

**SAFETY AND SAFEGUARDS EVALUATION REPORT**  
**RENEWAL OF LICENSE SNM-124 FOR**  
**NUCLEAR FUEL SERVICES, INC., ERWIN, TENNESSEE**  
**DOCKET NUMBER 70-143**

**ML102780085**

Enclosure 2

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## LIST OF ACRONYMS AND ABBREVIATIONS

AIHA	American Industrial Hygiene Association
ALARA	as low as is reasonably achievable
ALI	annual limit on intake
Am	americium
ANSI	American National Standards Institute
ANS	American Nuclear Society
ASTM	American Society for Testing and Materials
B&W	Babcock and Wilcox
BLEU	blended low enriched uranium
CAAS	criticality accident alarm system
CB	Compass Bank
CCB	Change Control Board
CD	commercial development
CFR	Code of Federal Regulations
CM	configuration management
Cs	cesium
DAC	derived air concentration
DCP	double contingency principle
DFP	decommissioning funding plan
DOE	U.S. Department of Energy
EA	enforcement action
F	fluorine
FNMC	fundamental nuclear material control
FR	<i>Federal Register</i>
FSME	Office of Federal and State Materials and Environmental Management Programs
HEPA	high-efficiency particulate air
HEU	high-enriched uranium
HS&E	health, safety and the environment
ICRP	International Commission on Radiation Protection
ID	inventory difference
IROFS	item(s) relied on for safety
ISA	integrated safety analysis
$k_{\text{eff}}$	effective neutron multiplication factor
LEU	low-enriched uranium
LTL	lower tolerance limit
MC&A	material control and accounting
mrem	millirem
mSv	millisievert(s)
Na	sodium
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
NFPA	National Fire Protection Association
NFS	Nuclear Fuel Services
NMSS	Office of Nuclear Material Safety and Security

NNSA	National Nuclear Security Administration
Np	neptunium
NRC	U.S. Nuclear Regulatory Commission
O	oxygen
Pb	lead
pCi/g	picocuries per gram
PM	preventive maintenance
Pu	plutonium
QA	quality assurance
Ra	radium
RCA	radiologically controlled area
RG	regulatory guide
RP	radiation protection
RPP	radiation protection program
RWP	radiation work permit
SEID	standard error of inventory difference
SER	safety evaluation report
SG	safeguards
SNM	special nuclear material
SRC	safety review committee
SSNM	strategic special nuclear material
SUNSI	sensitive unclassified nonsafeguards information
Tc	technetium
Th	thorium
U	uranium
USL	upper subcritical limit
W	willful
wt%	weight percent
$\sigma$	standard deviation

## **1.0 GENERAL INFORMATION**

On June 30, 2009, Nuclear Fuel Services (NFS) applied for renewal of Materials License SNM-124 (NFS, 2009a). The application, as subsequently revised and supplemented (NFS, 2009b; NFS, 2010a; NFS, 2011a; NFS, 2011d; NFS, 2011f; NFS, 2011j) requests a renewed license to operate for a term of 25 years. Under its renewed license, NFS plans to continue processing enriched uranium into fuel for nuclear reactors and conduct related activities. Unless noted otherwise, the application requests no significant changes to its authorized activities. These activities have been conducted for many years and the NRC staff has reviewed and approved them previously. The authorized location of the activities will continue to be the NFS facility in Erwin, Tennessee.

Although the authorized activities are essentially unchanged, the format of the application has changed significantly. One year after the last license renewal in 1999, the NRC published a major revision of the regulations in 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." In 2002, revised guidance for preparing a license application was published in NUREG-1520, "Standard review Plan for the Review of a License Application for a Fuel Cycle Facility." The NFS application was completely rewritten to follow the new format. The NRC's evaluation primarily follows the NUREG-1520 format.

### **1.1 Facility and Process Description**

#### *1.1.1 Purpose of Review*

The staff of the U.S. Nuclear Regulatory Commission (NRC) reviewed the facility and process description to determine whether the license renewal application submitted by NFS met the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 70.22, "Contents of Applications," and 10 CFR 70.65(b)(1), (2), and (3), "Additional Content of Applications." The staff's review includes an evaluation of whether the application adequately presents an overview of the site layout and a summary description of the applicant's manufacturing process.

#### *1.1.2 Staff Review and Analysis*

The staff obtained the information to support this review from the original 2009 application (NFS, 2009a), an onsite review (NRC, 2010b), and additional information submitted in 2010 (NFS, 2010a) and 2011 (NFS, 2011f). In Chapter 1 of the application and in the associated environmental report, NFS provided a summary description of the site and facility. The description included a discussion of site utilities and services. The staff concluded that the description of the site and facility was adequate for the staff to understand the site and facility, and the description was consistent with the integrated safety analysis (ISA) summaries. The description included fuel production facilities, laboratories, waste treatment facilities, and support facilities for maintenance, administration, and warehousing.

#### *1.1.3 Evaluation Findings*

The staff reviewed NFS general site description in accordance with Section 1.1 of NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," (NRC, 2002a). NFS adequately described the site and processes so that the staff has an overall understanding of the relationships between the facility features and the function of each feature. NFS cross-referenced its general description with more detailed descriptions

elsewhere in the application. The staff concluded that NFS complied with the general requirements of 10 CFR 70.22, 10 CFR 70.60, "Applicability," and 10 CFR 70.65(b)(1), (2), and (3), as applicable to this section.

## **1.2 Institutional Information**

### *1.2.1 Purpose of Review*

The NRC staff reviewed the institutional information to establish whether the application included adequate detail identifying the company, its characteristics, and the proposed activity.

### *1.2.2 Staff Review and Analysis*

#### *1.2.2.1 Corporate Identity*

NFS is incorporated in the State of Delaware, with its corporate offices located at 1205 Banner Hill Road, Erwin, TN 37650-9718. NFS is a subsidiary of NFS Holdings, Inc., which is a subsidiary of NOG-Erwin Holdings, Inc., which is a wholly-owned subsidiary of Babcock and Wilcox (B&W) Nuclear Operations Group, Inc., incorporated in Delaware.

#### *1.2.2.2 Financial Qualifications*

On December 23, 2008, the NRC approved the indirect transfer of control over Material License No. SNM-124 (NRC, 2008a). The indirect transfer was the result of selling NFS Holdings, Inc. (the owner of NFS), from NFS Services, LLC, to NOG-Erwin Holdings, Inc. The request for NRC approval of the transfer included a balance sheet forecast for fiscal years 2007-2012 and an income statement for fiscal years 2003-2012. The NRC found that projected revenue and expenses were within reasonable expectations, given past performance. On June 15, 2010, the NRC approved another indirect transfer of control resulting from a spinoff of the Babcock and Wilcox Company (ultimate corporate parent of NFS) from McDermott International (NRC, 2010a). The evaluation considered the financial transaction and foreign ownership control and influence. The NRC staff found that the indirect transfer of control had no significant impact on NFS operations and that NFS would remain qualified to use special nuclear material (SNM).

In response to requests for additional information, NFS provided updated information on its financial qualifications (NFS, 2010a). After reviewing this information, the NRC staff raised concerns about declining assets that may be insufficient to cover future liabilities. The President of B&W Nuclear Operations Group (NFS corporate parent) submitted a letter stating that B&W Nuclear Operations Group is aware of the potential need for additional resources at NFS and that it will exercise prudent and responsible financial discipline regarding future investments in NFS (B&W, 2011a). In addition, NFS reported that tens of millions of dollars have recently been invested and parties plan to invest tens of millions more dollars in the near future (NFS, 2011j). Based on the long operating history of the company (over 50 years), along with current production contracts, financial instruments for decommissioning, corporate parent support, and other investments, the NRC staff finds that NFS appears to be financially qualified to engage in the proposed activities in accordance with 10 CFR Part 70.

### 1.2.2.3 Type, Quantity, and Form of Licensed Material

In accordance with 10 CFR 70.22(a)(2) and (4), NFS described the types, quantities, and forms of licensed material to be permitted at this site. This information is identical to the material and uses authorized in the existing license, except for the removal of restrictions on pyrophoric forms of uranium and plutonium. Chapter 7 of this safety and safeguards evaluation report (SER) contains the staff's evaluation of and agreement with removing the restrictions. The licensed material is defined as follows:

Material Type	Chemical and Physical Form	Maximum Quantity
A. Uranium enriched up to 100 weight percent in the U-235 isotope, which may contain up to an average of $10^{-6}$ grams of plutonium per gram of uranium, 0.25 millicuries of fission products per gram of uranium, and $1.5 \times 10^{-5}$ grams of transuranic materials (including plutonium) per gram of uranium, as contaminants.	A. As described in Appendix 1B to the application.	A. As described in the Sensitive Information Addendum of the application.
B. Uranium enriched up to 100 weight percent in the U-233 isotope	B.1 Any form, but limited to residual contamination from past operations.	B.1 As described in the Sensitive Information Addendum of the application.
	B.2 Any form, as received for analysis or for input into development studies.	B.2 As described in the Sensitive Information Addendum of the application.
C. Plutonium	C.1 Counting and calibration standards.	C.1 10 millicuries.
	C.2 As residual contamination and holdup from previous operations	C.2 As described in the Sensitive Information Addendum of the application.
	C.3 Any form, as received for analysis or input into development studies.	C.3 As described in the Sensitive Information Addendum of the application.
	C.4 Any form, as contamination on equipment and materials received for decontamination and volume reduction.	C.4 As described in the Sensitive Information Addendum of the application.
D. Transuranic isotopes	D. As waste resulting from processing enriched uranium.	D. As described in the Sensitive Information Addendum of the application.
E. Fission products	E. As waste resulting from processing enriched uranium.	E. As described in the Sensitive Information Addendum of the application.

The NRC staff notes that the last NFS license renewal in 1999 granted an exemption from the definition of “production facility” in 10 CFR 50.2, “Definitions.” As discussed in Section 1.2.2.6, the staff continues to find the exemption acceptable.

#### 1.2.2.4 Authorized Uses

The application requests the use of enriched uranium and plutonium for operations involving the following:

- product processing operations (fuel manufacturing, uranium recovery, and physical/chemical conversion)
- laboratory operations
- general service operations (storage, maintenance, and decontamination)
- research and development operations
- waste treatment and disposal operations

These uses are identical to the uses authorized in the existing license.

#### 1.2.2.5 Term of License

An Atomic Energy Commission license issued on September 18, 1957, to W.R. Grace and Company, Davison Chemical Division, authorized initial operations with enriched uranium. The license was transferred to NFS on December 31, 1963. The license was renewed on the following dates:

- November 5, 1965
- January 27, 1978
- March 16, 1979
- June 9, 1992
- July 2, 1999

In September 2006, the Commission approved a new policy, under which maximum license terms of 40 years were authorized for license renewals and new applications, specific to licensees required to submit ISA summaries in accordance with the requirements in 10 CFR Part 70, Subpart H, “Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material.” The Commission also approved license terms for such licensees of less than 40 years, to be decided on a case-by-case basis if the agency has concerns with safety risk, or if a licensee is introducing a new process or technology. On December 4, 2006, the NRC published this new policy in the *Federal Register* (71 FR 70441).

The 2009 application requested renewal for a period of 40 years (NFS, 2009a). As discussed below, NFS reduced its requested renewal term to 25 years (NFS, 2011j) and the NRC staff recommends approval of the shorter term.

The NFS compliance history from 1999 to 2010 (see Table 1-1) is a measure of the potential risk posed by continued operations in the future. In this regard, the staff evaluated the history of NFS escalated enforcement actions (EAs). Such actions involve safety-significant violations that are categorized as Severity Level I, II, or III under the NRC’s Enforcement Policy. When the NFS license was last renewed in 1999, the NRC had issued seven escalated EAs from 1992 to 1998 (an average of one escalated EA per year). Over the last 11 years, the NRC has issued

22 escalated EAs (an average of two escalated EAs per year), of which eight involved willful violations. (The term “willful” refers to conduct involving either a careless disregard for requirements, or a deliberate violation of requirements or falsification of information.) A summary of the violations is provided in Table 1-1.

**Table 1-1 NFS Compliance History**

Year	Severity Level 2 Violations	Severity Level 3 Violations	Violations Addressed with Alternative Dispute Resolution
7/1999 - 6/2000		EA-99-218	
7/2000 - 6/2001	-----	----- none -----	-----
7/2001 - 6/2002		EA-01-098	
7/2002 - 6/2003	-----	----- none -----	-----
7/2003 - 6/2004	EA-04-023	EA-03-124 EA-03-178 (W)	
7/2004 - 6/2005		EA-04-197 (W) EA-05-032 EA-05-093	
7/2005 - 6/2006		EA-05-180 EA-06-018	
7/2006 - 6/2007			EA-06-129 (W) EA-06-133 EA-06-141 (W) EA-06-160 EA-06-179 EA-06-182 (W)
7/2007 - 6/2008	-----	----- none -----	-----
7/2008 - 6/2009		EA-08-346 EA-09-087	
7/2009 - present		EA-10-086	EA-08-103 (W) EA-08-321 (W) EA-10-076 (W)

(W) – A case involving a willful violation

Many of the safety-significant problems listed in Table 1-1 were associated with new processes and technologies. Examples include the following:

- 2003 - Failure To Implement Category I Security Order
- 2005 - Multiple Failures To Properly Control Strategic Special Nuclear Material (SSNM)
- 2006 - Failure To Comply with Fitness-For-Duty Requirements
- 2006 - Poor Performance during Security Exercise
- 2006 - Spill of High-Enriched Uranyl Nitrate Solution in Blended Low Enriched Uranium (BLEU) Preparation Facility
- 2007 - Falsification of Medical Exams for Security Officers
- 2009 - Unexpected Exothermic Reaction in BLEU Preparation Facility
- 2009 - Fire in Commercial Development (CD) Line Glovebox
- 2010 - Overpressurized Uranium Hexafluoride Cylinders

In addition, as shown in the following list, NFS has implemented a number of new processes and technologies over the last 10 years, some of which were required by NRC orders:

- 1999 - Began Operation of New KAST Fuel Manufacturing Process (Classified)
- 2002 - Ordered To Implement Additional Security Measures for Category I SNM
- 2003 - Ordered To Implement Additional Security Measures for Category III SNM
- 2003 - Ordered To Implement Revised Design Basis Threat
- 2004 - Began Downblending Operations in New BLEU Preparation Facility
- 2006 - Began Extensive Upgrades to Security Measures
- 2009 - Began Uranium Hexafluoride Conversion Operations in New CD Line

NFS has made numerous commitments to upgrade its programs and improve its performance. Many of these efforts are ongoing and will take years to complete. For most of the last 10 years, the NRC has conducted enhanced oversight activities above those normally performed under the NRC inspection program. This has included the assignment of a second resident inspector to the site and many special inspections. The staff expects to continue enhanced oversight activities for the foreseeable future, until NFS corrective actions are found to be effective.

The staff notes that there have been periods (in 2000, 2002, and 2007) where NFS demonstrated improved performance and no escalated EAs were issued. However, NFS has been unable to sustain improved performance for an extended period. Since 2007, NFS has been on the agenda of the Agency Action Review Meeting, which is a meeting of senior NRC managers to review agency actions that have been taken for licensees with significant safety or security issues.

In response to a request for additional information, NFS noted that instead of seeking traditional enforcement, it made sweeping commitments to revolutionize its configuration management (CM) program, focus on strengthening its safety culture, and implement industry best practices in the area of human performance. In addition, NFS agreed to shut down all process lines in early 2010 to allow personnel to focus on strengthening practices in these areas. The staff acknowledges that inspectors found improvements during the 2010 restart readiness reviews for several processing lines. NFS noted that its ownership by the Babcock and Wilcox Company provides increased access to resources and an ability to invest in infrastructure and system improvements at a level previously unattainable.

