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**The Environmental Protection Agency's Safety Standards for Disposal of Spent Nuclear Fuel: Potential Path Forward in Response to the Report of the Blue Ribbon Commission on America's Nuclear Future – 13388**

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**ABSTRACT**

Following the decision to withdraw the Yucca Mountain license application, the Department of Energy created a Blue Ribbon Commission (BRC) on America's Nuclear Future, tasked with recommending a national strategy to manage the back end of the nuclear fuel cycle. The BRC issued its final report in January 2012, with recommendations covering transportation, storage and disposal of spent nuclear fuel (SNF); potential reprocessing; and supporting institutional measures.

The BRC recommendations on disposal of SNF and high-level waste (HLW) are relevant to the U.S. Environmental Protection Agency (EPA), which shares regulatory responsibility with the Nuclear Regulatory Commission (NRC): EPA issues "generally applicable" performance standards for disposal repositories, which are then implemented in licensing. For disposal, the BRC endorses developing one or more geological repositories, with siting based on an approach that is adaptive, staged and consent-based. The BRC recommends that EPA and NRC work cooperatively to issue generic disposal standards—applying equally to all sites—early in any siting process. EPA previously issued generic disposal standards that apply to all sites other than Yucca Mountain. However, the BRC concluded that the existing regulations should be revisited and revised. The BRC proposes a number of general principles to guide the development of future regulations.

EPA continues to review the BRC report and to assess the implications for Agency action, including potential regulatory issues and considerations if EPA develops new or revised generic disposal standards. This review also involves preparatory activities to define potential process and public engagement approaches.

**INTRODUCTION**

The decision to withdraw the Yucca Mountain license application prompted a reassessment of the U.S. national program for management of spent nuclear fuel (SNF) and high-level waste (HLW). Under the direction of the President, the U.S. Secretary of Energy in 2010 convened the Blue Ribbon Commission (BRC) on America's Nuclear Future. The BRC was tasked with comprehensively reviewing and recommending a national strategy for managing the back end of the nuclear fuel cycle. The Commission's charter identified a number of key issues, including "options for permanent disposal of used fuel and/or high-level nuclear waste, including deep geological disposal." [1, p. 122] The BRC initiated work in March 2010, conducting its work through a series of open meetings and site visits both in the U.S. and abroad. The BRC issued its final report in January 2012. [2]

## **RECOMMENDATIONS OF THE BLUE RIBBON COMMISSION**

Recommendations from the BRC covered transportation, storage and disposal of SNF and HLW, as well as potential reprocessing and institutional measures. The recommended strategy has eight key elements:

- "1. A new, consent-based approach to siting future nuclear waste management responsibilities.
- "2. A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed.
- "3. Access to the funds nuclear utility ratepayers are providing for the purpose of nuclear waste management.
- "4. Prompt efforts to develop one or more geologic disposal facilities.
- "5. Prompt efforts to develop one or more consolidated storage facilities.
- "6. Prompt efforts to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities when such facilities become available.
- "7. Support for continued U.S. innovation in nuclear energy technology and for workforce development.
- "8. Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns." [2, p. vii]

The BRC recommendations most relevant to EPA are those regarding disposal of SNF and HLW, for which EPA has an environmental regulatory role. In terms of disposal, the BRC endorses development of one or more geological repositories, with siting based on a new approach that is adaptive, staged and consent-based. According to the BRC's proposed approach, a new single-mission waste management organization would take over responsibility for the siting process (as well as other aspects of SNF management) from the Department of Energy.

The BRC makes some specific observations regarding regulation of disposal. Under the standing regulatory scheme, any future disposal repository would be subject to regulation by both EPA and NRC. (Note that the operating Waste Isolation Pilot Plant [WIPP] and the proposed Yucca Mountain repository both fall under different and separate regulatory schemes shaped by specific legislative mandates.) Under the existing framework, EPA is responsible for issuing "generally applicable environmental standards for the protection of the general environment from radioactive material. ...[S]tandards mean limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material." [3] NRC is responsible for issuing requirements and for evaluating and approving the construction, operation and closure of repositories—i.e., licensing. [4] Other agencies, such as the Department of Transportation, have ancillary regulatory roles for specific aspects of worker and transportation safety.

