety analysis, and provide defense-in-depth?
- Are technical safety issues requiring resolution identified, tracked and resolved in a timely manner?
- Is there a adequate project design crosswalk between the top-level safety design criteria of DOE O 420.1C (or successor) and associated implementation guidance, to the specifics of the design description and the specified safety SSCs?
- If a graded approach of design criteria is used, is an adequate basis for the approach provided?

3. DOE may authorize the contractor to perform limited procurement and construction activities without approval of a PDSA if DOE determines that the activities are not detrimental to public health and safety and are in the best interests of DOE. (10 CFR 830.206.b.2)

- Are the safety functions and performance requirements of the affected (i.e., limited procurement) SSCs completely understood and acceptable?
- Are safety functions and performance criteria of the affected SSCs based on conservative estimates of frequency and consequences for the accidents that potentially involve these SSCs?
- If the proposed design of the SSC is based on preliminary information, will the affected SSC fully meet required safety criteria in the final DSA? If not, are appropriate compensatory measures identified and implemented?
- Is the functional classification, reliability, or rigor of the design code for an affected SSC appropriately conservative?
- Have any consequences due to early procurement or construction been adequately identified that could be detrimental to public health and safety? If so, are appropriate compensatory measures adequately identified, approved and implemented?

REVIEW APPROACH

Record Review:

- Hazard identification records such as chemical and radiological inventories
- Hazard identification tables
- Hazard analysis procedures and guides
- Hazard analysis output documents including hazard event records and hazard tables
- Hazard analysis reports
- System design descriptions
- System design information including piping and instrumentation drawings, logic diagrams, electrical one-line drawings, detail drawings and calculations
- System and safety function requirements documents
- Supporting safety calculations
- Approved safety design strategy
- Process flowsheets and calculations
- Conceptual Safety Design Report
- Preliminary Safety and Design Results
- Preliminary Documented Safety Analyses
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- Corrective actions which were initiated by engineering, configuration management, maintenance, surveillance and testing and operations organizations as a result of normal daily activities and based on CSE reviews.
- Trend analysis and performance indicator reports.
- Assignment of significance level (priority) to deficiencies by facility management.
- Sample of corrective actions covering deficiencies identified in assessments, daily activities and CSE reviews.
- Sample of corrective actions taken in response to previous Independent Oversight appraisal activities.
- Training and qualification records for personnel performing assessments of engineering, configuration management, maintenance, surveillance and testing and operations.
- Facility startup procedures for any recently facility startups.
- Documented Safety Analysis
- Technical Safety Requirements

Interviews:

- Hazard identification records such as chemical and radiological inventories
- Hazard identification tables
- Hazard analysis procedures and guides
- Hazard analysis output documents including hazard event records and hazard tables
- Hazard analysis reports
- System design descriptions
- System design information including piping and instrumentation drawings, logic diagrams, electrical one-line drawings, detail drawings and calculations
- System and safety function requirements documents
- Supporting safety calculations
- Approved safety design strategy
- Process flowsheets and calculations
- Conceptual Safety Design Report
- Preliminary Safety and Design Results

- Preliminary Documented Safety Analyses

Observations:

- Facility and building walkdowns and reviews
- Hazard analysis team meetings
- Control decision meetings

Federal DSA/TSR Review and Approval

Approval of safety basis documents and safety design documents is required by 10 CFR 830. DOE review of the safety basis for nuclear facilities determines whether the safety basis has been developed in a manner that provides reasonable assurance of adequate protection of workers, the public, and the environment from adverse consequences, taking into account the work to be performed and the associated hazards. DOE review and approval of the safety design basis documents for nuclear facilities provides reasonable assurance that the safety design basis is sufficient to proceed to the next phase of design or construction.

CRITERIA

Safety Review Letter (SRL)

The safety review letter (SRL) is used to document the review of the CSDR safety basis document submittal. The SRL is used to review the early conceptual design documents to identify and raise any concerns with the design early in the design process when changes are less expensive to make and to ensure the safety design is sufficient to proceed to the next phase of design.

1. The SRL should include concise summary statements of the bases for review of the safety design basis document and any recommended actions. (DOE-STD-1104-2016, Section 8.7)

    - Does the SRL executive summary provide a statement on the acceptability of the safety design basis document indicating that the document has undergone an appropriate review and the design information is sufficient to continue the design process?
    - Does the SRL adequately describe the review process used and the rationale and level of effort and detail to include (DOE-STD-1104-2016, §8.7.2):
        - Key participants in the review?
        - How the review was accomplished (e.g., verification of information, independent calculations)? and
        - The scope of the review (e.g., selected independent calculations and design reviews attended)?
    - Does the SRL adequately document the bases for review and the recommendations to proceed with the design and construction (DOE-STD-1104-2016, §8.7.3)?
    - Does the SRL provide an adequate synopsis of major site, facility, and operational process features (DOE-STD-1104-2016, §8.7.4)?
    - Does the SRL adequately describe how the hazard and accident analyses are consistent with DOE-STD-1189-2016 and follow the format of Appendix C of that standard (DOE-STD-1104-2016, §8.7.5)?
    - Does the SRL adequately identify the designated nuclear facility hazard category level (HC 1, 2, or 3) and assess whether the designated level is appropriate (DOE-STD-1104-2016, §8.7.6)?
    - Does the SRL adequately describe the safety SSCs, their bases and their functions and any issues related to the set (DOE-STD-1104-2016, §8.7.7)? Does it similarly describe any identified SACs (DOE-STD-1104-2016, §8.7.8)? It is not expected that the SACs will be developed in detail for the CSDR.

