Updating the Regulatory Framework for Spent Nuclear Fuel Reprocessing - 10127

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ABSTRACT

There is renewed domestic interest in establishing spent nuclear fuel recycle in the U.S. after about a 30 year hiatus. Introduction of safe, proliferation-resistant, and economical civilian nuclear fuel cycles, especially the reprocessing step, in the U.S. poses numerous technical, social, and regulatory challenges. Initially, fuel recycle[1] activities are expected to focus on light-water reactor fuels, but it is anticipated that recycle of fuel from advanced reactors such as liquid-metal-cooled reactors and gas-cooled reactors will follow. Proposed reprocessing technologies include processes for removing heat-producing and high-risk fission products and actinides from waste streams prior to disposal. Proposed reprocessing processes and operations raise a range of issues identified in this paper that would require new and revised regulations to effectively and efficiently ensure their safety. The NRC prepared a report (NUREG-1909) documenting the background, status, and potential future issues concerning recycle of spent nuclear fuel that is summarized in this paper. In response to the issues, the NRC Commissioners, and other stakeholders, the NRC staff has conducted two analyses to identify and prioritize regulatory gaps for spent fuel reprocessing facilities and held public meetings to obtain stakeholder input. The NRC staff is now working on a revised regulatory framework for reprocessing facilities with a goal of completing the revisions by FY 2012. This paper summarizes the contents of NUREG-1909 and the activities of the NRC staff to update the regulatory framework in to address the issues that have been identified.

INTRODUCTION

A desirable method for disposition of the spent nuclear fuels (SNF) from the 104 operating commercial Light Water Reactors (LWRs) and from projected future reactors in the U.S. would meet the following goals: 1) increasing utilization of fissile and fertile materials by recycling them, 2) reducing the risk of proliferation by avoiding production of a pure plutonium stream, 3) reducing release of radionuclides that are predicted to result in the highest dose to humans, e.g., Np-237, Tc-99, and I-129, from repositories, and 4) removal of long-lived, heat-producing radionuclides, e.g., Cs-137, Sr-90, and Am-241 from high-level waste going to repositories. To meet these goals the Department of Energy (DOE) is conducting a research and development initiative to develop innovative recycle processes leading ultimately to advanced nuclear fuel recycle facilities; advanced nuclear reactors for irradiating neptunium, plutonium, americium and curium; and a fuel cycle research facility to develop advanced recycle technologies.

In response to DOE's fuel recycle initiative the Nuclear Regulatory Commission's (NRC's) Advisory Committee on Nuclear Waste and Materials prepared a white paper on advanced

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[1] Recycle involves SNF reprocessing, fabrication of new fuel, management of wastes generated by these activities, and storage of SNF and wastes.

recycle facilities [1] summarized in this paper that covered the following topics;
- Nuclear fuel designs
- Historical, current, and advanced SNF recycle processes and facilities
- Recycle facility siting and design
- Advanced spent fuel recycle initiatives
- Regulation and licensing of fuel recycle facilities
- Important issues associated with licensing and regulation of fuel recycle facilities and operations

In addition, appendices were included that covered a description of the Purex process in the Barnwell nuclear fuel plant and estimates of the volume of and radionuclide distribution in wastes from advanced aqueous reprocessing facilities.

The GNEP provided the initial impetus for the NRC to begin considering the adequacy of the existing regulatory framework for SNF recycle in 2006. In 2008 the GNEP was redirected by Congress so that it does not involve near-term deployment of industrial-scale recycle facilities but subsequently nuclear industry companies provided the impetus for the NRC's activities by indicating their intent to submit a license application for a SNF reprocessing facility in the 2013-2014 timeframe. Based on the results of the white paper, direction from the NRC Commissioners, and input from stakeholders outside the NRC, the NRC staff has initiated an effort to promulgate the regulatory framework by 2013.

The NRC's regulations, sometimes called rules, impose requirements that licensees must meet to obtain or retain a license or certificate to use nuclear materials or operate a nuclear facility. These regulations govern the transportation of materials; the use of materials at such nuclear facilities as power plants, research reactors, uranium mills, fuel facilities, and waste repositories; and the use of materials for medical, industrial, and academic purposes. The process of developing regulations is called rulemaking. The NRC's effort to revise the regulatory framework for reprocessing will be accomplished primarily through the rulemaking and guidance development process.

Activities that have been completed and which are discussed in this paper are:
- Performing a first-order analysis to identify regulatory gaps
- Performing a more detailed follow-on regulatory gap analysis that identified and prioritized 23 gaps in four categories
- Held public meetings on a white paper by the Nuclear Energy Institute (NEI) and on revising the regulatory framework.

Subject to budget considerations, the NRC staff plans to complete the revised regulatory framework in FY 2012 using a process that provides extensive opportunities for public involvement.