The BRC recommendations preserve the fundamental regulatory roles for disposal of these wastes: "the general division of responsibilities that currently exists between EPA (establishing standards) and NRC (licensing and regulating waste management facilities) is appropriate and should be preserved." [2, p. 93] The commission makes a number of recommendations regarding

the framework, process and approach to regulation of disposal for SNF and HLW.

## **DEVELOPING FUTURE DISPOSAL FACILITY STANDARDS**

While the BRC does not make specific recommendations regarding the form or stringency of standards for disposal, the report does offer some principles and guidelines for the approach to regulation.

First, the BRC states, “The standard and supporting regulatory requirements to license a facility should be generic—that is, applicable to all potential sites.” [2, p. 93] The commission further recommends that such standards should be issued before or early in any facility siting process. A generic standard is seen as promoting the efficient consideration of multiple potential sites. More importantly, the BRC concludes that site-specific standards for Yucca Mountain engendered suspicion that the standards were tailored to allow approval of the site: “Lack of adaptability [in considering alternative sites] further undermined confidence in the analysis and planning conducted by... federal agencies, making it easy to view these efforts as mere paper exercises, rigged to justify a foreordained conclusion. Similarly, by directing EPA to develop safety standards specific to the Yucca Mountain site. . . , Congress undermined confidence that those standards represented an independent and comprehensive scientific judgment about what was necessary to protect human health and the environment.” [5, p. 20] The BRC’s view is that having generic standards apply equally to all sites under consideration—and ensuring that the standards are available before detailed consideration or screening of sites is undertaken—is more likely to earn public confidence that the siting process is objective and transparent.

Generic EPA standards for waste disposal already exist. [6] EPA first issued these standards in 1985 and revised them in 1993. They would apply to all sites except Yucca Mountain and, in fact, are the basis for the certification (licensing) and oversight of the current WIPP repository for transuranic waste. The BRC concludes, “because the thinking about repository regulations evolved considerably during the development of the Yucca Mountain requirements..., the generic regulations that would currently apply to all other sites will need to be revisited and revised in any case.” [2, p. 90]

### **Process Considerations for New Disposal Standards**

The BRC report points to a number of considerations that should shape the process used to develop new disposal standards: transparency, cooperation and public engagement.

An overriding factor in all of the BRC recommendations is the need to build public confidence and implement a national waste management program based on societal and community consent. These concepts relate to regulation as much as to other elements of implementation:

“Transparency, flexibility, patience, responsiveness, and a heavy emphasis on consultation and cooperation will all be necessary—indeed, these are attributes that should apply not just to siting but to every aspect of program implementation.” [2, p. ix] A balance must be struck between setting reasonable implementation milestones (e.g., deadlines for regulations, siting, etc.) and accountability, and allowing adequate flexibility for consultation and public engagement. As the BRC notes, “any attempt to short-circuit the process will most likely lead to more delay.” [2, p. x]

The BRC also encourages a high degree of coordination between EPA and NRC in setting their respective standards. The NRC's licensing standards must be consistent with EPA's safety standards for disposal. Past problems of coordination and consistency between EPA and NRC were presented to the BRC as contributing to public distrust in the Yucca Mountain project, and comments to the Commission also pointed to public confusion and frustration regarding how rule-making processes operate. [2, p. 94] To avoid such problems, the BRC recommends that EPA and NRC undertake a "coordinated and open process" to develop new regulations. [2, p. 94] The process should allow a clear definition of regulatory issues, open airing of any differences in regulatory philosophies between the agencies and a clear explanation and justification of regulatory decisions. [2, pp. 93-94]

The BRC further recommends that standards should be designed to accommodate an adaptive, staged approach to repository development. Features of an adaptive, staged approach include transparency, flexibility and a commitment to systematic learning. [5, p. 76] From a regulatory perspective, such a process demands additional flexibility to leave open certain decision points (e.g., regarding design, construction or operations) and to adapt plans or regulatory evaluations as new information becomes available.

