POLICY ISSUE
(Notation Vote)

August 14, 2012 SECY-12-0110

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: CONSIDERATION OF ECONOMIC CONSEQUENCES WITHIN THE U.S. NUCLEAR REGULATORY COMMISSION'S REGULATORY FRAMEWORK

PURPOSE:

The purpose of this Commission paper (SECY) is to provide the Commission with information and options to address to what extent, if any, the U.S. Nuclear Regulatory Commission's (NRC's) regulatory framework should be modified regarding its consideration of the economic consequences of an unintended release of licensed nuclear materials to the environment.

SUMMARY:

The accident at the Fukushima Dai-ichi nuclear power plant in Japan initiated discussion of how the NRC's regulatory framework considers offsite property damage and other economic consequences caused by a significant radiological release from an NRC-licensed facility and licensed material. In response to this discussion, on April 6, 2012, the Office of the Executive Director for Operations (OEDO) directed the staff (see Enclosure 1, "Tasking for RES") to provide a notation vote paper to the Commission on how the NRC's regulatory framework currently considers the economic consequences associated with the unintended[1] release of licensed nuclear material to the environment and alternatives for Commission consideration.

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[1] For the purposes of this paper, the terms "unintended" and "unplanned" are used synonymously, and are meant to include discussion of accidental releases but exclude deliberate sabotage events. The staff notes that the term "unplanned" is used in several regulations (e.g., 10 CFR 30.50, 10 CFR 40.60, 10 CFR 70.50) in reference to radiological contamination events.

This paper focuses on the NRC's current processes for considering economic consequences arising from offsite property damage caused by radiological contamination events.[2] Based on an analysis of these processes, the staff concluded that the NRC's regulatory framework for considering offsite property damage is sound and affords sufficient flexibility to account for the offsite economic consequences associated with unintended radionuclide releases and subsequent land contamination. Nonetheless, this paper provides options for updating staff guidance and methods in this area, as well as an option for exploring the merits of potential changes to the regulatory framework.

BACKGROUND:

NRC requirements relating to the adequate protection of public health and safety do not consider costs. Although health and safety requirements are not intended to minimize economic consequences, they have that effect by preventing or mitigating events that could lead to a radiological release. Additionally, the NRC considers the economic consequences of property damage from radiological contamination in establishing its regulatory requirements. Enclosure 2 includes further background material, including a discussion of the NRC's safety goal policy statement and a summary of specific regulatory requirements and guidance addressing offsite property damage. The NRC's legal authority in this area is discussed in Enclosure 3, "NRC Legal Authorities Concerning Offsite Property Damage." The NRC conducts cost-benefit determinations within regulatory, backfitting, and environmental analyses, which may include property damage and other economic consequences.

In performing cost-benefit determinations, the NRC has traditionally considered two categories of property, onsite and offsite. Generally, onsite property is owned or controlled by the license- or certificate-holder and located within the boundaries of the licensed facility, whereas offsite property is located outside of the site boundaries, and is not owned or controlled by the license- or certificate-holder.[3] However, in a cost-benefit analysis, the distinction between offsite and onsite property goes beyond the location or ownership of the property. Onsite property costs include replacement power, decontamination costs, and costs associated with refurbishment or decommissioning. Offsite property costs include both the direct costs associated with property damage (e.g., diminution of property values) and indirect costs (e.g., tourism, manufacturing, and agriculture disruption). The NRC has periodically reevaluated the consideration of offsite property damage within its regulatory framework.[4]

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[2] A number of terms have been used to describe offsite economic impacts and property loss following a radiological accident, including land contamination, offsite economic consequences, offsite contamination effects, and offsite property damage. In this paper, the term "offsite property damage" encompasses a broad range of offsite economic impacts associated with the unintended release of radionuclides: loss of use and damage to property, relocation costs, and business disruption. The intent is to be consistent with the NRC's regulatory authority, regulations, and guidance.

[3] As stated in NUREG/BR-0058, Revision 4, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," issued September 2004, "offsite property" refers to property that is not owned or leased by a licensee.

[4] See, for example, SECY-97-208, "Elevation of the Core Damage Frequency Objective to a Fundamental Commission Safety Goal," dated September 12, 1997; SECY-98-101, "Modifications to the Safety Goal Policy Statement," dated May 4, 1998; SECY-99-191, "Modifications to the Safety Goal Policy Statement," dated July 22, 1999; SECY-00-0077, "Modifications to the Reactor Safety Goal Policy Statement," dated March 30, 2000; and SECY-01-0009, "Modified Reactor Safety Goal Policy Statement," dated January 22, 2001.

