

## **Strategy for Integrating Extended Storage and Transportation Project Plan and Waste Confidence Rule Update Activities**

Staff Requirements Memorandum (SRM)-COMSECY-10-0007, "Project Plan for Regulatory Program Review to Support Extended Storage and Transportation of Spent Nuclear Fuel," dated December 6, 2010, directed U.S. Nuclear Regulatory Commission (NRC) staff to develop a plan to address the integration of the plans for extended storage and transportation (EST) and the waste confidence (WC) update. The Commission also directed the staff to prioritize the main elements of the plan and present a discussion of the impacts on activities that may be deferred because of the WC update. This enclosure presents the main elements of the plans that will be integrated and includes a discussion of the activities that might be deferred because of the WC update.

### ***Status of Extended Storage and Transportation Activities***

The staff is implementing the current EST project plan<sup>1</sup> in accordance with the partial approval in SRM-COMSECY-10-0007. The staff is leveraging and adjusting current research plans, and is performing gap assessments to identify areas of additional research, relative priorities, and potential policy issues that need to be addressed to bolster the technical basis for EST. In parallel, the staff is monitoring national developments in EST activities and has engaged various stakeholder groups through various industry meetings, workshops, public meetings, and conferences.

The staff has used the information from these interactions to identify regulatory and technical issues, and identify important research activities that are needed to bolster the technical basis. The staff plans to hold a public workshop in the summer of 2011 with industry and other groups to solicit input on technical and regulatory issues related to EST challenges. The staff will seek further opportunities to engage specific stakeholders and share technical information to ensure that EST activities are fully informed. Below is a summary of major activities by external organizations that are addressing EST issues of interest to NRC.

The U.S. Department of Energy's (DOE's) Blue Ribbon Commission on America's Nuclear Future (BRC) has established a transportation and storage subcommittee to address whether the United States should change storage practices for spent nuclear fuel (SNF) and high level waste (HLW) while one or more final disposal locations are established. The subcommittee has held several meetings to gather information from various stakeholders. The meetings thus far have addressed many topics, such as the role of storage in U.S. SNF management strategies, technical uncertainties in long-term storage, transportation safety and security issues, storage at decommissioned power reactor sites, and siting and transportation issues associated with potential interim storage facilities. The NRC staff has participated in some of these meetings to provide its perspectives on storage and transportation regulatory issues. The staff also monitors BRC meetings and informs NRC management of strategic and emergent issues. The BRC has also commissioned development of a specific study on SNF and HLW transportation in the

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<sup>1</sup> The "current EST project plan" refers to the staff's "Project Plan for Regulatory Program Review to Support Extended Storage and Transportation of Spent Nuclear Fuel," dated June 15, 2010 (ADAMS Accession No. ML101390216). A high-level EST Regulatory Program (discussed in next section) will integrate EST project plan activities and future WC activities. It is under development and will supersede the current EST project plan, as discussed here within.

United States. The BRC intends to issue draft and final recommendations to the DOE in July 2011 and January 2012. The staff plans to evaluate the studies and recommendations of the BRC, and consider them within the context of EST and WC activities as appropriate.

The Electric Power Research Institute (EPRI) is facilitating its Extended Storage Collaboration Program (ESCP) to review the current technical bases for storage licenses, evaluate ongoing gap analyses, conduct field studies and experiments to address gaps, and promote a dry storage cask demonstration and monitoring program for current storage technologies and high-burnup fuel. Some objectives of the ESCP demonstration program are to develop confirmatory data for long-term aging effects, provide long-lead indicators for any unanticipated phenomena, and develop data necessary to ensure a safe EST capability. The NRC staff regularly participates in ESCP meetings along with EPRI, DOE, utilities, cask vendors, and international participants to share technical information and provide regulatory insights, as appropriate.

DOE's Office of Nuclear Energy is conducting its own analyses to develop a technical basis to support the extension of long-term storage of commercial SNF for up to 300 years with subsequent transportation; the NRC staff believes that these analyses could inform the technical basis for the WC update. The DOE program is divided into four areas: (1) research and development projects focused on the identification and prioritization of technical gaps that need to be addressed to develop the technical arguments for EST; (2) an assessment of the security implications of extended storage and subsequent transportation; (3) an evaluation of the concepts necessary to integrate the research and design work with the security work and to assess options for conducting the research; and (4) an evaluation of the transportation issues in the overall assessment of the management of SNF. The pace of DOE's technical gap assessments is generally consistent with the pace of ongoing NRC regulatory gap assessments. NRC staff frequently communicates with DOE to discuss and share insights on technical and regulatory gaps.

