

Joyce L. Connery, Chair
Thomas A. Summers, Vice Chair
Jessie H. Roberson

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



June 1, 2021

The Honorable Jennifer Granholm
Secretary of Energy
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Granholm:

On February 21, 2020, the Defense Nuclear Facilities Safety Board issued Recommendation 2020-1, *Nuclear Safety Requirements*. The recommendation is intended to strengthen DOE's regulatory framework, including 10 CFR 830, *Nuclear Safety Management*, and relevant DOE orders and standards. The Board received DOE's response rejecting the majority of the recommendation on June 11, 2020. The Board originally issued Recommendation 2020-1 while DOE was revising 10 CFR 830, and DOE subsequently issued the revised final rule in October 2020.

The Atomic Energy Act mandates that the Board review and evaluate the content and implementation of DOE standards, including all applicable regulations. The Atomic Energy Act further requires that the Board make recommendations to the Secretary of Energy regarding those specific measures that should be adopted in order to ensure that the public health and safety are adequately protected.

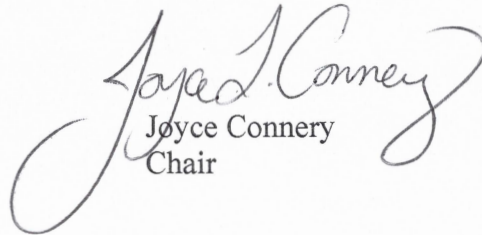
Given DOE's response to the recommendation, and DOE's completion of the rulemaking for 10 CFR 830, the Board has made the following revisions to Recommendation 2020-1:

- Modified sub-recommendations related to facility hazard categorization to reflect DOE's actions in the final rulemaking, and the results of a subsequent Board review of DOE hazard categorization standards.
- Combined sub-recommendations on causal analysis reviews. This sub-recommendation was also revised to reflect DOE's actions in final rulemaking to remove the annual approval requirement.
- Modified remaining sub-recommendations to reflect DOE's completion of rulemaking; to incorporate additional relevant Board correspondence issued since the original recommendation was transmitted; and to provide additional clarity on the intent of the sub-recommendations.

After careful consideration of DOE's response, the Board—in accordance with 42 USC § 2286d(e)—reaffirms its recommendation, with the revisions noted above. The Board further reiterates that the content and implementation of 10 CFR 830 are fully within its statutory mandate. The revised Recommendation 2020-1 is enclosed.

The Board will evaluate DOE's response to this revised recommendation in accordance with the Board's *Policy Statement on Recommendations*.

Sincerely,



Joyce Connery
Chair

Enclosure

c: Mr. Joe Olencz

We are happy to
provide you a
briefing on this
if you would like.
JC.

RECOMMENDATION 2020-1 TO THE SECRETARY OF ENERGY

Nuclear Safety Requirements

Pursuant to 42 USC § 2286a(b)(5)

Atomic Energy Act of 1954, As Amended

Dated: May 18, 2021

Introduction. The Department of Energy’s (DOE) defense nuclear facilities and associated infrastructure are aging, but DOE will need to continue to use many of the facilities and much of the infrastructure for the foreseeable future. Safety systems and features that were designed into buildings or installed during construction are also aging. At the same time, DOE is proposing, designing, and building new defense nuclear facilities to support its continued mission. DOE needs to maintain a robust safety posture and strong regulatory framework to ensure that both its aging facilities and infrastructure and its new facilities provide adequate protection of public health and safety. DOE will need clear requirements and guidance for its staff to follow and enforce.

Background. DOE Policy 420.1, *Nuclear Safety Policy*, states, “It is the policy of the Department of Energy to design, construct, operate, and decommission its nuclear facilities in a manner that ensures adequate protection of workers, the public, and the environment.” Title 10, Code of Federal Regulations (CFR), Part 830, *Nuclear Safety Management*, provides a foundation of requirements upon which DOE relies to ensure adequate protection of workers, the public, and the environment. With this rule, DOE has developed a robust regulatory framework—including orders, guides, and standards—to provide requirements and guidance for the safe design, construction, operation, and decommissioning of its defense nuclear facilities.

10 CFR 830 captures the fundamental requirements for nuclear safety management to ensure contractors perform work “with the hazard controls that ensure adequate protection of workers, the public, and the environment.” DOE provides additional requirements in orders and standards. These additional requirements may be imposed on contractors by reference in regulations or by contract. DOE also provides non-mandatory guidance in guides, handbooks, and manuals.

In its initial *Notice of Proposed Rulemaking* creating 10 CFR 830¹, DOE noted:

The [Price-Anderson Amendments Act of 1988], coupled with DOE efforts to improve the assurance of safety in its nuclear operations, led DOE to conclude that basic DOE nuclear safety requirements should be established through rulemaking. These requirements would revise and supplement the existing requirements, and in particular, establish specific requirements for applicable DOE nuclear facilities and provide a structured means for measuring the adequacy of the implementation and compliance on a facility-specific basis. Compliance would be measured against specific requirements and against provisions of programs required by these requirements and approved by DOE.

As specified in its enabling legislation, the first function of the Defense Nuclear Facilities Safety Board (Board) is to “review and evaluate the content and implementation of the standards

¹ 56 FR 64316, December 9, 1991.

relating to the design, construction, operation, and decommissioning of defense nuclear facilities of the Department of Energy (including all applicable Department of Energy orders, regulations, and requirements) at each Department of Energy defense nuclear facility.”² Since its creation, the Board has provided several recommendations that focus on creating a standards-based safety management system for DOE’s defense nuclear facilities. DOE issued a notice of proposed rulemaking for 10 CFR 830 in August 2018³, and issued the revised final rule in October 2020. In this recommendation, the Board recommends to the Secretary of Energy specific measures that DOE should adopt as requirements in its regulatory framework, including 10 CFR 830 and associated orders and standards, to include the implementation thereof, to ensure that public health and safety are adequately protected.

The Board notes a fundamental principle of responsibility and delegation in Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*:

*In any delegation of responsibility or authority to lower echelons of DOE or to contractors, the highest levels of DOE continue to retain safety responsibility. While this responsibility can be delegated, it is never ceded by the person or organization making the delegation. Contractors are responsible to DOE for safety of their operations, while DOE is itself responsible to the President, Congress, and the public.*⁴

DOE is responsible for designing, constructing, operating, and decommissioning its defense nuclear facilities in a manner that ensures adequate protection of the public. Therefore, DOE prescribes the requirements for its operating contractors to follow and implement, approves the facilities’ safety bases,⁵ and oversees compliance through line management and independent oversight.