While program improvements implemented by NFS are encouraging and have the potential to improve performance, the staff's view is that sustained improvement in NFS operations must be demonstrated over a period of years before a renewed license term of up to 40 years could reasonably be granted under the 2006 policy. The NRC staff was concerned about the poor compliance history discussed above, and the ongoing need to demonstrate an improved safety culture.

On October 5, 2011, NRC staff contacted NFS to review these concerns and asked NFS to reconsider its request for a 40-year license renewal term. On November 21, 2011, NFS revised its application to request a term of 25 years (NFS, 2011j). The NRC staff finds that a term of 25 years is a reasonable balance between the factors that support a longer term (*i.e.*, an approved ISA summary and program improvements) and the concerns that warrant a shorter term (*i.e.*, poor compliance history and safety culture issues). If significant new problems are identified

during the renewal term, the NRC can exercise its authority to modify or suspend the license, or take other enforcement action as appropriate.

#### *1.2.2.6 Special Exemptions or Special Authorizations*

##### Changes to Application without Prior NRC Approval

In the transmittal letter for the original application (NFS, 2009a), NFS requested authorization to make changes to the commitments in its application without prior NRC approval. The NRC has granted this authorization to other licensees. The NRC staff has reviewed the application and confirmed that it contains commitments to ensuring that operations are conducted safely and in compliance with all regulations. Organizational responsibility for compliance begins with the NFS President. The NRC staff proposes the following license condition, which is consistent with the process for making changes under 10 CFR 70.72, "Facility Changes and Change Process":

S-2 NFS may make changes to the License Application that do not reduce the effectiveness of the License Application, without prior NRC approval, if the change meets the following provisions:

- The change does not decrease the level of effectiveness of the design basis as described in the License Application.
- The change does not result in a departure from the methods of evaluation described in the License Application used in establishing the design basis.
- The change does not result in a degradation of safety.
- The change does not affect compliance with applicable regulatory requirements.
- The change does not conflict with an existing license condition.
- Within 6 months after each change is made, the licensee shall submit the revised chapters of the License Application to the Director, NMSS, using an appropriate method listed in 10 CFR 70.5(a), and a copy to the appropriate NRC regional office.

##### Definition of Production Facility

The previous license renewal in 1999 (NRC, 1999a) granted an exemption from the definition of "production facility" in 10 CFR 50.2. Specifically, the NRC granted NFS a possession limit for uranium containing plutonium and transuranic materials based on grams of total uranium, instead of grams of uranium-235 (U-235). In granting the original exemption, the NRC staff evaluated radiation protection, criticality safety, and environmental impact. The radiation protection evaluation concluded that internal exposures would decrease slightly and external exposures would increase slightly; however, the exemption would not significantly increase the risk to personnel. The criticality safety evaluation concluded that the amount of plutonium required to have a detectable effect on the criticality calculation was at least 17 parts per million (ppm). This compares to the requested limits of 1 ppm plutonium (Pu) and 15 ppm of transuranics. The analysis used pure Pu-239. It showed that, even if the entire 15 ppm of transuranics was Pu-239, the effect on criticality would be negligible. Assuming all of the transuranics to be Pu-239 is conservative for all credible isotopes of transuranic material. The environmental impact evaluation concluded that the potential impact was minimal. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from 10 CFR 50.2 is granted for the renewal period.

### Criticality Monitoring

NFS requests the continuation of an exemption from the criticality monitoring requirements of 10 CFR 70.24, "Criticality Accident Requirements," for SNM stored in authorized shipping containers that are in isolated arrays or on a transport vehicle and that are no more reactive than that approved for transport. Each NFS license renewal since 1979 (NRC, 1979c, 1992d, and 1999a) has authorized this exemption. The NRC staff continues to find this exemption acceptable because of the requirements in 10 CFR 71.55, "General Requirements for Fissile Material Packages," and 10 CFR 71.59, "Standards for Arrays of Fissile Material Packages." These requirements ensure that arrays will remain subcritical under normal conditions and under accident conditions. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period.

### Posting and Labeling

NFS requests the continuation of an exemption from the requirement in 10 CFR 20.1904(a) [formerly 10 CFR 20.203(f)] that every container of licensed material bear a label. Every license renewal since 1979 (NRC, 1979c, 1992d, and 1999a) has authorized this exemption which remains in force. NFS committed to post each entrance into the plant security fence with a sign stating "Caution, Radioactive Materials, Every container or vessel within this area may contain Radioactive Materials." The NRC staff continues to find it acceptable because operating experience over many years has demonstrated that the lack of a label on every container has not resulted in significant contamination control problems. Workers are trained to treat every container inside the plant as potentially contaminated. There are numerous containers in the plant and it is a reasonable alternative to labeling every container. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period.

### Contamination-Free Articles

The previous license renewal in 1999 (NRC, 1999a) approved the use of the limits specified in Chapter 4 of the application to release facilities and equipment for uncontrolled use. The limits are based on guidelines issued by the NRC in 1993 (NRC, 1993b). These guidelines are referenced in the standard review plan (NRC, 2002a) as an acceptable method of demonstrating compliance with the radiation survey and monitoring requirements in 10 CFR Part 20. The staff finds the method is still acceptable. Accordingly, a continuation of the approval is granted for the renewal period.

### Decommissioning Funding Plan

NFS requests the continuation of an exemption from the requirements of 10 CFR 70.25(f) that specify the funding methods NFS may use to guarantee funds for decommissioning. Each NFS license renewal since 1992 (NRC, 1992d and 1999a) has authorized this exemption for decommissioning facilities manufacturing fuel for government reactors. In 2003, NRC granted the same exemption for decommissioning facilities manufacturing fuel for commercial reactors (NRC, 2003h). Specifically, the exemption allows NFS to use statements of intent from government agencies (or equivalent contract clauses) as funding methods for decommissioning financial assurance. Normally, the NRC accepts statements of intent only from government licensees because government licensees must have operating budgets approved each year by

a legislature. Although NFS is not a government licensee, most of the facilities at NFS have been constructed and operated to provide contract services to Federal Government agencies. Under these contracts, the Federal agencies have committed the United States Government to fund the cost of decommissioning these facilities.

The staff finds the continuation of the exemption acceptable because the ability of the United States Government to pay its obligations is at least equivalent to the ability of a private financial institution to honor a guarantee of funds through one of the other methods specified in 10 CFR 70.25(f). The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period.

#### Decommissioning-Related Activities Performed before the End of Plant Life

NFS requests the continuation of a special authorization that facilities or grounds may be remediated or decontaminated on a project-by-project basis before the end of plant life. In 2003, the NRC amended the license to authorize NFS to conduct various decommissioning projects to reduce the source term at the site (NRC, 2003a). The renewed license will continue to authorize this activity. NFS must evaluate decommissioning procedures and activities under the requirements of 10 CFR 70.38(g)(1) and submit a decommissioning plan for approval if required. The staff finds this special authorization acceptable because NFS has conducted several major decommissioning projects over the years and has extensive experience with decommissioning activities. In Chapter 10 of the application, NFS committed to conducting these evaluations under its change control program. NFS submits internally authorized changes made under that program to NRC each year. The annual report will allow the NRC staff to review changes made without prior NRC approval. Accordingly, a continuation of the special authorization is granted for the renewal period.

#### Transportation Security

NFS requests the continuation of an exemption from certain physical security requirements (10 CFR 73.24(b), 73.25, 73.26, 73.27, 73.67(e) and 73.72) when special nuclear material (SNM) is shipped as a contaminant in low-level waste. In 2006, the NRC granted this exemption which remains in force (NRC, 2006a). The staff finds that a continued exemption is acceptable because it would be difficult for an adversary to recover SNM from low-level waste. Therefore, security measures required for significant amounts of SNM are not necessary when the SNM is uniformly distributed as a contaminant in a large quantity of waste, and the SNM is not readily separable from the waste. Proposed decommissioning activities will continue to generate large quantities of waste contaminated with SNM. The NRC staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period.

#### Use of Values from Publication 68 of the International Commission on Radiation Protection

NFS requests the continuation of an exemption from Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," to 10 CFR Part 20, "Standards for Protection against Radiation." In 2003 (NRC, 2003g), NRC granted this exemption which authorizes the use of DAC and ALI values from International Commission on Radiation Protection (ICRP) Publication 68, "Dose Coefficients for Intakes of Radionuclides by Workers," (ICRP, 1994). The staff finds that a continued exemption is acceptable because the

newer models in this international standard are an acceptable method of calculating exposure to radioactive materials and demonstrating compliance with dose limits. Also, in a Staff Requirements Memorandum dated April 21, 1999 (SECY-99-077), the Commission approved the staff granting exemptions based on the precedent set by the decision to authorize the use of models in ICRP Publication 68. The NRC staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period.

### Additional Exemptions

Chapter 12 of this SER addresses several exemptions from the requirements in 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material."

#### *1.2.2.7 Security of Classified Information and Safeguards Information*

The National Industrial Security Program directed Federal agencies to avoid dual regulation of information security at regulated facilities by designating one agency to be the Cognizant Security Agency. Therefore, on January 4, 2001, the NRC asked the U.S. Department of Energy (DOE) to accept Cognizant Security Agency responsibilities for the information security program at NFS, given DOE's preponderant responsibilities under its contracts with NFS for classified products. On July 17, 2001, DOE accepted Cognizant Security Agency responsibilities for the protection of classified information at NFS. These responsibilities include issuing a facility clearance to NFS and conducting inspections of DOE regulations that are similar to the regulations in 10 CFR Part 25, "Access Authorization," and 10 CFR Part 95, "Facility Security Clearance and Safeguarding of National Security Information and Restricted Data."

The NRC staff contacted the Director of Security for the National Nuclear Security Administration (NNSA) in DOE. The NRC staff requested confirmation that NNSA intended to continue serving as the Cognizant Security Agency for NFS. On April 14, 2011, NNSA confirmed the following information (DOE, 2011a):

- The current contract security specification for NFS is NRLFO-11-411, dated January 31, 2011.
- The facility clearance for NFS is valid.
- NNSA believes the current NFS information security program is adequate.
- NNSA will continue providing program oversight.
- The most recent DOE Security Survey at NFS was completed on August 19, 2010, resulting in a finding of Satisfactory with no significant issues identified.

In addition to classified information, NFS must protect Safeguards Information in accordance with the requirements in 10 CFR Part 73, "Physical Protection of Plants and Materials." It is NRC policy that when a facility is governed by a DOE classification guide, Safeguards Information is not a designation that should be used on documents prepared by that facility. However, if the facility receives information marked as Safeguards Information, it must honor the marking and protect the information accordingly. NFS has a procedure for protecting Safeguards Information that NRC inspectors have reviewed and found acceptable. The most recent security inspection that examined the protection of Safeguards Information found no violations (NRC, 2011e). Inspection reports of security programs are withheld from the public.

### *1.2.3 Evaluation Findings*

The staff has reviewed the institutional information for NFS according to Section 1.2 of NUREG-1520. On the basis of the review, the NRC staff has determined that the applicant has adequately described and documented the corporate structure and financial information and is in compliance with those parts of 10 CFR 70.22 and 10 CFR 70.65, "Additional Content of Applications," related to institutional information. In addition, the applicant has adequately described the types, forms, quantities, and proposed uses of licensed material to be authorized at the facility.

The applicant has provided the institutional information necessary for the staff to understand the ownership, financial qualifications, location, planned activities, and nuclear materials to be handled in connection with the renewed license. The applicant's proposed activities are consistent with the Atomic Energy Act of 1954, as amended.

## **1.3 Site Description**

### *1.3.1 Purpose of Review*

The NRC staff reviewed the site description to determine whether the information provided by NFS adequately described the geographic, demographic, meteorologic, hydrologic, geologic, and seismologic characteristics of the site and surrounding area, in accordance with 10 CFR 70.22(a)(2) and 70.65(b). The site description is a summary of the information that NFS used in preparing the environmental report, emergency plan, and ISA summary.

### *1.3.2 Staff Review and Analysis*

#### *1.3.2.1 Site Geography*

The application describes the site location, major nearby highways, nearby bodies of water, and significant geographic features such as the valley orientation. The site is located within the city limits of Erwin, in Unicoi County, TN. The addendum to the application shows the site boundaries and controlled area boundaries.

#### *1.3.2.2 Population Information*

The application describes the latest census results for the City of Erwin. In addition, it describes nearby population centers, public facilities, other industrial facilities, uses of land within 1 mile of the facility, and uses of nearby bodies of water.

#### *1.3.2.3 Meteorology*

The application describes primary wind directions and average wind speeds. In addition, it describes annual amounts and forms of precipitation and severe weather conditions in the Erwin area.

#### *1.3.2.4 Hydrology*

The application describes the characteristics of nearby bodies of water, depth to the water table, groundwater flow, the uppermost aquifer, and potential flooding events.

#### *1.3.2.5 Geology*

The application describes the characteristics of soil and bedrock, design-basis earthquakes and return periods, and other geologic hazards such as slope failures.

#### *1.3.3 Evaluation Findings*

The staff reviewed the site description for NFS according to Section 1.3 of NUREG-1520. NFS adequately described and summarized general information pertaining to (1) the facility and processes at the site, (2) institutional information, including types, forms, and quantities of licensed materials and proposed uses, and (3) site geography, population information, meteorology, hydrology, and geology for the site. The reviewer verified that the site description is consistent with the information used as a basis for the environmental report, emergency plan, and ISA summary. The staff finds that NFS has met the 10 CFR 70.22(a)(2) and 70.65(b) requirements.

### **1.4 References**

- |              |  |
|--------------|--|
| (B&W, 2011a) | Babcock & Wilcox Nuclear Operations Group, "Request for Additional Information Concerning License Renewal for SNM-124," May 6, 2011, ML11131A037.                                  |
| (DOE, 2011a) | U.S. Department of Energy, National Nuclear Security Administration, "Cognizant Security Agency for Nuclear Fuel Services," April 14, 2011, ML111750142.                           |
| (ICRP, 1994) | International Commission on Radiation Protection, "Dose Coefficients for Intakes of Radionuclides by Workers," Publication 68, Annals of the ICRP, Volume 24, No. 4, 1994.         |
| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.  |
| (NFS, 2009b) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469.                        |
| (NFS, 2010a) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.                            |
| (NFS, 2011f) | Nuclear Fuel Services, Inc., "Revisions for Chapter 1, Addendum, Chapter 2, Chapter 5, Chapter 10, and Chapter 11 for Renewal of SNM License 124," September 9, 2011, ML11258A051. |

(NFS, 2011j)	Nuclear Fuel Services, Inc., "Supplemental Information to Support the NFS Response to RAI Question 1.9 for Renewal of License SNM-124," November 21, 2011, ML11333A264.
(NRC, 1979c)	U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," March 16, 1979, ML11325A134.
(NRC, 1992d)	U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," June 9, 1992, ML11325A132.
(NRC, 1993b)	U.S. Nuclear Regulatory Commission, Branch Technical Position, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," April 1993, Accession no. 9706230286.
(NRC, 1999a)	U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," July 2, 1999, Accession No. ML11325A131.
(NRC, 2001a)	U.S. Nuclear Regulatory Commission, "Request U.S. Department of Energy Accept Security Cognizance for Nuclear Fuel Services," January 4, 2001, ML092861084.
(NRC, 2002a)	U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.
(NRC, 2003a)	U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc. Amendment 38 - Source Reduction," May 7, 2003, ML031280699.
(NRC, 2003g)	U.S. Nuclear Regulatory Commission, "Amendment 40 – Request to Use ICRP 68 Values," August 21, 2003, ML032340426.
(NRC, 2003h)	U.S. Nuclear Regulatory Commission, "Amendment 45 – Request for Exemption from Decommissioning Financial Assurance Requirements," November 13, 2003, ML033140300.
(NRC, 2006a)	U.S. Nuclear Regulatory Commission, "Amendment 73 – Exemption of Low Level Waste Shipments from Certain Physical Security Requirements," July 17, 2006, ML072630273.
(NRC, 2008a)	U.S. Nuclear Regulatory Commission, "Consent to Indirect Transfer of Control of Nuclear Fuel Services, Inc. License," December 23, 2008, ML083500508.
(NRC, 2010a)	U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for Transfer of Control Due to Spin-off of the Babcock & Wilcox Companies from McDermott International Inc.," June 15, 2010, ML101660709.
(NRC, 2010b)	U.S. Nuclear Regulatory Commission, "Trip Summary of April 5 – 7, 2010, Site Visit at Nuclear Fuel Services," June 4, 2010, ML101530546.