The Nuclear Waste Technical Review Board (NWTRB) is an independent agency that provides scientific and technical oversight of DOE's program for managing and disposing of high-level radioactive waste and spent nuclear fuel. The NWTRB has independently developed a comprehensive report regarding the evaluation of the technical basis for extended dry storage and transportation of SNF. Staff will continue to consider regulatory gaps identified by DOE and NWTRB, and will continue to share information through various forums, as appropriate.

Some countries, such as Japan and Germany, have active national programs to assess extended storage issues with their cask storage technologies. The NRC staff routinely engages with these countries through various forums, such as technical and regulatory conferences, International Atomic Energy Agency consultancy activities, EPRI ESCP meetings, and cooperative agreements. The staff will continue to seek opportunities to share research on common technical issues and to work with international counterparts to support the technical basis of EST.

## ***Integration of Activities into the Extended Storage and Transportation Regulatory Program***

Based on the direction in SRM-COMSECY-10-0007 and SRM-SECY-09-0090, "Final Update of the Commission's Waste Confidence Decision," dated September 15, 2010, the staff will integrate activities into an EST Regulatory Program with two main goals: (1) update the Waste Confidence decision and rule to ensure the continued long-term stability of the generic safety and environmental findings in the rule by developing a NEPA analysis (in this case an EIS) that continues to be informed by current circumstances and scientific knowledge, and (2) enhance the technical and regulatory basis of the existing regulatory framework (i.e., 10 CFR Parts 71, 72, and 73) to identify and resolve technical, environmental, and regulatory issues associated with regulation of SNF for extended periods. Figure 2-1 illustrates how the current EST project plan activities support and align with related analyses needed to support the EIS and WC update. The staff will transform the EST project plan into a high-level EST Regulatory Program with integrated goals, key research objectives and key milestones for both EST and WC activities. The staff will also issue the draft gap assessments and preliminary scope of the EIS (see Enclosure 1) for stakeholder comment in November 2011. The staff will update the EST Regulatory Program and finalize the gap assessment in April 2012. The following discussion describes the major elements of the current EST project plan, and how staff will integrate them with the new WC activities.

### Extended Storage and Transportation Safety Program Review

As described in Section 3.1 of the current EST project plan, the staff is conducting a gap assessment to enhance the technical safety basis for the EST regulatory framework. SNF storage systems may need to perform their intended functions beyond the current license periods of 20 or 40 years. The safety program review focuses on bolstering the technical basis for EST to ensure that the NRC is positioned to regulate the safety of extended storage facilities and extended aging management programs. The technical analyses of cask system performance will initially consider storage periods up to 300 years.

The staff will expand these assessments to examine the relative importance of environmental factors and to identify any additional research and analyses needed for the EIS. The priority and scope of research activities generally will be determined by a combination of (1) the potential impacts of long-term aging phenomena and site environments on SNF and key storage and transportation cask components; (2) the staff's knowledge of aging phenomena and capabilities to monitor and detect long-term degradation; (3) the relative importance of key components in maintaining long-term safety under an enhanced aging management framework; and (4) the potential impacts of significant aging management activities on the environment. Given the close relationship between an enhanced EST aging management regulatory framework and the technical information needed for the EIS, most of the research and analyses are expected to support both goals. However, the staff may adjust the scope and depth of activities in each technical area to address specific objectives of both the WC update and the EST regulatory framework.

Based on the preliminary results of the ongoing EST gap assessments, the staff has identified key areas that should be assessed and is adjusting research plans to address these areas.

These high-priority areas include long-term canister shell and weld integrity, metallic seal and lid bolt integrity, and concrete overpack integrity in various external environmental conditions. These components provide fundamental safety roles in confinement of SNF in normal environmental conditions and accident events.

Evaluation of SNF cladding integrity for extended periods of wet and dry storage modes is also a high priority. Cladding is the primary fission product barrier and should be preserved to the extent practical during the storage and transportation phases of the fuel cycle. However, the staff recognizes that the uncertainty associated with maintaining cladding integrity for extended periods (within spent fuel pools, dry cask storage, and subsequent transportation) may require the consideration of new mitigating solutions to safely manage a large population of fuel. There is limited data regarding the performance of cladding integrity in wet storage modes for periods beyond 60 years. Operational monitoring alone is currently used to identify potential cladding problems during wet storage. The monitoring data may not be sufficient to predict and identify cladding aging effects during extended wet storage, which may impact handling capability and criticality safety over long periods. Embrittlement of high-burnup cladding after long-term storage also may be a limiting condition under current transportation safety requirements.