Analysis.

Aging Infrastructure—When DOE first issued 10 CFR 830, the majority of its defense nuclear facilities were already a few decades old, and DOE had launched an effort to construct new facilities to replace them. The Replacement Tritium Facility at the Savannah River Site (now known as Building 233-H) is an example. However, nearly three decades after construction and startup of the replacement facility, DOE continues to rely on some older facilities to support its tritium operations, and will continue to do so for the indefinite future.

Similarly, DOE has embarked upon the design and construction of the Uranium Processing Facility at the Y-12 National Security Complex, but intends to operate two associated 50-plus year old facilities for another several decades to support its production commitments for national security purposes. Also, the time from concept to startup of a new defense nuclear

² 42 United States Code (USC) § 2286a(b)(1).

³ 83 FR 38982, August 8, 2018.

⁴ Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*. May 21, 2004.

⁵ From 10 CFR 830.3, “Safety basis means the documented safety analysis and hazard controls that provide reasonable assurance that a DOE nuclear facility can be operated safely in a manner that adequately protects workers, the public, and the environment.”

facility has increased dramatically in recent years, placing further emphasis on the need for continued operation of aging facilities.

As facilities age, concerns develop over whether DOE can still safely operate and maintain them. Safety structures, systems, and components may degrade and not be able to reliably perform their safety functions. Older facilities might continue to update their safety bases to comply with 10 CFR 830 without ensuring the reliability of safety systems, comprehensively evaluating the need for refurbishment or replacement of those systems, reconsidering the design or integrity of structures, or conducting a backfit analysis of equipment important to safety. Aging impacts are especially concerning for passive features (e.g., facility structures and fire walls) that may not be required to be surveilled to ensure they can perform their safety functions. While DOE performs some upgrades and retrofits at aging facilities, it lacks a formal, complex-wide regulatory structure for identifying and performing upgrades necessary for the adequate protection of public and workers.

In addition, as the infrastructure supporting safety systems (e.g., utilities and site services) ages, the supporting infrastructure may also degrade and impact the reliability of safety systems. DOE has taken action to address specific issues at particular sites, such as the Extended Life Program (ELP) at Y-12. However, the Board's concerns about aging infrastructure extend across the complex. Efforts such as the Y-12 ELP are laudable, but a much more systematic approach is required to address the needs across the complex. The Board has previously communicated its concerns regarding age-related degradation of infrastructure.

In a 2019 report⁶, DOE's Infrastructure Executive Committee noted that "the deferred maintenance trend for active facilities" had "hovered around \$6B" between 2014 and 2018. Also, the report noted that 9 of the Department's 79 core capabilities⁷ were potentially at risk due to inadequate infrastructure, including 4 core capabilities related to defense nuclear facility infrastructure and operation.

The Administrator of the National Nuclear Security Administration (NNSA) recognized the challenges NNSA faces with regards to its aging infrastructure in her April 11, 2018, testimony to the U.S. Senate Committee on Appropriations, Subcommittee on Energy and Water Development: "NNSA's infrastructure is in a brittle state that requires significant and sustained investments over the coming decade to correct. There is no margin for further delay in modernizing NNSA's scientific, technical, and engineering capabilities, and recapitalizing our infrastructure needed to produce strategic materials and components for U.S. nuclear weapons."

In addition to financial investment, a strong regulatory framework is needed to ensure the continued functionality and reliability of the aging infrastructure that supports defense nuclear facilities until it can be replaced or taken out of service. Accordingly, the Board believes that DOE needs to review its priorities and establish department-level policy and guidance for managing aging infrastructure.

⁶ *Annual Infrastructure Executive Committee Report to the Laboratory Operations Board*, April 2019.

⁷ Core capability is defined in DOE Order 430.1C, *Real Property Asset Management*, as the ability to conduct programmatic activities that would be degraded should the asset fail to perform as intended.

Hazard Categories—In 10 CFR 830, DOE applies a graded approach to the preparation of the safety basis for nuclear facilities, such that the rigor and level of detail in the analysis is commensurate with facility complexity and level of hazard. DOE uses the hazard category of a facility to inform this graded approach and groups facilities into categories based on the significance of their radiological consequences to different receptors (i.e., offsite/public, onsite/collocated workers, and local/facility workers). 10 CFR 830 requires that contractors categorize nuclear facilities “consistent with DOE-STD-1027-92 (“Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports,” Change Notice 1, September 1997).”

While 10 CFR 830 cites DOE Standard 1027-92, Change Notice 1, DOE has interpreted that the phrase “consistent with” allows contractors to use other documents for hazard categorization, so long as DOE determines that the methodology in those documents is fundamentally the same as that in the cited version. DOE has issued two additional hazard categorization standards that it has determined to be consistent with DOE Standard 1027-92, Change Notice 1: (1) DOE Standard 1027-2018, *Hazard Categorization of DOE Nuclear Facilities*; and (2) NNSA Supplemental Directive (SD) 1027, Admin Change 1, *Guidance on Using Release Fraction and Modern Dosimetric Information Consistently with DOE STD 1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice No. 1.*

The Board reviewed these three hazard categorization standards and determined that deficiencies and inconsistencies amongst the standards could lead to inappropriate hazard categorization. Inappropriate hazard categorization could lead to inadequate safety analyses, which may result in inadequate controls for the protection of workers and members of the public. The Board transmitted the results of its review to DOE on January 19, 2021.

DOE Approvals—In establishing Subpart B of 10 CFR 830, DOE required the preparation of a safety basis, including a documented safety analysis (DSA), to ensure the “nuclear facility can be operated safely with respect to workers, the public, and the environment.” 10 CFR 830 requires contractors to “update the safety basis to keep it current and to reflect changes.” Methods for maintaining the DSA include the unreviewed safety question (USQ) process and the annual update process, in which DOE required that contractors annually submit the DSA to DOE for approval. However, DOE’s recent revision of 10 CFR 830 removed the requirement for DOE to approve annual DSA updates. The revised 10 CFR 830 instead contains language in Appendix A to Subpart B that “DOE will review each documented safety analysis: (i) As part of the initial submittal; (ii) When revisions are submitted as part of a positive USQ determination or major modification; (iii) If DOE has reason to believe a portion of the safety basis to be inadequate, or; (iv) If DOE has reason to believe a portion of the safety basis has substantially changed.”