DISCUSSION:

Significant offsite property damage and associated economic consequences would generally only occur if substantial amounts of radioactive material were released. This paper focuses on those regulations associated with nuclear power plants licensed under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants"; materials licensed under Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," 10 CFR Part 40, "Domestic Licensing of Source Material," and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material"; independent spent fuel storage installations licensed under 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"; and gaseous diffusion plants certified under 10 CFR Part 76, "Certification of Gaseous Diffusion Plants." This does not imply that the above regulations encompass all regulated activities that may result in economic consequences, but these are the most significant requirements associated with offsite property damage from unintended releases.

Certain intentional releases could result in substantial offsite effects. This paper does not consider property damage from a radiological dispersal device (RDD) or radiological exposure device (RED), or any deliberate sabotage event.[5] In 2010, the Radiation Source Protection and Security Task Force[6] recommended that Federal agencies reevaluate their protection and mitigation strategies to protect against a significant RED or RDD attack using both potential severe immediate or short-term exposure and contamination consequences (i.e., economic consequences arising from property damage). Enclosure 4, "Radiation Source Protection and Security Task Force, Recommendation 2," describes past Commission direction and staff efforts to address the recommendation of the Radiation Source Protection and Security Task Force.

Within the context of unintended releases of nuclear materials to the environment, the NRC traditionally has relied on a defense-in-depth approach to prevent or minimize the consequences of accidents. Although the defense-in-depth philosophy has been applied to provide adequate protection of public health and safety, it also provides ancillary protection to offsite property, and thus minimizes offsite economic consequences.[7] For example, NRC regulations that address the prevention of core damage and containment of radionuclides for nuclear power plants also serve to minimize the potential for land contamination. In this way,

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[5] SECY-09-0051, "Evaluation of Radiological Consequence Models and Codes," dated March 31, 2009, and SRMs, which affect radiation source security activities, have directed the staff not to independently develop criteria for economic consequences as a result of an RED or RDD. Rather, the staff continues to support the risk assessment activities of the U.S. Department of Homeland Security (DHS) regarding its Radiological and Nuclear Terrorism Risk Assessment (RNTRA).

[6] The Interagency Radiation Source Protection and Security Task Force, led by the NRC, evaluates the security of radiation sources in the United States from potential terrorist threats, including acts of sabotage, theft, or use of a radiation source in a RDD, and provides recommendations to the President and Congress.

[7] SECY-08-0038 states that it is "the longstanding Commission policy that protection of humans is also protective of non-human species" (SECY-08-0038, p. 3). Further, the enclosure to SECY-03-0038 states that "the NRC has a well-established system for considering environmental impacts to non-human species associated with its regulatory and licensing decisions." The staff reaffirmed this position in SECY-12-0064, "Recommendations for Policy and Technical Direction to Revise Radiation Protection Regulations and Guidance."

the NRC's regulatory philosophy has been based on the premise that protection public health and safety also affords protection for the environment.

This regulatory approach was affirmed by the NRC's Near Term Task Force (NTTF) following the accident at the Fukushima Dai-ichi nuclear power station. The NTTF examined the NRC's current approach to land contamination and concluded that:

> The current NRC approach to land contamination relies on preventing the release of radioactive material through the first two levels of defense-in-depth, namely protection and mitigation. Without the release of radioactive material associated with core damage accident, there would be no significant land contamination. The task force also concludes that the NRC's current approach to the issue of land contamination from reactor accidents is sound.[8]

Nonetheless, the accident at Fukushima-Dai-ichi resulted in a large area of radioactively contaminated land in Japan. This land contamination has disrupted the lives of a large number of Japanese citizens and raised stakeholder concern about such economic consequences. In light of the continued discussions regarding land contamination following the Fukushima Dai-ichi nuclear power plant accident, the staff reexamined areas of the regulatory framework, specifically, regulatory, backfit, and environmental analyses and the associated guidance and tools as areas of key consideration. Each of these is discussed below:

- Regulatory Analysis: The staff conducts regulatory analyses to support proposed and final rules and to evaluate requirements, guidance, or staff positions that would result in a change in licensee resources. If there is a change in licensee resources, the regulatory analysis will evaluate societal costs and benefits of the proposed action, and the staff considers offsite property damage is such cost-benefit analyses. The staff uses regulatory analyses to inform decision makers about (1) the basis supporting the need for regulatory change, and (2) alternatives considered. Enclosure 5, "Regulatory and Backfit Analysis," contains a detailed description.

