Technical Basis for Amending Title 10 of the Code Federal Regulations Part 40 To Establish Integrated Safety Analysis Requirements for Uranium Conversion and Deconversion Facilities

Background

During a Commission briefing on March 8, 2007, the Office of Nuclear Material Safety and Safeguards stated that it anticipates that the agency will receive license applications from commercial entities within the near term for new uranium conversion and depleted uranium deconversion facilities. For example, during the licensing proceeding for the Louisiana Energy Services (LES) uranium enrichment project, LES indicated that it would prefer to use commercial deconversion and disposal firms as its preferred option for the disposition of depleted uranium generated during its enrichment operations. LES has a memorandum of understanding with Areva Enterprises, Inc. (AREVA), to license and construct a deconversion plant. At this time, neither LES nor AREVA has formally announced plans for such a facility.

Other entities have also expressed interest in expanding uranium conversion capacity to meet future demand. These entities may also be considering the technical advantages of combining both uranium conversion and depleted uranium deconversion activities at a single plant. Plants that combine conversion and deconversion operations would be able to recycle the fluorine (F) from the chemical processes. At this time, only one company, International Isotopes, Inc., has expressed interest in building such a facility. The firm stated in a letter of intent to the NRC that it intends to construct the first commercial deconversion facility in the United States. The NRC expects to receive a license application for a full scale facility in 2009.

The health and safety risks at uranium conversion and depleted uranium deconversion operations are primarily chemical in nature from the use of hydrogen fluoride (HF), which is a highly reactive and corrosive chemical that presents a substantial inhalation and skin absorption hazard to workers and the public. Because of the large quantities of HF on site, unit operations and material handling must be tightly controlled to minimize a hazardous work environment and danger to offsite residents.

Based on safety concerns raised in a February 22, 2007, briefing, the Commission issued Staff Requirements Memorandum (SRM) M070308B (Agencywide Documents Access and Management System (ADAMS) Accession No. ML070820023) on March 22, 2007, directing the staff to propose options for rulemaking that would require conversion and deconversion facilities to complete an integrated safety analysis (ISA) similar to that currently required in Subpart H, "Additional Requirements for Certain Licensees Authorized To Possess a Critical Mass of Special Nuclear Material," of Title 10, Part 70, "Domestic Licensing of Special Nuclear Material," of the *Code of Federal Regulations* (10 CFR Part 70).

On August 24, 2007, in SECY-07-0146, "Regulatory Options for Licensing New Uranium Conversion and Depleted Uranium Deconversion Facilities" (ADAMS Accession No. ML071700584), the NRC staff recommended that the Commission do the following:

1. Approve keeping the Starmet and Aerojet Ordnance facilities under Agreement State jurisdiction and, if similar new facilities are proposed in Agreement States in the future, NRC would retain jurisdiction of only those facilities that exceed the threshold quantity limits discussed below in Recommendation 2.

2. Approve conducting a rulemaking in accordance with the prioritization of the rulemaking action plan, to amend Part 40, to require new applicants and existing licensees for conversion and deconversion facilities with uranium hexafluoride (UF_6) or uranium tetrafluoride (UF_4) inventories greater than 10,000 kg (or alternative threshold quantity) and HF inventories greater than 1,000 Pounds (or alternate threshold quantity) to meet similar requirements, as required in Part 70, Subpart H. These requirements would not apply to existing facilities currently undergoing decommissioning. If new applicants submit license applications before the completion of the rulemaking, the NRC would issue orders establishing the Part 70, Subpart H, performance requirements as part of the licensing basis for the application review.

Other alternatives presented in SECY-07-0146 included: (1) issuing orders imposing the 10 CFR Part 70, Subpart H, performance requirements in lieu of rulemaking; and (2) not taking any action in rulemaking or issuing orders. The staff did not recommend these alternatives.

In SRM-SECY-07-0146 (ADAMS Accession No. ML072830536), dated October 10, 2007, the Commission accepted the staff recommendations. In addition, the SRM stated the following:

> Prior to developing the proposed rule, the staff should conduct a workshop with stakeholders and invite comment on the appropriateness of the staff's proposed threshold limits for determining when a facility will be regulated by the NRC or an Agreement State.

Stakeholder Interactions in Developing the Technical Basis

The NRC held a public meeting on February 22, 2008, at NRC Headquarters in Rockville, Maryland, to discuss the scope of the proposed rulemaking and to seek industry input on the proposed threshold quantities of hazardous material that would trigger NRC oversight of a facility. The agency announced the meeting on the NRC Web site as well as in a press release sent out by the Office of Public Affairs. The major stakeholders that would be impacted attended the meeting, either in person at NRC Headquarters or via teleconference. The meeting followed a workshop format, and representatives from stakeholders such as Honeywell and NEI gave presentations. All participants also were encouraged to send in written comments within 30 days.