(NRC, 2011e) U.S. Nuclear Regulatory Commission, "Inspection Report 07000143-11-401 – Nuclear Fuel Services," July 8, 2011, ML111890609 (non-public).

## **2.0 ORGANIZATION AND ADMINISTRATION**

### **2.1 Purpose of Review**

The NRC staff reviewed the renewal application describing the NFS organization and administration to ensure that its management and staff are qualified by reason of training and experience to use the material for the purpose requested in accordance with 10 CFR 70.22(a)(6) and 10 CFR 70.23(a)(2). This review evaluated whether management policies provide reasonable assurance that the licensee plans, implements, and controls site activities in a manner that ensures the safety of workers, the public, and the environment. The review also confirmed that NFS identified and provided adequate qualification descriptions for key management positions.

### **2.2 Staff Review and Analysis**

The staff used the acceptance criteria in Chapter 2 of NUREG-1520 (NRC, 2002a) in its review of the organization and administration of NFS and made the following findings:

- The applicant identified and functionally described the organizational groups that are responsible for managing the design, construction, operation, and modification of licensed activities. Figure 2-1 in the application provided an organization chart.
- The applicant clearly defined the qualifications, responsibilities and authorities of key supervisory and management positions responsible for the protection of health, safety, and the environment (HS&E).
- The HS&E groups are independent of operational groups, allowing them to conduct objective audit, review, and control activities.
- The Safety Discipline Director has the authority to shut down operations, approve the restart of operations, and require additional safety measures when needed for plant safety.
- Section 11.4 of the application commits NFS to conduct HS&E functions in accordance with written procedures prepared in compliance with a formal document control program.
- A problem identification system is available for any person at NFS to report potentially unsafe conditions. A screening committee assigns an owner to each issue and defines followup requirements. Corrective actions are tracked to completion.
- The application defines adequate lines of communication and authority among the engineering, safety, and production disciplines.
- The application committed to formal management measures that ensure the availability and reliability of items relied on for safety (IROFS). Chapter 11 of this report provides a more detailed evaluation of this area.
- The emergency plan submitted as part of the application documents written agreements with offsite response organizations for firefighting, police, ambulance, and medical services.

### **2.3 Evaluation Findings**

NFS described its organization and management policies for providing adequate management for the safe operation of the facility. The staff reviewed the elements listed above. These organizational and administrative elements described clear responsibilities and associated

resources for the safe operation of the facility. The staff concluded that NFS has an acceptable organization and administrative policies and sufficient competent resources to provide for the safe operation of the facility under both normal and abnormal conditions. The staff finds that NFS management and staff are qualified by reason of training and experience to use the material for the purpose requested in accordance with 10 CFR 70.22(a)(6) and 10 CFR 70.23(a)(2).

## **2.4 References**

- |              |  |
|--------------|--|
| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.  |
| (NFS, 2010a) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.                            |
| (NFS, 2011d) | Nuclear Fuel Services, Inc., "Revised Chapters 2, 7, 10, and 11 for Renewal of SNM License 124," August 1, 2011, ML11221A286.  |
| (NFS, 2011f) | Nuclear Fuel Services, Inc., "Revisions for Chapter 1, Addendum, Chapter 2, Chapter 5, Chapter 10, and Chapter 11 for Renewal of SNM License 124," September 9, 2011, ML11258A051. |
| (NRC, 2002a) | U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.                 |

## **3.0 INTEGRATED SAFETY ANALYSIS AND INTEGRATED SAFETY ANALYSIS SUMMARY**

### **3.1 Purpose of Review**

The NRC staff conducted this review to evaluate whether the applicant has complied with the requirements in Subpart H of 10 CFR Part 70 for an ISA. An ISA identifies potential accident sequences in the facility's operations, designates IROFS to either prevent such accidents or mitigate their consequences to an acceptable level, and describes management measures to provide reasonable assurance of the availability and reliability of IROFS. Applicants must perform an ISA and submit a summary (referred to as an "ISA summary") to the NRC, for approval. The ISA summary principally differs from the ISA by focusing on higher risk accident sequences with consequences that could exceed the performance criteria of 10 CFR 70.61, "Performance Requirements." The ISA summary is a synopsis of the results of the ISA and contains the information specified in 10 CFR 70.65(b).

Under 10 CFR 70.62(c), the NRC requires the licensee to conduct and maintain an ISA of appropriate detail for the complexity of the process. The ISA identifies the following:

- radiological hazards related to possessing or processing licensed material
- chemical hazards of licensed material, and hazardous chemicals produced from licensed material
- facility hazards that could affect the safety of licensed materials and thus present an increased radiological risk
- potential accident sequences caused by process deviations, or other events internal to the facility, and credible external events, including natural phenomena
- the consequence and the likelihood of occurrence of each potential accident sequence identified pursuant to 10 CFR 70.62(c)(1)(iv), and the methods used to determine the consequences and likelihoods of each
- each IROFS identified pursuant to 10 CFR 70.61(e); the characteristics of its preventive, mitigative, or other safety function; and the assumptions and conditions under which the item is relied on to support compliance with the performance requirements of 10 CFR 70.61

Under 10 CFR 70.65(b), the NRC requires that ISA summaries be submitted with applications for license renewal. The ISA summaries must contain the following information:

- a general description of the site, with emphasis on factors that could affect safety
- a general description of the facility, with emphasis on areas that could affect safety
- a description of each process in sufficient detail to understand the theory of operation and the hazards of each process, and a general description of the types of accident sequences
- information that demonstrates compliance with the performance requirements of 10 CFR 70.61, including management measures, criticality alarms, and baseline design criteria, if applicable
- a description of the ISA team, their qualifications, and methods used in the ISA
- a brief list of the IROFS in sufficient detail to understand their functions in relation to the performance requirements
- a description of the quantitative standards used to assess consequences from a chemical exposure on site

- a list of sole IROFS
- definitions of “unlikely,” “highly unlikely,” and “credible” as used in the ISA

### **3.2 Staff Review and Analysis**

The NRC staff used the acceptance criteria in Chapter 3 of NUREG-1520 (NRC, 2002a) for this review. In addition to the commitments in Chapter 3 of the application (NFS, 2009a), the application incorporates the following ISA summaries by reference (NFS, 2009b) and proposes no changes to these documents:

- NFS Site ISA Summary
- BLEU Preparation Facility ISA Summary
- BLEU Uranyl Nitrate Building ISA Summary
- BLEU Oxide Conversion and Effluent Processing Buildings ISA Summary
- Building 100 Non-Destructive Analysis Laboratory ISA Summary
- Building 110B, 110D, and 131 Laboratory ISA Analysis
- Building 300 Warehouse ISA Summary
- Building 310 Warehouse ISA Summary
- CD Line ISA Summary
- Building 105 Laboratory ISA Summary
- 300 Complex Production Areas ISA Summary
- 300 Complex Recovery ISA Summary
- 300 Complex Support Systems ISA Summary
- Waste Water Treatment Facility ISA Summary

Note that two ISA summaries existed for the CD Line in 2009. One ISA summary supported the license amendment, and one ISA summary addressed systems not requiring prior NRC approval. In 2010, the two documents were merged into a single ISA Summary for the CD Line when the annual update was submitted.

#### ***3.2.1 Process Safety Information***

The staff found that the applicant committed to compiling and maintaining up-to-date process safety information. As noted below, extensive onsite reviews and inspections have confirmed that NFS has compiled written information on (1) the hazards of all materials used or produced in the processes, (2) the technology of the processes, and (3) the equipment used in the processes.

The staff found that the application included procedures and criteria for changing the ISA. The application committed to a facility change mechanism that meets the requirements of 10 CFR 70.72. Chapter 2 of the application states that the ISA Manager has the authority and the responsibility to update the ISA.

The staff found that the application committed to an ISA Team with appropriate experience and expertise to maintain the ISA. Team members will be knowledgeable in the ISA methods and the operation, hazards, and safety design criteria of the process being analyzed.

### *3.2.2 Integrated Safety Analysis*

The staff found that the applicant committed to conducting and maintaining an ISA of appropriate complexity for each process. As noted below, extensive onsite reviews conducted previously found that process hazard analyses have been conducted using acceptable methodologies. The results of the analyses have been used to identify process hazards, credible accident scenarios, the consequences and likelihood of those scenarios, and the IROFS needed to meet the performance criteria in 10 CFR 70.61. The application commits to using methods listed in NUREG-1513, "Integrated Safety Analysis Guidance Document," and NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook." The application commits to maintain the ISA accurate and up to date using a CM program described in Chapter 11. The application commits to training ISA team members in ISA methods. ISA team members will use these methods to evaluate proposed changes to the facility or its processes. The team will evaluate IROFS and management measures promptly if change evaluations identify new accident scenarios or increases in their consequences or likelihood. The application commits to addressing unacceptable performance deficiencies in IROFS.

### *3.2.3 Management Measures*

In 2003, NRC approved a license amendment which added commitments to establish and maintain management measures to ensure the reliability and availability of IROFS (NRC, 2003b). This application retains those commitments. Chapter 11 of this report provides a detailed evaluation. The existing license contains a condition on setpoint determinations. The license has contained this condition for several years without incident. The NRC staff recommends retaining the condition as follows:

- S-3     NFS shall utilize, for setpoint determinations, conservative engineering analyses that account for safety limits, instrument and system accuracies, response times, instrument drift, manufacturer's data and operating experience. The analysis for each safety setpoint shall be a formal calculation and shall be documented for each IROFS interlock and alarm.

### *3.2.4 ISA Summaries*

Using teams of technical reviewers, the NRC staff previously reviewed the ISA Summaries listed above. The reviews included onsite vertical slice reviews of the underlying ISAs. The following documents provide the results of these previous detailed reviews:

- Safety Evaluation Report (SER) for License Amendment Authorizing Operations at Uranyl Nitrate Building (NRC, 2003b)
- SER for License Amendment Authorizing Operations at BLEU Oxide Conversion Building and Effluent Processing Building (NRC, 2004a)
- SER for License Amendment Authorizing Operations at BLEU Preparation Facility (NRC, 2004b)
- Technical Evaluation Report for NFS's Integrated Safety Analysis Summary for Those Facilities Not Approved as Part of the BLEU Amendments (NRC, 2007a)
- SER for License Amendment Authorizing Operations at New Commercial Development Line (NRC, 2009a)

The NRC formally approved all of the ISA summaries listed in Section 3.2 except for the CD Line ISA summary for those processes which NFS was authorized to add without prior NRC approval. The NRC staff evaluated this “nonlicense amendment” ISA summary during an operational readiness review inspection and identified no violations (NRC, 2009c).

In addition, NFS has submitted annual updates to these ISA summary documents in accordance with 10 CFR 70.72. The NRC staff has found the annual updates to be acceptable. The most recent finding was issued in August 2011 (NRC, 2011i). The license renewal application proposes no changes to these ISA summaries. The staff finds the ISA summaries to be acceptable.

### **3.3 Evaluation Findings**

As discussed above, the NRC staff has conducted detailed reviews, including onsite vertical slice reviews, of the ISA documents. Annual updates to the ISA Summaries have been reviewed also. The NRC staff finds that NFS has performed an ISA of appropriate level of detail for the complexity of the processes, and that it identified and evaluated potential hazards and accidents as required by the regulations. The NRC staff finds that the ISA summaries and other information provide reasonable assurance that the licensee has established a safety program, maintains process safety information and an ISA, and has established management measures that demonstrate that the safety program meets the performance requirements of 10 CFR 70.61. Specifically, the NRC staff finds that the ISA results, as documented in the ISA summaries, provide reasonable assurance that the IROFS, management measures, and programmatic commitments will make all credible high consequence events “highly unlikely” and all credible intermediate consequence events “unlikely.”

The NRC staff also finds that the licensee’s safety program is established and maintained pursuant to 10 CFR 70.62, “Safety Program and Integrated Safety Analysis,” and provides reasonable assurance that the IROFS are available and reliable to perform their intended safety functions when needed, and in the context of the performance requirements of 10 CFR 70.61.

### **3.4 References**

- |              |   |
|--------------|---|
| (NFS, 2009a) | Nuclear Fuel Services, Inc., “Renewal of Special Nuclear Material (SNM) License 124,” June 30, 2009, ML091900061.   |
| (NFS, 2009b) | Nuclear Fuel Services, Inc., “Response to Request for Additional Information Concerning License SNM-124 Renewal Application,” August 28, 2009, ML092450469.   |
| (NRC, 2002a) | U.S. Nuclear Regulatory Commission, NUREG-1520, “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility,” March 2002, ML020930033.  |
| (NRC, 2003b) | U.S. Nuclear Regulatory Commission, “Safety Evaluation Report: Nuclear Fuel Services, Inc., Amendment 39 (TAC Nos. L31688, L31739, L31721 and L31748) – To Authorize Uranyl Nitrate Building at the Blended Low Enriched Uranium Complex and Possession Limit Increase,” July 7, 2003, ML050120434. |

- (NRC, 2004a) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for Nuclear Fuel Services, Inc., License Amendment 51, Blended Low Enriched Uranium Oxide Conversion Building and Effluent Processing Building," July 30, 2004, ML042540349.
- (NRC, 2004b) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for Nuclear Fuel Services, Inc., License Amendment 47, Blended Low Enriched Uranium Preparation Facility," January 13, 2004, ML050110444.
- (NRC, 2007a) U.S. Nuclear Regulatory Commission, "Technical Evaluation Report for Nuclear Fuel Services, Inc.'s Integrated Safety Analysis Summary for Those Facilities Not Approved as Part of the Blended Low Enriched Uranium Amendments," August 24, 2007, ML082120209.
- (NRC, 2009a) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for Nuclear Fuel Services, Inc., License Amendment 88, Authorization to Process Uranium Fluoride Compounds in the New Commercial Development Line," May 11, 2009, ML090490686.
- (NRC, 2009c) U.S. Nuclear Regulatory Commission, "Inspection Report No. 07000143-09-009 – Nuclear Fuel Services," July 24, 2009, ML092050562.
- (NRC, 2011i) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc. – Acceptance of Revisions to Integrated Safety Analysis Summaries for Calendar Year 2010," August 8, 2011, ML112160558.

## 4.0 RADIATION PROTECTION

### **4.1 Purpose of Review**

The NRC staff conducted this review to determine whether the radiation protection program (RPP) described in the NFS license renewal application is adequate to protect the radiological health and safety of workers and to comply with the associated regulatory requirements in 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, and 10 CFR Part 70. Chapter 9 of this report discusses protection of the public and the environment.

### **4.2 Staff Review and Analysis**

The NRC staff used the acceptance criteria in Chapter 4 of NUREG-1520 (NRC, 2002a) for this review. The information to support this review was obtained from the original 2009 application (NFS, 2009a) and additional information submitted in 2011 (NFS, 2011a, and NFS, 2011d). The staff notes that NFS has an existing radiation protection program which has been reviewed and inspected for many years. In its license renewal application, NFS proposes no significant changes to the program and NFS commits to maintaining the various elements of the program during the term of the renewed license, as discussed below.