### **Principles and Issues for New Disposal Standards**

The final BRC report identifies key issues for consideration in setting standards: [2, p. 92]

- What should the basis be: a desired level of protection or what is reasonably achievable using today's technology?
- For how long must compliance be demonstrated?
- Who is to be protected—individuals or populations?
- What is the desired level of protection?
- What is the measure of compliance (e.g., doses to individuals vs. releases to the environment)?
- How should compliance be demonstrated—primarily through quantitative calculations or through a broader safety analysis that involves multiple lines of qualitative as well as quantitative considerations?
- What level of confidence is required?
- How should the potential for human intrusion be addressed?
- How should retrievability be addressed?
- Can compliance take credit for institutional controls and if so, for how long?
- Should groundwater be separately protected?
- Should there be performance requirements for subsystem elements of a disposal facility (e.g., the waste package or the geologic setting)?

The BRC does not take positions on these issues, which it notes involve societal and policy judgments that are appropriately mediated through the rulemaking process. [2, p. 90] Most, if not all, of these issues have been key elements of EPA's previous rulemakings, so there exists significant national and international regulatory experience, as well as extensive literature and international guidance (from the International Atomic Energy Agency and Nuclear Energy Agency, for example) that can inform decision making.

The BRC offers some principles to guide development of future regulations. First, the BRC recommends that “standards and requirements for compliance demonstrations (including the required level of confidence in the demonstration or ‘standard of proof’) should not go beyond what is scientifically possible and reasonable.” [2, p. 93] In particular, it has proved workable, in existing EPA regulations, to recognize that absolute proof (in the usual sense of the word) is not possible over long compliance periods; instead, a “reasonable expectation” of compliance is expected. [See 6, section 191.13(b), for example.] The commission expresses its view, for example, that “over-reliance on million-year calculations can reduce credibility rather than enhance it.” [2, p. 93]

The BRC also recommends that the “standard of proof” be defined at the same time that performance standards are set. The BRC notes “the stringency of a given standard depends critically not only on the numeric level of the standard but on the timeframe over which it is applied, the methodology that is used to demonstrate compliance, and the standard of proof (or level of confidence) that is required for the demonstration.” [5, p. 93] The associated level of confidence in calculations or modeling results is an integral part of evaluating compliance with specific numerical criteria. It is important to ensure that the standard of proof to which licensees are held is consistent with that expected when the performance standards are formulated. This would be an important area of coordination for future disposal standards, where these two steps may be handled by different agencies (EPA and NRC).

#### **PATH FORWARD FOR EPA IN RESPONSE TO THE BRC**

The EPA tracked and provided input to the BRC deliberations. [7] The Agency continues to review the final report and subcommittee reports to assess the implications for EPA. No legislative changes are necessary to implement the recommendations related to updated generic disposal standards; existing legislation provides adequate authority. However, it is possible that broad waste management legislation in response to the BRC report could adjust EPA’s authorities and impose additional requirements or restrictions on Agency action.

The BRC recommendations and principles provide an important framework for EPA in shaping the process and identifying issues for consideration in a possible rulemaking. EPA is conducting scoping activities to better define key issues, to assess public engagement options and to identify key stakeholders likely to take an interest in EPA action. Other preparatory activities could include a survey of international guidance and regulatory models and early outreach to stakeholders to gather input on process considerations and conceptual approaches.

#### **REFERENCES**

1. “Blue Ribbon Commission on American’s Nuclear Future, U.S. Department of Energy Advisory Committee Charter, March 1, 2010”. In Blue Ribbon Commission on America’s Nuclear Future: Report to the Secretary of Energy, pp. 122-125, Washington, DC, January 2012.
2. Blue Ribbon Commission on America’s Nuclear Future: Report to the Secretary of Energy, Washington, DC, January 2012.
3. Reorganization Plan No. 3 of 1970 (35 F.R. 15623, 84 Stat. 2086), Section 2(6).

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4. Energy Reorganization Act of 1974, as amended, Pub. L. 93-438, 88 Stat. 1233 (42 U.S.C. 5801 et seq.), Section 201.
5. Disposal Subcommittee Report to the Full Commission: Updated Report, Blue Ribbon Commission on America's Nuclear Future, Washington, DC, January 2012.
6. 40 CFR 191: Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 50 FR 38084, Sept. 19, 1985 and amendments.
7. See, e.g., Letter from Gina McCarthy to Tim Frazier, dated Nov. 8, 2011, regarding EPA comments on the BRC draft report. Available on the BRC web [site](#).