NEI and Honeywell submitted similar written comments and concerns. Both supported the NRC taking regulatory control of new conversion/deconversion facilities whether or not they were located in an Agreement State. They also supported the concept of threshold quantities to determine if requirements analogous to 10 CFR Part 70, Subpart H, should be required for new licensees. However, neither supported implementing the proposed new requirements analogous to 10 CFR Part 70, Subpart H, at existing facilities.

The commenter expressed the opinion that the NRC's mission is to protect public health and safety from the effects of radiological materials and not from chemical hazards. Both noted that 10 CFR Part 70, Subpart H, focuses on preventing criticality concerns and assessing and mitigating the radiological risk of facility operations. They felt that the primary health and safety concerns from licensed operations are chemical in nature, and since chemical concerns are not the mission of the NRC, the ISA should be narrowly focused to deal only with radiological concerns.

Within its written comments, Honeywell noted that it has already voluntarily submitted a risk-based ISA in support of its license renewal, an effort that it only just completed, and observed that the plant has only been operating under the provisions of the ISA since November 2007. It stated that this period has been too short to assess the effectiveness of the current ISA. Therefore, the NRC should not proceed with any rulemaking that would require Honeywell to reassess its current ISA until it has had several years to determine whether the current ISA is adequate.

The staff has taken these comments into consideration, but has decided to move forward as planned.

Rationale for Changing the Regulation

There is a heightened threat of sabotage and terrorist attacks at nuclear facilities after the events of September 11, 2001. Based on this increased threat, the NRC issued advisories, letters, and orders to increase security at nuclear facilities (including conversion facilities) to prevent such attacks. Conversion and deconversion facilities not only handle radioactive source material but also large volumes of hazardous chemicals that are involved in processing the nuclear material. The complex procedural operations at these facilities involve hazardous chemicals as well as nuclear material, making it difficult to separate the additional common defense and security requirements from the program requirements designed to protect public health and safety. The NRC is the only regulatory agency, under the Atomic Energy Act (AEA), that could implement such a unified program.

Historically, the NRC has regulated uranium conversion facilities in the United States. For example, the NRC retained regulatory authority over the Allied Chemical UF_6 conversion plant (now known as the Honeywell plant in Metropolis, Illinois) when Illinois became an Agreement State in 1987. The NRC declined the State's request to regulate the facility because of its potential significance to the common defense and security. In addition, the NRC regulated the Sequoyah Fuels Corporation conversion plant, which is currently in decommissioning.

In SRM-M070308B, the Commission stated that the NRC would regulate future major fuel cycle facilities licensed under 10 CFR Part 40, "Domestic Licensing of Source Material" (e.g., uranium conversion and deconversion facilities). On April 13, 2007, the NRC staff informed the Agreement States of that decision (ADAMS Accession No. ML071030304). In an April 27, 2007, letter (ADAMS Accession No. ML071280354), the U.S. Department of Energy expressed support for the NRC's policy decision to retain licensing jurisdiction of uranium conversion and depleted uranium deconversion facilities located in Agreement States.

Based on the Commission directive and consistent with the approach taken in the past, the NRC would apply its regulatory authority on a facility-wide basis to avoid dual regulation of the facility in an Agreement State. Therefore, the NRC would retain regulatory authority over all applications of source, byproduct, and special nuclear material (e.g., use of sealed sources in gauges and for instrument calibration) at new conversion and deconversion facilities. Existing fuel cycle facilities that have Agreement State licenses for the storage of depleted uranium and the use of sealed sources in gauges would not be affected because no adverse impacts have been identified in the existing programs.

The current regulations in 10 CFR Part 40 do not have specific, risk-informed requirements that address accident requirements analogous to those in 10 CFR Part 70, Subpart H. Because uranium conversion and depleted uranium deconversion facilities would be licensed under 10 CFR Part 40, an applicant would not be required to comply with the performance requirements in 10 CFR Part 70. However, because of the unique and significant hazards at

these facilities, the NRC staff considers that similar requirements are necessary for an ISA under 10 CFR Part 40 based on a structured, risk-informed approach for evaluating the consequences of facility accidents. Implementing this approach would establish a structured set of requirements for conversion and deconversion facilities that would be similar to the licensing requirements that fuel fabrication and enrichment facilities are already required to meet.

