

## STAFF RESPONSES TO COMMISSION'S QUESTIONS IN SRM-SECY-11-0163

Staff's responses to the Commission's questions in Staff Requirements Memorandum (SRM), "Staff Requirements-SECY-11-0163—Reprocessing Rulemaking: Draft Regulatory Basis and Path Forward," dated August 30, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML122430189) are provided below. Staff listed the questions in the order in which they appear in the introductory paragraph and bulleted items within SRM-SECY-11-0163.

### 1. Provide staff's assessment of current state of activity and U.S. Department of Energy and industry plans regarding reprocessing.

Staff's understanding of the U.S. Department of Energy's current state of activity is that the Department continues its long-term research and development program that includes reprocessing technologies with a goal of achieving a safe, proliferation-resistant, closed fuel cycle, using fast-spectrum reactors. For example, the U.S. Department of Energy continues to expend effort in developing advanced methods for separating spent nuclear fuel, capturing fission gases, and generating robust (degradation resistant) high-level waste forms. The Department of Energy's program is consistent with the Blue Ribbon Commission on America's Nuclear Future recommendations discussed in Chapter 11, "Advanced Reactor and Fuel Cycle Technologies," of its January 2012 report to the Secretary of Energy ([www.brc.gov](http://www.brc.gov)). The Blue Ribbon Commission report highlighted proliferation and economic issues with reprocessing technologies. In addition, the Blue Ribbon Commission report stated that, "a well-designed Federal [Research, Design, and Development] program is critical to enabling the [United States] to regain its role as the global leader of nuclear technology innovation and should be attentive to...[l]onger-term efforts to advance potential 'gamechanging' nuclear technologies and systems that could achieve very large benefits across multiple evaluation criteria compared to current technologies and systems. Examples might include fast-spectrum reactors demonstrating passive safety characteristics that are capable of continuous actinide recycling and that use uranium more efficiently."

Staff's assessment of industry planning by the vendors (i.e., AREVA, EnergySolutions, General Electric-Hitachi Nuclear Energy, and Westinghouse Electric Company) is that they are developing reprocessing strategies as part of an integrated fuel management strategy that includes research, development, and demonstration of advanced fuel utilization and recycling technologies. Industry is pursuing long-range reprocessing strategies and has indicated that a clear and stable reprocessing regulatory framework is important in rendering business decisions on implementing fuel management strategies. The following is a list of recent communications from industry and the Nuclear Energy Institute to the U.S. Nuclear Regulatory Commission (NRC) regarding their plans for reprocessing:

AREVA: On October 23, 2012 (ADAMS Accession No. ML12298A318), AREVA stated that it is developing, along with Eddy Lea Energy Alliance, the concept of a used nuclear fuel consolidated storage facility in southwestern New Mexico that would include recycling spent nuclear fuel. AREVA also stated that it plans to submit a license application for a recycling facility in 2019 once the regulatory framework is established.

On April 20, 2012 (ADAMS Accession No. ML121640512), AREVA commended the NRC staff for its progress on reprocessing rulemaking activities. AREVA encouraged the NRC to continue its activities to develop a reprocessing regulatory framework under potential Title 10 of the *Code of Federal Regulations* (10 CFR) Part 7x in a timely manner.

EnergySolutions LLC: On January 10, 2013 (ADAMS Accession No. ML13016A043), EnergySolutions stated that it is very keen to continue to take an active part in setting up one or more consolidated storage facilities for used nuclear fuel in the United States and the pursuit of reprocessing. EnergySolutions also stated that it supported the continuation of a rulemaking for the creation of a 10 CFR Part 7x.

General Electric-Hitachi Nuclear Energy: On March 24, 2011 (ADAMS Accession No. ML11125A069), General Electric-Hitachi Nuclear Energy (GE-Hitachi) expressed continued commitment to its power reactor innovative small modular/advanced recycling center technology (electrochemical separation process) and its support for a revised regulatory framework for reprocessing.

Westinghouse Electric Company: On June 28, 2011 (ADAMS Accession No. ML11200A157), Westinghouse Electric Company stated its support for a revised rule to identify the regulatory requirements that any future reprocessing facility (i.e., production facility) will have to meet, and that can be used to guide its research and development activities.

