

NRC Waste Incidental to Reprocessing Program: Overview of Consultation and Monitoring Activities at the Idaho National Laboratory and the Savannah River Site – What We Have Learned - 12470

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ABSTRACT

In 2005 the U.S. Nuclear Regulatory Commission (NRC) began to implement a new set of responsibilities under the Ronald W. Reagan National Defense Authorization Act (NDAA) of Fiscal Year 2005. Section 3116 of the NDAA requires the U.S. Department of Energy (DOE) to consult with the NRC for certain non-high level waste determinations and also requires NRC to monitor DOE's disposal actions related to those determinations. In Fiscal Year 2005, the NRC staff began consulting with DOE and completed reviews of draft waste determinations for salt waste at the Savannah River Site. In 2006, a second review was completed on tank waste residuals including sodium-bearing waste at the Idaho Nuclear Technology and Engineering Center Tank Farm at the Idaho National Laboratory. Monitoring Plans were developed for these activities and the NRC is actively monitoring disposal actions at both sites. NRC is currently in consultation with DOE on the F-Area Tank Farm closure and anticipates entering consultation on the H-Area Tank Farm at the Savannah River Site.

This paper presents, from the NRC perspective, an overview of how the consultation and monitoring process has evolved since its conception in 2005. It addresses changes in methods and procedures used to collect and develop information used by the NRC in developing the technical evaluation report and monitoring plan under consultation and the implementation the plan under monitoring. It will address lessons learned and best practices developed throughout the process.

INTRODUCTION

NRC began fulfilling its role under the NDAA [1] in March 2005 with the consultative review of the draft waste determination (WD) for low-activity salt waste disposal at the Savannah River Site (SRS) in South Carolina. Since that initial consultation, the NRC has completed Technical Evaluation Reports for two additional waste determinations (INL [4] and F-Area Tank Farm [5]) and is in the process of monitoring disposal actions at both Savannah River Site and the Idaho National Laboratory.

The DOE and NRC have made significant progress in adapting to the novel roles and responsibilities created by the NDAA. Accustomed to regulating commercial nuclear facilities, the NRC has had to adapt its review approach to a consultative role with respect to reviewing the basis for the Secretary of Energy's WD and a monitoring role with respect to DOE disposal actions. With no regulatory and enforcement authority, the NRC has had to modify its approach in interacting with the DOE in the areas of pre-submittal engagement, technical information exchange, and public interaction. This paradigm shift in viewing the relationship has occurred in small increments but has been steady over the years as each agency has built on past challenges and the lessons they provide.

With each WD and performance assessment (PA) review, the process of continuous improvement has resulted in the identification of more techniques and approaches that can be used to further enhance the review process and ultimately facilitate tank closure at both INL and SRS. Basic lessons from other similar experiences are being used as well to improve communication between the technical staff and promote resolution of issues and points of disagreement in substance and approach.

Passage of the NDAA created expectations that high level waste tank closure would begin swiftly in Idaho and South Carolina. Closure activities at SRS ceased after only two tanks were closed due to legal actions at the Federal level [6]. The NDAA removed legal uncertainty from the tank closure process and opened the door for the DOE, in consultation with the NRC, to move forward in making non-HLW determinations and completing disposal actions and tank closure.

Though the NDAA created the legal framework to facilitate tank closure at DOE facilities in the two states (Idaho and South Carolina), translating the 'act into action' was the joint responsibility of the DOE and NRC. Both agencies have struggled with differing interpretations of the NDAA and different agency corporate cultures

This paper presents a discussion of the challenges faced in implementing Section 3116 of the NDAA and documents the progress that has been made and the efforts for continuous improvement in the future from the NRC's perspective.