- Backfit Analysis: The backfit rules contained in 10 CFR Parts 50, 70, 72, and 76 help ensure that requirements that go beyond adequate protection[9] provide a substantial[10] increase in the overall protection of public health and safety, and that the direct and indirect costs of implementation are justified in view of this substantial increase in protection. Analogous backfitting provisions applicable to early site permits and standard design certifications, differing in some regards from those in 10 CFR 50.109 are set forth in 10 CFR 52. Enclosure 5 describes a three-step process and factors considered during backfit analysis.

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8 Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident. p. 21. See ADAMS Accession No. ML111861807.

9 In general, the backfitting provisions do not require a backfit analysis for proposed changes necessary to ensure adequate protection to the health and safety of the public, necessary to bring a facility into compliance with the licensed rules or orders, or involving a redefinition of adequate protection. Some variation exists in the exemptions of the backfitting provisions contained in 10 CFR 50.109(a)(4), 10 CFR 70.76(a)(4), 10 CFR 72.62(b), and 10 CFR 76.76(a)(4).

10 The Commission has stated that "substantial" means important or significant in a large amount, extent, or degree. (See the SRM to James M. Taylor and William C. Parler from Samuel J. Chilk, "SECY-93-086—Backfit Considerations," dated June 30, 1993.)

- Environmental Analysis: As part of the implementation of the National Environmental Policy Act (NEPA) requirements, NRC evaluates the costs and benefits of Severe Accident Mitigation Alternative and Severe Accident Mitigation Design Alternative analyses, including offsite property damage for certain nuclear reactor licensing and application reviews. For materials, waste, and fuel cycle facility licensing, there are no comparable analyses for treating accidents and offsite consequences. However, the staff considers economic consequences as part of its evaluation of potential environmental impacts. Enclosure 6, "Environmental and NUREG-0800 Standard Review Plan Chapter 19 Analysis," describes the NEPA process in more detail, primarily for nuclear power plants. It is important to emphasize that NEPA is a procedural statute which does not mandate a specific outcome. In other words, the NRC may not impose any safety requirements solely based on a finding that it would be cost-beneficial under NEPA.

Cost-Benefit Analysis Guidance, Tools, and Current Staff Initiatives: The staff uses similar guidance documents to perform the cost-benefit analysis portion of the above analyses as described in Enclosures 5 and 6. Together these documents provide the analysis methodology and specific values and parameters used in cost-benefit determinations. Among these parameters is the offsite impacts attribute, which is typically the product of the change in accident frequency and the property consequences resulting from an accident.

Prior to the most recent revision of the dollar per person-rem conversion factor, the offsite impacts attribute was subsumed within this conversion factor, and this value was $1000 per person-rem. In 1995, the NRC updated this value to $2000 per person-rem, which no longer subsumed offsite impacts, and it was incumbent upon staff to consider these costs elsewhere in the cost-benefit analysis.[11] Enclosure 7, "Relationship Between the Value of a Person-Rem Averted and Offsite Property Damage," provides a more detailed discussion of the historical relationship between the dollar per person-rem conversion factor and property damage.

The staff is updating specific aspects of the guidance (e.g., dollar per person-rem conversion factor, replacement power costs) as described in Enclosure 8, "Current Staff Initiatives to Update the Dollar per Person-Rem Conversion Factor Policy and Replacement Power Costs." However, several guidance documents have not had a comprehensive revision in many years. Furthermore, earlier guidance focused on the regulatory actions of operating reactors. Subsequently, the NRC has developed and implemented additional regulations (e.g., backfit rules specific to materials facilities and backfitting provisions applicable to early site permits and standard design certifications under 10 CFR Part 52). Future guidance updates may be necessary to ensure consistency across business lines.

In addition to the guidance, the staff uses the MELCOR Accident Consequence Code System version 2 (MACCS2) computer code to evaluate potential land contamination scenarios and the resultant offsite property damage. Enclosure 9, "MELCOR Accident Consequence Code System, Version 2 (MACCS2)," contains an overview of the MACCS2 code.