#### *4.2.1 Radiation Protection Program Implementation*

The discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's evaluation as to whether the information provided by the applicant meets the criterion.

- (1) "design and implement a radiation protection (RP) program that meets the regulatory requirements of 10 CFR Part 20, Subpart B"

In Section 4.1 of the application, the applicant commits to establishing, maintaining, and implementing an RPP commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of 10 CFR 20.1101, "Radiation Protection Programs." This includes the use of engineered and administrative controls to maintain radiation exposure as low as reasonably achievable (ALARA); development of procedures for implementation of the RPP; implementation of a self-assessment program to periodically (at least annually) review the RPP; and a staff of suitably trained radiation protection personnel, with sufficient resources to implement the RPP independent from facility operations.

- (2) "outline the RP program structure and define the responsibilities of key program personnel"

Section 4.1 of the application states that the RPP will be structured to include specific programs for ALARA, contamination control, internal and external dosimetry, dose registry, training, safety (radiation) work permits, airborne radioactivity monitoring, and sealed source control. The applicant commits to establishing key program personnel with program ownership and responsibility.

As stated in Section 2.3.5.2 of the application, the manager of the radiation protection function is responsible for administering the activities associated with radiological safety as necessary to ensure the protection of employees at NFS and the community. Health physicists assist the manager and are charged with developing and implementing radiological control programs to meet program goals and objectives. The radiation monitoring manager administers the safety monitoring program to comply with license conditions and all applicable local, state and federal regulations. The radiation technician supervisors coordinate and assign daily radiation monitoring tasks supporting health physics activities while radiation technicians perform the tasks as assigned.

- (3) “staff the RP program with suitably trained people, provide sufficient resources, and implement the program”

The applicant currently staffs its existing RPP with sufficient personnel and resources to implement the program. During the 2010 license performance review (NRC, 2011c), the NRC found the applicant to have no specific areas needing improvement with regard to radiological controls. In addition, the applicant stated in Section 4.1 of the application that it will have a staff of suitably trained radiation protection personnel, with sufficient resources to implement the RPP independent from facility operations.

- (4) “commit to the independence of the radiation protection function from the facility’s operations”

Section 4.1 of the application states that the applicant will maintain and implement the RPP independent from facility operations. Section 2.3.5.2 of the application states that the Radiation Protection Function Manager will be responsible directly to the NFS president (or equivalent) in vital matters of radiological safety.

- (5) “review, at least annually, the content and implementation of the radiation protection program as required by 10 CFR 20.1101(c)”

As previously mentioned, Section 4.1 of the application states that NFS will implement a self-assessment program to periodically (at least annually) review the RPP.

As indicated above, 10 CFR 20.1101(c) requires NFS to annually review its RPP. The applicant’s RP program has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this program. Based on the staff’s evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.1.3 of NUREG-1520 (NRC, 2002a), the staff finds that the RP program provides assurance that NFS will satisfy the requirements in 10 CFR 20.1101 during the renewed license term. Therefore, the NRC staff finds that the RP program is acceptable.

#### *4.2.2 ALARA Program*

The staff reviewed the applicant’s ALARA program commitments against the acceptance criteria in NUREG-1520, Section 4.4.2.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and provides the staff’s evaluation as to whether the information provided by the applicant meets the criterion:

- (1) “establish a comprehensive, effective, and written ALARA program”

As described in Sections 2.4, 4.1, 4.2, and 9.1 of the application, NFS commits to implement an ALARA program using written procedures to ensure that radiation exposures to workers and offsite releases of radioactivity are kept both below regulatory limits and ALARA such that exposures are consistent with the requirements of 10 CFR 20.1101. NFS will maintain an ALARA program document that provides specific guidance for implantation of the ALARA philosophy using the guidance in Regulatory Guide (RG) 8.10, “Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable,” (NRC, 1977). Senior managers at the facility will approve the ALARA program document, which will have many facets for implementing ALARA. The applicant recently demonstrated the effectiveness of its ALARA program during the 2010 licensee performance review (NRC, 2011c) which found no specific areas needing improvement with respect to radiological controls.

- (2) “prepare policies and procedures to ensure occupational exposures are maintained ALARA, and that such exposures are consistent with the requirements of 10 CFR 20.1101”

As described in Sections 4.2.1 and 4.2.2 of the application, the applicant will have an ALARA program document that provides specific guidance for implementation of the ALARA philosophy using the guidance in RG 8.10 (NRC, 1977).

Section 9.1 of the application states that action levels for air effluents will be established such that dose to members of the public will not be expected to exceed the dose constraint in 10 CFR 20.1101(d) (i.e., 10 mrem per year from atmospheric releases).

- (3) “outline specific ALARA program goals, establish an ALARA program organization and structure, and have written procedures for its implementation in the facility design and operations”

As stated in Section 4.2.2 of the application, the applicant commits to appoint a health physicist, within the radiation protection function, with responsibility for overseeing and coordinating the ALARA program. NFS has developed a formal written ALARA document, approved by senior managers, which implements the ALARA policy by requiring training in the ALARA philosophy for all radiation workers; requiring the development, approval, and implementation of specific ALARA goals for selected operating units and the designation of an ALARA coordinator, as appropriate, for each group to review the progress toward the attainment of specific ALARA goals; requiring the measurement and monitoring of progress toward goal achievement and the issuance of regular progress reports to management and supervisors; requiring the performance of specific ALARA reviews during the design phase of engineering projects for new facilities or the modification of facilities or equipment; defining, as appropriate, specific long-term ALARA goals incorporating new approaches, technologies, operating procedures, or changes that could reduce potential radiation exposures at a reasonable cost; establishing an ALARA technical review committee comprising the safety review committee (SRC) (see item 5 below) to review all proposed facility modifications and their ALARA evaluations, operating procedures, and ALARA reports; requiring a periodic report of radiation and other safety-related monitoring and audits to appropriate levels of management together with recommendations on methods for lowering exposures, both occupational and environmental; requiring the analysis of monitoring data for trends that

might indicate an increase in radiation exposures; conducting a periodic audit of the ALARA program implementation; and requiring routine inspections of operating areas focused on the implementation of radiological controls.

- (4) “establish an ALARA Committee, or equivalent organization, with sufficient staff, resources, and clear responsibilities to ensure that the occupational radiation exposure dose limits specified in 10 CFR Part 20 are not exceeded under normal operations”

Section 2.4 of the application states that NFS will have an SRC that will serve as the ALARA committee and see that operating procedures incorporate controls to ensure that exposure to radiation and the release of radioactivity are maintained as far below regulatory limits as is reasonably achievable. The SRC meets at least semiannually to discuss ALARA considerations and at least quarterly to review license-required safety inspections, audits, investigations, and violations of regulations or license conditions. The SRC includes the senior managers in the areas of production, engineering, safety, material control and accountability (MC&A), and security.

- (5) “use the ALARA program as a mechanism to facilitate interaction between RP and operations personnel”

As stated previously, a health physicist within the radiation protection function will be responsible for overseeing and coordinating the ALARA program. The SRC, which acts as the ALARA committee, includes the senior managers in the areas of production, engineering, safety, MC&A, and security. At a minimum, the SRC reviews the ALARA program for trends in airborne radioactivity, cumulative exposure, engineering design, and personnel work practices. It also works with staff in the safety discipline to implement the ALARA program. In addition, specific ALARA goals are developed for selected operating units. A designated ALARA coordinator for each group will review the progress toward attainment of the goals. The applicant stated that the manager of each discipline will be responsible for ensuring that appropriate radiation protection controls are incorporated into all activities under his or her supervision. Each person working within a restricted area accepts the responsibility for maintaining his or her exposure ALARA by complying with approved procedures.

- (6) “regularly review and revise, when appropriate, the ALARA program goals and objectives and to incorporate, when appropriate, new approaches, technologies, operating procedures or changes that could reduce potential radiation exposures at a reasonable cost”

As stated previously, NFS has an ALARA document that implements the facility’s ALARA policy by: requiring the development, approval, and implementation of specific ALARA goals for selected operating units and the designation of an ALARA coordinator, as appropriate, for each group to review the progress toward the attainment of specific ALARA goals; requiring the measurement and monitoring of progress toward goal achievement and the issuance of regular progress reports to management and supervisors; requiring the performance of specific ALARA reviews during the design phase of engineering projects for new facilities or modifications of the facility or equipment; and defining, as appropriate, specific long-term ALARA goals incorporating new approaches, technologies, operating procedures, or changes that could reduce potential radiation exposures at a reasonable cost.

As indicated above, NFS is subject to the 10 CFR 20.1101 ALARA requirements. The renewal application does not propose any significant changes to the NFS ALARA program, which has been implemented successfully for many years. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.2.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that the ALARA program will stay in compliance with the requirements in 10 CFR 20.1101 during the renewed license term. Therefore, the staff finds that the ALARA program is acceptable.

#### *4.2.3 Organization and Personnel Qualifications*

The staff reviewed the applicant's organization and personnel qualifications against the acceptance criteria in NUREG-1520, Section 4.4.3.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's evaluation as to whether the information provided by the applicant meets the criterion:

- (1) "appoint suitably trained RP personnel and identify their authority and responsibilities"

The applicant described the organization of and personnel qualifications for the RPP in Sections 2.3.1, 2.3.5, 2.3.5.2, and 4.1 of the application. Section 4.1 of the application commits to a staff of suitably trained radiation protection personnel at the facility with sufficient resources to implement the RPP independent from facility operations. The radiation protection group is part of the described facility's safety group. Section 2.3.5 of the application states that the safety discipline monitors operations to ensure that they are conducted in compliance with Federal, State, and local regulations and that the safety staff is authorized to suspend operations, approve the restart of operations, and require additional safety precautions when such measures are necessary in the interest of plant safety. The staff finds the authority and responsibilities of key program personnel defined in Sections 2.3.1, 2.3.5, and 2.3.5.2 to be acceptable because RP personnel are responsible for establishing and maintaining the radiation safety program, and are authorized to stop work if safety issues are identified. In addition, this is an existing program which has been reviewed and inspected for many years and the application proposes no significant changes to the program.

- (2) "establish clear organizational relationships among the individual positions responsible for the radiation protection program and other line managers"

Section 2.3.1 of the application states the NFS president, or delegated alternative, has overall responsibility for the operation of the facility. Section 2.3.5 of the application states the director of the safety discipline is responsible to provide programs, procedures, and reviews to ensure worker health and safety, environmental protection, and compliance with applicable NRC regulations and the facility license and other permits. The safety discipline is administratively independent of the production discipline, but both disciplines may report to a common management position. The radiation protection manager reports to the director of the safety discipline who, in turn, reports to the facility president with overall responsibility for the site. Figure 2-1 of the application presents a functional organization chart.

- (3) "appoint a suitably trained RP program director (typically referred to as the radiation safety officer) who has direct access to the facility manager, who is skilled in the interpretation of data and regulations pertinent to radiation protection, who is familiar with the operation of the facility and RP concerns of the site, who is used as a resource

in radiation safety management decisions, and who will be responsible for establishing and implementing the RP program”

Section 2.3.5.2 of the application states that the qualifications for the manager of the radiation protection function are a Bachelor of Science or Bachelor of Arts degree in science or engineering and at least 3 years of experience in applied health physics in a program dealing with radiation safety problems similar to the one managed. The radiation protection manager is responsible directly to the NFS president (or equivalent) in vital matters of radiological safety. The training and qualifications of radiation protection personnel are based on guidance from RG 1.8, “Qualification and Training of Personnel for Nuclear Power Plants,” (NRC, 2000d).

- (4) “assign responsibility to the RP program staff for implementation of the RP program functions”

Section 4.1 of the application states that RPP functions include a specific program for ALARA, contamination control, internal and external dosimetry, dose registry; training; safety work permits; airborne radioactivity monitoring, and sealed source control. Section 2.3.5.2 of the application lists various program staff members who will implement the RPP. Specifically, the manager of the radiation protection function will be responsible for administering the activities associated with radiation safety. To assist the manager, health physicists have been charged with developing and implementing radiological control programs to meet program goals and objectives. The radiation monitoring manager administers the safety monitoring program to comply with license conditions and government regulations. The radiation technician supervisors coordinate and assign daily radiation monitoring tasks supporting health physics activities. The radiation technicians perform the monitoring tasks as assigned by the supervisors.

- (5) “describe the minimum training requirements and qualifications for the RP staff”

As previously stated, the training and qualifications of the applicant’s radiation protection personnel are based on the guidance from RG 1.8 (NRC, 2000d) which the staff finds acceptable.

The NFS license renewal application does not propose any significant changes in its organization and personnel qualifications. Based on the staff’s evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.3.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that during the renewed license term the RPP organization will adequately protect health and minimize danger to life and property in accordance with 10 CFR 70.23(a)(4), and that NFS personnel will be qualified by reason of training and experience to use the licensed material for the purpose requested in accordance with 10 CFR 70.23(a)(2). Therefore, the NRC staff finds that the organization and personnel qualifications are acceptable.

#### *4.2.4 Written Procedures*

The staff reviewed the applicant’s written procedure commitments against the acceptance criteria in NUREG-1520, Section 4.4.4.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff’s evaluation as to whether the information provided by the applicant meets the criterion:

- (1) “prepare written, approved RP procedures to carry out activities related to the RP program”

In Sections 4.1 and 4.4 of the application, the applicant committed to using written procedures to implement the RPP. Section 11.4 of the application states that activities involving the routine handling of SNM and IROFS will be conducted in accordance with written procedures.

- (2) “specify how the RP procedures will be prepared, authorized, approved, and distributed”

Section 11.4 of the application states that written procedures will define the process for the development and implementation of radiation protection procedures. These procedures will address how radiation protection procedures are developed, reviewed, approved, distributed, revised, and deleted. The work request system will administer nonroutine activities, including facility construction, modification, equipment maintenance, and service work that are not normally covered by documented procedures, in restricted areas.

The SRC is responsible for reviewing and approving new and revised operating and general safety procedures. Section 11.4.6 of the application states that if an active operating or general safety procedure has not been revised within a 3-year period, NFS will review the procedure to ensure it remains current and relevant. Support group procedures, such as may be used to implement the RPP, are approved by the discipline manager for the originating group and by the appropriate safety function manager(s) if the procedure contains safety-related information.

- (3) “specify written, approved RWPs for activities involving licensed material that are not covered by written RP procedures”

Section 11.4 of the application states that activities involving the routine handling of SNM and IROFS will be conducted in accordance with written procedures.

As discussed in Section 4.4.6 of the application, safety work permits (which includes radiation work permits) will be required within the work request system for nonroutine activities involving significant radiological hazards. The individual responsible for the nonroutine work will be responsible for obtaining an RWP. The individual requesting the RWP will also be responsible for ensuring the RWP is approved and that only personnel who have completed required safety training are assigned to perform work under the RWP. The RWP will specify the nature and location of the work and the necessary safety controls, as appropriate, including personnel monitoring devices, protective clothing, respiratory protective equipment, special air sampling, and additional precautionary measures to be taken. The health physicist will evaluate the need for an RWP based on the work scope, the radiological hazards, and the sufficiency of radiological controls provided by other means.

RWPs will be used to delineate radiological controls, special monitoring and surveillance, and safety precautions that must be taken to maintain exposure ALARA. RWP controls and job site/work evolution will be reviewed before beginning work. This review normally includes a visual inspection of the work site to determine the appropriateness of proposed controls and includes a prejob briefing for workers. A health physicist or a radiation technician supervisor will approve RWPs.

The NFS license renewal application does not propose any significant changes to its written procedures as summarized above, and such procedures have been implemented successfully for many years. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.4.3 of NUREG-1520 (NRC, 2002a), the staff finds, in accordance with 10 CFR 70.23(a)(4), the commitments provide assurance that during the renewed license term the procedural controls will adequately protect health and minimize danger to life and property. Therefore, the staff finds that the written procedures are acceptable.