HISTORICAL OVERVIEW OF SNF REPROCESSING

U.S. Defense Reprocessing Plants

SNF reprocessing started as a U.S. wartime activity for the recovery of plutonium from production reactors for use in nuclear weapons. Major fuel reprocessing plants were constructed in Washington at the Hanford site and in South Carolina at the Savannah River site. The first large-scale plutonium reprocessing was carried out using a precipitation process based on very small scale chemical studies using bismuth phosphate as a carrier for plutonium (the Bismuth Phosphate Process). Subsequently improved processes based on solvent extraction were developed and implemented. The first large-scale solvent extraction process was based on methyl isobutyl ketone as a solvent (the HEXONE process); subsequently the HEXONE process was displaced by an improved process based on solvent extraction of plutonium and uranium into tri-n-tributyl phosphate, commonly known as TBP (the PUREX process). The Bismuth Phosphate, HEXONE and PUREX processes produced large amounts of wastes[2] that have proven to be difficult to manage as attempts are made to empty the large waste storage tanks during site cleanup efforts. After WWII the Atomic Energy Commission (AEC) encouraged commercial SNF reprocessing in the U.S. and at the same time the U.S. government encouraged reprocessing overseas.

U.S. Commercial Reprocessing Plants

Partly as a consequence of encouragement by the U.S. government, three commercial reprocessing initiatives were started. All three of these plants were based on the PUREX Process, as are all commercial reprocessing plants worldwide. Figure 1 is a greatly simplified diagrammatic representation of the universally used PUREX Process.

The first commercial reprocessing plant was the Nuclear Fuel Services West Valley Plant. This plant was built in western New York and had a nominal throughput of 300 metric tons of initial heavy metal (MTIHM) per year. This plant operated for about seven years until required upgrades proved to be too costly and the plant was shut down. The second plant was the General Electric Plant in Illinois. This plant had design flaws and was only operated with uranium during "cold" tests before being shut down. The third plant was the Barnwell Nuclear Fuel Plant with a projected capacity of 1500 MTIHM per year. As a result of proliferation concerns, actions were taken by Presidents Ford and Carter that led to the plant never being licensed or operated with SNF.

International Reprocessing Plants

Other countries did not follow the U.S. lead in eschewing SNF reprocessing and, in fact, aggressively pursued reprocessing, both for weapons production and for commercial gain. At the present time France, U.K., Russia, Japan, India and China have publicly declared operating reprocessing plants and Israel is known to have an undeclared plant. Germany and Belgium had reprocessing plants that are now inactive or shut down. Both France and U.K. operate commercial reprocessing plants for both foreign and domestic SNF. Table I [1] summarizes the capacity of civil (non-weapons) reprocessing plants that are operating or planned.

[2] The wastes in the high-level waste storage tanks are predominantly sodium nitrate, sodium nitrite, sodium hydroxide, iron oxides, and sludges comprised of oxides/hydroxides of the fission products and actinide elements.