Technical Basis for Changing the Regulation

As it currently exists, 10 CFR Part 40 is deficient for the regulatory oversight of new conversion/deconversion facilities for the following reasons:

- It was founded for the control of a valuable and strategic material (i.e., uranium). This fact was central to the definition of nuclear material in the 1946 AEA.

- Radiation protection and chemical safety were not central to the 1946 AEA.

- The definitions of fissionable special nuclear material, both source and byproduct materials, are based on security and not safety.

- The current requirements of 10 CFR Part 40 do not represent a risk-informed approach to regulation.

Uranium conversion and deconversion facilities not only handle radioactive source material but also large volumes of hazardous chemicals that are involved in processing the nuclear material. Thus, the health and safety risks at uranium conversion and depleted uranium deconversion operations are primarily chemical in nature. In particular, one chemical, HF, has a significant potential for offsite consequences. HF is a highly reactive and corrosive chemical that presents a substantial inhalation and skin absorption hazard to both workers and the public. Because of the large quantities of HF on site, unit operations and material handling must be tightly controlled to minimize a hazardous work environment and the danger to offsite residents. The current 10 CFR Part 40 does not have specific, risk-informed requirements that address accident requirements (that are analogous to those in 10 CFR Part 70, Subpart H), and yet many fuel cycle facilities, whether regulated under 10 CFR Part 70 or 10 CFR Part 40, have similar hazards.

Because of the unique and significant hazards at conversion/deconversion facilities, the NRC staff considers an ISA as a structured, risk-informed approach for evaluating the consequences of facility accidents. Implementing this approach would establish requirements for conversion and deconversion facilities that would be similar to the licensing requirements that other fuel fabrication and enrichment facilities are already required to meet. It should be noted that the Honeywell uranium conversion facility has voluntarily prepared an ISA for its facility as a means of defining accidents for its emergency plan.

Lastly, the ISA is a living document that is continually updated. The practice of allowing a maximum license term of 10 years would be replaced with a license term analogous to that allowed in 10 CFR Part 70, which is a maximum of 40 years.

In SRM-SECY-07-0146, the Commission accepted the staff recommendations to amend 10 CFR Part 40 to require new applicants and existing licensees for conversion and deconversion facilities with UF_6 or UF_4 inventories greater than 10,000 kilograms (or alternative threshold quantity) and HF inventories greater than 454 kg (1000 lbs) (or alternate threshold quantity) to meet similar requirements, as stipulated in 10 CFR Part 70, Subpart H. These

requirements would not apply to existing facilities currently undergoing decommissioning. If new applicants submit license applications before completion of the rulemaking, the NRC would issue orders establishing the 10 CFR Part 70, Subpart H, performance requirements as part of the licensing basis for the application review.

In order to establish a risk-informed basis for the rulemaking and to establish within 10 CFR Part 40 requirements analogous to those of 10 CFR Part 70, Subpart H, the staff recommends a source material threshold quantity of 5000 kilograms of UF_6 or UF_4 and a quantity threshold of 454 kg (1000 lbs) of HF. This is a reduction from the recommendation of 10,000 kilograms of UF_6 or UF_4 in SECY-07-0146. The reduction is proposed because the original logic considered the HF produced because of an accident involving a UF_6 storage or transport package. Five thousand kilograms of UF_6 will produce about 454 kg (1000 lbs) of HF, which is analogous to the U.S. Environmental Protection Agency threshold within the process safety management rule.

This will impose requirements analogous to those of 10 CFR Part 70, Subpart H, on any new facilities as well as to existing operating facilities that have quantities of material that exceed the threshold quantities. It would not apply to facilities undergoing decommissioning.

Current Agreement State Licensed Facilities

Three 10 CFR Part 40 facilities located in Agreement States deconvert UF_6 or UF_4 into uranium metal. They are the Starmet facility in Concord, Massachusetts (formerly the Nuclear Metals site); the Starmet facility in Barnwell, South Carolina; and the Aerojet Ordnance facility in Jonesborough, Tennessee. The two Starmet facilities are currently undergoing decommissioning. The Aerojet Ordnance facility fabricates depleted uranium metal for U.S. Army antitank rounds from depleted UF_4 using a magnesium-thermite reduction reaction and by recycling depleted uranium metal. The magnesium-thermite reduction reaction produces uranium metal and solid magnesium fluoride with only traces of HF gas. These sites do not represent a significant public hazard because the Starmet facilities are no longer in operation and the Aerojet Ordnance facility does not produce significant quantities of HF or F as reaction products.