Without a required periodic formal review DOE may miss opportunities to identify negative effects of minor changes over time. Beyond evaluating recent changes, periodic reviews could also prevent the propagation of latent errors or other quality issues in the safety basis. Many times a year, DOE’s contractors declare the discovery of a “potential inadequacy of the documented safety analysis,” which suggests that routine reviews are valuable for finding

issues. Periodic reviews also provide opportunities to evaluate the reliability of safety structures, systems, and components, which are important for identifying latent risks as facilities and infrastructure age.

With the removal of the requirement to approve annual updates, DOE is also placing greater reliance on effective implementation of the USQ process to maintain configuration of the DSA. As part of the USQ process, 10 CFR 830.202(g)(3) requires that when contractors identify a potential inadequacy of the safety analysis (PISA) they “Submit the evaluation of the safety of the situation [ESS] to DOE prior to removing any operational restrictions initiated to” place or maintain the facility in a safe condition. Those operational restrictions may continue to be required for a long period of time. Per DOE Guide 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*, the vehicle for operating under restrictions for “an extended period of time” is the justification for continued operations (JCO), which is a “temporary change to the facility safety basis.”

The DOE guide states that the contractor should submit the JCO to DOE for approval. DOE Standard 1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, states that “DOE may approve a JCO using a [safety evaluation report] or by letter with a basis of approval.” However, the rule does not mention the concept of JCOs, nor provide requirements for their preparation or implementation, nor formally require DOE’s approval of one, and the relevant DOE guide and standard do not contain a clear requirement for DOE approval. This creates a potential scenario in which DOE might not approve an updated DSA or supporting document (i.e., JCO, or ESS with operational restrictions) that modifies the safety basis last approved by DOE for an extended period of time.

Evaluation of DSA Preparation and Review Processes—When it published the August 2018 notice of proposed rulemaking, DOE stated that DOE’s approval of the annual update of the DSA was duplicative given that DOE already approves substantive changes through the USQ process. DOE further stated the regulation’s “additional requirement for a second approval has led to considerable implementation challenges, and unnecessary review iterations without providing additional safety benefit.”

However, as discussed above, it is important for DOE to perform formal reviews beyond the review of incremental changes to the DSA through the USQ process. Further, the fact that there were implementation challenges suggests that there are issues with the preparation and review of DSAs. DOE did not provide a more thorough analysis of the implementation problems it was attempting to address by removing the requirement to approve DSA annual updates. It is therefore not clear that DOE’s elimination of the requirement is an effective solution. Removal of this requirement complicates DOE’s ability to ensure the configuration of the facility, the processes, and the documentation, and to evaluate the cumulative impact of temporary or permanent changes on the safety of the facility. It is important that DOE fully understand any issues contributing to ineffective DSA preparation and review to ensure that DOE-approved safety bases continue to provide adequate protection of the public. As the Board noted in Recommendation 2004-1, “Contractors are responsible to DOE for safety of their operations, while DOE is itself responsible to the President, Congress, and the public.”

The Board has also observed that the annual update process has been problematic at some defense nuclear facilities with complex activities. The Board has noted situations where there have been multiple “review iterations” by the contractors and their DOE approval authorities. This could be a sign of disagreement between DOE and its contractor, or the lack of adequate technical quality or content in the safety basis documents submitted to DOE for approval. Difficulties in the annual update process also could indicate that DOE’s contractors are not implementing the USQ process consistent with DOE requirements. Challenges are compounded when DOE and its contractors defer correcting known deficiencies until the next annual update instead of correcting the deficiencies within the current cycle.

Safety Basis Process and Requirements—10 CFR 830 captures the fundamental requirements for nuclear safety management to ensure contractors perform work “with the hazard controls that ensure adequate protection of workers, the public, and the environment.” DOE provides additional requirements in orders and standards. These additional requirements may be imposed on contractors by reference in regulations or by contract. DOE also provides non-mandatory guidance in guides, handbooks, and manuals.

DOE uses a number of processes for implementing an approved safety basis. The USQ process determines the approval authority for proposed changes to DSAs. Technical safety requirements (TSR) ensure that “important operating parameters are maintained within acceptable limits and that safety structures, systems, and components...are available and able to perform their intended safety functions” under all types of conditions⁸. Specific administrative controls (SACs) are higher level administrative controls that have safety importance equivalent to engineered controls that would be classified as safety-class or safety-significant.

USQs, TSRs, and SACs are all very important aspects of implementing and maintaining the safety basis at defense nuclear facilities. However, DOE does not provide specific implementation requirements in its regulatory framework, including 10 CFR 830, for contractor implementation of USQs, TSRs, and SACs. Instead, DOE provides non-mandatory guidance for USQ and TSR implementation via guidance documents and some requirements for SACs via a standard.⁹ This lack of implementation requirements leads to inconsistent safety basis implementation across the complex. Board reviews of the PISA process¹⁰ and of TSR violations¹¹ have found that additional requirements in these areas would be beneficial for risk reduction. Therefore, the Board concludes DOE should incorporate specific implementation requirements for USQs, TSRs, and SACs, in its regulatory framework, including 10 CFR 830.

The attached *Findings, Supporting Data, and Analysis* document provides the Board’s supporting analysis for this recommendation.

⁸ DOE Guide 423.1-1B, *Implementation Guide for Use in Developing Technical Safety Requirements*, March 2015.

⁹ DOE Standard 1186-2016, *Specific Administrative Controls*, contains requirements; however, those requirements are only enforceable if Standard 1186-2016 is included in a contract.

¹⁰ See Board letter dated July 10, 2020, and enclosed staff report, *Complex-Wide Implementation of the Potential Inadequacy of the Safety Analysis Process*.

¹¹ See Board letter dated August 7, 2020, and enclosed technical report DNFBSB/TECH-45, *Violations of the Nuclear Safety Basis*.

Conclusion. DOE needs to have a robust regulatory framework that provides sufficient structure such that both aging and new defense nuclear facilities continue to provide adequate protection of workers and the public. This recommendation is intended to strengthen DOE's regulatory framework in its current form, including DOE's orders and standards, and implementation thereof. DOE's nuclear enterprise has grown since the original issuance of the rule; however, DOE's regulatory framework has not been updated to include requirements for key concepts and safety control strategies upon which its defense nuclear facilities rely.

Recommendation. To ensure adequate protection at defense nuclear facilities, the Board recommends that DOE carry out the following actions by topic area below:

1. Aging Infrastructure.

- a. Develop and implement an integrated approach—including requirements—for the management of aging infrastructure that includes formal processes to identify and perform infrastructure upgrades necessary to ensure facilities and structures, systems, and components can perform their safety functions.