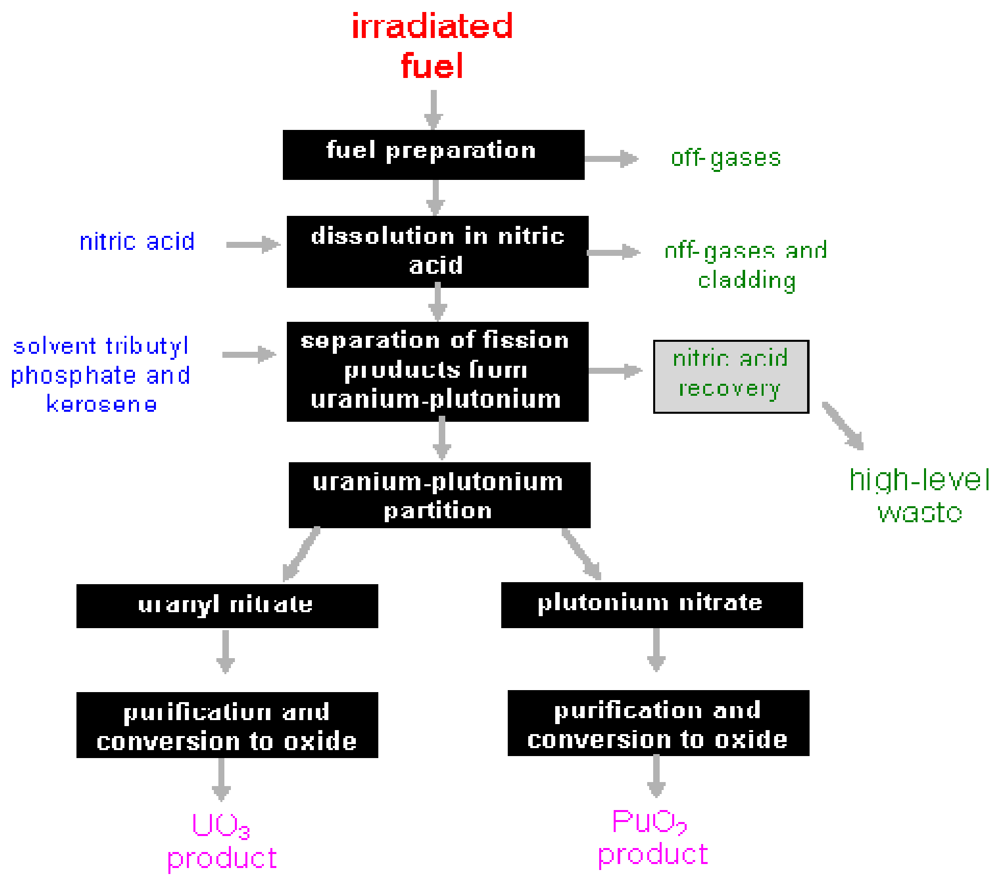

Fig. 1. Greatly simplified diagrammatic representation of the PUREX Process

CURRENT REPROCESSING ACTIVITIES

There are several types of SNF from a variety of different reactor types being processed in commercial reprocessing plants. The most common SNF is from LWRs, of which the most prevalent is the PWR. The next most prevalent reactor type is the boiling water reactor (BWR). These reactors both use uranium oxide fuel in Zircaloy clad fuel rods supported by hardware composed of Zircaloy, Inconel, and stainless steel.

BWR fuel is similar to PWR fuel in most respects except that its horizontal dimensions are smaller and its sides are surrounded by a sheet of Zircaloy. From the point of view of reprocessing it is very nearly the same as PWR fuel. Reprocessing, as illustrated in Fig. 1 for the PUREX process, involves dissolving the uranium dioxide "meat" in nitric acid and extracting uranium and plutonium into TBP. Other actinide elements and fission products remain in an acidic waste stream. The hardware accounts for about one fourth of the total weight of an assembly and comprises a separate radioactive waste stream that must be disposed of. During the SNF reprocessing dissolution step significant quantities of radioactive gases such as Kr-85, I-129, and Carbon-14 dioxide are released into the plant off-gas system. Tritium (H-3 or T) reacts with water to produce HTO unless removed as T_2 gas prior to dissolution.

Table I. Operating and Planned Reprocessing Plants in Other Countries

Country	Location	Scale	Rated Capacity, MTIHM/yr	Source of Feed Material[a]
China	Lanshou[b]	Pilot Plant	0.1	PWR.HWRR
France	LaHague UP2-800	Commercial	850	LWR
France	LaHague UP3	Commercial	850	LWR
India	Kalpakkam Reprocessing Plant (KARP)	Demonstration	100	PHWR
India	Lead Minicell Facility (LMF)	Pilot Plant	n/a	FBTR
India	Power Reactor Fuel Reprocessing Plant (PREFRE)	Demonstration	100	PHWR. LWR
India	Fast Reactor Fuel Reprocessing Plant[b]	Commercial	n/a	FBTR
Japan	Rokkasho Reprocessing Plant	Commercial	800	LWR
Japan	JNC Tokai Reprocessing Plant	Demonstration	210	LWR
Russia	Research Institute Atomic Reactors (RIAR)	Pilot Plant	1	N/A
Russia	RT-1, Combined Mayak	Commercial	400	VVER-440
United Kingdom	British Nuclear Fuels Limited (BNFL): B205	Commercial	1500	U Metal (MAGNOX)
United Kingdom	BNFL Thermal Oxide Reprocessing Plant	Commercial	1200	LWR, AGR OXIDE

[a] PWR: pressurized water reactor, HWRR: heavy water research reactor, PHWR: pressurized heavy water reactor, FBTR: fast breeder test reactor, VVER: Vodo-Vodyanoi Energetichesky Reactor, MAGNOX: **Mag**nesium **n**on-**ox**idising (fuel cladding), AGR: advanced gas-cooled reactor

ACCIDENTS OCCURING IN RECYCLING SNF

Spent nuclear fuel reprocessing has not been without accidents resulting in the release of radioactivity. In addition, deliberate release of Kr-85 and C-14 has been practiced as has release of some radionuclides from reprocessing plants abroad into the sea. Table II lists occurrences and types of some accidents at SNF reprocessing plants and sites.

Table II. Occurrences and Types of Reprocessing Accidents

Type of accident	Liquid releases	Gaseous releases	Occurrence
Criticality in dissolver tank	X	X	Windscale, 1973 Tokai, 1999[a]
Fire		X	La Hague, 1981 Karlsruhe, 1985 Tokai, 1997
Explosion		X	Savannah River, 1953 Kyshtym, 1957 Oak Ridge, 1959 La Hague, 1970 Savannah River, 1975 UTP Ontario, 1980 Tomsk-7, 1993 Tokai, 1997 Hanford, 1997
Leak of discharge pipe; breach in a tank	X		La Hague, 1979-80 Sellafield, 1983
Loss of coolant		X	Savannah River, 1965 La Hague, 1980

[a]The September 1999 accident at Tokai Mura did not involve a reprocessing plant but is a type of accident that could occur in a reprocessing plant.