#### *4.2.5 Training*

The staff reviewed the applicant's training commitments against the acceptance criteria in NUREG-1520, Section 4.4.5.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and provides the staff's evaluation as to whether the information provided by the applicant meets the criterion:

- (1) "design and implement an employee RP training program that complies with the requirements of 10 CFR Parts 19 and 20"

In Section 4.5 of the application, the applicant committed to having a radiation protection training program that is sufficient to demonstrate compliance with the requirements of 10 CFR Part 19 and 10 CFR Part 20. The NRC has previously reviewed and approved this existing program. The application does not propose any significant changes. Therefore, the NRC staff continues to find the program acceptable.

- (2) "provide training, to all personnel and visitors entering restricted areas, that is commensurate with the health risk to which they may be exposed, or provide trained escorts"

In Section 4.5 of the application, NFS committed to a radiation protection training program that will be designed and implemented to provide training to all personnel and visitors who enter restricted areas, unless the individuals have trained escorts, commensurate with the radiological hazard to which they may be exposed.

- (3) "provide a level of training based on the potential radiological health risks associated with that employee's work responsibilities"

Section 4.5 of the application states that the level of training will be based on the potential radiological health risks associated with the individual's work responsibilities.

- (4) "incorporate, in the RP training program, the provisions of 10 CFR 19.12 and topics such as: correct handling of radioactive materials; minimization of exposures to radiation and/or radioactive materials; access and egress controls and escort procedures; radiation safety principles, policies, and procedures; monitoring for internal and external exposures; monitoring instruments; contamination control, including protective clothing and equipment; ALARA and exposure limits; radiation hazards and health risks; and, emergency response"

Section 4.5 of the application states that the radiation protection training program will incorporate the provisions in 10 CFR 19.12, "Instruction to Workers," and topics such as

the correct handling of radioactive materials; minimization of exposures to radiation and radioactive materials; access and egress controls and escort procedures; radiation safety principles, policies, and procedures; monitoring for internal and external exposures; monitoring instruments; contamination control, including protective clothing and equipment; ALARA and exposure limits; radiation hazards and health risks; and emergency response. In addition, the radiation protection training program will be developed using guidance from American Society of Testing and Materials (ASTM) E1168-95: "Standard Guide for Radiological Protection Training for Nuclear Facility Workers," (ASTM, 2008).

- (5) "review the RP training program at least every 3 years and to conduct refresher training at least every 3 years to address changes in policies, procedures, requirements, and the facility ISA"

Section 4.5 of the application states that NFS will review the radiation protection training program at least every 3 years and will evaluate the effectiveness and adequacy of the training program curriculum and instructors. It will conduct refresher training at least every 3 years to address changes in policies, procedures, requirements, and the facility ISA.

- (6) "evaluate the effectiveness and adequacy of the training program's curriculum and instructors"

As stated above, at least every 3 years, NFS will review the training program and evaluate the effectiveness and adequacy of the curriculum and instructors.

The NFS license renewal application does not propose any significant changes to its training program. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.5.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that the NFS training program will continue to ensure that NFS personnel are qualified by reason of training and experience to safely use licensed material in accordance with the 10 CFR 70.23(a)(2) requirements. Therefore, the NRC staff finds that this program is acceptable.

#### *4.2.6 Ventilation and Respiratory Protection Programs*

The staff reviewed the applicant's ventilation and respiratory protection program commitments against the acceptance criteria in NUREG-1520, Section 4.4.6.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and provides the staff's evaluation as to whether the information provided by the applicant meets the criterion:

- (1) "install appropriately sized ventilation and containment systems in areas of the facility identified in the ISA Summary as having potential airborne concentrations of radionuclides that could exceed the occupational, derived air concentration values specified in 10 CFR Part 20, Appendix B, during normal operations"

Sections 4.6.1, 4.6.2, and 4.6.3 of the application discuss general ventilation design. In areas where SNM is processed, air flow will be designed to direct flow from areas of low contamination potential to areas of increasing contamination potential when uncontained radioactive material is present. Measurement checks are performed at least monthly to ensure compliance. Ventilation for occupied areas will be designed to maintain average

work station concentrations of airborne radioactive materials, during normal conditions, below the DAC values in Appendix B to 10 CFR Part 20. In special circumstances for which engineering controls are impractical or infeasible, alternatives such as portable containment or respiratory protection devices will be used to control exposure to radioactive materials.

NFS commits to provide process containment, enclosure, and exhaust ventilation designed to maintain average concentrations of airborne radioactive materials, under normal conditions, below the DAC. If process ventilation fails or degrades such that average concentrations greater than the DAC are experienced for 7 days or more, NFS commits to begin an investigation and take corrective actions.

- (2) “describe management measures, including preventive and corrective maintenance and performance testing, to ensure that the ventilation and containment systems designated as items relied on for safety (IROFS) operate when required, and are within their design specifications”

Chapter 11 of the license renewal application describes the management measures for maintaining IROFS reliable and available. Chapter 11 of this SER provides the staff's evaluation of the management measures and the finding that the management measures are acceptable.

- (3) “describe the design criteria for the ventilation and containment systems, including minimum flow velocity at openings in these systems, maximum differential pressure across filters and types of filters to be used”

Section 4.6.2 of the application states that the design criteria for inward air flow through the open face of a containment enclosure in a process area used to handle radioactive material that has a propensity to suspend in air is at least 125 (+/-25) linear feet per minute. For operations, the inward air flow through the open face of containment enclosures used to process radioactive material that has a propensity to suspend in air is at least 100 (+/-20) linear feet per minute, with some exceptions. These exceptions are openings used to transfer contained materials or equipment, where controls are not intended to provide airborne radioactivity containment, where low radiotoxicity materials are handled, or where excessive air flow interferes with analytical equipment. Internal procedures will establish the minimum rate of flow into these containments.

In laboratory areas, the design criteria for inward air flow through the open face of a containment enclosure used to handle radioactive material that will suspend in air is in accordance with the recommendations in American National Standards Institute (ANSI)/American Industrial Hygiene Association (AIHA) Z9.5-2003, “Laboratory Ventilation” (ANSI/AIHA, 2003). NFS commits to determine the total air flow for each type of containment enclosure to ensure proper installation and function. The total flow will then be correlated to a proper average face velocity for the containment enclosure.

Any ventilated containment with an open door or port through which uncontainerized radioactive material is routinely handled is subject to these requirements (however, the intermittent opening of a door, glove port, or other opening for the sole purpose of adding or removing containerized material or equipment does not constitute handling radioactive material with a propensity to suspend in air). In addition, the inward air flow

requirements exclude any ventilated containment with an opening to the room that has a high-efficiency particulate air (HEPA) filter for exhaust or overpressurization protection.

Exhaust systems where dry material is processed with potentially contaminated airborne effluents are either equipped with HEPA filter media (selected to maintain integrity when subjected to chemicals and solvents in the processes) or a scrubber/demister. The HEPA filters are rated at least 99.97 percent efficient for removal of 0.3-micron particles and have a fire resistance rating in accordance with Underwriters Laboratories 586, "High-Efficiency, Particulate, Air Filter Units."

- (4) "describe the frequency and types of tests to measure ventilation and containment systems performance, the acceptance criteria, and actions to be taken when the acceptance criteria are not satisfied"

Sections 4.6.2 and 4.6.3 of the application state that NFS will perform air flow measurement checks at least monthly or after significant modifications or changes to the ventilation system. Differential pressure indicators will typically be provided for glove boxes or other closed systems, including inert glove boxes. Process air (air inside a glovebox or hood) that is routinely discharged to the room will be HEPA filtered and sampled under the airborne radioactivity monitoring program. All HEPA filters (both primary and secondary) in the exhaust system will be equipped with a device for measuring differential pressure that is checked by personnel before each use. HEPA filter integrity will be evaluated when the differential pressure across the filter exceeds 4 inches of water. A HEPA filter will be replaced following evidence of the inability of the filter or the exhaust system to perform its function properly. In no case will filters continue to be operated at differential pressure values that exceed the manufacturer's rating for the filter.

- (5) "establish a respiratory protection program that meets the requirements of 10 CFR Part 20, Subpart H"

In Section 4.6.4 of the application, NFS commits to have a respiratory protection program addressing the requirements in 10 CFR Part 20, Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas." The program's primary objective is to prevent or mitigate the hazardous condition at the source. The program delineates responsibility, use conditions, and guidelines for limitations on work periods. The staff believes these commitments are sufficient because this is an existing program which has been reviewed and inspected for many years.

- (6) "prepare written procedures for the selection, fitting, issuance, maintenance, testing, training of personnel, monitoring, and recordkeeping for individual respiratory protection equipment, and for specifying when such equipment is to be used"

As stated in Section 4.6.4.3 of the application, NFS has committed to maintain its written procedures that give program details on responsibility; selection and issuance of respiratory equipment; use of respiratory equipment; cleaning and sanitizing of respiratory equipment; inspection, maintenance, recertification, and storage; medical qualification; fit testing; record keeping; and audits.

- (7) “revise the written procedures for use of individual respiratory protection equipment as applicable, when processing, facility, or equipment changes are made”

Section 4.6.3 of the application states that NFS will review and revise, as necessary, all respiratory protection procedures to address processing, facility, or equipment changes.

- (8) “maintain records of the respiratory protection program, including training for respirator use, and maintenance”

NFS maintains the records of the respiratory protection program, along with all facility safety-related documents, in accordance with the facility records management program, which is described in Section 11.7 of the application.

The NFS license renewal application does not propose any significant changes to the ventilation and respiratory protection programs, which have been successfully implemented for many years. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.6.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that the equipment and procedures to be used in the ventilation and respiratory protection will continue to adequately protect health and minimize danger to life and property in accordance with 10 CFR 70.23(a)(3) and (a)(4). Therefore, the NRC staff finds that these programs are acceptable.

#### *4.2.7 Radiation Survey and Monitoring Programs*

The staff reviewed the applicant's radiation survey and monitoring program commitments against the acceptance criteria in NUREG-1520, Section 4.4.7.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's evaluation as to whether the information provided by the applicant meets the criterion:

- (1) “have radiation surveys and monitoring programs consistent with the requirements of 10 CFR Part 20, Subpart F”

Section 4.7 of the application discusses radiation survey and monitoring programs. It commits to equipment and procedures that address the requirements in 10 CFR Part 20, Subpart F, “Surveys and Monitoring.” This is an existing program which has been reviewed and inspected for many years. The application does not propose any significant changes. Therefore, the NRC staff continues to find the programs acceptable.

- (2) “prepare written procedures for the radiation survey and monitoring program that include an outline of the program objectives, sampling procedures, data analysis methods, types of equipment and instrumentation to be used, frequency of measurements, recordkeeping and reporting requirements, and actions to be taken when measurements exceed 10 CFR Part 20 occupational dose limits or administrative levels established by the applicant”

As stated in Section 4.7 of the application, the applicant has a radiation survey and monitoring program using prepared written procedures that address monitoring of the work place, the individuals, and the environment. The facility work place and the individuals are monitored using routine monitoring, operational monitoring, and special monitoring as applicable to the situation.

- (3) “design and implement a personnel monitoring program for external occupational radiation exposures that outlines methods or procedures to
- a. Identify the criteria for worker participation in the program
  - b. Identify the types of radiation to be monitored
  - c. Specify how exposures will be measured, assessed and recorded
  - d. Identify the type and sensitivity of personal dosimeters to be used, when they will be used, and how the collected data will be processed and evaluated
  - e. Identify the facility’s administrative exposure levels or action levels at which actions are taken to investigate the cause of exposures exceeding these levels”

Section 4.7.6 of the application discusses the external monitoring program. NFS will provide individual dose monitoring based upon an evaluation of the individual's potential for exposure. The applicant further stated that it will provide dosimetry devices that are sensitive to beta and gamma radiation and that can typically measure levels as low as approximately 10 mrem and have them processed at appropriate frequencies by a vendor accredited by the National Voluntary Laboratory Accreditation Program. These devices (typically thermoluminescent dosimeters) will be used for monitoring individual external radiation exposure and will provide the dose of record. Self-reading dosimeters may be used in specific areas as an ALARA tool. Table 4-2 of the application presents action levels and resultant actions.

- (4) “design and implement a personnel monitoring program, for internal occupational radiation exposures, based on the requirements of 10 CFR 20.1201, 20.1204, and 20.1502(b), that outlines methods or procedures to:
- a. Identify the criteria for worker participation in the program
  - b. Identify the type of sampling to be used, the frequency of collection and measurement, and the minimum detection levels
  - c. Specify how worker intakes will be measured, assessed, and recorded
  - d. Specify how the data will be processed, evaluated, and interpreted
  - e. Identify the facility’s administrative exposure levels or the levels at which actions are taken to investigate the causes of exposures exceeding these levels”

Section 4.7.5 of the application discusses the internal monitoring program. Worker participation in the program will primarily depend on the worker’s potential for exposure. The program does not differentiate between employees and others. The internal radiation monitoring program, including bioassay procedures, will be designed to ultimately express measurements in terms of estimated dose. Breathing zone air samplers or representative fixed air sampling or both will be used as the primary means of determining intakes for workers. Bioassay measurements (including urinalysis and in vivo counting), when they possess the necessary sensitivity, may be used as an overcheck of the air sampling program and may be used to make adjustments or additions to an individual worker's dose record. NFS currently uses the IMBA Expert internal exposure assessment program for bioassay data which relies on ICRP models to estimate the intake from the interpretation of bioassay results. Bioassay frequencies at a minimum will be established in accordance with Table 1 of RG 8.34, “Monitoring Criteria and Methods to Calculate Occupational Radiation Doses,” (NRC, 1992c), and guidance given in RG 8.9, “Acceptable Concepts, Models, Equations, and Assumptions

for a Bioassay Program” (NRC, 1993a). Tables 4-2 and 4-4 of the application present action levels and resultant actions.

- (5) “comply with the requirements of 10 CFR 20.1202 for summation of external and internal occupational radiation exposures through the use of procedures such as those outlined in RG 8.7 or 8.34”

Section 4.7.5.1 of the application states that NFS will sum external and internal exposures consistent with the requirements of 10 CFR 20.1202, “Compliance with Requirements for Summation of External and Internal Doses,” and through procedures consistent with RG 8.7, “Instructions for Recording and Reporting Occupational Radiation Exposure Data,” (NRC, 2005a) or RG 8.34 (NRC, 1992c).

- (6) “design and implement an air sampling program in areas of the facility identified as potential airborne radioactivity areas, to conduct air surveys, and to calibrate and maintain the airborne sampling equipment in accordance with the manufacturer’s recommendations”

The applicant will perform several forms of work place air sampling, as described in Section 4.7.7 of the application. Stationary air sampling will be based on guidance provided in RG 8.25, “Air Sampling in the Workplace,” (NRC, 1992b). If it is likely that a worker intake could exceed one-tenth of the ALI and the stationary air sampling is used as the primary means to assign the intake record, then the sampling must be shown to be representative. Breathing zone air samplers (called lapel samplers) will be used to either augment or verify stationary air samplers and to monitor personnel exposure to airborne radioactivity. Continuous air monitors will be used to alert workers to upset conditions such that intakes could exceed 40 DAC-hours in a day. High-volume air samplers can be used to perform immediate assessments of airborne radioactivity levels for determining respiratory protection requirements, evacuation, or other necessary protective measures. Air monitoring systems will be calibrated in accordance with the manufacturer’s recommendations using the guidance found in NRC RG 8.21, “Health Physics Surveys for Byproduct Material at NRC-Licensed Processing and Manufacturing Plants,” (NRC, 1979a) and RG 8.24, “Health Physics Surveys During Enriched Uranium-235 Processing and Fuel Fabrication, (NRC, 1979b). Table 4-5 of the application presents action levels and responses for the various air sampling methods.