2. Hazard Categories.

- a. Revise DOE Standard 1027-2018 to address the deficiencies noted in the Board's letter dated January 19, 2021.
- b. Mandate use of the updated version of DOE Standard 1027 when performing hazard categorization of new defense nuclear facilities.
- c. Review existing hazard category 3 and below hazard category 3 defense nuclear facilities to confirm they are appropriately categorized.

3. DOE Approvals.

- a. Establish requirements in DOE Standard 1104 for timely periodic DOE reviews of facility safety bases to ensure they meet the requirements of 10 CFR 830.
- b. Establish clear requirements in DOE Standard 1104 for DOE approval of JCOs and ESSs for PISAs that result in a positive USQ determination.
- c. Update 10 CFR 830 to incorporate the requirements established per items 3.a and 3.b.

4. Evaluation of DSA Preparation and Review Processes.

- a. Conduct an independent review of contractor and federal processes to identify and evaluate the underlying issues that prevented the annual submittal and approval of high-quality safety basis documents, and use the findings to improve the relevant processes.

5. Safety Basis Process and Requirements.

- a. Establish clear requirements for USQs and JCOs in an order or invoked standard, including elevation of key concepts and guidance from DOE Guide 424.1-1. While developing these requirements, address issues discussed in the Board's letter dated July 10, 2020.
- b. Establish clear requirements for TSRs in an order or invoked standard, including elevation of key concepts and guidance from DOE Guide 423.1-1. While developing these requirements, address issues discussed in DNFSB Technical Report 45, *Violations of the Nuclear Safety Basis*.
- c. Establish requirements for SACs by invoking DOE Standard 1186 in an appropriate DOE order.
- d. Update 10 CFR 830 to incorporate the requirements established per items 5.a through 5.c.
- e. Establish requirements in 10 CFR 830 regarding the concept of defense-in-depth.


Joyce Connery
Chair

RECOMMENDATION 2020-1 TO THE SECRETARY OF ENERGY
Nuclear Safety Requirements
Risk Assessment for Draft Recommendation 2020-1

This risk assessment supports the Defense Nuclear Facility Safety Board's (Board) Draft Recommendation 2020-1, *Nuclear Safety Requirements*. Board's Policy Statement 5, *Policy Statement on Assessing Risk*, states:

Risk assessments performed in accordance with the Board's revised enabling statute will aid the Secretary of Energy in the development of implementation plans focused on the safety improvements that are needed to address the Board's recommendations.

This recommendation identifies deficiencies with the Department of Energy's (DOE) *Nuclear Safety Management* rule, 10 Code of Federal Regulations (CFR) 830, and with the implementation of the rule's requirements. Subpart B of the rule, *Safety Basis Requirements*, applies to the highest hazard defense nuclear facilities across the complex. The Secretary of Energy is required to ensure adequate protection of the public. DOE established 10 CFR 830 as a fundamental part of the Secretary of Energy's ability to ensure adequate protection. Given the weaknesses in the rule, the Secretary of Energy cannot consistently ensure adequate protection. Therefore this recommendation is justified and necessary.

RECOMMENDATION 2020-1 TO THE SECRETARY OF ENERGY
Nuclear Safety Requirements
Findings, Supporting Data, and Analysis

Background. The Department of Energy (DOE) developed the first draft of Subpart B to Title 10, Code of Federal Regulations (CFR), Part 830, *Safety Basis Requirements*, in the mid-1990s using subject matter expertise from the Nuclear Regulatory Commission (NRC). DOE designed its format and contents similar to NRC’s 10 CFR 50, *Domestic Licensing of Production and Utilization Facilities*. To that end, DOE created the concept of a safety basis, which is a series of documents comprising a documented safety analysis (DSA), a technical safety requirements (TSR) document, and a safety evaluation report (SER). DOE would review and approve the contractor-developed DSA and TSR documents, and issue the SER to document its review and approval.

To maintain configuration control of the DSA while allowing some operational flexibility for the contractors, DOE established the unreviewed safety question (USQ) process so that contractors could make some changes to their activities as long as the changes were within the bounds of the DOE-approved DSA. Thus, three distinct sections were created in the main body of the rule (for the DSA, USQ process, and TSRs), with the USQ process dedicated to the configuration control of the DSA; and any changes to the TSR document were to be submitted to DOE for approval prior to implementation. DOE Standard 1104, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*, established DOE’s process for its review and approval activities and the development of the SER.

DOE provided additional details on these concepts in Appendix A to Subpart B as “DOE’s expectations for safety basis requirements of 10 CFR 830, acceptable methods for implementing these requirements, and criteria DOE will use to evaluate compliance with these requirements.” This concept is similar to NRC’s appendices that “establish minimum requirements” that need to be met in order to comply with 10 CFR 50. For example, Appendix A to Part 50 provides the general design criteria and Appendix R provides fire protection requirements. NRC provided additional detailed guidance in the regulatory guides that utilities use to comply with Part 50. Similarly, DOE provided a list of standards in Appendix A to Part 830 that contractors should use as acceptable methodologies for compliance with 10 CFR 830, Subpart B. These are known as the safe harbor standards.

Introduction. As part of the DOE’s regulatory reform activities under Executive Order 13777, *Enforcing the Regulatory Reform Agenda*, DOE directed its Office of Environment, Health, Safety and Security¹, working with the Office of the General Counsel, to initiate a rulemaking to revise 10 CFR 830 to address the following areas (amongst others):

- ***Regulatory Treatment of Hazard Category 3 Facilities.*** Differentiate the treatment of Hazard Category 2 and Hazard Category 3 nuclear facilities by developing a new subpart to 830 for Hazard Category 3 that provides an appropriate graded approach

¹ Memorandum from Dan R. Brouillette, Deputy Secretary, to heads of elements, *Initiate a Rulemaking to Revise 10 CFR 830*, dated August 15, 2017.

to the implementation of the requirements in 830 for both contractors and the Department.