STATUS OF THE EXISTING REGULATORY FRAMEWORK FOR REPROCESSING

There are a number of existing regulations for licensing fuel reprocessing facilities. Under current U.S. government regulations, various parts of a SNF reprocessing facility would have to meet the requirements of following regulations: 10 CFR Part 50, 10 CFR Part 70, 10 CFR Part 30, 10 CFR Part 40, 10 CFR Part 73 and 10 CFR Part 74. The primary licensing regulation, 10 CFR Part 50 "Domestic Licensing of Production and Utilization Facilities," has evolved to focus on licensing LWRs. The NRC has used Part 70 to license fuel fabrication facilities, and this regulation was the basis for licensing the mixed oxide fuel fabrication plant in Wilmington, SC. 10 CFR Part 70 allows for a one-step licensing process.

.While licensing under these regulations is possible, the result would be both inefficient and complex because the regulations would have to be substantially modified to account for the features of a reprocessing plant (e.g., significant amounts of reactive chemicals) while still being applicable to other facilities. These differences lead to the need for substantial changes to existing regulations or to new regulations. In 2007 the NRC directed its staff to begin developing the primary regulatory framework to license SNF reprocessing facilities using an option based on 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." Advisory committees to the NRC have recommended that a risk-informed, performance-based approach based on a probabilistic risk assessment (PRA) is preferred for licensing a future reprocessing. In a risk-informed, performance-based regulatory approach risk is an important consideration, but other things such as cost and environmental considerations should be balanced against risk reduction. The NRC has defined risk-informed regulation. [4]

ISSUES ASSOCIATED WITH LICENSING AND REGULATING ADVANCED FUEL RECYCLE FACILITIES IDENTIFIED IN THE WHITE PAPER

In addition to establishing the approaches to use for the primary licensing regulations for fuel recycle facilities it will be necessary to evaluate the impact that fuel recycle facilities and operations may have on other regulations that may be invoked or need to be developed. Fuel recycle facilities and other aspects of recycle that fall into this category include:

- New products, effluents, and wastes: cladding waste, Kr-85, I-129, C-14, H-3, recovered uranium, and transuranic (GTCC) wastes
- Waste classification: determining the class of some of the novel wastes in the foregoing bullet in the present waste classification system
- Waste forms: how to stabilize long-lived, mobile radionuclides (I-129, C-14) or non-reactive radionuclides (e.g., Kr-85)
- Distribution of radionuclides in various streams: how do key radionuclides such as I-129 distribute in the process streams of a highly integrated reprocessing facility
- Disposal technology: Identification of an appropriate disposal technology for wastes containing the radionuclides identified in the first bullet and revised or new licensing regulations for the disposal facility
- Repository licensing: Impacts of separate waste forms containing the radionuclides in the first bullet and the substantial reduction in heat load on the repository if essentially no cesium, strontium, and the actinides are in the wastes sent to the repository
- Uranium handling and disposal facilities: Licensing regulations for facilities to recycle or dispose of recovered uranium containing U-232, U-236, and trace contaminants
- Cesium and strontium storage and disposal: Licensing regulations for the long-term storage facility contemplated by DOE to allow radio-cesium and radio-strontium to decay to the Class C waste concentration and for *in situ* closure of the facility or alternative disposal of its contents
- Transuranium element storage and disposal: safeguards, security, and safety for transuranium elements containing substantial amounts of americium and curium stored awaiting recycle
- Integrated plant performance of very complex plants: how to account for the many recycle streams in highly integrated facilities
- Decontamination and decommissioning (D&D): how to design and operate the plant to facilitate D&D
- Sigma inventory differences: reconciling inconsistencies among IAEA, NRC and DOE requirements for limits on the permissible significant (sigma) plutonium inventory differences

OTHER IMPORTANT ISSUES RELATED TO LICENSING

In the 1970s DOE's predecessor agencies began a generic environmental impact statement (GEIS) and the Environmental Protection Agency (EPA) began to develop standards for radionuclide releases and environmental radiation protection standards for reprocessing facilities.

The GEIS effort ended with the publication of the GESMO document, but limitations in the scope of GESMO, advances in technology, and risk assessment techniques during the last few decades make it essentially irrelevant to what DOE and the commercial SNF recycle industry is contemplating. DOE initiated a proposal [5] for a follow-on Programmatic Environmental Impact Statement (PEIS) but this was recently suspended.

EPA's efforts ultimately produced Title 40, Part 190 of the Code of Federal Regulations (40 CFR 190). Of special relevance to reprocessing is 40 CFR 190.10(b) which limits release of Kr-85 and I-129. The NRC adopted the same limits as 10 CFR 20.1301(e). Studies of release limits for C-14 and H-3 had begun but ceased when President Carter decided to defer commercial SNF reprocessing. Because the technologies of obtaining the specified EPA release limits have not been industrially demonstrated they may be uneconomical or impractical for commercial practice in the near term.