- Does the SRL adequately verify the CSDR conclusions on whether the design meets the nuclear facility design requirements of DOE O 420.1C (DOE-STD-1104-2016, §8.7.10 and §8.7.11)?
- Does the SRL adequately describe any conditions of approval for proceeding to the next stage of design or document the recommendation that the project is not ready to proceed (DOE-STD-1104-2016, §8.7.12)?
- Does the SRL adequately summarize the significant issues in the review and document whether the CSDR is acceptable (DOE-STD-1104-2016, §8.7.13)?

PDSA Safety Evaluation Report (SER)

The safety evaluation report (SER), for preliminary design, is used to document the acceptance of the PDSA. Significant issues concerning the PDSA are resolved and incorporated into the document prior to SER preparation and approval. The SER is intended to provide an overall summary of the methodology, assumptions, bases, conclusions, and commitments in the PDSA rather than a total reanalysis (i.e., independent verifications and validation) of the activities addressed in the document.

2. The PDSA is, in part, to ensure that DOE and the contractor agree that safety has been adequately integrated into the design before construction begins. (DOE-STD-1104-2016, Section 8.6)
    - Does the Executive Summary present adequate summary information regarding the basis of the review of the design basis document (DOE-STD-1104-2016, §7.2.3)? Specifically, does it include:
        - Clear identification of the facility for which approval is being granted and its hazard category?
        - A statement of the facility mission and scope of operations encompassed by the mission?
        - A summary of the major facility hazards and dominant accident scenarios?
        - A discussion of pertinent exemptions and/or consent agreements impacting the approval?
        - Discussions of major mission and project-related influences affecting the decision to authorize operations?
        - Any conditions of approval and/or open issues raised with regard to the approval bases including associated paths forward for resolution (if applicable)? and
        - A conclusion statement on the acceptability of the safety basis document(s) being reviewed, indicating that the document(s) have undergone an appropriate review?
    - Does the SER make a sufficient statement that the PDSA provides a reasonable basis for the preliminary conclusion that the nuclear facility can be operated safely based on:
        - The nuclear design criteria in DOE O 420.1C (or successor document in the site contract) have been satisfied?
        - A safety analysis meeting DOE O 420.1C and DOE-STD-1189-2016 requirements to support the design has been performed? and
        - An initial listing of the safety management programs that have been or will be developed to address operational safety considerations has been provided?
    - Does the SER adequately describe the review process used to review the safety basis document(s)? Does the information summarized include the following?

  - Basic premises of the review, particularly those representing some consensus with the preparer of the PDSA being reviewed;
  - Summary of the review effort;
  - Key participants in the review process;
  - Scope of special efforts, if any, such as selected independent calculations or walkthroughs;

- Does the SER provide an adequate basis for approving the adequacy of the base information, including any conditions of approval imposed?
- Does the SER adequately verify that the PDSA addresses activity-level hazards and hazard controls and evaluate facility/process hazards?

- Does the review of the SER adequately verify that the PDSA confirms that:
  - The design safety analysis is complete and demonstrates the adequacy of the design from the safety perspective?
  - The safety design requirements specified at the end of the final design have been met?
  - The hazards and accident analysis is consistent with DOE-STD-1189-2016, Section 4.4?
  - The DBAs considered for new facilities have been prevented or have mitigated offsite dose consequences below the EG?
  - The description of the final design of the facility is adequate with respect to safety SSCs and safety design features?
  - Safety SSCs, SACs, and other hazard controls are identified and their performance requirements are clearly stated? Note: In addition to the review consideration presented in Section 8.6 of DOE-STD-1104 regarding SACs, expectations for the discussion of SACs in the PDSA are included in Appendix D of DOE-STD-1189-2016;
  - The description of how the selected safety controls prevent and/or mitigate identified hazards and accidents is adequate?
  - The initial list of safety management programs is complete?
  - The description of how the nuclear safety design criteria of DOE O 420.1C (or successor) have been satisfied by the design is adequate?
  - Any technical issues that required research or other data collection to finalize the design have been resolved?
  - Preliminary approaches to startup and operations management have been documented?
  - Any open Conditions of Approval identified in the SRL have been resolved?

REVIEW APPROACH

Record Review:

- PDSA and associated hazard and accident analysis documents
- Safety Review Letter
- Safety Evaluation Report
- Approved Safety Design Strategy
- DOE direction and guidance documents
- Technical support documents, including calculations and engineering analyses
- DOE plans and records of reviews for the PDSA submittals
- DOE review comment record forms and associated documentation
- Procedures and guidance for maintenance and update of the PDSA and associated elements

Interviews:

- DOE Nuclear Safety Specialists
- DOE Nuclear Safety personnel
- DOE personnel responsible for coordinating DSA and TSR reviews for nuclear operations
- DOE delegated approval authority
- DOE safety basis review managers
- DOE Safety Basis Review Team members

Observations:

- SBRT comment resolution meetings with Contractor personnel, if applicable