Research of long-term cask monitoring is also a high priority. This research will provide insights on the detection and mitigation of safety significant degradation during extended periods. As further described in Section 3.1 of the current EST project plan, the staff is participating with DOE, EPRI, and the industry in the initial planning of a long-term cask demonstration and monitoring program (with high burnup fuel). The staff considers this external initiative a high priority activity because it could ultimately validate extrapolations from short-term data to predict long-term behavior. Long-term monitoring may also proactively identify unknown detrimental aging effects before it would become a problem for a large cask population in extended operations.

The staff may identify additional research that is needed to address environmental issues related to alternate disposal and reprocessing scenarios. On-going internal environmental scoping assessments will help the staff determine which research efforts should be completed before finalizing the EIS, and which activities may continue after the EIS is published to fully inform an EST aging management regulatory framework. The staff will revise the specific plan for the WC update if research involving accelerated testing and analyses with bounding assumptions cannot adequately evaluate high-priority safety and environmental issues in the WC update (see Enclosure 1).

#### Extended Storage and Transportation Security and Financial Reviews

As described in Section 3.1 of the current EST project plan, the staff planned to perform a financial gap assessment to identify any financial assurance or financial qualification issues related to EST activities. The financial review is a low priority, and has been deferred until all EST gap assessments (safety and security) are finished, the final BRC recommendations are available, and the WC EIS is more fully developed. As described in Section 3.2 of the current EST project plan, the staff plans to perform a security gap assessment to identify any additional research needs for EST security. This activity is a medium priority, and is currently deferred until completion of the integrated safety and environmental gap assessments, and completion of the ongoing 10 CFR Part 73, "Physical Protection of Plants and Materials," storage rulemaking

activity. Upon completion of these activities, the staff will formulate plans for addressing EST security. In the interim, the staff will address security issues only to the extent they need to be examined as part of the WC update. The staff will later inform the Commission of plans for addressing the EST security and financial issues, as directed in SRM-COMSECY-10-0007.

### Extended Storage and Transportation Environment Program Review

As described in Section 3.3 of the current EST project plan, the staff had planned to conduct an environmental gap assessment for a generic environmental impact statement (GEIS) to directly support EST regulatory enhancements. The current environmental scoping efforts and WC EIS should accomplish some of the objectives of the potential GEIS described in the current EST project plan. However, the WC EIS would not replace any EIS or environmental assessment that may be needed to support specific rule changes or future licensing actions. The staff will defer development of a separate GEIS as currently described in the current EST project plan. The staff will consider the need for additional generic environmental analyses, to directly support a major rule change or a class of major licensing actions (e.g., regional storage facilities), upon completion of the WC EIS.

### Cross-Cutting Strategies

As described in Section 4 of the current EST project plan, the staff plans to consider various cross-cutting strategies, such as risk-informing, international cooperation, codes and standards, state-of-the-art technology incentives, and stakeholder participation. The staff believes these cross-cutting activities will improve the technical basis for EST; will address previous Commission direction<sup>2</sup>; and are necessary to meet other agency strategic objectives. The staff will pursue these activities as resources allow, but generally as lower priority activities. The comprehensive risk-informed and performance-based enhancements (as described in Section 4.1 of the EST project plan) will be deferred in the near term. However, limited risk assessments and associated research activities will be pursued to directly inform the expanded gap assessments and the EIS.

Other cross-cutting strategies—such as international cooperation (in terms of comparing international standards), domestic codes and standards development, and state-of-the-art technology incentives—will also be deferred in the near term to allow the staff to focus on higher priority WC update and EST research activities.

As described in Section 4.5 of the EST project plan, stakeholder participation remains paramount in developing the technical basis for EST and the WC update and is a very high priority activity. The staff will adjust communication plans and continue to engage various stakeholders for both EST framework and WC update activities.

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<sup>2</sup> COMDEK-09-0001, “Revisiting the Paradigm for Spent Fuel Storage and Transportation Regulatory Programs,” dated August 9, 2009.