- ***Safe Harbor Standards.*** *Table 2 of Appendix A of 10 CFR 830, Subpart B, should be removed from the rule and become a separate standard (or other mechanism) referenced in the Rule.*
- ***Standard 1027 (STD) Successor Document.*** *Add the term ‘or successor document’ to the 10 CFR 830 requirement to categorize nuclear facilities consistent with DOE STD 1027-92. The [working] Team recommends that DOE initiate a new revision to DOE STD 1027 (in addition to the existing 1027-92 revision effort) that updates the hazard categorization methodology and can be synched with the eventual revision to 830.*
- ***Updates to Documented Safety Analyses.*** *Increase the periodicity from the existing annual requirement to either 2 or 3 years; the current (arbitrary) annual requirement is problematic for complex facilities (e.g., the DOE review/approval can take several months and overlap with contractor delivery of the annual update for the subsequent year). In addition, appropriately scoped updates should not require DOE approval.*
- ***Unreviewed Safety Question.*** *Set appropriate USQ approval levels, improving operational flexibility, and clarifying terminology.*
- ***Limiting Analyses of Chemical Hazards.*** *Limiting the requirement for the analysis of chemical hazards in DSAs, unless the chemicals, for example, are an initiator to a nuclear event, or inhibit responses to nuclear events. [Note: chemical hazards are already addressed in 10 CFR 851, Worker Safety and Health Program.]*

These activities were to “result in significant improvements in efficiency and/or decrease in cost in Laboratory and DOE operations, while maintaining accountability and contractor performance standards [and] an appropriate level of DOE oversight.”

Findings. DOE issued the notice of proposed rulemaking for 10 CFR 830 in August 2018. DOE issued the final rule on October 19, 2020. The following paragraphs provide the Board’s findings and analysis of DOE’s changes to 10 CFR 830, Subpart B, *Safety Basis Requirements*, and its referenced documents.

1. Aging Infrastructure.

DOE’s memorandum that initiated the rulemaking relied on input and proposals from a working group to “identify internal DOE reforms that could result in significant improvements in efficiency and/or decrease in cost...while maintaining accountability and contractor performance standards.” From the working group’s proposal, DOE identified several focus areas, including reform of 10 CFR 830, for further development of actions that may achieve the goal of improving efficiency and decreasing cost. This effort did not identify issues with the aging

infrastructure, including lack of DOE guidance or requirements for maintenance, or the adequacy of safety posture for indefinite continued operation.

It is clear that as defense nuclear facilities age, their safety bases will become more complex. In some cases, DOE introduced new missions into old facilities, which are dependent upon dated technological infrastructure. Complexity has been shown to drive the contractors to heavily rely on administrative controls, instead of engineered features, to overcome the inherent difficulties involved in trying to comply with the requirements of 10 CFR 830, Subpart B.

At the time when 10 CFR 830 was crafted, the majority of defense nuclear facilities were only a few decades old, and DOE had launched an aggressive effort to construct new facilities to replace them. Facilities such as the Replacement Tritium Facility (RTF, now known as Building 233-H) at the Savannah River Site were examples of this vision in the early 1990s. However, three decades after the construction and startup of RTF, DOE continues to rely on some older facilities to support its tritium operations for the indefinite future. Similarly, DOE embarked upon design and construction of the Uranium Processing Facility at the Y-12 National Security Complex, but plans to continue to rely on operation of two other 50-plus year old facilities for another several decades to support its production commitments for national security purposes.

A significant number of defense nuclear facilities in the complex are now more than 50 years old and have surpassed their design life by decades. As facilities age, concerns develop over whether DOE can still safely operate and maintain them. Safety structures, systems, and components may degrade and not be able to reliably perform their safety functions. Older facilities might continue to update their safety bases to comply with 10 CFR 830 without ensuring the reliability of safety systems, comprehensively evaluating the need for refurbishment or replacement of those systems, reconsidering the design or integrity of structures, or conducting a backfit analysis of equipment important to safety. Aging impacts are especially concerning for passive features (e.g., facility structures and fire walls) that may not be required to be surveilled to ensure they can perform their safety functions. While DOE performs some upgrades and retrofits at aging facilities, DOE lacks a formal, complex-wide regulatory structure for identifying and performing upgrades necessary for the adequate protection of public and workers.

In addition, as the infrastructure supporting safety systems (e.g., utilities and site services) ages, the supporting infrastructure may also degrade and impact the reliability of safety systems. DOE has taken action to address specific issues at particular sites, such as the Extended Life Program (ELP) at Y-12. However, the Board's concerns about aging infrastructure extend across the complex. Efforts such as the Y-12 ELP are laudable, but a much more systematic approach is required to address the needs across the complex. The Board has previously communicated its concerns regarding age-related degradation of infrastructure. For example, in prior communications the Board has expressed concerns with age-related degradation in:

- General-service water distribution systems that provide water to safety-significant or safety-class fire suppression systems;

- General-service electrical distribution systems that could impact the reliability of safety-significant confinement ventilation systems; and
- Building structures and internal systems that cannot withstand the seismic loads required to meet their designated performance categories.²

In a 2019 report³, DOE’s Infrastructure Executive Committee noted that “the deferred maintenance trend for active facilities” had “hovered around \$6B” between 2014 and 2018, and that 9 of DOE’s 79 core capabilities⁴ were potentially at risk due to inadequate infrastructure (see Table 1 for examples).

Table 1. Core Capabilities Potentially at Risk Due to Infrastructure Deficiencies⁵

Core Capability	Replacement Plant Value⁶ assessed as Inadequate
Nuclear Material Accountability, Storage, Protection, and Handling	42%
Plutonium	37%
Uranium	36%
Weapons Assembly/Disassembly	35%

In recognition of the general situation of aging infrastructure in DOE and its potential impacts on the defense nuclear facilities, the Board is concerned that DOE needs to review its priorities and establish department-level policy and guidance for managing the aging infrastructure supporting those facilities.

DOE has not conducted a comprehensive analysis of the difficulties facing its aging infrastructure at defense nuclear facilities. Without this analysis, DOE’s efforts will not address the fundamental reasons for increased cost or other difficulties of maintaining old facilities in operational condition; nor will it assess the reduction in their margin of safety that may occur as facilities age.

² See Board correspondence dated March 13, 2007; February 6, 2009; September 10, 2010*; September 30, 2011*; March 27, 2012; October 31, 2012*; February 25, 2013; October 30, 2013*; February 4, 2015; October 29, 2015; December 16, 2015; May 11, 2017; September 7, 2018; and July 2, 2019. The four dates with an asterisk are annual aging infrastructure reports the Board issued to Congress and forwarded to DOE. The dates are from the cover letters forwarding the reports to DOE.

³ *Annual Infrastructure Executive Committee Report to the Laboratory Operations Board*, April 2019.

⁴ Core capability is defined in DOE Order 430.1C, *Real Property Asset Management*, as the ability to conduct programmatic activities that would be degraded should the asset fail to perform as intended.

⁵ Data is from Table C of *Annual Infrastructure Executive Committee Report to the Laboratory Operations Board*; April 2019.

⁶ Replacement Plant Value (RPV) is defined in DOE Order 430.1C, *Real Property Asset Management*, as the cost to replace the existing structure with a new structure of comparable size using current technology, codes, standards, and materials.