Waste Incidental to Reprocessing Reviews Prior to NDAA

To appreciate the complex challenges associated with implementing the roles and responsibilities under the NDAA, it is important to understand the history of the interactions between the DOE and NRC with respect to WIR or non-high level waste

determinations. Prior to the passage of the NDAA, the NRC consulted with the DOE on specific waste determinations at several sites. In 1996, DOE requested that NRC agree that the Hanford tank waste planned for removal from the tanks and disposal on-site was incidental waste (i.e., not high-level waste) and, therefore not subject to NRC regulatory authority [37]. DOE was in the early stages of planning how to treat single-shell and double-shell tanks at Hanford. Part of the strategy was to segregate the waste into HLW and Low-level waste (LLW) fractions and dispose of them accordingly. The LLW fraction of the waste could be considered not-HLW and disposed of on site. Of primary interest was the residue waste in the tanks. The tanks would be cleaned and grouted after waste removal operations. DOE would obtain NRC agreement that the waste was incidental prior to grouting the tanks.

In 1997 NRC performed a review of information submitted by DOE through an Interagency Agreement [8]. The information included a technical basis report for classifying the waste as LLW and other supporting documentation including a PA for the tank waste. The basis for the NRC review involved the determination that residue waste would have to meet the three incidental waste classification criteria specified in the 1993 Denial of Petition for Rulemaking to the Commission to amend 10 CFR Part 60 to redefine HLW [9]. The criteria specified that:

- Criterion One: “...wastes have been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical”
- Criterion Two: “...wastes will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C [low-level waste] as set out in 10 CFR Part 61”
- Criterion Three: “...wastes are to be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives in 10 CFR Part 61, Subpart C are satisfied.”

The staff reviewed the separation technologies identified for radionuclide removal, calculations characterizing the vitrified waste form, and the interim PA. In SECY-97-083, NRC reached a provisional determination that the LLW fraction of the waste planned for removal and disposal onsite was incidental waste and not subject to NRC licensing authority [10]. However, the NRC proposed the caveat that if information significantly changed, such as tank inventory or waste form type, then re-analysis by NRC staff would be required for NRC’s agreement to remain valid.

After completion of the Hanford review, the DOE and NRC began formal collaboration in addressing incidental waste issues at other sites in the DOE complex [11, 12, 13]. Through Interagency Agreements and Memoranda of Understanding, NRC acted in an advisory capacity on incidental waste issues. NRC did not have regulatory authority over the waste in question and was not providing regulatory approval of the waste determinations. The NRC provided technical assistance to DOE in regard to the tank closure program, specifically, the staff reviewed the methodology established by DOE for tank closure and evaluated DOE's approach for classification and determination of tank residues as incidental waste once waste removal operations were completed.

However, in subsequent reviews, the Commission directed the staff to modify the criteria developed for the review of the Hanford site [14]. In SRM-SECY-99-0284, the Commission directed the staff to take a more generic, performance-based approach in reviewing DOE's proposed methodology for classification and stabilization of residual tanks wastes. The change in the criteria directed the staff to focus on Criteria One (removal of key radionuclides to the maximum extent that is technically and economically practical) and Criteria Three (demonstration that the approach could meet performance objectives). This was viewed as adequate by the Commission to provide protection of the public health and safety and the environment.

The staff initiated a systematic approach to evaluating information provided by DOE. The staff evaluated DOE-submitted information, generated Requests for Additional Information, met with DOE representatives to discuss technical questions and issues, and documented the final review results in Technical Evaluation Reports. The performance-based reviews conducted by the staff assessed whether DOE's technical assumptions, analyses, and conclusions were reasonable and whether there was reasonable assurance that the applicable criteria could be met. In general, the staff focused on technical areas such as estimated radionuclide inventory, technology alternatives, PA methodology, engineered system performance, infiltration, release and transport parameters, receptor scenarios and assumptions, and uncertainty and sensitivity analysis. Additionally, the Technical Evaluation Reports were provided to the Commission for review and after any directed changes were made, the staff transmitted the final Technical Evaluation Report to DOE.