REVISING THE REGULATORY FRAMEWORK FOR LICENSING A SPENT NUCLEAR FUEL REPROCESSING FACILITY

The Global Nuclear Energy Partnership and Spent Fuel Reprocessing

In February 2006, the Administration announced the Global Nuclear Energy Partnership (GNEP), part of the President's Advanced Energy Initiative aimed at advancing three identified ways to meet the challenge of generating more electricity; clean coal technology, advanced emission-free nuclear power, and renewable resources, such as solar and wind. The international aspect of GNEP involved the development of a framework to manage spent nuclear fuel, enhance the nuclear energy option, and provide safe and secure nuclear power to foreign countries.

In August 2006, the Department of Energy (DOE) sought expressions of interest from the nuclear industry for constructing spent fuel reprocessing and transmutation fuel fabrication facilities. DOE subsequently established contracts with four industry consortia headed by Energy *Solutions*, International Nuclear Recycling Alliance (INRA), General Atomics, and General Electric-Hitachi (GEH), for the purpose of assessing options to close the nuclear fuel cycle in the U.S. In January 2008, each of the consortia provided DOE conceptual designs, cost bases, and schedules for the Consolidated Fuel Treatment Center (CFTC), a recycling center that would reprocess SNF, and the Advanced Burner Reactor (ABR), a new reactor that generates electricity while converting long-lived transuranic radionuclides contained in fuel manufactured at the CFTC into short-lived radioactive waste [6,7,8,9]. The consortia updated their proprietary submittals and provided these to DOE on June 30, 2008. DOE subsequently provided these to the NRC.

The four proposals DOE received from various industry consortia ranged from aqueous based reprocessing methods with light water reactor (LWR) recycling of the fuel (as mixed oxide {MOX} fuel) to pyroprocessing technologies with ABR recycling of the fuel.

In FY 2009 Congress redirected all funding of domestic GNEP and directed DOE to transition its focus from a combination of R&D with near-term commercial deployment of recycling facilities and a fast reactor demonstration project to a purely R&D approach under the long-term, science-based Fuel Cycle Research and Development (FCR&D) program which includes recycling.

Revising the Regulatory Framework after the Domestic GNEP Program

Initially, NRC believed that a new U.S. reprocessing facility would be the result of the DOE's GNEP program. Before investing significant NRC resources, the Commission directed the NRC staff to await the Energy Secretary's decision regarding a path forward for the chosen spent fuel reprocessing technology. The Energy Secretary deferred indefinitely making a decision on GNEP

In mid-2008, two nuclear industry companies informed the agency of their intent to seek a license for a reprocessing facility in the U.S. An additional company expressed its support for updating the regulatory framework for reprocessing, but stopped short of stating its intent to seek a license for such a facility. At the time, the NRC staff also noted that progress on some GNEP initiatives had waned and it appeared appropriate to shift the focus of the staff's efforts from facilities specific to GNEP to a more broadly applicable regulatory framework for commercial reprocessing facilities.

As a result, the staff concluded GNEP should no longer be the impetus for considering reprocessing-related activities and it was appropriate to devote limited resources at a pace consistent with industry interest and commitment, to develop an appropriate, effective, and efficient regulatory framework for licensing a potential commercial spent nuclear fuel reprocessing facility.

The NRC still maintains an interagency agreement (IA) with DOE to allow NRC staff to develop its knowledge base in the area of recycling and provide DOE regulatory insights into key safety, safeguards and security topics to inform DOE's FCR&D program. The IA was recently extended to September 30, 2010.

Industry Initiatives Associated with Spent Nuclear Fuel Reprocessing

In July 2008, NRC staff was made aware that the Nuclear Energy Institute (NEI) had established its "Closing the Fuel Cycle Task Force." The task force's primary objective is to facilitate implementation of a regulatory structure to license reprocessing facilities and the associated fuel fabrication facilities. A secondary objective is addressing the regulatory framework for the ABR. The task force initially determined that the primary objective needs to be implemented by 2012 to be in alignment with industry's interest/intent. The NEI task force has prepared a white paper on the regulatory framework for recycling SNF [10] and the NRC held a public meeting to obtain comments on the paper in February 2009.

REGULATORY FRAMEWORK DEVELOPMENT

Initial Regulatory Gap Analysis

Currently, 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," provides the licensing framework for production and utilization facilities. Although a reprocessing facility is one type of production facility, its industrial processes are more akin to fuel cycle processes than to production or utilization facility processes, such as a power reactor. Most fuel cycle facilities are licensed to operate under 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." Therefore, in accordance with Commission direction to the NRC staff [3], the staff completed an initial regulatory gap analysis [11] focused on necessary changes to 10 CFR Part 70 considering requirements, where appropriate, from Part 50, as the basis for a revised reprocessing regulatory framework. The goal of this "gap" analysis was to identify the regulatory gaps and not to devote NRC resources to identify potential solutions.

The results of first-order gap analysis confirmed that 1) although current regulations could be used to license a reprocessing facility, new regulations will be required to enhance the effectiveness and efficiency of regulatory oversight, and 2) it would neither be effective nor efficient to revise Part 50 to license modern reprocessing facilities.