- (7) “implement additional procedures, as may be required by 10 CFR Part 20 and the ISA Summary, to control the concentration of airborne radioactive material (e.g., control of access, limitation of exposure times to licensed materials, and use of respiratory protection equipment)”

As stated in Section 4.7.7.8 of the application, whenever airborne concentrations at any work station exceed 25 percent of the appropriate DAC value, as averaged over a work week, and no cause has been identified, the work station is investigated, including the equipment in use, operator work habits, and ventilation effectiveness. An indication that the average airborne radioactivity concentration for any work station, as averaged over a work shift (or over the sampling period, in areas where less frequent samples are collected), is in excess of the DAC, will result in confirmation of the continued existence of airborne radioactivity in the area through short-term, high-volume air sampling; determination of the number and identity of personnel who may have been exposed; posting of the room, area, or building with signs indicating the need for respiratory

protection equipment, as appropriate; investigation to determine the sources of airborne radioactivity, and; initiation of appropriate corrective action to control further releases of radioactivity.

- (8) “conduct a contamination survey program in areas of the facility identified in the ISA Summary most likely to be radiologically contaminated (the program must include the types and frequencies of surveys for various areas of the facility and the action levels and actions to be taken when contamination levels are exceeded)”

Section 4.7.11 discusses the applicant’s contamination control program. NFS will perform routine surface contamination monitoring for process and manufacturing areas, warehousing facilities, and support facilities. Uncontrolled areas inside the plant will also be surveyed periodically to ensure that radioactive materials are adequately confined in the radiologically controlled areas (RCAs). Removable contamination surveys will be used primarily to assess contamination levels and the potential for transfer to uncontrolled areas; however, fixed contamination measurements may also be made for information purposes. Action guidelines are established to ensure that appropriate corrective actions are taken for contamination control. Table 4-6 of the application presents survey frequencies, and Table 4-7 presents surface contamination guidelines. Decontamination or access restriction is the action typically taken when the guideline values are exceeded.

- (9) “implement the facility’s corrective action program when the results of personnel monitoring or contamination surveys exceed the applicant’s administrative personnel contamination levels”

Section 4.7.11.6 of the application states that the applicant will implement corrective actions through the NFS corrective action program in the event of personnel contamination exceeding the action levels in Table 4-8. Similarly, Section 4.7.11.5 states that, at the conclusion of each contamination survey, the surveyor will advise all supervisors or management of all areas that exceed the action guidelines. The responsible party would then initiate action to ensure timely decontamination and the action is documented on the survey form. Section 4.7.7.8 states that, if an indication of average airborne radioactivity concentration at a work station, as averaged over a work shift, is in excess of the DAC, then NFS will begin appropriate corrective action to control further releases of radioactivity. The formal corrective action program will be initiated if the concentration at a work station exceeds 100 times the DAC. In Table 4-2 of the application, the response to exceeding internal or external exposure guidelines includes investigating the cause and recommending corrective actions. Section 4.8.2 states that any incident in which the resulting dose exceeds either the dose limits in 10 CFR 20.2202, “Notification of Incidents,” or the reporting requirements in 10 CFR 70.74, “Additional Reporting Requirements,” will be referred to the corrective action program.

- (10) “implement the facility’s corrective action program when any incident results in airborne occupational exposures to radiation exceeding the facility’s administrative limits, or the dose limits in 10 CFR Part 20, Appendix B, or 10 CFR 70.61”

The discussion under item 9 above addresses this item.

- (11) “use equipment and instrumentation with sufficient sensitivity for the type or types of radiation being measured and to calibrate and maintain equipment and instrumentation in accordance with manufacturers’ recommendations”

Section 4.7.12 of the application discusses equipment and instrumentation. The applicant stated that an adequate number of radiation detection instruments will be available to ensure that proper radiation surveys can be performed. Selection criteria for portable and laboratory counting equipment will be based on the types of radiation detected, maintenance requirements, ruggedness, interchangeability, and the upper and lower limits of detection. The radiation protection function reviews the types of instruments being used for each monitoring purpose and makes appropriate recommendations based upon regular input and ongoing evaluation. Monitoring instruments used for routine radiation protection purposes will be calibrated before initial use, after major maintenance, and on a routine basis in accordance with the manufacturer’s recommendation following the last calibration, using the guidance in RG 8.21 (NRC, 1979a) and RG 8.24 (NRC, 1979b), as well as the recommendations found in ANSI N323A-1997, “American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments” (ANSI, 1997), ANSI N323B-2003, “American National Standard for Radiation Protection Instrumentation Test and Calibration, Portable Survey Instrumentation for Near Background Operation” (ANSI, 2003), and ANSI N323D-2002, “American National Standard for Installed Radiation Protection Instrumentation” (ANSI, 2002). The accuracy of calibration sources should be, at a minimum,  $\pm 5$  percent of the stated value and traceable to the National Institute of Standards and Technology.

- (12) “establish policies to ensure equipment and materials removed from restricted areas to unrestricted areas are not contaminated above the specified release levels in NRC Branch Technical Position, ‘Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material,’ April 1993”

Section 4.7.11.7 of the application states that unrestricted release of potentially contaminated equipment and material from the plant site or to uncontrolled areas shall be in accordance with the NRC branch technical position entitled, “Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material,” (NRC, 1993b).

- (13) “leak-test all sealed sources in accordance with the following NRC Branch Technical Positions: (1) ‘License Condition for Leak-Testing Sealed Byproduct Material Sources,’ [NRC, 1993c], (2) ‘License Condition for Leak-Testing Sealed Plutonium Sources,’ [NRC, 1993d], (3) ‘License Condition for Plutonium Alpha Sources,’ [NRC, 1993e], (4) ‘License Condition for Leak-Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters,’ [NRC, 1993f], and (5) ‘License Condition for Leak-Testing Sealed Uranium Sources,’ [NRC, 1993g]”

According to Section 4.8.3 of the application, NFS will conduct a physical inventory every 6 months to account for all sealed sources and devices received and possessed. Each sealed source will be tested for leakage at intervals not to exceed 6 months. It is not required that a sealed source be surveyed if it contains 100 microcuries or less of beta/gamma-emitting material or 10 microcuries or less of alpha-emitting material.

Sources that have been removed from service will not be required to be leak tested, but they will be leak tested before being returned to service if the source has been in storage for more than 6 months. The test will be capable of detecting the presence of 0.005 microcuries of removable contamination on the test sample. If the test reveals the presence of 0.005 microcuries or more of removable contamination, the sealed source will immediately be withdrawn from use and decontaminated and repaired by a person appropriately licensed to make such repairs, or disposed of in accordance with the current regulations. Within 5 days after determining that any source has leaked, NFS will file a report with the NRC describing the source, test results, extent of contamination, apparent or suspected cause of source failure, and corrective action taken. NFS will send a copy of the report to the Regional Administrator of the nearest NRC regional office listed in Appendix D, "United States Nuclear Regulatory Commission Regional Offices," to 10 CFR Part 20. This is consistent with the NRC branch technical positions cited in the acceptance criterion.

- (14) "establish and implement an access control program that ensures that (a) signs, labels, and other access controls are properly posted and operative, (b) restricted areas are established to prevent the spread of contamination and are identified with appropriate signs, and (c) step-off pads, change facilities, protective clothing facilities, and personnel-monitoring instruments are provided in sufficient quantities and locations"

As stated in Sections 4.7.11 and 4.7.11.1 of the application, the restricted area at NFS is fenced and posted to control access. The restricted area includes the Northsite Remediation Project and plant protected area which encompasses manufacturing operations as well as radioactive material storage. Access to the plant protected area is controlled. Within the restricted area are clean (uncontrolled) areas and potentially contaminated RCAs. Classification of areas within the plant restricted area and the internal action guidelines applied will be based on the use to which the specific area is committed and the potential hazard presented by the presence of surface contamination, particularly with regard to inhalation and resuspension tendency. RCAs may be further subdivided into special controlled areas, contamination areas, buffer zones, step-off pads, and other areas where appropriate. Radiological postings inform workers of radiological conditions and requirements for entry and exit. Monitoring devices for personnel contamination detection are located at or near the entrance or exit of RCAs. Upon leaving a RCA, all persons will survey for contamination.

- (15) "have a radiation reporting program consistent with the requirements of 10 CFR Parts 19 and 20"

Section 4.8.2 of the application states that reports will be made in accordance with internally established requirements and procedures. Formal reports will be issued in accordance with the requirements of 10 CFR Part 20 and other applicable regulations.

The NFS license renewal application does not propose any significant changes to the radiation survey and monitoring programs, which have been successfully implemented for many years. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.7.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that the proposed equipment and procedures to be used in the radiation survey and monitoring programs will continue to adequately protect health and minimize danger to life and property in accordance with 10 CFR 70.23(a)(3) and (a)(4). Therefore, the NRC staff finds that these programs are acceptable.

#### 4.2.8 Additional Program Requirements

The staff reviewed the applicant's additional program commitments against the acceptance criteria in NUREG-1520, Section 4.4.8.3 (NRC, 2002a). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's evaluation as to whether the information provided by the applicant meets the criterion.

- (1) "maintain records of the RP program (including program provisions, audits, and reviews of the program content and implementation), radiation survey results (air sampling, bioassays, external-exposure data from monitoring of individuals, internal intakes of radioactive material), and results of its corrective action program referrals, RWPs, and planned special exposures"

Section 4.8.2 of the application states that NFS will maintain records appropriate to radiation protection activities, occupational exposure of personnel to radiation, releases of radioactive materials to the environment, and other pertinent activities in such a manner as to demonstrate compliance with NRC license conditions and regulations. Records associated with ALARA findings, employee training, personnel radiation exposures, and environmental activities will be generated and retained in such a manner as to comply with the relevant requirements of 10 CFR Part 20. Table 4-11 of the application contains a comprehensive listing of the records being retained.

- (2) "establish a program to report to the NRC, within the time specified in 10 CFR 20.2202 and 10 CFR 70.74, any event that results in an occupational exposure to radiation exceeding the dose limits in 10 CFR Part 20"

As stated in Section 4.8.2 of the application, the applicant will make reports in accordance with internally established requirements and procedures. Formal reports will be issued in accordance with the applicable regulatory requirements.

- (3) "prepare and submit to the NRC an annual report required by 10 CFR 20.2206(b)"

Section 4.8.2 of the application states that NFS will submit to the NRC an annual report of individual monitoring, consistent with the requirements of 10 CFR 20.2206(b).

- (4) "refer to its corrective action program any radiation incident that results in an occupational exposure that exceeds the dose limits in 10 CFR Part 20, Appendix B, or is required to be reported per 10 CFR 70.74, and to report to the NRC both the corrective action taken (or planned) to protect against a recurrence and the proposed schedule to achieve compliance with the applicable license condition or conditions"

Section 4.8.2 of the application states that any incident in which the resulting dose exceeds either the 10 CFR 20.2202 dose limits or the reporting requirements of 10 CFR 70.74 will be referred to the corrective action program. As stated previously, the applicant will make reports in accordance with internally established requirements and procedures. Formal reports will be issued in accordance with the applicable regulatory requirements.

The NFS license renewal application does not propose any significant changes to the recordkeeping and reporting commitments discussed in section 4.8.2 of its application, and

these commitments have been met for many years. Based on the staff's evaluation of the application commitments pertaining to the acceptance criteria in Section 4.4.8.3 of NUREG-1520 (NRC, 2002a), the staff finds the commitments provide assurance that NFS will comply with 10 CFR 20.2202, 20.2206 and 70.74. Therefore, the NRC staff finds that these program commitments are acceptable.

### **4.3 Evaluation Findings**

The applicant has committed to an acceptable RPP that includes the following:

- an effective, documented program to ensure that occupational radiological exposures are ALARA
- an organization with adequate qualification requirements for the radiation protection personnel
- approved, written radiation protection procedures and RWPs for radiation protection activities
- radiation protection training for all personnel who have access to restricted areas
- a program to control airborne concentrations of radioactive material with engineering controls and respiratory protection
- a radiation survey and monitoring program that includes requirements for controlling radiological contamination within the facility and monitoring of external and internal radiation exposures
- other programs to maintain records, report to the NRC in accordance with 10 CFR Part 20 and 10 CFR Part 70 and correct for upsets at the facility

The NRC staff concludes there is reasonable assurance that during the renewed license term the applicant's radiation protection program will meet the applicable requirements of 10 CFR Parts 19, 20, and 70 as discussed in Section 4.2 above.

### **4.4 References**

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|--------------|--|
| (ANSI, 1997) | American National Standards Institute, ANSI N323A-1997, "American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments," 1997.                                       |
| (ANSI, 2002) | American National Standards Institute, ANSI N323D-2002, "American National Standard for Installed Radiation Protection Instrumentation," 2002.   |
| (ANSI, 2003) | American National Standards Institute, ANSI N323B-2003, "American National Standard for Radiation Protection Instrumentation Test and Calibration, Portable Survey Instrumentation for Near Background Operation," 2003. |

- (ANSI/AIHA, 2003) American National Standards Institute/American Industrial Hygiene Association, ANSI/AIHA Z9.5-2003, "Laboratory Ventilation," 2003.
- (ASTM, 2008) American Society for Testing and Materials, ASTM E1168-95, "Standard Guide for Radiological Protection Training for Nuclear Facility Workers," 2008.
- (NFS, 2009a) Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.
- (NFS, 2011a) Nuclear Fuel Services, Inc., "Revised Chapter 4 for Renewal of SNM License 124," May 13, 2011, ML11138A050.
- (NFS, 2011d) Nuclear Fuel Services, Inc., "Revised Chapters 2, 7, 10, and 11 for Renewal of SNM License 124," August 1, 2011, ML11221A286.
- (NRC, 1977) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," May 1977.
- (NRC, 1979a) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.21, "Health Physics Surveys for Byproduct Material at NRC-Licensed Processing and Manufacturing Plants," October 1979.
- (NRC, 1979b) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.24, "Health Physics Surveys During Enriched Uranium-235 Processing and Fuel Fabrication," Revision 1, October 1979.
- (NRC, 1992b) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.25, "Air Sampling in the Workplace," Revision 1, June 1992.
- (NRC, 1992c) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses," July 1992.
- (NRC, 1993a) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," Revision 1, July 1993.
- (NRC, 1993b) U.S. Nuclear Regulatory Commission, Branch Technical Position, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," 1993.
- (NRC, 1993c) U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Leak-Testing Sealed Byproduct Material Sources," 1993.
- (NRC, 1993d) U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Leak-Testing Sealed Plutonium Sources," April 1993.

- (NRC, 1993e) U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Plutonium Alpha Sources," April 1993.
- (NRC, 1993f) U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Leak-Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters," April 1993.
- (NRC, 1993g) U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Leak-Testing Sealed Uranium Sources," April 1993.
- (NRC, 2000d) U.S. Nuclear Regulatory Commission, Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 3, May 2000.
- (NRC, 2002a) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.
- (NRC, 2005a) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," Revision 2, November 2005.
- (NRC, 2011c) U.S. Nuclear Regulatory Commission (NRC), "Licensee Performance Review of Licensed Activities for Nuclear Fuel Services, Inc., Docket Number 70-143 (Non-Safeguards Portion)," March 7, 2011, ML110660633.

## **5.0 NUCLEAR CRITICALITY SAFETY**

### **5.1 Purpose of Review**

The NRC staff conducted this review to determine whether the nuclear criticality safety (NCS) program at NFS is adequate to support safe operation of the facility, as required by 10 CFR Part 70. The NFS commitments to maintain the various elements of its NCS program during the term of the renewed license are discussed in Section 5.2 below.