Based on the staff's evaluation, the NRC's regulatory framework for considering offsite property damage is sound, and affords sufficient flexibility to account for the offsite economic consequences associated with unintended releases of radionuclides with subsequent land

[11] See COMSECY-95-003.

contamination. To protect public health and safety, NRC regulations are focused on reducing the likelihood of a radiological release, which also provides protection to the environment. Within this framework, the staff has identified needed improvements to the implementation guidance for cost-benefit analysis to address updates and to enhance the consistency and efficiency of regulatory analysis, backfitting analysis, and environmental analyses.

The staff recognizes that the current Commission safety goal policy statement and backfit rule provisions of the reactor and materials regulations do not expressly require the minimization of land contamination and offsite property damage. The accident at the Fukushima Dai-ichi nuclear power plant has prompted various external organizations and stakeholders to question whether the existing NRC regulatory framework sufficiently considers economic consequences from radiological contamination.[12] Therefore, should the Commission desire to expand consideration of offsite property damage, the staff has identified potential ways to revise the regulatory framework.

Based on the staff's analysis, the staff identified three primary options for Commission consideration: (1) status quo, (2) updates to regulatory analysis guidance to enhance consistency, and (3) exploring the merits of potential changes to the regulatory framework. Options 1 and 2 are consistent with the assertion that the NRC's current approach to considering offsite property damage is sound, and they are focused on updating and enhancing guidance used within the current regulatory framework.

- Option 1—Status Quo: This option would maintain the status quo with regard to the agency's current practice of considering economic consequences in regulatory, backfit, and environmental analyses. The staff would update the existing guidance for these analyses on the current schedule and frequency. To ensure that the various program offices proceed in a coherent and consistent manner, the staff plans to improve the coordination and prioritization of these activities. These updates are associated with the values and parameters used in cost-benefit analysis, and do not result in a fundamental change in the regulatory framework (there would be no new or revised policy statements, changes in regulatory requirements, or revision to the cost-benefit analysis methodology).

  Pros and Cons

  The primary advantages to this option are that it would maintain regulatory stability and would require minimal additional resources. It is consistent with the NTTF report's conclusion that the NRC's current approach to land contamination from reactor accidents is sound.

  The primary disadvantage is that the current approach may not accomplish consistency across programs and is not responsive to stakeholder concerns that NRC should provide more consideration of economic consequences. Although the staff currently has sufficient flexibility to address offsite property damage within the current regulatory framework,

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[12] There has been initial discussion on analyzing how economic consequences are currently calculated in the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) member countries. Enclosure 10, "Consideration of Property Damage by External Organizations," summarizes staff's review of how select external organizations address economic consequences arising from property damage (e.g., land contamination).

analysts may need to derive their own economic consequence estimates for each new analysis, which could result in inefficiency and inconsistency.

- Option 2—Enhanced Consistency of Regulatory Analysis Guidance: Under this option, the staff would systematically update and enhance regulatory analysis guidance in a more comprehensive, integrated, and coordinated fashion compared to Option 1. The pace for these update activities would be moderated by coordination with other ongoing activities (e.g., NTTF Recommendation 1).

  In addition to ongoing updates, the staff would improve guidance for estimating offsite economic costs based on up-to-date data and advancements in accident consequence assessment knowledge (e.g., SOARCA insights, the current Level 3 probabilistic risk assessment project, and Fukushima follow-up activities), as applicable. In addition, staff would identify potential areas to develop new guidance, as needed, for other regulatory applications (e.g., materials, fuel cycle facilities, security, and emergency preparedness) and conforming changes to associated documents across business lines. Similar to Option 1, this option maintains the current regulatory framework.

  Pros and Cons

  Advantages of this option are that it would be a more systematic approach to updating guidance and addressing agency-level needs across programs while providing a stable and predictable regulatory process, and would also provide more comprehensive guidance for methods and parameters than is currently available. This option would help harmonize regulatory analysis guidance across the agency. As with Option 1, this option is consistent with the NTTF report's conclusion that the NRC's current approach to the issue of land contamination from reactor accidents is sound.

  The primary disadvantage of this option is that it would not be responsive to stakeholder concerns about the need to expand considerations of economic consequences. In addition, this option would require more resources than Option 1. These resources would be associated with coordinating and developing additional new guidance in a more comprehensive, integrated and coordinated fashion.