Over the years, Part 50 has essentially evolved to be a LWR-specific regulation and the resources needed to address a modern reprocessing facility in Part 50 would be extensive and not timely considering industry's interest. Furthermore, results of the regulatory gap analysis indicated that Part 70 currently does not adequately address all the hazards associated with the reprocessing of spent nuclear fuel including but not limited to, an increase in radiological risk and the complex process streams which are different than the uranium fuel processing facilities process streams for which Part 70 was most recently revised in 2000. The hazards and risks will manifest themselves in different ways throughout a reprocessing process and their contributions will be considered as staff prepares the technical basis document and begins the development of new regulations. NRC staff has considered examples of technology-neutral regulatory frameworks currently under consideration. These examples were considered for their applicability for reprocessing facilities. Additionally, the staff considered that the existing Part 70 currently regulates many different types of fuel cycle facilities and provides a model of a regulation capable of licensing several different types of facilities. As such, the NRC 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, and, potentially, non-aqueous techniques. Further, the unique design and safety issues associated with a reprocessing facility could be efficiently tailored and consolidated in a new Part without unnecessarily complicating the existing 10 CFR Parts 50 and 70. The form of the new regulations will be determined upon completion of the technical basis document.

Second Regulatory Gap Analysis

The second regulatory gap analysis was completed in March 2009 [12]. Building on the first-order gap analysis, it considered several other documents, including: NUREG-1909 [1], correspondence from the Union of Concerned Scientists [12], and the NEI white paper [10]" The results are discussed in detail in [13]. Briefly, the staff identified 23 regulatory gaps and categorized each of the identified gaps in one of four categories:

i) Lack of regulations
ii) Existing regulations pose a significant hindrance or regulatory burden to effective and efficient licensing.
iii) Gaps resulting from potentially licensing a production facility under Part 70 (versus Part 50).
iv) Requirements exist, but modifications may be needed for clarity.

Fourteen gaps were identified as high priority gaps; five identified as moderate priority gaps; and, four identified as low priority gaps. High priority gaps are those that must be resolved to establish an effective and efficient regulatory framework. An example of a high priority gap is Gap 2, "Independent storage of high level waste" which describes the lack of available independent waste storage options to accommodate solidified high level waste. The staff will pursue high priority gaps in the technical basis development to follow.

Moderate priority gaps are those that should be resolved, but are not essential, at this stage. An example of a moderate priority gap is Gap 15, "Waste confidence for reprocessing facilities." Gap 15 details that the existing waste confidence rule does not apply to reprocessing facilities. Because applicants for reprocessing facility licenses can address long-term storage of their waste in their environmental reports, resolution of Gap 15 was not determined to be essential at this point. However, the effectiveness and efficiency of the regulatory process could be enhanced by resolving this gap through rulemaking. Moderate priority gaps will be addressed in the technical basis development, in conjunction with the high priority gaps, if sufficient resources are available.

Low priority gaps could be resolved, but are determined to be not essential. An example of a low priority gap is Gap 20, "Advanced fuel cycles and transuranic special nuclear material (SNM) classification." Gap 20 details the need to expand SNM requirements to other materials in order to accommodate reprocessing technologies. The Commission did not previously support this expansion, as stated in the Staff Requirements Memorandum to SECY-08-0059 [14], and this gap will not be pursued in the reprocessing technical basis. Staff has determined that for the reprocessing framework development, low priority gaps are not essential and will not be pursued in the technical basis development, unless the Commission directs the staff to do so.

The Rulemaking Process

The NRC's regulations, sometimes called rules, impose requirements that licensees must meet to obtain or retain a license or certificate to use nuclear materials or operate a nuclear facility. These regulations govern the transportation of materials; the use of materials at such nuclear facilities as power plants, research reactors, uranium mills, fuel facilities, and waste repositories; and the use of materials for medical, industrial, and academic purposes. The process of developing regulations is called rulemaking.

The NRC considers public involvement in the agency's activities to be a cornerstone of strong, fair regulation of the nuclear industry. For that reason, the NRC has a long-standing practice of conducting its regulatory responsibilities in an open manner, and keeping the public informed of the agency's regulatory, licensing, and oversight activities. Toward that end, the regulatory process provides a variety of opportunities, shown in Fig. 2, for citizens to be heard. For example public meetings are announced on the NRC Web site to enable interested members of the public to participate. The NRC also encourages public involvement in rulemaking, provides related information on our Rulemaking Dockets page, and provides opportunities for public involvement in hearings. See the Public Meetings and Involvements link on the NRC web page [15] and NUREG/BR-0215 [16] for general information about the available opportunities for public involvement.