***Prioritization of the Extended Storage and Transportation Project Plan and Waste Confidence Update Activities***

Table 2-1 further specifies the relative priorities of major elements of the current EST project plan and future WC update activities that are known at this time. The new EST Regulatory Program will be developed to implement the activities within the scheme of the relative priorities and the timeframe for completing the WC update and EST framework updates with available resources. The staff will periodically adjust the relative priorities as gap assessments are completed, and new information becomes available through NRC research and the initiatives of external organizations.

The new WC activities were not budgeted for fiscal year (FY) 2011 and FY 2012. The staff will realign available resources for the current EST project plan to focus on both EST and WC update activities, according to relative priority. In general, high-priority and medium-priority activities need to be completed to achieve the main goals of the EST Regulatory Program. The staff will pursue high-priority activities first within the shortest feasible timeframe, given available resources. The staff will pursue medium-priority activities in parallel, but resource availability could affect the start times and pace of activities. Low-priority activities are important to EST Regulatory Program goals, but may not be essential to the WC update. Low-priority activities will be deferred or reduced in scope as a result of any resource constraints or competing need to complete high- and medium-priority activities.

Enclosure 3 discusses projected resource needs and future budget planning. The addition of high-priority WC activities to existing EST activities within the current budgets for FY 2011 and FY 2012 (without additional funding) will result in the following impacts on current EST Regulatory Program activities: (1) some high-priority research and analyses in FY 2012 will start as soon as possible, but may initially progress at a slower pace; (2) some medium-priority research and analyses in FY 2012 may be delayed until FY 2013; and (3) low-priority EST activities will likely be deferred until FY 2013 or FY 2014.

**Table 2-1 Prioritization of the EST Regulatory Program  
(Elements of Current EST Project Plan and New WC Update Activities)**

<b>Activity</b>	<b>Priority</b>	<b>Basis</b>
<b>Integrated EST/WC Gap Assessment</b>	<b>High</b>	Safety and WC EIS gap assessment and scoping activities are high priority. These activities are necessary to identify additional research and analytical needs to develop the WC update and enhance the EST regulatory basis. (Financial and security gap assessments are currently deferred)
Draft Gap Assessment(s) for Comment	High	
Final Gap Assessment	High	
<b>Supporting Research and Analyses</b>	<b>High to Low</b>	The staff has identified research activities on canister integrity, seals and bolts, structural concrete, cladding integrity, and environmental conditions as high-priority activities based on preliminary results from NRC and DOE gap studies. The staff intends to expand ongoing research in these areas to support the technical basis for an enhanced EST framework and to inform the WC update in a timely manner. Progress on a cask demonstration program to provide long-term data on cask performance is a high priority.  Other storage and transportation components, reprocessing, and alternate disposal technical issues have a medium or low priority. For planning purposes, they are expected to require further analyses to inform potential scenarios in the EIS. These activities will be prioritized at the completion of the draft integrated gap assessments. Other research activities may be important to the EST regulatory basis, but are not as essential for the EIS, and are tentatively considered medium priorities.
Canister Confinement Boundary	High	
Seals and Bolts	High	
Concrete Overpack	High	
High-Burnup Fuel Integrity	High	
Neutron Absorbers	Medium	
Other Cask Components	Low	
Long-Term Cask Monitoring Needs	High	
Site Environmental Conditions (EIS)	High	
Reprocessing Issues (EIS)	Low	
Alternate Disposal Issues (EIS)	Low	
Limited Risk Assessments (EIS)	Medium	
U.S. Cask Demonstration Program	High	
International Research Coordination	Medium	
Stakeholder Participation	High	
<b>WC Rule</b>	<b>High</b>	Development of the WC update is designated as a high-priority rulemaking, per SRM-SECY-09-0090.
EIS Prescoping Assessments	High	
EIS Public Scoping Process	High	
Final EIS and Generic Safety Findings	High	
Updated Waste Confidence Rule	High	
<b>EST Regulatory Basis Development</b>	<b>Medium to Low</b>	Development of an enhanced regulatory basis for EST rulemaking is important, but generally a medium priority compared to the priority of the WC update. Additional activities, such as international cooperation on regulations and enhanced codes and standards, address previous Commission direction in COMDEK-09-0001 and are important in meeting other agency strategic objectives; but are generally not essential for developing the WC update and near-term EST needs.
Updated EST Guidance	Medium	
Rulemaking Regulatory Basis (if needed)	Medium	
Risk-Informed Enhancements	Medium	
International Cooperation	Low	
Enhanced Codes and Standards	Low	
Security Program Review	Medium	
Financial Assurance Review	Low	

**Figure 2-1 Extended Storage and Transportation Regulatory Program**