The NCS programmatic review determined that NFS has (1) provided for the appropriate management of the NCS program, (2) identified, and committed to, the responsibilities and authorities of individuals for developing and implementing the NCS program, (3) committed to the facility management measures described in 10 CFR 70.62 which will support the implementation and maintenance the NCS program, and (4) described an adequate NCS program which includes identifying and committing to the NCS methods and NCS technical practices used to ensure the safe operation of the facility, as required by 10 CFR Part 70.

### **5.2 Staff Review and Analysis**

#### *5.2.1 Management of the NCS Program*

The primary purpose of the NFS NCS program is to designate the controls and barriers that are relied on to prevent criticality in operations using SNM. The NFS NCS program also serves to (1) prevent an inadvertent nuclear criticality, (2) protect against the occurrence of an identified accident sequence in the ISA summary, (3) ensure compliance with the NCS performance requirements of 10 CFR 70.61, (4) establish and maintain NCS safety parameters, procedures, IROFS, and safety and operating limits for IROFS, and (5) conduct NCS evaluations to ensure that under normal and credible abnormal conditions, all nuclear processes will remain subcritical and maintain an approved margin of subcriticality for safety. The licensee also committed to providing training in emergency procedures in response to an inadvertent nuclear criticality and to complying with the NCS baseline criteria requirements in 10 CFR 70.64(a), the NCS ISA summary requirements in 10 CFR 70.65(b), and the NCS ISA summary change process requirements in 10 CFR 70.72.

The licensee's approach to criticality safety is based on the double-contingency principle (DCP), which states that process designs should incorporate sufficient margins of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible. In those instances where multiple controls are used to prevent changes in a single parameter (e.g., mass, moderation, or configuration) and double-contingency protection exists (multiple process upsets must occur before a criticality accident is possible), sufficient redundancy and diversity of controls are used to ensure that at least two process upsets remain independent. NFS relies on passive, active, enhanced administrative, and simple administrative controls to maintain subcriticality. Where practicable, NFS relies on equipment design in which "favorable" geometry is used, rather than on administrative controls.

The licensee's NCS function establishes limits and controls for all activities involving SNM. Administrative limits and controls are conveyed via postings in the operating area or via operating procedures or both. Engineered limits and controls are provided in operating and maintenance procedures as necessary. Before a modification or addition is made to the facility, process, or equipment used for handling, processing, or storing SNM, the change is evaluated

and approved following an established procedure. NCS reviews all changes unless it is determined through change management procedures that NCS review is not required to evaluate the change.

Key responsibilities of the licensee's NCS function include performing nuclear criticality evaluations of applicable SNM operations and proposed changes to those operations, establishing limits and controls based on those evaluations, ensuring the proper incorporation of limits and controls in applicable procedures and work instructions, and monitoring plant compliance with the NCS requirements through inspections and audits.

The staff has reviewed the licensee's management of the NCS program and finds that it is acceptable because the licensee committed to developing, implementing, and maintaining an NCS program to meet the regulatory requirements of 10 CFR Part 70, Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material," and established NCS safety parameters and procedures. Additionally, the staff finds that the licensee has addressed the acceptance criteria in NUREG-1520, Section 5.4.3.1 (NRC, 2002a).

### *5.2.2 Organization and Administration*

The licensee's organizational commitments include designating organizational functions important to criticality safety, assigning responsibility and authority to these positions to carry out NCS functions, and stating the requirements for the qualification of NCS personnel. NFS committed to American National Standards Institute/American Nuclear Society (ANSI/ANS) 8.19, "Administrative Practices for Nuclear Criticality Safety," (ANSI/ANS, 2005), and ANSI/ANS-8.1, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," (ANSI/ANS, 1998), as each standard applies to organization and administration. NFS management has delegated the responsibility and authority for NCS to the Manager, Nuclear Criticality Safety. The NCS Manager reports to the Safety Director. The Safety Director reports to the President. The President has overall accountability for ensuring that all nuclear fuel manufacturing activities at NFS are conducted safely and in compliance with applicable regulations and license conditions. The NCS organization is administratively independent of the manufacturing, engineering, and quality organizations.

NFS committed to providing NCS postings in areas, operations, work stations, and storage locations, as appropriate. NFS also committed to allowing all personnel to report defective NCS conditions to the NCS function and to performing response and corrective actions only in accordance with written, approved procedures. Unless a specific procedure deals with the situation, personnel shall report defective NCS conditions to the NCS function and take no action until the NCS function has evaluated the situation and provided recovery directions or procedures.

The minimum requirements for a position as an NCS manager are a baccalaureate degree with a science or engineering emphasis and 3 years of experience in NCS. An NCS manager has appropriate knowledge of NCS and its administration. The minimum requirements for the position of an NCS engineer are a baccalaureate degree with a science or engineering emphasis and 1 year of experience in positions involving NCS activities in the nuclear business. An NCS engineer has knowledge of the quality execution of assigned function programs (typically demonstrated by formal performance reviews by an NCS manager), and in administration of assigned functional programs (e.g., performing NCS evaluations). A senior

NCS engineer must have an additional 2 years of experience in positions involving NCS activities in the nuclear business.

The staff has reviewed the NFS NCS organizational structure and finds that it is acceptable because the NCS organization is independent from the production staff. Qualified reviewers perform NCS evaluations, with independent review, to ensure quality assurance (QA), and to confirm that the NCS organization is consistent with the requirements in ANSI/ANS-8.19 (ANSI/ANS, 2005). Additionally, the staff finds that the licensee has addressed the acceptance criteria in NUREG-1520, Section 5.4.3.2 (NRC, 2002a).

### *5.2.3 Nuclear Criticality Safety Management Measures*

NFS maintains several programs, systems, and functions to ensure that all IROFS will be available and reliable, will remain available and reliable, and will be under surveillance for malfunction detection and appropriate corrective action. These management measures include training, procedures, and audits and assessments.

#### *5.2.3.1 Nuclear Criticality Safety Training*

Sections 5.3.2, 5.3.3, and 11.3 of the NFS application address the nuclear criticality safety training provided to NFS personnel, and include commitments to provide annual general NCS training to all new employees. This training includes how to recognize the criticality accident alarm system (CAAS) signal and the importance of immediately evacuating if there is a criticality accident. NFS also committed to provide annual specialized training for personnel who handle fissile material. The effectiveness of training is evaluated by a combination of observation and skills demonstration, written tests, or oral examinations.

The application states that NFS complies with the requirements of ANSI/ANS-8.19 (ANSI/ANS, 2005) and ANSI/ANS-8.20, "Nuclear Criticality Safety Training" (ANSI/ANS, 1991), as they relate to training. In addition, the application states that NFS employees receive training regarding the policy that NFS personnel shall report defective NCS conditions and perform response/corrective actions only in accordance with written, approved procedures. Unless a specific procedure deals with the situation, NFS personnel shall take no action until the NCS function has evaluated the situation and provided recovery directions. Based on its review of the commitments in the NFS application, the NRC staff finds that the application meets the acceptance criteria for NCS training in Section 5.4.3.3 of NUREG-1520 (NRC, 2002a) and that the NCS training program is acceptable.

#### *5.2.3.2 Nuclear Criticality Safety Audits and Assessments*

Audits and assessments are conducted by NFS to compare established NCS standards to NFS performance. NFS committed to meeting the guidelines of ANSI/ANS-8.19 (ANSI/ANS, 2005), as the standard relates to audits and assessments. In addition, NCS engineers perform weekly NCS inspections or walkdowns of selected site operations involving SNM to determine if activities are being conducted in accordance with NCS requirements and limits.

NFS states that its audits are compliance-based evaluation activities conducted to verify compliance of operations with established regulatory requirements, license commitments, and standard industry practice. Quarterly NCS audits of selected plant activities are conducted such that SNM processing or storage facilities are audited biennially. The purpose of the audits is to determine that (1) site operations are conducted in compliance with license conditions,

operating procedures, and posted limits, (2) administrative controls and postings are consistent with nuclear criticality safety evaluations (NCSEs), (3) equipment and operations comply with NCSEs, and (4) corrective actions related to findings of NCS inspections are adequate.

Assessments are performance-based evaluation activities conducted to determine the effectiveness of health, safety, and environmental compliance functions in achieving their designated purpose, particularly in providing reasonable assurance of the availability and reliability of IROFS. An independent assessment of the NCS program is conducted every 3 years.

Findings and observations from NCS audits, inspections, and assessments are entered into the corrective action program and tracked until closure.

#### *5.2.3.3 Procedures*

NFS committed to meeting the requirements of ANSI/ANS-8.19 (ANSI/ANS, 2005) as it relates to procedures and to the policy that no single, inadvertent departure from a procedure could cause an inadvertent nuclear criticality. Operating procedures are provided for activities involving SNM, and the procedures incorporate appropriate safety limits and controls.

The staff has reviewed the licensee commitments to NCS management measures and finds that they are acceptable because the licensee committed to providing training to personnel, to conducting activities involving SNM with written and approved procedures, to conducting NCS walkdowns on a weekly basis, to conducting NCS audits such that all processes and all aspects of the program are audited within 2 years, and to the DCP as it relates to procedures. The staff finds that the licensee has addressed the acceptance criteria in NUREG-1520, Section 5.4.3.3 (NRC, 2002a).

#### *5.2.4 Methodologies and Technical Practices*

##### *5.2.4.1 Computer Codes*

The staff reviewed the licensee's commitments to criticality code validation and verification as described in Section 5.5.4 of the license application (NFS, 2011b). The staff finds the licensee's commitments to code validation and verification acceptable, as discussed below. The staff also reviewed one of the licensee's validation reports in detail (also discussed below) and determined that it meets the criteria listed in Section 5.4.3.4.1(8) of NUREG-1520 (NRC, 2002a).

Section 5.5.4 of the license application (NFS, 2011b) states that validation is performed in accordance with ANSI/ANS-8.1 (ANSI/ANS, 1998). The staff determined that the licensee's description of the code validation methodology in the license application, and its commitments to ANSI/ANS-8.1 satisfy the acceptance criteria in Section 5.4.3.4.1(7) of NUREG-1520 (NRC, 2002a).

In support of its proposed margin of subcriticality for safety, NFS provided a copy of one criticality code validation report for review (54T-05-0036/NCS-01-01-04, Revision 1, "Validation of the Scale-PC (Version 4.4a/27-Group) Computer Code Package for Uranium Systems Enriched in the U-235 Isotope"). This report (henceforth referred to as the "validation report") describes the validation methodology, critical benchmarks used in the validation, the results of calculating the effective neutron multiplication factor ( $k_{\text{eff}}$ ) for those benchmarks, the results of

the statistical determination of the upper subcritical limit (USL), and the determination of the area of applicability. This validation report was patterned after a previous validation study documented in ORNL/CSD/TM-238, "Validation of KENO V.a: Comparison with Critical Experiments," for a DOE implementation of KENO V.a.

The validation report includes 290 critical benchmarks, including 114 low-enriched, 46 intermediate-enriched, and 130 high-enriched benchmark experiments. The benchmark experiments were obtained from ORNL/CSD/TM-238. Validation calculations using these benchmarks were performed using the 27-group cross section library, and only uranium systems enriched in the U-235 isotope were considered. The systems modeled contained  $\text{UO}_2$ ,  $\text{U}_3\text{O}_8$ ,  $\text{UO}_2\text{F}_2$  solution, UNH solution, U-metal, U-metal rods in  $\text{UO}_2\text{F}_2$  solution,  $\text{UF}_4$ , and  $\text{U}(\text{nat})\text{O}_2$ - $\text{PuO}_2$  rods. The various systems were also modeled using different materials, geometries, arrays, and reflectors. The uranium systems analyzed for this report range in enrichments from 0.71 to 97.67 weight percent (wt%) U-235.

The statistical analysis procedure used by NFS consisted of determining an average and a standard deviation for the set (or grouping) of  $k_{\text{eff}}$  values being analyzed for each of the benchmark experiments that are representative of conditions and operations at NFS. The groupings of validation benchmarks included (1) the entire set of benchmarks for low-enriched uranium (LEU), intermediate-enriched uranium, and HEU, (2) only low-enriched benchmarks, (3) low-enriched metal benchmarks (thermal), (4) low-enriched nonmetal benchmarks, (5) LEU-HEU/plutonium benchmarks, (6) only intermediate-enriched benchmarks, (7) only high-enriched benchmarks, (8) high-enriched metal benchmarks (nonthermal), and (9) high-enriched nonmetal benchmarks. From the results for each grouping, the calculational margin and USL were determined based on the methodology described in NUREG/CR-6698, "Guide for Validation of Nuclear Criticality Safety Calculational Methodology," (NRC, 2001b).

As specified in NUREG/CR-6698, a one-sided lower tolerance limit (LTL) should be used when no trends are apparent in the critical experiment results. Use of the one-sided LTL requires the critical experiment results to have a normal statistical distribution. If the data do not have a normal statistical distribution, a nonparametric statistical treatment must be used. Also, when using the one-sided LTL method, a 95/95 statistical confidence should be used (i.e., 95 percent confidence that 95 percent of all future critical benchmark calculations lie above the LTL). In addition, the use of positive bias (i.e., when the calculated value of  $k_{\text{eff}}$  is greater than the experimental value) is prohibited, whether the licensee uses the nonparametric method or a method that uses average  $k_{\text{eff}}$  values (i.e., the one-sided LTL).

Based on the NFS results in the validation, NFS concluded that the validation data did not correlate well with other parameters (e.g., moderating ratio, average energy group causing fission, or ratio of total fissions to thermal fissions) and that no discernible trends existed that could be quantified. As a result, NFS used the one-sided LTL method to calculate the USL. The critical benchmarks were tested for normality using USLSTATS from the SCALE suite of programs, which is widely accepted in the literature, and found to be normal for each grouping analyzed. For this license application, the LTL was designated the USL. The USL also contains an additional 0.015 arbitrary margin required by the license. The minimum USL for all the groupings was 0.9635, which occurred for the low-enriched metal grouping.

For safety analysis purposes, a calculated  $k_{\text{eff}}$  plus two standard deviations ( $\sigma$ ) must lie below the USL (i.e.,  $k_{\text{eff}} + 2\sigma \leq \text{USL}$ ). NFS employs two different  $k_{\text{eff}}$  safety limits for determining subcriticality based on computer code calculations:

$$k_{\text{eff}} + 2\sigma \leq 0.95 \quad (\text{uranium enriched to greater than 10 wt\% U-235})$$

$$k_{\text{eff}} + 2\sigma \leq 0.97 \quad (\text{uranium enriched to less than or equal to 10 wt\% U-235})$$

where  $k_{\text{eff}}$  is the calculated neutron multiplication factor and  $\sigma$  is its standard deviation. NFS performed an additional validation to establish a USL for uranium enriched to less than or equal to 10 wt% U-235 (54T-03-0009/NCS-01-01-04, Revision 1, "Validation of SCALE 4.4a-PC for Homogeneous Uranium Systems with Enrichments between 0.72 and 10.0 wt% <sup>235</sup>U Using the 238-Group ENDF/B-V Cross Section Library"). The minimum USL was 0.9792, which contains an additional 0.015 arbitrary margin required by the license. As shown for the limits involving uranium enriched to greater than 10 wt% U-235 and for uranium enriched to less than or equal to 10 wt% U-235, the  $k_{\text{eff}}$  safety limits are less than the minimum USL by some arbitrary margin.

The staff determined that the licensee used an appropriate validation methodology, that appropriate critical benchmarks were selected, that statistical analysis (including normality testing) was appropriately done, and that specification of USLs and the areas of applicability was appropriate. In each area, the methods and calculations met the expectations set in regulatory guidance, in particular, NUREG/CR-6698 (NRC, 2001b). The staff therefore finds the licensee's validation report to be acceptable.