Nuclear Energy Institute: On November 7, 2012 (ADAMS Accession No. ML12312A096), the Nuclear Energy Institute stated that rulemaking is important because industry must consider the regulatory framework for reprocessing in making business decisions about whether or not to move forward and encouraged the NRC to move forward with the reprocessing rulemaking.

**2. Provide recommendations regarding the need for continued effort to develop a rule.**

Industry is pursuing long-range reprocessing strategies and has indicated that a clear and stable reprocessing regulatory framework is needed. Continued development of a revised regulatory framework and a new rule, 10 CFR Part 7x, for licensing a commercial reprocessing facility would be beneficial because existing regulations do not efficiently and effectively address unique issues associated with reprocessing and their use may lead to significant regulatory uncertainties. A new 10 CFR Part 7x for licensing a reprocessing facility would allow development of technology-neutral requirements. A new, reprocessing-specific regulation would provide the most efficient and effective approach to licensing and regulating a reprocessing facility. In addition, continued development of the regulatory basis would leverage the staff's current knowledge of reprocessing technologies and coordination with DOE, as well as influence international standards to enhance safety, security, environmental protection, and safeguards for reprocessing.

**3. Provide anticipated schedule and resources required to complete the rule.**

The anticipated schedule and resources required to complete the rule are provided in Enclosure 2, "Estimated Time and Resources."

**4. Provide an appropriate range of options for rulemaking.**

In the draft regulatory basis, staff described four potential options for developing a regulatory framework for licensing a reprocessing facility. One of the four options would not require rulemaking. The four options are summarized in the body of this Commission paper. The pros and cons for the four options are provided below.

**Options**

Regardless of which one of the four options the Commission approves, the following tasks would need to be performed: (a) assuring compliance with operator licensing and technical specifications; (b) developing requirements to deal with worker protection from radiological and chemical hazards and accidents; (c) developing applicable regulatory guidance; (d) resolving regulatory gaps; (e) developing a standard review plan; (f) conducting an environmental review; (g) updating the policy statement on reprocessing in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” Appendix F, “Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities”; (h) assuring conformance with Commission policies and practices; (i) incorporating appropriate safeguards requirements; and (j) developing general design criteria specific to reprocessing facilities. All options are comparable in resource needs.

Option 1: Use existing 10 CFR Part 50.

Pros:

- Maintains the status quo.
- Uses one regulation for both reactor and reprocessing facilities.
- Uses a subset of requirements in 10 CFR Part 50 for production facilities that is still applicable for reprocessing facilities. For example, Appendix F to 10 CFR Part 50 focuses on reprocessing facilities.

Cons:

- 10 CFR Part 50 does not provide a complete and up-to-date regulatory framework addressing all safety and safeguards issues related to reprocessing.
- Licensing under the existing 10 CFR Part 50 may increase uncertainties to existing and future reactor licensees, and, as stated by the Advisory Committee on Reactor Safeguards when developing 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” rulemaking, “[10 CFR] Part 50 is already confusing because it is a multipurpose regulation that includes power reactors, nonpower reactors, and fuel cycle facilities” [ADAMS Accession No. [ML003707808](#)].
- Licensing a reprocessing facility may require orders, exemptions, and license conditions to effectively address the regulatory gaps.
- The design and operational safety and safeguards issues associated with a commercial reprocessing facility would be very different from design and operational safety and safeguards issues associated with a light-water reactor.
- 10 CFR Part 50 does not have emergency management requirements appropriate for reprocessing facilities.
- Adding to 10 CFR Part 50 may unnecessarily complicate existing 10 CFR Part 50 licensing and oversight programs.
- 10 CFR Part 50 does not effectively address chemical impacts to workers and the public from potential accidents.
- 10 CFR Part 50 does not effectively address potential accidents such as inadvertent criticality events that can have immediate acute radiological impacts on workers.

Option 2: Modify 10 CFR Part 50.

Pros:

- Uses one regulation for both reactor and reprocessing facilities.
- Uses a subset of requirements in 10 CFR Part 50 for production facilities that is still applicable for reprocessing facilities.
- Eliminates the need for licensing by exemptions and orders.