RESOURCES AND STAKEHOLDER INVOLVEMENT

Although the revised regulatory framework for an advanced burner reactor is no longer included in the scope, the staff has reviewed its estimates for completing the regulatory framework for reprocessing and concluded that the activity will: (1) be more comprehensive than originally

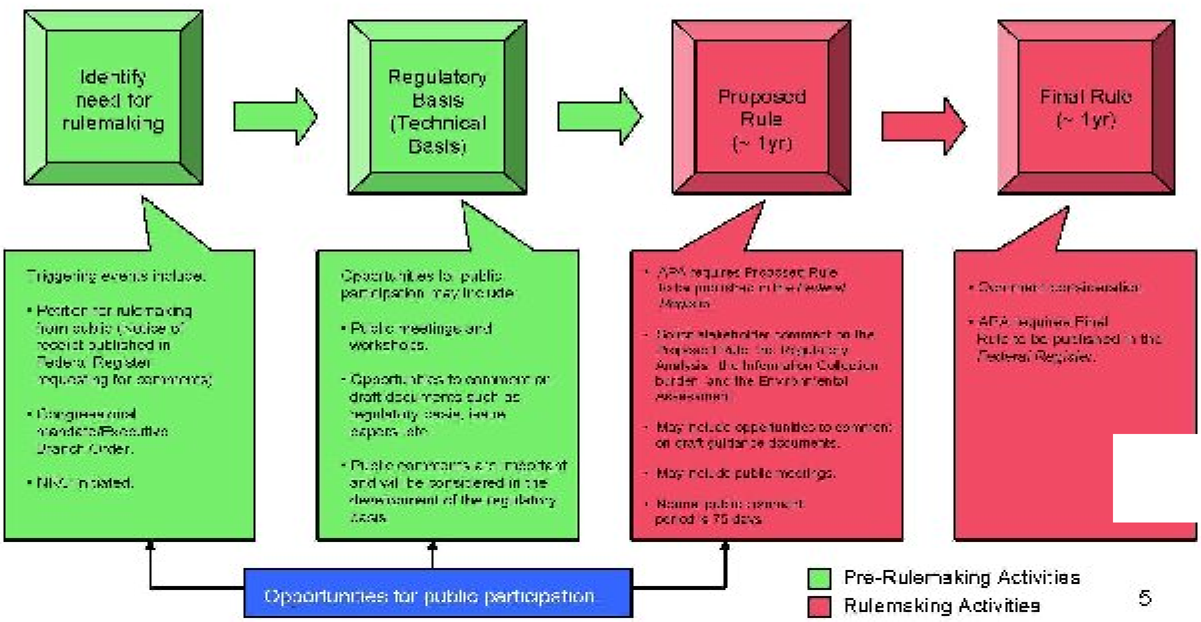

Fig. 2. Opportunities for public participation in NRC rulemaking activities.

envisioned; (2) will involve resolution of several complex technical and policy-related issues; (3) will entail the development of new and substantive regulatory guidance; and (4) will require extensive stakeholder involvement.

As stated in industry correspondence, industry’s intent is to submit an application for a reprocessing facility in the 2013-2014 timeframe. To be prepared to review a potential application in that timeframe, the NRC staff planned to complete the revised regulatory framework in FY 2012. The staff estimates that in order to complete the rulemaking activities in FY 2012, a total of approximately 15-20 FTE and $1.5-$2.0 million dollars will be needed in the

FY 2010 – 2012 period. The staff recognizes that resolution of several policy and technical issues, independent of the resources available, may inform the final schedule for revising the reprocessing regulatory framework, such as the Secretary of Energy's plan to create a commission to study alternatives to a nuclear waste repository at Yucca Mountain.

The process for revising the regulatory framework began in 2006. The initial pace was slow and will continue consistent with industry commitment and the NRC's staff allocated resources. Figure 3 depicts a timeline that shows several significant interactions and milestones related to the ongoing development of the revised regulatory framework.

The staff plans to continue to appropriately engage stakeholders during the development of the technical basis, achieving transparency and openness in the regulatory process. Completion of the technical basis will be contingent on the availability of resources, which the Commission will decide in the development of the Agency budget for fiscal year 2011.

