

# **REGULATORY ANALYSIS FOR DRAFT REGULATORY GUIDE (DG)- 1381, CONTROL OF HEAVY LOADS AT NUCLEAR FACILITIES**

*(Proposed New Regulatory Guide 1.244)*

## **1. Introduction**

This document presents the regulatory analysis of the U.S. Nuclear Regulatory Commission's (NRC's) proposed issuance of Regulatory Guide (RG) 1.244, "Control of Heavy Loads at Nuclear Facilities." The NRC is considering issuing this new RG to update the NRC's implementation of a risk-informed, performance-based approach to licensing activities related to the movement of heavy loads.

The existing guidance is contained in technical reports NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," issued August 1980 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML070250180), and NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," issued May 1979 (ADAMS Accession No. ML110450636). This guidance has not been updated and does not reflect a current risk-informed perspective on heavy load handling activities.

The NRC staff proposes endorsement of national consensus standards to replace the existing licensing guidance in these technical reports. Management Directive 6.5, "NRC Participation in the Development and Use of Consensus Standards" (ADAMS Accession No. ML18073A164). states that it is the policy of the NRC to (i) involve all interested stakeholders in the NRC's regulatory development processes, (ii) participate in the development of consensus standards that support the NRC's mission, and (iii) use consensus standards developed by voluntary consensus standards bodies consistent with the provisions of the National Technology Transfer and Advancement Act of 1995 (NTTAA)(Public Law 104-113). The NRC also considers standards development through multi-lateral international organizations such as the International Atomic Energy Agency.

## **2. Statement of the Problem**

The staff recognizes that safe control of heavy load handling activities at nuclear facilities may be accomplished in several ways. The preferred method, as suggested in RG 1.13, "Spent Fuel Storage Facility Design Basis," Revision 2, issued March 2007, is to design the layout of the facility so that overhead lifting equipment cannot operate over or near structures, systems, or components essential to accomplishment of fundamental safety functions. However, light-water reactor design and operation involve certain load handling activities, such as the transfer of irradiated fuel from the storage pool to dry storage and the removal of the reactor vessel head and internal structures in support of refueling, which could challenge the performance of key safety functions if the load were dropped. Other reactor types may also require load handling activities for continued operation that could similarly challenge key safety functions. In addition, existing facilities were constructed without full consideration of load handling activities that could challenge key safety functions. For these handling evolutions, other methods provide reasonable assurance that key safety functions would be accomplished in the event of failures affecting load handling equipment, including controlled crane range of motion, use of enhanced-reliability handling systems, or defined load movement safety envelopes based on engineering analysis. The consensus standards proposed for endorsement provide current guidance for implementation of heavy load handling programs, including these methods to ensure the accomplishment of safety functions, and specific guidance for the design and testing of enhanced-reliability handling systems.

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## 3. Objective

The objective of this regulatory action is to update NRC guidance and provide applicants with a method to demonstrate compliance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic licensing of production and utilization facilities,” 10 CFR Part 52, “Licenses, certifications, and approvals for nuclear power plants,” and 10 CFR Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste,” to ensure that safety functions would be accomplished following load handling system equipment failures. The updated guidance would endorse, with clarifications, the following consensus standards:

- American Society of Mechanical Engineers (ASME) Standard (Std.) NML-1, “Rules for the Movement of Loads Using Overhead Handling Equipment in Nuclear Facilities,” 2019
- ASME Std. NOG-1, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder),” 2020
- ASME Std. BTH-1, “Design of Below-the-Hook Lifting Devices,” 2017, in part, only Chapters 1 through 3.

The staff expects endorsement of these consensus standards to provide safety and efficiency benefits. The standards incorporate lessons from several decades of operating experience handling heavy loads at nuclear facilities, including enhancements to crane design and rigging. The endorsement would also promote standardization of programs and training, which could increase the efficiency of personnel who work at several nuclear facilities. The standards proposed for endorsement would also relax the inspection and testing necessary for demonstrating continued compliance of special lifting devices, because operating experience has shown these permanent rigging structures have a low probability of failure in routine use at nuclear facilities.

Issuing this RG to endorse consensus standards is consistent with the NRC policy of evaluating the latest versions of national consensus standards to determine their suitability for RG endorsement. This approach also will comply with the NRC’s Management Directive (MD) 6.5 and Public Law 104-113, “National Technology Transfer and Advancement Act of 1995.”

## 4. Identification and Analysis of Alternative Approaches

The NRC staff considered the following alternative approaches:

1. Do not issue a new RG or other new regulatory guidance.
2. Revise existing guidance in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)” (SRP), Section 9.1.5, “Overhead Heavy Load Handling Systems,” without issuing an associated RG.
3. Issue a new RG.

### 4.1 Alternative 1: Do Not Issue New Regulatory Guide

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Under alternative 1, the NRC would not issue updated guidance, and the current guidance would be retained. If the NRC does not act, there would be no impact on costs or benefit to the public, the licensees, or the NRC. This alternative is considered the “no-action” alternative and provides a baseline condition from which any other alternatives will be assessed.