Cons:

- Updates to 10 CFR Part 50 may increase uncertainties to existing and future reactor licensees, and, as stated by the Advisory Committee on Reactor Safeguards when developing 10 CFR Part 52 rulemaking, “[10 CFR] Part 50 is already confusing because it is a multipurpose regulation that includes power reactors, nonpower reactors, and fuel cycle facilities” (ADAMS Accession No. [ML003707808](#)).
- Updating 10 CFR Part 50 may unnecessarily complicate existing 10 CFR Part 50 licensing and oversight programs.

Option 3: Modify 10 CFR Part 70, “Domestic Licensing of Special Nuclear Material.”

Pros:

- The existing safety approach in 10 CFR Part 70 for a special nuclear materials processing facility could be extended to a spent nuclear fuel reprocessing facility consistent with Commission views in SRM-SECY-07-0081, which envisioned regulations specific to reprocessing being developed under 10 CFR Part 70, while 10 CFR Part 50 remains focused on nuclear reactor safety.
- 10 CFR Part 70 implements a risk-informed approach to safety of workers, members of the public, and the environment from accidents that can result in both radiological and chemical impacts. This approach could be extended to reprocessing facilities.

Cons:

- 10 CFR Part 70 encompasses a broad range of fuel cycle facilities, the hazards of which are significantly less than in a reprocessing facility. Specifically, existing fuel cycle facilities do not process large quantities of materials consisting of fission products and transuranic radionuclides. Therefore, incorporating more stringent requirements for reprocessing facilities may unnecessarily complicate existing 10 CFR Part 70 licensing and oversight.
- The NRC did not develop 10 CFR Part 70 for licensing and regulating a reprocessing facility. 10 CFR Part 70 currently does not effectively address specific hazards related to reprocessing facilities.
- 10 CFR Part 70 does not effectively address requirements for operator licensing and technical specifications.

Option 4: Develop New 10 CFR Part 7x (Recommended).

Pros:

- Does not add to complexities of existing multipurpose regulations and associated licensing and oversight programs.
- Uses applicable requirements from 10 CFR Part 50, 10 CFR Part 70, and other applicable regulations to develop an integrated regulatory framework that addresses the specific safety and safeguards needs of a reprocessing facility.
- Provides greater transparency and regulatory certainty for stakeholders because it would be a single source for all regulatory requirements applicable to spent nuclear fuel reprocessing licenses.

Cons:

- No significant negative attributes were identified, when compared to Options 1, 2, and 3.

**5. Provide staff's estimate of the resources and time that would be needed to complete a reprocessing license application review using the current framework in 10 CFR Part 50.**

Staff's estimate of the resources and time that would be needed to complete a reprocessing license application review using the current framework in 10 CFR Part 50 is provided in Enclosure 2.

**6. Provide the pros and cons of completing a reprocessing license application review using the current framework in 10 CFR Part 50.**

The pros and cons for completing a reprocessing facility license application review using the current framework in 10 CFR Part 50 are provided in the response to Question 4 above.

**7. Provide staff's assessment and recommendation regarding whether a PRA-based or qualitative risk assessment methodology should be applied.**

Staff continues to identify and assess risk assessment options in its review of Gap 5, "Safety and Risk Assessment Methodologies and Considerations for a Reprocessing Facility." A probabilistic risk assessment-based methodology may be applied to aid in assuring public health and safety. An area where quantitative methods could apply is radiological and chemical accidents that can significantly impact public health and safety. In addition, the use of integrated safety analysis methods may be applied to accidents of lesser impact. Integrated safety analysis methods for worker safety could include an appropriate mix of qualitative and quantitative methods as addressed in NUREG-1513, "Integrated Safety Analysis Guidance Document," dated May 2001, and other guidance. These approaches would enable staff to do the following: Risk-inform programs, such as in-service inspections, technical specifications, and backfit analyses; incorporate risk insights into the design process of a facility; and risk-inform items relied on for safety. Given budgetary constraints, staff has placed priority on reviewing Gap 5 in fiscal year 2013. With the constraints associated with current resource levels, this review will continue into fiscal year 2017.