- Option 3—Exploring the Merits of Potential Changes to the Regulatory Framework: This option could be combined with either Option 1 or Option 2. Under this option, the staff would explore the merits of potential changes to the regulatory framework to more expressly consider adverse offsite economic consequences. The staff would evaluate the following potential changes to the regulatory framework:

  - Risk-informed policy statement for offsite property damage: This alternative would involve developing a policy statement for offsite property damage that parallels the design and structure of the Policy Statement on Safety Goals for the Operation of Nuclear Power Plants. If implemented, such a policy statement could be used to support guidance development and future regulatory enhancements for consideration for offsite property damage.

- Rulemaking: This alternative would consider regulatory changes explicitly. For instance, these changes could include adding licensing requirements addressing offsite property damage to 10 CFR Parts 50 and 52, similar to those found in 10 CFR Parts 30, 40, 70, 72, and 76 (e.g., 10 CFR 30.11, 10 CFR 30.32, and 10 CFR 30.34). This alternative could also explore changes to the backfit regulations in 10 CFR Part 50, 10 CFR Part 70, 10 CFR Part 72, and 10 CFR Part 76 and the finality provisions in 10 CFR Part 52 to expressly consider offsite property damage. Such a change to the backfit regulations could be a new exception to the preparation of a backfit analysis, which would reflect a policy decision to treat economic consequences as equivalent in regulatory character to matters of adequate protection or compliance. Another alternative could be modifying the backfit analysis standard to allow a showing of either a substantial increase in protection to public health and safety (or common defense and security) or a substantial reduction in adverse offsite economic consequences, which would reflect a policy decision to treat offsite economic consequences as equivalent in regulatory character to "safety enhancements."

- Analysis Methodology: This alternative would explore revisions to the methodology described in regulatory analysis guidance documents to change the overall regulatory framework when considering offsite property damage. For example, current staff practice is to assess potential offsite economic impacts using site-specific values for facility-specific backfits and generic values that are representative of the affected class of facilities for generic backfits. A change in policy to conduct generic backfitting analyses on a site-by-site basis using facility-specific offsite economic values could result in backfitting only a subset of the facilities within the generic class.

Any actions taken under Option 3 would be coordinated with ongoing initiatives, such as NTTF Recommendation 1 and activities conducted in response to NUREG-2150, "A Proposed Risk Management Regulatory Framework (RMRF)," issued in April 2012. Some aspects of this coordination are discussed in Enclosure 11, "Coordination with Ongoing Initiatives."

Pros and Cons

Advantages to this approach are that it could provide a clear Commission statement on the importance of offsite property damage as a consequence of severe accidents, and demonstrate the NRC's willingness to explore alternatives to revise the existing regulatory framework. Furthermore, this option would allow for stakeholder input to proposed revisions or policy changes and would promote the transparency of agency decision-making.

One disadvantage to this option is that it could signal the Commission's intent to change the regulatory framework, which could increase regulatory uncertainty. Another disadvantage is that staff would be exploring revisions to the regulatory framework in parallel with other potential regulatory changes that may arise from NTTF or RMRF follow-up activities. As discussed above, this would require close coordination with other activities, increase the complexity of the task, require substantial resources, and may not be feasible in the near future given current and competing priority assignments.

RESOURCES:

The resources required for Option 1 have already been included in proposed budgets for fiscal years (FYs) 2013 and 2014. Implementation of Option 1 would require no additional resources.

The resource estimate for Option 2 is approximately two additional staff full-time equivalents (FTEs) in FY 2013, which would be spread across multiple business lines. Approximately three to four additional FTEs may be required per fiscal year in FY 2014 and beyond.

Option 3 is estimated to require two additional FTEs in FY 2013 and additional resources in future years to identify and assess potential changes to the regulatory framework. The staff estimates that approximately five to seven FTEs may be required per fiscal year in FY 2014 and beyond.

For all options, resources in future years would be either reallocated or addressed through the Planning, Budgeting, and Performance Management process.

RECOMMENDATION:

The staff recommends that the Commission approve Option 2. The staff has determined that this option would enhance the currency and consistency of the existing framework through updates to guidance documents integral to performing cost-benefit analyses in support of regulatory, backfit, and environmental analysis.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objection.

/RA MWeber for/

R. W. Borchardt
Executive Director
for Operations

Enclosures:
As stated

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