In July 1999 DOE published a new order to facilitate management of DOE-managed radioactive waste. DOE Order 435.1 "Radioactive Waste Management" initialized a new Waste Incidental to Reprocessing (WIR) evaluation process and the criteria for a WIR determination [15]. The DOE Order 435.1 and its associated manual required that all DOE radioactive waste be managed as HLW, TRU waste, or LLW. The Order stated

that waste, determined to be incidental to reprocessing, was not HLW and shall be managed in accordance with the requirements for TRU waste or LLW, if it meets appropriate criteria. The criteria for WIR was specified in the manual accompanying the order (DOE-M 435.1-1) in Section II.B (2)(a). This criteria specifies that waste be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C LLW as set out in 10 CFR 61.55 in order to be managed as LLW. However, based on direction from the Commission, evaluations prepared by the NRC remained focused only on criteria related to removal of key radionuclides and meeting performance objectives. This approach typified NRC reviews for all DOE sites prior to the passage of the NDAA.

INITIAL CONSTRUCT OF CONSULTATION CONCEPT UNDER NDAA

In implementing its consultation role under the NDAA, the NRC staff intended to follow a technical approach similar to the reviews of DOE's non-HLW determinations previously performed through Interagency Agreements and Memoranda of Understanding with DOE [4,5,11,12, and 13]. The NRC staff had previously conducted technical reviews of specific DOE WIR determinations where the NRC provided technical assistance and advice to DOE regarding its WIR determinations. Similar to the role prescribed under the NDAA, this work was of a consultative nature, and the NRC did not possess regulatory approval or authority over DOE actions.

In SECY-05-0073, the staff proposed to continue the same technical approach that proved to be successful in conducting the previous reviews for DOE's non-HLW determinations [16]. The staff's reviews would commence with the submittal of the DOE non-HLW determination. The staff would conduct a risk-informed, performance-based review of the non-HLW determination and supporting documentation to determine whether DOE's assumptions, modeling, and conclusions were technically adequate and in compliance with the requirements of the NDAA. This process would include NRC Requests for Additional Information and technical discussions similar to the previous process. However, the reviews would be conducted in a more transparent, open, and traceable fashion than reviews previously conducted.

Consultation under NDAA began in 2005 with the Interagency Agreement between DOE and NRC that was put in place in February 2005 [17]. The Interagency Agreement described the work roles and responsibilities for consultation on 3116 determinations. DOE would provide draft determinations and associated supporting documentation to the NRC. The NRC would review the information to assess the reasonableness of DOE's analyses. The NRC would document its analyses in a technical evaluation

report to DOE. The process appeared to be nearly identical to the reviews performed prior to the NDAA.

The review schedule envisioned in the Interagency Agreement estimated a review time of 3 months for the NRC to review the (WD) and submit a Requests for Additional Information package to DOE. Upon receipt of adequate responses to the entire Requests for Additional Information package, the Interagency Agreement estimate that the NRC would complete its technical review and provide a Technical Evaluation Report to DOE within two (2) months.

The NRC initiated the review of the salt waste WD in late February 2005 and issued a Request for Additional Information to DOE in late March 2005 [18]. Issues quickly surface in the Request for Additional Information process. Previous reviews prior to NDAA produced between 20 - 30 questions [19, 20]. The Request for Additional Information submitted for the first NDAA review contained 68 questions, many with subparts. It stands to reason that the NRC also considered its additional responsibilities of monitoring DOE disposal actions while involved in the consultation phase. The knowledge that the NRC would be responsible for monitoring disposal actions after consultation drove the staff to take a more fundamental look at the underlying assumptions and parameters in the WD. It is clear that the staff's questions increased in complexity and quantity at the beginning of the NDAA process and this was not anticipated by DOE.

As a result of the nature of the Requests for Additional Information submitted by NRC, DOE was unable to respond in full to the complete set of questions in the timeframe previously discussed. Consequently, DOE initially submitted responses to 61 of 68 Requests for Additional Information [21] in June 2005. Additionally, DOE submitted supplemental documents for the staff to review. Both these factors prompted the NRC to inform DOE that the staff would not be able to complete the Technical Evaluation Report in two months from the receipt of the incomplete Requests for Additional Information responses on July 1, 2005. These complications occurred even though the DOE and NRC held several public meetings to clarify the intent of the Requests for Additional Information. In general, the meetings were deemed helpful but did not seem to translate into high quality and timely response.