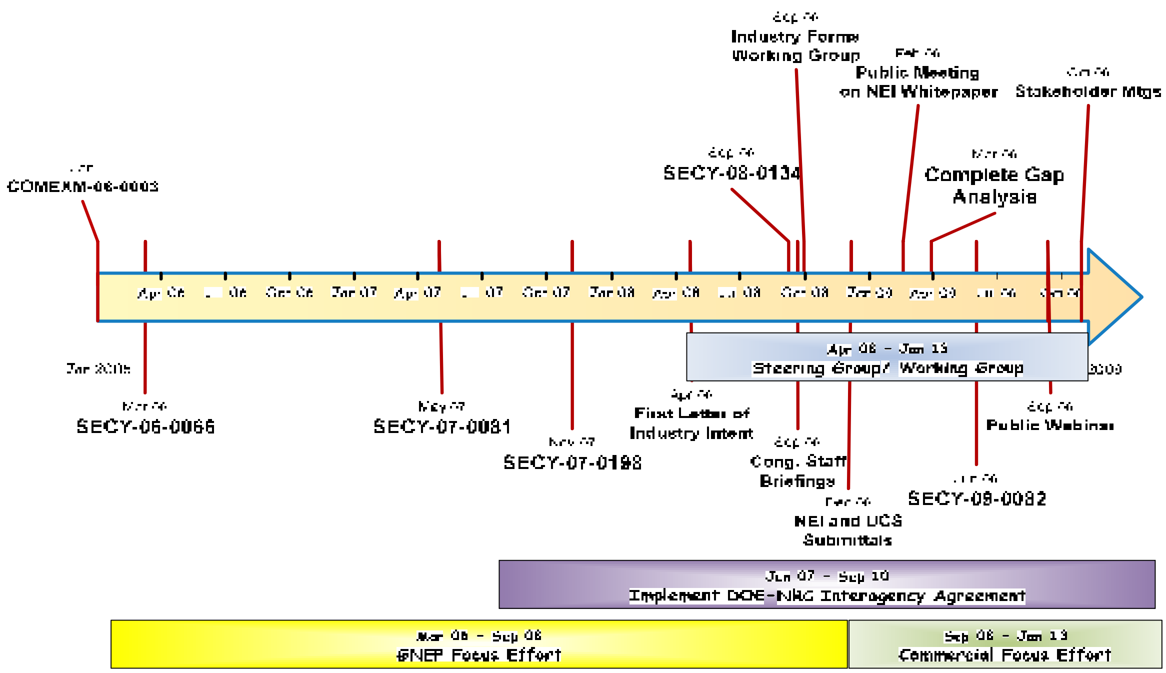

Fig. 3. Schedule, key interactions, and milestones for updating the regulatory framework for spent fuel reprocessing

REFERENCES

1. A.G. CROFF, R.G. WYMER, L.L. TAVLARIDES, and H.G. LARSON, "Background, Status, and Issues Related to the Regulation of Advanced Spent Nuclear Fuel Recycle Facilities," NUREG-1909, U.S. Nuclear Regulatory Commission (June 2008).

2. D. ALBRIGHT, "Shipments of Weapons-Usable Plutonium in the Commercial Nuclear Industry," The Institute for Science and International Security (ISIS), (January 3, 2007).

3. A. L. VIETTI-COOK, "Staff Requirements - SECY-07-0081 – Regulatory Options for Licensing Facilities Associated with the Global Nuclear Energy Partnership (GNEP)," U.S. Nuclear Regulatory Commission (June 27, 2007).

4. A. L. VIETTI-COOK, "Staff Requirements - SECY-98-144 - White Paper on Risk-Informed and Performance-Based Regulation," U.S. Nuclear Regulatory Commission (March 1, 1999).

5. U.S. DEPARTMENT OF ENERGY, "Notice of Intent to Prepare a Programmatic Environmental Impact Statement for the Global Nuclear Energy Partnership," 72 FR 331 (January 2007).

6. INTERNATIONAL NUCLEAR RECYCLING ALLIANCE, "Integrated U.S. Nuclear Fuel Strategy – International Nuclear Recycling Alliance" (May 1, 2008).

7. ENERGY*SOLUTIONS*, "GNEP Deployment Studies Overall Summary Report," Rev. 1 (May 19, 2008).

8. GENERAL ATOMICS GNEP TEAM, "GNEP Deployment Studies: Executive Summary," PC-000555, Rev. 2 (May 22, 2008).

9. GE HITACHI NUCLEAR ENERGY, "Global Nuclear Energy Partnership Conceptual Design Studies: Summary (Non-Proprietary)" (April 10, 2008).

10. F. M. KILLAR, "Regulatory Framework for a NRC Licensed Recycling Facility," letter and enclosures sent to M. F. Weber, U.S. Nuclear Regulatory Commission, Nuclear Energy Institute (December 19, 2008).

11. U.S. NUCLEAR REGULATORY COMMISSION, "First Order Regulatory Gap Analysis for Potentially Licensing a Reprocessing Facility Originally as a Part of GNEP," ML082260223 (December 18, 2009).

12. UNION OF CONCERNED SCIENTISTS, "Revising the Rules for Materials Protection, Control and Accounting," correspondence to U.S. Nuclear Regulatory Commission (2008).

13. M.F. WEBER, "Update on Reprocessing Regulatory Framework – Summary of Gap Analysis," U.S. Nuclear Regulatory Commission, SECY-09-0082 (May 28, 2009).

14. A. L. VIETTI-COOK, "Staff Requirements – SECY-08-0059 -- Rulemaking Plan: Part 74—Material Control and Accounting of Special Nuclear Material," U.S. Nuclear Regulatory Commission (February 5, 2009).

15. U.S. NUCLEAR REGULATORY COMMISSION, link to Public Involvements and Meetings, http://www.nrc.gov/public-involve.html (2009).

16. U.S. NUCLEAR REGULATORY COMMISSION, "Public Involvement in the Regulatory Process," NUREG/BR-0215 (October 2004).