Under the "no action" alternative, there would be no cost to the NRC for issuing the guide. However, the operational experience and lessons learned from the last several decades of industry practice would not be made available in the guidance. Therefore, the “no-action” alternative would not address identified concerns with the current dated NRC guidance. The NRC would continue to review each application on a case-by-case basis.

## **4.2 Alternative 2: Revise Guidance in the Standard Review Plan without Issuance of a Regulatory Guide**

Under this alternative, the NRC would eliminate reference to the outdated technical reports from staff guidance as an acceptable approach to meet applicable regulations, and the staff would replace this guidance with appropriate current consensus standards. However, this action would not provide a readily available description of the methods the NRC staff considers acceptable for demonstrating compliance with 10 CFR Part 50 requirements to provide reasonable assurance that safety functions would be accomplished following handling system equipment failures.

Although this alternative would be somewhat less costly than new RG issuance, it would impede the ability of licensees to invoke the regulatory guidance for efficiency enhancements without a license amendment and the public’s access to the regulatory guidance while incurring many of the same costs of new RG issuance.

## **4.3 Alternative 3: Issuance of a New Regulatory Guide**

Under this alternative, the NRC would issue a new RG to endorse consensus standards and provide updated guidance to applicants. This revision would incorporate the latest information from national consensus standards addressing control of heavy load movement at nuclear facilities, supporting guidance, and review practices. By doing so, the NRC would ensure that the regulatory guidance available is current and accurately reflects the staff’s position.

Issuance of a new RG would benefit the NRC staff, applicants, Combined Operating License (COL) holders, and licensees by providing guidance based on current generally accepted methods and procedures for control of heavy load handling activities. Specifically, the newly issued RG would endorse national consensus standards providing common criteria for managing heavy load movement activities, designing highly reliable handling systems, and designing special lifting devices.

Application of the new RG by the NRC’s licensees, COL holders, and applicants would be voluntary. The new RG would not impose new requirements or change existing regulations. The staff anticipates that the impact on the industry of implementing the new guidance would be minimal because the industry has the option to use current guidance. The staff expects that adoption of the revised guidance would result in continuing cost savings associated with standardized heavy load handling programs across multiple sites and the reduced burden

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associated with testing to demonstrate continued conformance for special lifting devices. The impact to the NRC would be the costs associated with preparing and issuing the RG. The impact to the public would be the voluntary costs associated with reviewing and providing comments to NRC during the public comment period. The benefit to NRC staff, applicants, COL holders, and licensees would be enhanced efficiency and effectiveness in using a common guidance document as the technical basis for licensing actions. The proposed changes to the NRC's guidance are expected to reduce the number of future license amendments submitted to the NRC by permitting certain changes to be implemented without NRC staff review, without a reduction in safety.

For parties who are in the process of submitting an application to the NRC, the impact would also be minimal because the existing guidance continues to be acceptable. However, if the applicant chooses to update the application, the costs associated with revising the submittal to adopt the new guidance may be offset by continuing cost savings associated with standardized heavy load handling programs across multiple sites and the reduced burden associated with testing to demonstrate continued conformance for special lifting devices.

## **5. Comparison of Alternatives**

This section compares the three alternatives against each other with respect to safety and resources of the NRC, licensees, COL holders, and applicants.

All three alternatives permit continued use of the existing technical reports for regulatory guidance. The use of new regulatory guidance would be voluntary. With respect to Alternative 1, not issuing the RG would not be likely to provide the efficiency and safety benefits of the new guidance because the endorsed standards would not be promoted as an acceptable approach and approval would involve an item-by-item review of the unendorsed guidance. Thus, the NRC staff, applicants, COL holders, and licensees would likely continue to use the current guidance. The failure to update the RG will cost nothing in the short term; however, it could result in extended review time for the NRC staff and additional work by licensees, COL holders, and applicants to address issues revealed by operating experience that have not been addressed by the existing guidance. Regulatory guidance and stability will remain unchanged because the RG will remain unchanged. This "no action" alternative will continue the current level of predictability and transparency. However, given the NRC's expectation for future applications and licensee-initiated changes, the current guidance would be insufficient.

Endorsement of the proposed standards within regulatory guidance intended for staff use (Alternative 2) would provide the safety benefits provided by issuance of the RG. However, this alternative would not provide the process efficiency gains derived from the guidance written for public use in a new RG, while imposing much of the same costs to update regulatory guidance. The guidance intended for staff use would not necessarily provide details included in RGs useful to applicants, COL holders, and licensees.

Issuing the RG (Alternative 3) would enhance safety because the revision will incorporate the most current information into the NRC guidance related to control of heavy loads. The staff expects RG issuance to enhance the safety of heavy load handling activities and improve efficiency by decreasing regulatory burden in areas related to testing and training. NRC resources are required to collate the information and develop a draft RG and supporting documents. This is a short time resource drain, but it should improve future NRC staff performance by reducing the time required for future reviews of heavy load handling activities at

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nuclear facilities and supporting licensing basis changes that may be implemented without NRC approval pursuant to the requirements of 10 CFR 50.59. The resource burden on NRC staff as well as applicants, COL holders, and licensees should be reduced if the submitter follows the revised RG. Regulatory stability and predictability will be improved by revising the RG as well as enhanced public transparency and confidence because the revised RG will provide consistent guidance to all stakeholders and allow the public to better understand the NRC staff review process.