Subsequently, the NRC and DOE engage in several rounds of public meeting to discuss Request for Additional Information responses and supplemental information. Ultimately, NRC was able to issue its Technical Evaluation Report on the salt waste disposal at the Savannah River Site December 28, 2005 [22].

INITIAL CHALLENGES IN THE IMPLEMENTATION OF NDAA

“...though we have had a long history of working together, 3116 is actually a very unique arrangement between the Commission and the Department, and it's taking us some time to actually just work out the details.”

Ben McRae, DOE, November 2006

LESSONS LEARNED AND THE PATH FORWARD

CHALLENGES BRIDGING AGENCY CULTURAL DIFFERENCES

LESSON #1 Identify and acknowledge cultural differences between the two agencies and minimize their negative impact on performing consultation and monitoring

In observing the initial interaction between DOE and NRC it became apparent that the NDAA joined two agencies with very different missions and operational cultures together to address high-level waste tank closure. The NRC is an independent Commission and a strong federal regulator accustomed to exercising oversight and enforcement authority over its licensees. DOE's Office of Environmental Management, on the other hand, is a self-regulating member of the Executive Branch whose primary mission at the legacy sites is to perform environmental remediation. The roles assigned in the NDAA specified overall responsibilities but did not offer detailed guidance on how the two agencies would interact. For example, decision authority remained with the Secretary but the process of making the decision was to be in consultation with the NRC [1]. Additionally, NRC had the responsibility to monitor, in coordination with the State, DOE disposal actions and assess, but not ensure, compliance with the stated performance objectives.

As a result, significant difficulties and misunderstanding were experienced as the two agencies attempted to exercise what authority and responsibility each assumed under the NDAA. Many challenges surfaced during the reviews regarding the roles and responsibilities of each agency in the consultation process, the original intent of Congress in the legislation, and the most efficient and prudent path forward to expedite the review.

The challenges were discussed in several meetings and culminated with a public meeting held on November 16, 2006 [23]. The meeting served many purposes. It highlighted the fact that the consultation process does work since two Technical Evaluation Reports were finalized and two waste determinations had been made. But

both agencies recognized the need to identify potential areas of improvement in the process and start to identify a path forward in optimizing the review process.

It was concluded that agency-to-agency meetings would be a useful means to address generic concerns and conduct candid discussions. In addition, each agency agreed to respect the fact that each agency may have a different technical basis and methodology. Differences in approach does not mean that one or the other is wrong, however, those differences need to be identified and resolved if the process is to move forward efficiently. Therefore, the process of identifying significant differences early and negotiating an agreement is essential to enhancing the NDAA process.

CHALLENGE TO DEGREE OF OPENNESS AND TRANSPARENCY

LESSON# 2 Balance the requirement for openness and transparency with the need for discussion of pre-decisional information and general candid technical exchanges

In the NRC's planned implementation of NDAA, several practices distinguished the NDAA reviews from the previous WIR reviews. One was the approach to public interactions during the review. The NRC decided to use the guidelines for public interaction established for its work under the West Valley Demonstration Project (WVDP) Act [24].

Following WVDP guidelines changed the way the NRC would handle information submitted by DOE in support of the review. Consistent with Management Directive 3.4, DOE's initial WD submittal, the staff's Requests for Additional Information, DOE's Requests for Additional Information responses and any revised WD, and NRC's final TER would all be made publicly available. This precluded the discussion of pre-decisional information and closed exchanges of generic concepts and approaches.

In using the WVDP guidelines as a model for NDAA public interactions, the staff committed to following Management Directive 3.5 for meetings between NRC and any outside person or entity. This meant that, in general, meetings between NRC and DOE staff would be open to the public. MD 3.5 allowed exceptions for certain types of meetings. Moreover, the nature of the relationship between the NRC and a non-licensee (DOE) was acknowledged and provisions were made for conducting some closed meetings.