Because of the low hazards at these Agreement State facilities, the Commission, in SRM-SECY-07-0146, accepted the NRC staff's recommendation to continue the Starmet and Aerojet Ordnance facilities under Agreement State jurisdiction, and, if similar new facilities are proposed in Agreement States in the future, the NRC would retain jurisdiction of only those facilities that exceed the threshold quantity limits discussed above.

Backfitting

Backfitting of the regulations on any licensed facility requires consideration of the following:

1) Change in staff position or rule that requires a change in Structures, Systems, and Components, procedures or organization;

2) Staff to qualitatively (non-monetarily) determine value of safety/safeguards improvement (NUREG/BR-0058 "net benefits" approach);

3) Other factors such as public confidence should also be taken into consideration in backfitting analyses; and

4) 10 CFR Part 70 backfitting guidance was issued in the form of an updated NMSS Policy and Procedural Letter (P&PL)1-82 in March 2004 (ML040980122).

This policy should be followed in the application of backfitting to current 10 CFR Part 40 licensees whose operations would be considered greater than "Low Risk".

As noted above, in its license renewal application, which the NRC approved on May 11, 2007, the Honeywell uranium conversion facility voluntarily prepared an ISA to define accidents for its emergency plan. However, 10 CFR Part 40 did not require this action for licensing. In its ISA and associated license renewal application, Honeywell incorporated commitments similar to the requirements of 10 CFR Part 70, Subpart H, such as establishing management measures, establishing a configuration management system, following a facility change process, and annually reporting facility and ISA changes. Honeywell did not commit to additional event reporting requirements or baseline design criteria. However, after taking their comments into consideration, staff considers that the risk to public health and safety warrant the implementation of the ISA and other regulatory requirements, covered in this technical basis onto Honeywell.

International Isotopes, Inc., is an uranium deconversion facility located in Idaho Falls, Idaho, and has a possession limit of 6000 kilograms of source material (uranium). The licensee uses a process that separates the F from depleted UF_4 (green salt) for the production of germanium fluoride and other compounds for use in the computer chip industry. Because of the limited operations and limited quantities of licensed material, the staff considers this to be a low-risk facility from a health and safety perspective. This licensee made no commitments to prepare an ISA, however, they could request an amendment to reduce their possession limit and thus avoid the ISA requirements of this rulemaking.

The Starmet facilities and the Aerojet Ordnance facility are currently licensed by Agreement States and are low-risk facilities.

Specific Issues To Consider in the Rulemaking

The NRC staff has identified four licensing issues for consideration within the rulemaking:

(1) The first issue is the mechanism by which the NRC should assert licensing jurisdiction over facilities that may be proposed in Agreement States.

(2) The second issue is how best to impose performance requirements equivalent to those in 10 CFR Part 70, Subpart H, for new uranium conversion and depleted uranium deconversion facilities.

(3) The third issue is whether performance requirements analogous to those of 10 CFR Part 70, Subpart H, should be imposed on the existing facilities (e.g., the Honeywell uranium conversion facility in Metropolis, Illinois). This section would also address the establishment of a screening mechanism for facilities that takes into consideration low-risk facilities that would not be required to comply with this enhanced rule. Examples include the International Isotopes, Inc., facility in Idaho Falls, Idaho, and other existing uranium conversion and deconversion facilities.

(4) The fourth issue is an administrative need to establish a regulation analogous to 10 CFR 50.52, "Combining Licenses." This allows a single 10 CFR Part 40 license to combine all the activities of an applicant that may otherwise need to be licensed by the Agreement State.

Support of Strategic Plan (Fiscal Years 2008–2013)

Amending 10 CFR Part 40 to require an ISA for those facilities that exceed the threshold quantity limits discussed above supports the NRC's 2008–2013 Strategic Plan in the areas of safety and organizational excellence. In the area of safety, the proposed amendment supports Safety Goal Strategy "1" (develop, maintain, and implement licensing and regulatory programs for material users to ensure the adequate protection of health and safety), by requiring an ISA. An ISA increases safety for both workers and the offsite public.

In the area of organizational excellence, the proposed amendment supports the objectives of openness and effectiveness. Specifically, soliciting input from the public on developing the technical basis for amending 10 CFR Part 40 supports Openness Strategy 3 (providing for fair, timely, and meaningful stakeholder involvement in NRC decision making) and Strategy 5 (initiating early communication with stakeholders on issues of substantial interest). In addition, amending 10 CFR Part 40 before receiving applications for additional uranium conversion or deconversion facilities supports Effectiveness Strategy 6 (anticipate challenges and promptly evaluate and respond to changes in the regulatory and technical environment).