Thus, the staff finds that issuing a new RG would provide acceptable guidance with respect to which changes are permissible without prior-NRC approval. In addition, the revision would increase regulatory effectiveness and efficiency. For example, the efficiency in NRC's licensing and oversight activities would increase by incorporating national consensus standards in the guidance for control of heavy load handling activities and potentially reducing the number of amendment requests from specific licensees and certificate holders, with no reduction in safety.

Based on this regulatory analysis, the NRC staff concludes that Alternative 3, issuance of a new RG, is the best alternative for providing NRC guidance on acceptable methods for control of heavy load handling activities at nuclear facilities to demonstrate compliance with applicable requirements, such as 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria 4 (GDC-4), "Environmental and dynamic effects design bases." Alternative 3 would incorporate the NRC's knowledge of the licensing and oversight processes, the operational experience and lessons learned from recent years of industry practice, as well as endorse national consensus standards. The proposed revision will enhance an applicant's ability to prepare submittals that meet the current generally accepted standards, methods and procedures. A new RG would reduce staff review time and the need for requests for additional information thus reducing costs to licensees, applicants, COL holders, and the NRC. The staff considered the cost to the NRC in issuing the RG and to licensees, COL holders, and applicants in adapting to a new RG to be far less than the benefits accrued by endorsing consensus standards that enhance safety, provide for increased standardization, and relax unnecessary regulatory burden.

## **6. Decision Rationale**

The three alternatives were compared against each other with respect to safety, resources, regulatory stability and predictability, public transparency and confidence.

With respect to safety, insights are garnered through practical experience or research and should not be ignored as would happen with Alternative 1 and 2; whereas, Alternative 3 would be superior to Alternative 1 and 2 in this respect. Alternative 3 would endorse existing industry standards that would enhance safety, improved clarity, reduce uncertainties, and facilitate timeliness in the licensing process.

With regard to NRC resources, Alternative 3 represents the greatest initial cost to the NRC, which is attributable to the costs associated with preparing a new RG. However, when considered over the lifetime of the RG and the potential for additional staff resources expenditures associated with evaluating submittals from applicants, COL holders, and licensees, the overall NRC cost of Alternative 3 is closer to or less than the overall cost of Alternatives 1 or 2.

With regard to licensee, COL holder, and applicant resources, Alternative 3 results in the least costs. Without additional guidance, their submittals may be delayed because the NRC

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may have to issue requests for additional information (RAIs), and applicants, COL holders, and licensees may have to perform additional analyses to address those RAIs. These additional activities would lead to increased costs to them and to the NRC for the staff time required to issue and review the RAIs. Since, Alternatives 1 and 2 does not reflect current industry standards, the NRC's reviews of the applicant, COL holder, and licensee submittals may be delayed because the NRC may have to issue RAIs, and the applicants, COL holders, and licensees may have to perform additional analyses to address those RAIs. Therefore, these additional RAIs and analyses would lead to increased costs and time delays.

With regard to regulatory stability and predictability for current licensees, Alternative 1 would at first appear to represent the most regulatory stability because the current guidance would be maintained. However, given the NRC's expectation for future applications and licensee-initiated changes, the current guidance would be insufficient because it is becoming dated and insufficiently flexible for new proposed heavy load handling systems. Therefore, Alternative 1 would not provide the greatest regulatory stability and predictability. Alternative 2 would endorse the updated standards, but would lack other features of the RG format beneficial to regulatory stability. Alternative 3 would provide the greatest regulatory stability and predictability, because the new RG would incorporate industry consensus standards that provide stability as a result of stakeholder input during development that applies to current handling system technologies.

With regard to public transparency and public confidence, Alternative 3 would result in the highest level of transparency and public confidence because it endorses the latest industry standards and explains the application of these standards in a manner appropriate for a broad range of stakeholders. Updating guidance for staff use under Alternative 2 would provide the technical benefits of the newer standards but would not serve the goals of public transparency and confidence as well as Alternative 3, because the format is not intended for all stakeholders. Incorporating the use of the current industry standards in a new RG would enhance public confidence in the effectiveness and quality of the NRC's regulatory activities. By contrast, failure to update guidance for licensees, COL holders, and applicants under Alternative 1 would result in the potential for regulatory instability and possible erosion of public confidence, because the guidance is not easily adaptable to proposed approaches for control of heavy loads. Maintaining the existing guidance under Alternative 1 would be inconsistent with transparency, as it would erroneously suggest that the NRC continues to believe that the guidance in the current RG is acceptable for all future applications for new and amended licenses. The dichotomy between the existing NRC guidance (out-of-date) and the current industry consensus standards does not promote public confidence in the NRC's regulatory activities.

Therefore, with respect to regulatory stability and predictability, public transparency and public confidence, the NRC finds Alternative 3 to be in the best interest of the NRC, public, licensees, applicants, and COL holders.