Interactions for the first two waste determinations were conducted primarily through a mix of closed, agency-to agency and open public meetings. DOE and NRC staff held public meetings on at least five (5) separate occasions to discuss and clarify NRC

Requests for Additional Information and DOE responses [25-29]. However, it became apparent that there was the need to discuss preliminary information and to have general pre-decisional technical exchanges among subject matter experts during the formal review process. DOE requested to have a limited number of closed meetings and the NRC evaluated and granted those requests on a case-by-case basis.

This practice came to a head when the NRC received a letter from two Congressional representatives (Dingell/Spratt) questioning why a planned August 31, 2006 meeting with DOE was closed to the public [30]. In their letter, the congressmen stressed that when the NDAA was enacted it was Congress' intent that the process be 'thorough, exacting, and public.' The letter suggested that all meetings between the DOE and NRC should be public unless significant national security concerns were being discussed. The basis of the position in the congressional letter seemed to be the interpretation of congressional intent in passing the NDAA and the 'matter of enormous public interest' in the disposal activities at the Savannah River Site.

NRC Chairmen Dale Klein responded to the congressional letter on August 31, 2006 [31]. Chairman Klein indicated that the staff had properly used the Management Directives in determining that the meeting could be closed to the public since its purpose was to facilitate a general information exchange with no direct substantive connection to any specific NRC decision or action. However, he agreed that since there was a considerable amount of public interest and no security information was being discussed the meeting could be opened to the public. Consequently the meeting was rescheduled and opened to the public. More importantly, DOE and NRC began to seek better ways of engaging in the consultation process to balance efficiency and effectiveness with openness and meaningful public engagement.

As a result, DOE and NRC have made a commitment to keep the process as open to the public and interested stakeholders as practicable [33]. There was the recognition that there may be a practical need for conducting a limited number of closed meetings such as generic technical exchanges and process or administrative discussions. However, closed meeting summaries will be developed by the DOE and distributed to all parties for review and approval. A public meeting summary will be created based on the closed meeting summary by DOE, reviewed by OGC, and distributed to all parties for review and approval within one month of the meeting. The meeting summaries will be posted in the NRC's document system. The public meeting summary of the closed meeting will be posted on the NRC's Incidental Waste external website.

CHALLENGE TO NRC'S STANDARD REVIEW PLAN

LESSON #3 Incorporating flexibility in establishing policies and practices affecting the review

Concurrent with the review of the salt waste WD, NRC staff had begun to develop a Standard Review Plan for waste determination reviews and monitoring activities [34]-. From the staff's perspective, development of the Standard Review Plan was consistent with the Interagency Agreement [17] which stated that the "NRC will prepare procedures for non-HLW determinations as needed in evaluating technical information associated with non-HLW determinations." NRC envisioned the Standard Review Plan as a tool to provide internal guidance to NRC staff, describe the type of information that may be assessed by NRC staff during the review, and provide consistency over the long term. In addition, the NRC believed it might be useful to DOE as a reference. Consequently, the staff included the Standard Review Plan development in SECY-05-0073, which communicated to the Commission the staff's approach in implementing new responsibilities under NDAA. On May 23, 2006, NRC issued the "draft Standard Review Plan for activities related to DOE Waste Determinations" for public comment.

On July 31, 2006, DOE submitted its comment on the Standard Review Plan, strongly opposing certain elements of the Standard Review Plan and calling for its withdrawal [35]. DOE stated that STANDARD REVIEW PLAN reflected a 'fundamental misreading' of the NDAA and 'established a process that casts the Commission in a role of the regulator...' Some of DOE concerns reflected differences in the culture of the two organizations. For example, DOE took issue with making all documents submitted to the NRC for review available to the public particularly those that were pre-decisional. DOE's view was that some of the documents were deliberative and should not be released until finalized. Other concerns revealed fundamental differences in the interpretation of the NDAA. For instance, DOE questioned whether the NDAA gave the Commission the authority to arrive at an independent conclusion as to whether there is reasonable assurance that the criteria in the NDAA are met. DOE believed there was a need to have a 'candid exchange of views' in an effort to improve the consultation process that it viewed as veering off track.