DOE needs to evaluate the state of its aging facilities, identify their required operational life to meet their mission needs, and develop an integrated plan for replacement or refurbishment of those facilities to maintain their safety posture and ensure adequate protection of the public, the workers, and the environment. DOE does not have any DOE-wide policies, directives, or requirements in place for implementing an effective aging management program. Accordingly, DOE needs to develop requirements and criteria for dealing with its aging infrastructure.

2. Hazard Categories.

Hazard Categorization Standards—In 10 CFR 830, DOE requires application of a graded approach to the preparation of DSAs and provides the criteria to be used for such gradation in Section 830.3. DOE uses the hazard category of a facility to inform this graded approach and groups facilities into categories based on the significance of their radiological consequences to different receptors (i.e., offsite/public, onsite/collocated workers, and local/facility workers).

10 CFR 830 requires that DOE contractors categorize facilities consistent with DOE Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. DOE permits contractors to use other standards for hazard categorization that it has determined to be consistent with the methodology of DOE Standard 1027-92. As a result, DOE allows the use of multiple documents for hazard categorization:

- DOE Standard 1027-92 Change Notice 1;
- National Nuclear Security Administration’s (NNSA) Supplemental Directive (SD) 1027 Admin Change 1, *Guidance on Using Release Fraction and Modern Dosimetric Information Consistently with DOE STD 1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice No. 1*; and
- DOE Standard 1027-2018 Change Notice 1, *Hazard Categorization of DOE Nuclear Facilities*.

The Board reviewed DOE’s hazard categorization standards and determined that deficiencies and inconsistencies between them could lead to inconsistent or inappropriate hazard categorization. Inappropriate hazard categorization could lead contractors to apply inadequate rigor and detail to the preparation of a facility’s safety basis, which may result in inadequate controls to protect workers and members of the public. The Board transmitted the results of its review on January 19, 2021, via letter and supporting staff report, *Review of DOE Nuclear Facility Hazard Categorization Standards*. The issues with the hazard categorization standards the Board identified include:

- DOE Standards 1027-92 and 1027-2018 use bounding assumptions regarding lung absorption type for hazard category 2 (HC-2) threshold quantity (TQ) derivations, while NNSA SD 1027 does not. NNSA SD 1027 changed the HC-2 TQ derivation

methodology compared to what is used in DOE Standard 1027-92. This change in methodology makes NNSA SD 1027 inconsistent with 10 CFR 830, and could lead to less conservative hazard categorization compared to the other hazard categorization standards.

- DOE changed the quantitative methodology used to derive the HC-3 TQ values in DOE Standard 1027-2018 and NNSA SD 1027 compared to what was used in DOE Standard 1027-92. This change in methodology nonconservatively increased TQ values for many radionuclides. As a result, the newer hazard categorization documents may be considered inconsistent with 10 CFR 830.
- The Board identified several opportunities to improve the clarity of DOE’s hazard categorization standards, as well as areas for DOE to upgrade guidance into requirements, to help ensure contractors apply consistent approaches and avoid under-categorizing facilities.

DOE should address the deficiencies in DOE Standard 1027-2018, and require contractors to use this improved standard for hazard categorization of new facilities. DOE should also review existing hazard category 3 and below hazard category 3 facilities to ensure they are appropriately categorized.

3. DOE Approval of Safety Bases.

Periodic DOE Approval of DSAs—In establishing Subpart B of 10 CFR 830, DOE required the preparation of a safety basis, including a DSA, to ensure the “nuclear facility can be operated safely with respect to workers, the public, and the environment.” 10 CFR 830 requires contractors to “update the safety basis to keep it current and to reflect changes.” Methods for maintaining the DSA include the USQ process and the annual update process, in which DOE required that contractors annually submit the DSA to DOE for approval. The DOE memorandum that initiated the 2018 rulemaking directed DOE elements to “increase the periodicity from the existing annual requirement to either two or three years; the current (arbitrary) annual requirement is problematic for complex facilities. In addition, appropriately scoped updates should not require DOE approval.” In accordance with the memorandum, the revision to 10 CFR 830 eliminated the requirement for DOE review and approval of the annual updates to the DSAs. This DOE action weakens the safety basis construct created by DOE in establishing Subpart B.

The revised 10 CFR 830 also contains language in Appendix A to Subpart B that “DOE will review each documented safety analysis: (i) As part of the initial submittal; (ii) When revisions are submitted as part of a positive USQ determination or major modification; (iii) If DOE has reason to believe a portion of the safety basis to be inadequate, or; (iv) If DOE has reason to believe a portion of the safety basis has substantially changed.” However, without a required periodic formal review and approval, DOE may miss opportunities to identify DSA quality issues. For example, DOE may not identify negative cumulative effects of minor changes over time. Beyond evaluating recent changes, a periodic review could also prevent the propagation of latent errors in the safety basis. Many times a year, DOE’s contractors declare

the discovery of a “potential inadequacy of the documented safety analysis,” which suggests that routine reviews are valuable for finding issues. Periodic reviews also provide opportunities to evaluate the reliability of safety structures, systems, and components, which are important for identifying latent risks as facilities and infrastructure age.

Temporary Authorization of Activities—10 CFR 830.202(g)(3) requires contractors to “Submit the evaluation of the safety of the situation to DOE prior to removing any operational restrictions initiated to” place or maintain the facility in a safe condition when addressing a potential inadequacy of the safety analysis (PISA). Those operational restrictions (or other compensatory measures) may continue to be required for a long period of time. Per DOE Guide 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*, the vehicle for operating under restrictions for “an extended period of time” until the next annual update of the DSA is issued is the justification for continued operations (JCO), which is a “temporary change to the facility safety basis.” The DOE guide states that the contractor should submit the JCO to DOE for approval. DOE Standard 1104-2016 states that “DOE may approve a JCO using a SER or by letter with a basis of approval.” However, the rule does not formally require DOE’s approval of a JCO.

In some cases, contractors eventually incorporate the operational restrictions and accompanying analyses (or some revised version of them) into the DSA via the annual update. In other cases, JCOs continue to be a stand-alone part of the safety basis for several years. With DOE’s revision to the rule, i.e., not requiring DOE approval of annual updates to the DSA, there will be important changes to the safety basis with no requirement for their approval by DOE.

