

Regulatory Framework for Recycling Nuclear Fuel

I. BACKGROUND

The Nuclear Energy Institute (NEI), as the organization responsible for establishing unified industry policy on matters affecting the commercial nuclear energy industry, including the regulatory aspects of generic operational and technical issues, established a task force directed at closing the nuclear fuel cycle. The task force, which developed this “White Paper”, is chaired by Mr. Jack Bailey, Vice President, Nuclear Generation Development, at the Tennessee Valley Authority. Members also include representatives from Exelon, Constellation Energy, Entergy, Duke Energy, AREVA, EnergySolutions, GE, and General Atomics. In addition, the task force is being supported by B&W Technical Services, Talisman International, CH2M Hill, and NEI staff.

Recycling used fuel provides the opportunity to utilize the energy remaining in such fuel, thus conserving resources and contributing to energy independence.¹ Companies within the nuclear industry are giving serious consideration to building and operating fuel recycling facilities. An important aspect of this consideration is the regulatory process that will be used to license these facilities. It is generally recognized, however, that current Nuclear Regulatory Commission (NRC) regulations do not provide a clear path and process for the licensing of a recycling facility.

In this regard, NEI is aware that the NRC has on-going an effort to develop a regulatory framework. As expressed in “SECY 08-134, Regulatory Structure for Spent Fuel Reprocessing (September 12, 2008),” the NRC anticipated a rulemaking completion date for a closed fuel

¹ The terms “used fuel” and “spent fuel”, and the terms “recycling” and “reprocessing” are used in this White Paper to reflect the fact that recycling involves utilizing the energy remaining in nuclear fuel when removed from a reactor. Current regulations use generally the terms “spent fuel” and “reprocessing.”

cycle of June 2012. From the perspective of the nuclear industry, however, June 2012 is consistent with its goals to license, construct, and operate recycling facilities in the next decade, however the industry is concerned adequate resources will be applied in order to achieve it.

In the interest of accelerating that schedule, so that the industry will be prepared to initiate applications sooner, NEI has generated this paper providing concepts which could be the basis for a regulatory framework which could be completed, not later than June 2012. To assist in achieving that goal, NEI is submitting this paper to the Commission to help it in its efforts to establish a regulatory framework for licensing a recycling facility under a new part, referenced as “Part 7x.” As discussed below, the framework would essentially be modeled on the risk-informal and performance-based approach of Part 70, supplemented with provisions from Part 50.²

II. ANALYSIS

A. Need for a new Part 7x

A domestic, commercial reprocessing plant is a “production facility” under the Atomic Energy Act (“AEA”). Such a facility is licensed under section 103 of the AEA, as are light water reactors (“LWRs”).

The basic NRC licensing provisions governing a production facility are currently found in 10 C.F.R. Part 50, “Domestic Licensing of Production and Utilization Facilities.” While a number of provisions in Part 50 are applicable to both production and utilization facilities, such as LWRs, there are relatively few requirements specifically applicable to reprocessing facilities in Part 50 other than in § 50.36 “Technical specifications;” Appendix B, “Quality Assurance

² Separate, but important to the success of a regulatory framework for regulations, will be the need to develop regulatory guidance similar to NUREG-1520, “Standard Review Plan for the Review of a License Application for a Mixed Oxide (MOX) Fuel Fabrication Facility,” and NUREG-1718, “Standard Review Plan for the Review of a License Application for a Mixed Oxide (MOX) Fuel Fabrication Facility.”

Criteria for Nuclear Power Plants and Fuel Reprocessing Plants;” and Appendix F, “Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities.”

In fact, a reprocessing facility’s operational characteristics differ significantly from an LWR. As the NRC Staff noted in SECY-06-0066, Regulatory and Resource Implications of a DOE Spent Nuclear Fuel Recycling Program (March 22, 2006):

Part 50 is focused on LWR design and technology and would have limited applicability to commercial reprocessing facility design and technology. That is, the design and operational safety issues associated with a commercial reprocessing facility would be very different from design and operational safety issues associated with an LWR. The current Part 50 regulations would not necessarily address all commercial reprocessing facility safety issues and, conversely, are likely to contain requirements that are not applicable to a reprocessing facility. The application of the whole Part 50 to the licensing of a commercial reprocessing facility would present significant challenges to the applicant and to the NRC. If Part 50 is used to license a commercial reprocessing facility, the regulations would have to be reviewed to determine which apply, which do not apply, and which may partially apply. Additional requirements would also need to be established to address reprocessing facility-specific design and safety issues.