In principle, DOE viewed the Standard Review Plan as a regulatory instrument, which was inconsistent with the NRC's role under as defined by the NDAA. DOE believed that the Standard Review Plan dictated the methodologies DOE must employ in issuing waste determinations. Specifically, the DOE expressed the concern that the Standard Review Plan created an expectation that the burden was on the DOE to justify its methodologies and approaches if they differed from the methods presented in the Standard Review Plan. This approach paralleled the NRC regulatory approach with licensees who have to justify methods that they employ that differ from NRC methods

and approaches referenced in its guidance. DOE further stated that the tenor of the Standard Review Plan and some of its terminology could lead others to conclude that the Commission was the decision maker rather than the Secretary.

In the final analysis, the NRC believed the consultation process reflected in the Standard Review Plan was consistent with the intent of the NDAA. It provided the basis for the independent and in-depth technical review the NRC would need to perform not only to fulfill its role in consultation but also to discharge its monitoring role, which is subject to judicial review. The NRC, however, did recognize the legitimacy of the DOE concerns regarding the optics of NRC possessing some regulatory role over DOE. In the publication of the interim final draft [35], NRC renamed the document the “NUREG - 1854, NRC STAFF GUIDANCE FOR ACTIVITIES RELATED TO U.S. DEPARTMENT OF ENERGY WASTE DETERMINATIONS, DRAFT FINAL REPORT FOR INTERIM USE.”

EARLY INTERACTION BEFORE WASTE DETERMINATION IS SUBMITTED

Lesson #4 Engage early and frequently prior to initiating the review of a WD

DOE and NRC had begun to implement activities under NDAA using an approach similar to that used for non-NDAA interactions. Under this paradigm, interactions between the staff did not begin in earnest until the WD was submitted. Early interactions on the initial two WD's under NDAA revealed that the two agencies had different views on technical and methodology issues. Consequently, DOE was asked to address methodology questions in the Requests for Additional Information process after the analyses, calculations, and modeling that was based on the methodology was already completed. Since policy approaches and technical methodologies were not discussed up front, DOE had to perform a significant amount of rework and re-analysis in order to address the NRC Requests for Additional Information. This was the source of tremendous inefficiency and significant delay.

Both agencies were committed to achieving the level of protection of human health and the environment required by the NDAA. However, each agency had its own methodologies for how to do the analyses, calculations, modeling associated with radioactive waste disposal. Moreover, some of the fundamental approaches to ensuring safety were diametrically opposed. For example, NRC's approach to long-term performance of a disposal site relies heavily on passive controls. The DOE's approach assumes active disposal site management and active controls for the first 100 years after closure and passive controls beyond that.

DOE and NRC agreed on the importance of early interaction and agency-to-agency meetings to work through the major issues in approach and methodology [33]. Conceptually, the agencies working together prior to a WD being on the table would theoretically provide some efficiency to the review process and possibly reduce the number and complexity of the Requests for Additional Information. Agency-to-agency discussions to resolve approaches and preclude a lot of the rework during the request for additional information phase of consultation is key to reducing the time for each subsequent WD and improving the efficiency.

Both agencies concluded that early interactions and frequent meetings would prove beneficial to both the public and the agencies. Some of the early meetings would undoubtedly fit the criteria established for closed agency-to-agency meetings. However, as discussed above, steps will be taken to keep the public informed of the closed meetings and summaries will be provided.

Conclusions

The NDAA has presented significant challenges for the NRC and DOE. Past and current successes demonstrate that the NDAA can achieve its intended goal of facilitating tank closure at DOE legacy defense waste sites. The NRC believes many of the challenges in performing the WD reviews have been identified and addressed. Lessons learned have been collected and documented throughout the review process. Future success will be contingent on each agencies commitment to consistently apply the lessons learned and continue to create an open and collaborative work environment to maintain the process of continuous improvement.

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