Instead of a JCO, contractors may prepare an evaluation of the safety of the situation (ESS) that includes operational restrictions. DOE Guide 424.1-1B states that DOE should approve ESSs for PISAs that represent a positive USQ; however, the rule does not require DOE approval for this situation. Under the revised rule, the ESS can represent a mechanism for the contractor to make important changes to the safety basis without any requirement for DOE approval.

4. Evaluation of DSA Preparation and Review Processes.

When it published the August 2018 notice of proposed rulemaking, DOE stated that DOE approval of the annual update of the DSA was duplicative given that DOE already approves substantive changes through the USQ process. DOE further stated the regulation’s “additional requirement for a second approval has led to considerable implementation challenges, and unnecessary review iterations without providing additional safety benefit.”

DOE did not provide an analysis of the implementation problems it was attempting to address by removing the requirement to approve DSA annual updates in the notice of proposed rulemaking or in publication of the final rule. It is therefore not clear that DOE’s elimination of the requirement is an effective solution. Removal of this requirement complicates DOE’s ability to ensure the configuration of the facility, the processes, and the documentation, and to evaluate the cumulative impact of temporary or permanent changes on the safety of the facility. As discussed above, it is important for DOE to perform formal reviews beyond the review of

incremental changes to the DSA through the USQ process. Further, the fact that there were implementation challenges suggests that there are issues with the preparation and review of DSAs.

The Board has noted that some defense nuclear facilities with complex activities have had difficulty meeting the annual update commitments. Although this was not anticipated by DOE at the time when Subpart B of 10 CFR 830 was issued in January 2001, when DOE intended that if “the USQ process has been followed properly, the annual approval of the documented safety analysis should require minimal effort.”⁷ The Board has noted that some sites rely on inter-related documents to comprise their safety bases,⁸ which might make it difficult to ensure that the various elements of their safety bases are updated consistently on an annual basis. The Board has also observed situations where there have been multiple “review iterations” by contractors and their DOE approval authorities. This could be a sign of disagreement between DOE and its contractor, or the lack of adequate technical contents of the DSAs submitted to DOE for approval. Difficulties in submitting an annual update also could indicate that DOE’s contractors are not implementing the USQ process consistent with the requirements.

It is important that DOE fully understand any issues contributing to ineffective DSA preparation and review to ensure that DOE-approved safety bases continue to provide adequate protection of the public. It would be prudent for DOE to evaluate the reasons why contractors and DOE experienced significant challenges implementing the annual requirement. DOE needs to conduct an analysis to determine why DOE and its contractors are having difficulties managing the review and approval of annual updates, and use the results of that analysis to fix the underlying problems.

5. Safety Basis Process and Requirements.

Fundamental Elements of Safety Bases—Unlike the safe harbors for DOE nonreactor nuclear facilities and nuclear explosive facilities for compliance with the DSA requirements of the rule, the rule does not provide any standards for compliance with USQs or TSRs; instead, it refers to DOE guides on those subjects, DOE Guide 424.1-1B and DOE Guide 423.1-1B, *Implementation Guide For Use In Developing Technical Safety Requirements*, respectively. DOE guides, however, “describe[s] acceptable, non-mandatory means for meeting requirements.” As a result, contractors’ implementation of USQs and TSRs at the sites are diverse and inconsistent. The Board has made observations that include lack of uniformity of implementation, and in some cases, inconsistency of implementation with the requirements of the rule.

Requirements Regarding the USQ Process—The Board has identified several examples where DOE would benefit from additional requirements regarding the USQ process. DOE Guide 424.1-1B provides an example of guidance on USQs that should be examined for elevation to a

⁷ 66 FR 1810, DOE response to Comment JJ, Section III of the final Rule, 10 CFR 830.

⁸ For example, see Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*.

requirement, and for inclusion in Subpart B. The guide includes expectations on the timeliness with which contractors process PISAs:

It is appropriate to allow a short period of time (hours or days but not weeks) to investigate the conditions to confirm that a safety analysis is potentially inadequate before declaring a PISA....If it is immediately clear that a PISA exists, then the PISA should be declared immediately⁹.

This timeliness is important for safety, as it causes the contractor to formally declare a PISA and take actions to place the facility in a safe condition. Contractors do not always perform this step in a timely manner (i.e., within hours or days, but not weeks). This leads contractors to delay implementing the necessary compensatory measures to place or maintain the facility in a safe condition that provides adequate protection of the public. There are instances where contractors have delayed a PISA declaration beyond hours or days because they deemed the information to be not yet mature enough to merit that action.¹⁰ The DOE guidance quoted above already addresses this situation, saying that the contractors may take hours or days to investigate, but not weeks. It should be noted that a similar statement was made in resolution of comments received for the 2001 rulemaking adding Subpart B to 10 CFR 830: “the contractor’s USQ procedure should define the period for the performance of a USQ determination related to a PISA and that this time period should be on the order of days, not weeks or months.” However, not all contractors comply with this expectation.

DOE should formalize this guidance on timeliness into a requirement, to ensure that contractors place facilities into safe conditions when they discover PISAs. If DOE believes it is necessary to make some allowance for delaying action because the new information is immature, DOE should provide the criteria for defining “information maturity.” Declaring the information as “immature” and not declaring a PISA should be exceptional and subject to compliance with DOE criteria. The Board communicated the results of a complex-wide review of implementation of the PISA process in a July 10, 2020, letter and associated staff report, *Complex-Wide Implementation of the Potential Inadequacy of the Safety Analysis Process*. The Board’s review found that due to lack of specific timeliness requirements and clear guidance in the DOE directives system, contractors inconsistently implement the PISA process across the complex. Specific requirements and clearer guidance related to timeliness would improve the implementation of the PISA process across the complex and help reduce unknown risk.

Additionally, the Board has observed that some contractors allow themselves a “grace period” to take action and return the facility into compliance with their safety bases without declaring a PISA.¹¹ As a result, the facility would be operating outside of its approved safety basis for the duration of the grace period without DOE’s knowledge or approval of the situation, and without having to take safety precautions to put the facility in a safe configuration. Section 830.202, Subpart B, does not allow this action, which may result in unsafe operation of defense nuclear facilities and a lack of adequate protection of the public.

⁹ DOE Guide 424.1-1B, Section C.2.

¹⁰ Board Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, February 20, 2019.

¹¹ *Ibid.*

Several of the USQ procedures approved by DOE lack any requirements for training and qualification of USQ screeners. These individuals are the first line of defense against lack of compliance with the requirements of the rule, and their knowledge of the facility and its safety basis, as well as the USQ process, is of utmost importance. While preparation of safety bases throughout the complex has created a wealth of knowledgeable subject matter experts that the contractors rely on, implementation of USQ procedures and USQ screening sometimes relies on available personnel, making their training and qualification an important aspect of the safety of operations.