**8. For the identified gaps and other issues identified by the staff as Commission policy decisions (such as the definition of Waste Incidental to Reprocessing),**

**provide the pros and cons of various approaches along with the staff's recommendation.**

Given budgetary constraints, staff has placed priority on analyzing Gap 5 in fiscal year 2013. Consequently, staff has not identified any gaps or other issues ready for Commission policy decisions. In fiscal year 2013, staff focused its limited resources on Gap 5, "Safety and Risk Assessment Methodologies and Considerations for a Reprocessing Facility." Staff's review of Gap 5 is not completed and staff did not review the remaining regulatory gaps. Further development of the pros and cons would be needed.

**9. Provide the rationale for any recommendations that differ from previous Commission policy or agency precedent.**

Staff has not identified any recommendations that differ from previous Commission policy or agency precedent. Staff will continue to comply with existing Commission policies and agency precedent and will submit policy issues to the Commission as they are identified and become ready for decision.

**10. Provide how the staff's activities are being integrated with other federal government activities related to reprocessing.**

Staff continues to develop technical expertise in advanced nuclear fuel cycle technologies. To accomplish this, staff is learning from foreign experience where reprocessing is operational, under construction, or being considered, and from interactions with industry. Other insights are obtained by monitoring the U.S. Department of Energy and the U.S. Environmental Protection Agency programs that impact or address existing and advanced fuel cycle facilities. Under a memorandum of understanding (ADAMS Accession No. ML071210153), the U.S. Department of Energy and the NRC established an interagency agreement that promotes the exchange of technical information on advanced fuel cycles. The U.S. Department of Energy reimburses the NRC under the interagency agreement to conduct technical information exchanges and to provide the U.S. Department of Energy with regulatory insights on its advanced fuel cycle research and development activities. Technological insights from the interagency agreement activities have benefitted the staff's understanding of advanced reprocessing design and hazards, including fuel cycle facility security and safeguards issues. The agreement does not apply to rulemaking or other regulatory-setting activities, which are authorized activities for the NRC under current statutes.

Staff remains engaged with the U.S. Environmental Protection Agency as the EPA considers revising Title 40, "Protection of Environment," of the *Code of Federal Regulations* (40 CFR) Part 190, "Environmental Protection Standards for Nuclear Power Operations." Regulations under 10 CFR Part 20, "Standards for Protection Against Radiation," incorporate the requirements of 40 CFR Part 190 by reference. The staff has held discussions with the U.S. Environmental Protection Agency on the Agency's development of an advance notice of proposed rulemaking for 40 CFR 190. The advance notice of proposed rulemaking is anticipated to be issued later this year for public comment.

**11. Prioritize those gaps that are not ripe for Commission decision and provide staff's plan including resources and timeframes to seek Commission direction for each gap.**

Gap 1 is ready for Commission decision while the remaining regulatory gaps require additional staff review and are not ready for Commission decision. In the draft regulatory basis, staff defined high-priority regulatory gaps as those that must be addressed to establish an effective and efficient regulatory framework. Staff defined moderate-priority regulatory gaps as those that are not essential to be addressed at this stage. Staff will request feedback from the Advisory Committee on Reactor Safeguards and stakeholders before submitting regulatory gaps to the Commission for decision. Staff's plan to seek Commission direction for each gap, including estimated resources and timeframes, are provided in Enclosure 2.

**12. Identify which gaps would be evaluated in fiscal year 13/14 and identify the resources needed to complete the analysis as well as the development of a proposed rule if the Commission approved proceeding to rulemaking.**

As discussed in Question 8 above, staff has placed priority on analyzing Gap 5 in fiscal year 2013. At current resource levels, this analysis will continue into fiscal year 2017. Staff's estimate of resources for completing the analysis for Gap 5 and development of a proposed rule, if the Commission approves proceeding to rulemaking, is provided in Enclosure 2.

**13. If direction is received from Congress that reflects a national policy that should be considered in the staff's evaluation, the Commission should be notified of any impacts to the preparation of the vote paper.**

If Congress issues direction that reflects a national policy that the agency should consider in its evaluation, staff will notify the Commission of any impact to the preparation of this vote paper.