In SECY-08-0134, Regulatory Structure for Spent Fuel Reprocessing (September 12, 2008), the Staff expressed the view that “it would not be effective or efficient to revise Part 50 to license reprocessing facilities.” NEI agrees that a reprocessing facility is more like a complex fuel cycle facility than a reactor, and that revising Part 50 to address the licensing of a reprocessing facility more directly would not be desirable.

B. Approach to developing Part 7x and selected elements

In SECY-08-0134 the NRC Staff stated:

[T]he existing Part 70 currently regulates many different types of fuel cycle facilities. 10 CFR 70 provides a model of a regulation capable of licensing several different types of facilities, yet adequately ensures safe facility operation. As such, the staff believes that it is possible to either include a new subpart to Part 70 that would provide new regulatory requirements for reprocessing facilities, or create a new Part specific for reprocessing. These new regulations could be capable of licensing aqueous separation techniques, as well as any potential pyroprocessing techniques.

Part 70, with its risk-informal, performance-based approach, provides a useful model for a new framework. However, a number of significant changes to Part 70 would be required to address procedural and substantive requirements necessary under the AEA, including both the two-step and combined license process for production facilities. Additional substantive requirements would also be needed because of the nature of a recycling plant and, particularly, the fact that such a facility involves a significantly greater source term than other fuel cycle facilities.

Adoption of a new Part 7x would have the benefit of establishing regulatory provisions applicable to a reprocessing facility clearly specifying requirements. The need to reference other provisions of NRC regulations could be minimal, as would the need to except out inapplicable provisions of Part 70. A new Part 7x could also be written to more clearly and effectively prescribe the licensing process applicable to a reprocessing facility.

A new Part 7x, however, can and should utilize useful regulatory concepts embodied in current provisions of NRC regulations. Specific, suggested elements are discussed below.

1. Risk-informed and performance-based approach

Part 70 embodies a regulatory philosophy utilizing a risk-informed, performance-based regulatory approach that includes: (1) the identification of performance requirements for prevention of accidents or mitigation of their consequences as well as specific design basis criteria; (2) the performance of an Integrated Safety Analysis (ISA) to identify potential accidents at the facility and the items relied on for safety (IROFS); (3) the implementation of measures to ensure that the IROFS are available and reliable to perform their function when needed; (4) the maintenance of the safety basis, including the reporting of changes to the NRC; and (5) the allowance for licensees to make certain changes to their safety program and facilities without prior NRC approval. The new Part 7x should embody this philosophy and approach.

Further, Part 7x should prescribe an underlying safety standard for the facility in terms of specific performance requirements. Such requirements could be identical to those of 10 C.F.R. § 70.61.

2. Licensing process and procedure

A fuel reprocessing facility is a production facility under the AEA. The licensing procedures prescribed in 10 C.F.R. Part 50 were developed to implement AEA requirements applicable to such facilities. Consequently, the licensing framework for Part 7x, though based on Part 70, should reflect pertinent procedures of Part 50.

In addition, however, it is appropriate, and consistent with the AEA³, to provide a process accommodating the option of proceeding via a combined license, similar to Part 52. Under such an approach, a determination can be made -- before construction even begins -- that the facility will be authorized to operate if it is constructed in accordance with the combined license.

Further, it would be useful for Part 7x to provide flexibility with respect to the licensing of facilities, other than reprocessing plants, related to the recycling of spent fuel. Such facilities -- denominated "recycling facilities" -- would include those providing for spent fuel storage; waste storage and processing, including vitrification; plutonium and/or minor actinide processing; and fuel fabrication and storage. Regulatory flexibility should be provided to accommodate the licensing of recycling facilities either under existing regulatory requirements; or, in combination under provisions of the new Part 7x.

³ See AEA § 185.b.

C. Framework for regulation

Included with this Paper, as Appendix A, are framework considerations which must be captured in regulations embodying the concepts and elements discussed above. The framework is not submitted for adoption by the Commission but, rather, to further illustrate the substance of the concept. Appendix B provides conceptional language for the implementation of the framework.

The each Appendix is divided into two sections. The first contains considerations specific to Part 7x, itself. The second section presents the principal changes to existing NRC regulations, required to implement the framework.

It should be noted that the framework is not complete. For example, Price Anderson issues under Part 140 and insurance issues related to those addressed in 10 C.F.R. § 50.54(w) are not addressed. The framework does, however, present, in the form of conception language, a description of the rulemaking changes necessary for establishing a recycling center.

III. CONCLUSION

For the reasons presented above, the NRC should initiate a proceeding to adopt regulations establishing a regulatory framework for the licensing of nuclear fuel recycling facilities. This “White Paper” is being provided to assist the NRC in its deliberations concerning the changes required as well as the concepts which should be considered.