The definition of USQ in the rule also warrants clarification. The definition for USQ in Section 830.3 uses the term “equipment important to safety.” This term is not defined in 10 CFR 830, though it is defined in DOE Guide 424.1-1B. Proper and consistent implementation would be better achieved if the definition from the guide were elevated to a requirements document.

Also, 10 CFR 830 does not specify what documentation a contractor is required to submit to DOE prior to obtaining approval for planned actions involving a USQ. Specifically, section 830.203(d) states, “A contractor responsible for a Hazard Category 1, 2, or 3 DOE nuclear facility must obtain DOE approval prior to taking any action determined to involve a USQ.” This section does not specify whether a contractor must submit planned changes to the safety basis, a description of planned changes, or if no documentation is required and a verbal explanation would suffice. Accordingly, when DOE approves the contractor action, it is not clear that DOE is specifically approving any planned changes to the safety basis.

Finally, DOE Guide 424.1-1B describes a JCO as a mechanism to make “a temporary change to the facility safety basis that would allow the facility to continue operating in view of a specific and unexpected situation, considering the safety significance of the situation and any compensatory measures being applied during this period.” However, because JCOs are not discussed in 10 CFR 830, it is unclear what requirements for safety basis preparation (e.g., adherence to a safe harbor or other approved methodology, DOE review and approval, DOE directed changes) apply to the development of JCOs.

Requirements Regarding TSRs—DOE Guide 423.1-1B includes some aspect of the content of TSR documents that should be considered for elevation as requirements and inclusion in the rule. In Appendix C to the Guide, DOE combines the Section 830.201 requirement for the contractor to “perform work in accordance with the DOE-approved safety basis” with the quality assurance requirements in Subpart A of the rule. From these two portions of the rule, DOE derives a need for the contractor to “independently confirm the proper implementation of new or revised safety basis controls.” This is an important concept for ensuring safe operation of the facility, and should be a requirement.

One area of difficulty for contractors preparing TSRs has been in the determination of “completion times.” TSRs typically define actions the contractor will take when safety structures, systems, and components (SSC) do not meet their limiting conditions for operation. This scenario can occur intentionally due to a maintenance outage, or unintentionally due to degradation of a safety-related SSC. TSRs define the required times (completion times) by

which the contractor must take temporary actions to compensate for the loss of safety SSCs, or by which the contractor will restore SSCs. According to the guide, when developing completion times, the contractor should consider “the safety importance of the lost safety function” and “the risk of continued operations.” In practice, some completion times appear excessively long, with no documented consideration of safety risk for DOE’s review and acceptance. DOE should require contractors to consider safety risks when developing completion times.

Similarly, some contractors have prepared TSR documents wherein the action to be taken when a safety SSC is inoperable or found to be unavailable is simply to submit to DOE a recovery plan. Some of these recovery plans are open-ended, without any completion date or compensatory measures in place to achieve an equivalent level of safety as provided in the TSR. As a result, some defense nuclear facilities could be operating outside the bounds of their approved safety basis, relying on an approved recovery plan to be completed by some unspecified date. Such situations warrant explicit requirements to prevent nuclear facilities from operating with less than adequate levels of safety.

On August 7, 2020, the Board transmitted technical report DNFSB/TECH-45, *Violations of the Nuclear Safety Basis*, to DOE. The technical report discusses the results of a Board review of implementation of TSRs at defense nuclear facilities, specifically declaration and reporting of violations. The report analyzes events and issues from defense nuclear facilities across the complex related to TSR violations. As noted in the report, the Board found differing interpretations of the guidance provided in DOE Guide 423.1-1B, and that the lack of requirements limited DOE’s ability to challenge the content and structure of TSRs proposed by the contractor. Clear requirements would improve DOE’s ability to hold contractor personnel to an appropriate standard for TSR development.

Fundamental Nuclear Safety Principles—10 CFR 830 provides the requirements for identification and analysis of hazards, identification of controls, and the quality assurance that must be applied to all stages of nuclear facility operations. However, it does not require implementation of the most fundamental nuclear safety principle, defense-in-depth, to ensure that no one layer of control is solely relied on for safety.

In a letter to the Deputy Secretary of Energy, dated July 8, 1999, the Board stated:

Current requirements for nuclear safety design, criticality safety, fire protection and natural hazards mitigation are set forth in DOE Order 420.1, Facility Safety. This Order (Section 4.1.1.2), when contractually invoked, requires that:

‘Nuclear facilities shall be designed with the objective of providing multiple layers of protection to prevent or mitigate the unintended release of radioactive materials to the environment.’

This “defense-in-depth” approach is the hallmark of nuclear facility and process designs.

DOE Order 420.1C, *Facility Safety*, includes an expanded discussion of what the defense-in-depth concept entails. However, the relevant requirements of Order 420.1C are not applied to the operation of existing defense nuclear facilities unless DOE's contract with the management and operating contractor has specifically identified and stipulated its application. As a result, DOE does not consistently implement the defense-in-depth concept to ensure safe operation of nuclear activities. The controls identified in DSAs for existing facilities are usually a compilation of the existing controls, and rarely have led to the identification of new controls for ensuring that multiple layers of protection exist to defend against the release of radioactive materials. This weakness is more common when contractors rely on specific administrative controls (SACs) to compensate for the lack of a safety-related engineered feature to prevent or mitigate an event.

10 CFR 830, Subpart B, needs to require the defense-in-depth construct to ensure that all nuclear facilities and activities meet this fundamental nuclear safety construct, and provide adequate protection of the public and the workers such that no one failure of a layer of protection would lead to the release of radioactive materials.

Specific Administrative Controls—DOE created the concept of the SAC in response to the Board's Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*. To provide guidance on this topic, DOE created a new standard, DOE Standard 1186, *Specific Administrative Controls*, and revised several other standards and guides to ensure consistency. SACs are higher level administrative controls that have safety importance equivalent to engineered controls that would be classified as safety-class or safety-significant. For this reason, SACs are an important tool for DOE to ensure adequate protection.

Although DOE created a new standard for SACs, DOE did not revise 10 CFR 830 to reflect the concept of implementing SACs as an equivalent TSR control, nor does DOE specifically invoke the requirements of the SAC standard via one of its orders. As a result, the discussion in 10 CFR 830 on safety controls is incomplete and does not fully reflect current DOE terminology and practice. Accordingly, DOE should include the concept of SACs within the requirements of 10 CFR 830, Subpart B.