The staff determined that the licensee's description of the programmatic commitments, the validation methodology, and the area of applicability were adequate. The licensee committed to perform validation in accordance with ANSI/ANS-8.1 (ANSI/ANS, 1998), which the NRC has endorsed. In addition, the description of the validation methodology is consistent with ANSI/ANS-8.1 and the guidance in NUREG/CR-6698 (NRC, 2001b). The staff determined that the  $k_{\text{eff}}$  limits will ensure that there is adequate allowance for uncertainty in the methodology, the benchmark data, and the calculated value of  $k_{\text{eff}}$  to ensure subcriticality, and will prevent the taking of any credit for positive bias.

The staff also finds that the licensee has addressed the acceptance criteria in NUREG-1520 (NRC, 2002a), specifically Sections 5.4.3.4.1(6) and 5.4.3.4.1(7)(a)-(j). Based on the above, the staff has reasonable assurance that criticality calculations performed in accordance with the license application will ensure that nuclear processes are subcritical under normal and credible abnormal conditions.

#### 5.2.4.2 Technical Practices

Section 5.5 of the license application describes the licensee's technical practices (NFS, 2011b). The relative effectiveness and reliability of NCS controls are considered during the NCS analysis process. The four means of NCS control in the order of preference are (1) passive engineered process, (2) active engineered control, (3) enhanced administrative control, and (4) simple administrative control. The licensee identifies 11 methods of NCS control (i.e., controlled parameters: (1) geometry; (2) spacing (or unit interaction); (3) volume; (4) neutron absorber (fixed/soluble); (5) piece count; (6) mass; (7) moderation; (8) concentration; (9) material composition; (10) enrichment; and (11) reflection. When evaluating an SNM-bearing system for criticality safety, each of these parameters will be assumed to be at its optimum (i.e., most reactive) credible condition unless acceptable controls are specified and implemented to limit the parameters to certain values. All assumptions relating to process, equipment, and material theory, function, and operation (including credible upset conditions) are justified, documented, and independently reviewed. Equipment relying on favorable geometry for control includes adequate factors of safety to ensure reliability under credible accident

conditions. Before beginning an operation, all dimensions relied on for geometry control are verified.

Controls and barriers that are designated as IROFS to prevent an inadvertent nuclear criticality are documented in NCSEs and the ISA summary as appropriate. Section 5.1.2 of the license application (NFS, 2011b) also contains requirements for limits, controls, and IROFS. The NCSEs document the criticality accident sequences, NCS limits, NCS controls, NCS-related IROFS, compliance with the DCP, and subcriticality for all normal and credible abnormal conditions. NFS shall establish and maintain NCS safety limits, controls, and procedures.

The licensee applies nuclear safety factors to single isolated units containing fissile material. The safety factors reduce the critical dimension, critical volume, critical mass, and critical concentration to ensure that the unit is subcritical. Equipment is designed by physically limiting the dimensions so that criticality cannot be achieved under any foreseeable conditions. For material limited by dimension, the dimension will not exceed 90 percent of the critical dimension for cylinder diameters and 85 percent of the critical dimension slab thickness. For a unit limited by volume, the maximum allowed value will not exceed 75 percent of the minimum critical spherical volume. For accumulations limited by mass, the maximum permissible mass will not exceed 45 percent of the minimum critical mass if double batching is credible, or 75 percent of the minimum critical mass, if double batching is not credible.

The staff reviewed the technical practices and finds that they are acceptable because the licensee committed to the DCP and defined the acceptability of controlled parameters used to define the criticality safety basis. Additionally, the staff finds that the licensee addressed the acceptance criteria in NUREG-1520, Section 5.4.3.4.2 (NRC, 2002a).

#### *5.2.4.3 Requirements in 10 CFR 70.24*

The licensee maintains a CAAS consistent with the requirements of 10 CFR 70.24 and the methodology described in RG 3.71, Revision 1, "Nuclear Criticality Safety Standards for Fuels and Material Facilities," (NRC, 2005b). As stated in Section 4.7.12.4 of the license application (NFS, 2011b), failure of the CAAS, either from the detector or from other electronic component failure, will initiate compensatory measures that may include evacuation of personnel, suspension of operations, deployment of auxiliary monitoring equipment, and/or immediate system repair. Compensatory measures are also established whenever the criticality alarm system is out of service, in storm-watch mode, or being tested or repaired. Periods when the criticality alarm system is out of service are minimized to the extent practical. In the event of an inadvertent criticality, NFS committed to ANSI/ANS-8.23, "Nuclear Criticality Accident Emergency Planning and Response" (ANSI/ANS, 2007).

The staff has reviewed the licensee's commitment to the CAAS requirements in 10 CFR 70.24 and finds that it is acceptable because the licensee maintains a CAAS that is capable of energizing a clearly audible alarm signal if accidental criticality occurs, and the licensee maintains emergency procedures for each area in which SNM is handled, used, or stored to ensure prompt personnel evacuation upon the sounding of the alarm. Additionally, the staff finds that the licensee has addressed the acceptance criteria in NUREG-1520, Section 5.4.3.4.3 (NRC, 2002a).

### **5.3 Evaluation Findings**

The staff reviewed the NCS program for NFS and has reasonable assurance that (1) NFS will continue to have in place a staff of managers, supervisors, engineers, process operators, and other support personnel who are qualified to develop, implement, and maintain the NCS program in accordance with the facility organization and administration and management measures, (2) NFS conduct of operations will continue to be based on NCS methodologies and NCS technical practices, which will ensure that the fissile material will be possessed, stored, and used safely and according to the requirements in 10 CFR 70.61, 70.62, 70.64, 70.65, and 70.72, (3) NFS will continue to develop, implement, and maintain a CAAS in accordance with the requirements in 10 CFR 70.24, and the site emergency management program, and (4) NFS will continue to ensure that under normal and credible abnormal operating conditions, all nuclear processes will be kept subcritical, including use of an approved margin of subcriticality for safety in accordance with 10 CFR 70.61(d) and will continue to meet the baseline design criteria requirements in 10 CFR 70.64(a).

Based on the NRC review, the staff concludes that the licensee's NCS program meets the above-mentioned requirements of 10 CFR Part 70, and provides reasonable assurance for the protection of public health and safety, including workers and the environment.

### **5.4 References**

- (ANSI/ANS, 1991) American National Standards Institute/American Nuclear Society, ANSI/ANS-8.20, "Nuclear Criticality Safety Training," 1991, R1999, R2005 (R=Reaffirmed).
- (ANSI/ANS, 1998) American National Standards Institute/American Nuclear Society, ANSI/ANS-8.1, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," 1998
- (ANSI/ANS, 2005) American National Standards Institute/American Nuclear Society, ANSI/ANS-8.19, "Administrative Practices for Nuclear Criticality Safety," 2005.
- (ANSI/ANS, 2007) American National Standards Institute/American Nuclear Society, ANSI/ANS-8.23, "Nuclear Criticality Accident Emergency Planning and Response," 2007.
- (NFS, 2011b) Nuclear Fuel Services, Inc., "Revised Chapter 5 for Renewal of SNM License 124," May 27, 2011, ML11157A114.
- (NRC, 2001b) U.S. Nuclear Regulatory Commission, NUREG/CR-6698, "Guide for Validation of Nuclear Criticality Safety Calculational Methodology," January 2001, ML010170125.
- (NRC, 2002a) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.

(NRC, 2005b) U.S. Nuclear Regulatory Commission, Regulatory Guide 3.71, Revision 1, "Nuclear Criticality Safety Standards for Fuel and Material Facilities," October 2005, ML051940351.

## **6.0 CHEMICAL PROCESS SAFETY**

### **6.1 Purpose of Review**

The NRC staff conducted the chemical process safety review to ensure that the licensee will adequately protect workers, the public, and the environment against chemical hazards of licensed material and hazardous chemicals produced from licensed material. The licensee must also protect against facility conditions or operator actions that could affect the safety of licensed materials and thus present an increased radiological risk.

The regulatory basis for this review is found in 10 CFR 70.22 and 10 CFR 70.65. These sections describe the general and additional contents of the application that address chemical process safety. In addition, the chemical process safety review should provide reasonable assurance of compliance with the 10 CFR 70.61 performance requirements, the 10 CFR 70.62 safety program and ISA requirements, and the 10 CFR 70.64 baseline design criteria regarding chemical protection. Section 6.4.3 of NUREG-1520 (NRC, 2002a) outlines the acceptance criteria for the NRC's review of chemical process safety.

The NRC's objective is to ensure safe operations involving licensed radioactive material and hazardous chemicals produced from licensed material, as defined in 10 CFR 70.4, "Definitions." The NRC recognizes that hazardous chemicals are also regulated by other Federal and State agencies. At the Federal level, the U.S. Occupational Safety and Health Administration has issued 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals," and the U.S. Environmental Protection Agency (EPA) has published 40 CFR Part 68, "Risk Management Plan."

### **6.2 Staff Review and Analysis**

The NRC staff examined the renewal application (NFS, 2009a), selected chapters of the ISA summaries, and NFS internal procedures. In addition to examining documents submitted for review, the NRC staff examined licensee internal procedures and interviewed key site managers during the onsite review. . The staff notes that NFS has an existing chemical safety program which has been reviewed and inspected over the past ten years. In its license renewal application, NFS proposes no significant changes to the program and NFS commits to maintaining the various elements of the program during the term of the renewed license, as discussed below.

#### ***6.2.1 Chemical Safety Program***

The regulation in 10 CFR 70.62(a) states in part that a licensee must establish and maintain a safety program that meets the 10 CFR 70.61 performance requirements, and will thus will adequately protect the worker, public health and safety, and the environment from the chemical hazards of licensed material. In Chapter 6 of the renewal application, NFS committed to evaluating the risks from chemical hazards of licensed materials, chemicals produced from licensed material, and plant activities that could affect the safety of licensed materials and thus present an increased radiological risk.

In Chapter 3 of the licensee application, NFS committed to identifying credible accident sequences using process hazard analyses or other approved methodology listed in NUREG-1513, "Integrated Safety Analysis Guidance Document," (NRC, 2001c).

### *6.2.2 Chemical Process Safety Information*

The regulation in 10 CFR 70.62(b) requires a licensee to maintain process safety information to enable the performance and maintenance of an ISA. In Chapter 1 of the renewal application, NFS described the primary unit processes, and their locations. Both raw materials and byproduct materials are identified. Appendix 1B to Chapter 1 lists the chemical forms of both uranium and plutonium. Each of the ISA summaries referenced in the application (NFS, 2009b) contains additional descriptions of the facility processes and hazards associated with them. The ISA summaries evaluate hazards from interaction, disposal, and transportation of chemicals.

Table 2-1 of the site-wide ISA summary lists the inventories of bulk hazardous chemicals and their hazardous characteristics (reactive, corrosive, explosive, and toxic). The individual ISA summaries maintain chemical safety information, including simplified process flow diagrams (block diagrams) or piping and instrument diagrams, description of the technology and equipment, a description of hazards from the listed chemicals, including adverse interactions, and a list of safety features for each process in each building.

The NRC staff finds that this information meets Criterion (1) in Section 6.4.3.1 of NUREG-1520 (NRC, 2002a) and is acceptable because the process descriptions are sufficiently detailed to allow an understanding of the chemical process hazards and to allow development of potential accident sequences.

### *6.2.3 Team Conducting the Hazard Evaluation*

The regulation in 10 CFR 70.62(c)(2) requires that a team with expertise in engineering and process operations perform an ISA. In Chapter 3 of the renewal application, NFS stated that the ISA is performed by a team consisting of personnel with expertise in the safety disciplines being evaluated. The team members are familiar with the process, engineering, and operations involved. The team is supported by a member knowledgeable in the process hazard analysis technique being used. Chapter 3 of this report contains the NRC staff's evaluation of the team qualifications.

### *6.2.4 Chemical Accident Sequences*

In conducting an ISA, 10 CFR 70.62(c) requires a licensee to identify facility and external hazards and their potential for initiating accident sequences, their likelihood and consequences, and the IROFS. The requirements in 10 CFR 70.65(b) specify what an ISA summary must contain. Chapter 1 of the site-wide ISA summary identifies external hazards. Chapter 2 of the site-wide ISA summary identifies the hazards associated with bulk chemicals on the site. The detailed ISA summaries for the individual buildings describe chemical hazards associated with specific processes. Chapter 3 of this SER contains the staff's evaluation of the ISA, and of the ISA summaries that NFS has submitted.

The NRC staff finds that this information meets Criterion (2) in Section 6.4.3.1 of NUREG-1520 (NRC, 2002a) and is acceptable because it provides an adequate list of the consequences and likelihoods of accident sequences involving hazardous chemicals.

### *6.2.5 Chemical Accident Consequences*

In 10 CFR 70.65(b)(7), the NRC requires a description of the proposed quantitative standards used to assess the consequences to an individual from acute chemical exposure to licensed material or chemicals produced from licensed materials that are onsite or expected to be onsite. Table 5-2 in Chapter 5 of the site-wide ISA summary presents this description. NFS selected values from emergency response planning guidelines and accepted industry values for soluble uranium intakes. Chapter 5 of the site-wide ISA summary describes an acceptable method of evaluating the consequences of indoor and outdoor releases. In Chapter 3 of the renewal application, NFS committed to evaluating the unmitigated consequences from accidents using methods compatible with those in NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook," (NRC, 1998a).

The NRC staff finds that this information meets Criterion (2) through (6) in Section 6.4.3.1 of NUREG-1520 (NRC, 2002a) and is acceptable because NFS committed to using appropriate analysis and modeling techniques, valid assumptions, and chemical exposure standards when evaluating the chemical hazards associated with site processes.

### *6.2.6 Chemical Process Safety Items Relied on for Safety*

In 10 CFR 70.61, the NRC requires that IROFS be applied to the extent needed to reduce the likelihood of occurrence of each high-consequence, credible event, so that the event is highly unlikely or the consequences are less severe. The regulation also requires that IROFS be applied to the extent needed to reduce the likelihood of occurrence of each intermediate-consequence, credible event, so that the event is unlikely or the consequences are mitigated. In Chapter 5 of the sitewide ISA summary, NFS documented its methodology for identifying and providing effectiveness and likelihood indices for IROFS when required to manage the risks from high- and intermediate-consequence events.

The NRC staff finds that the methods used for identification and application of IROFS meet Criterion (1) and (2) in Section 6.4.3.2 of NUREG-1520 (NRC, 2002a) and are acceptable because NFS describes the design basis for chemical process safety during normal operations and identifies IROFS to prevent or mitigate the consequences of a chemical accident.

### *6.2.7 Chemical Process Management Measures*

In 10 CFR 70.62(d), the NRC requires that management measures be established to ensure compliance with the performance requirements of 10 CFR 70.61. In Chapters 3 and 11 of the renewal application, NFS committed to maintain its definitions of management measures for credited IROFS using a graded approach based on the type of IROFS and assigned risk reduction. Chapter 4 of the site-wide ISA summary provides additional information.

The NRC staff finds that the commitments meet Criterion (3) in Section 6.4.3.2 of NUREG-1520 (NRC, 2002a) and are acceptable because they define the measures to ensure the reliable operation of engineered controls and the measures to ensure that administrative controls will be correctly implemented when required.

### *6.2.8 Coordination of Chemical Process Safety and Emergency Management*

For hazardous chemicals, 10 CFR 70.22(i)(3)(xiii) requires that the emergency plan certify that the licensee has met its responsibilities under the Emergency Planning and Community Right-

to-Know Act of 1986. The NFS emergency plan states that the facility complies with Title III of the Superfund Amendment and Reauthorization Act of 1986, also known as the "Emergency Planning and Community Right to Know Act." Chapter 8 of this report contains the NRC staff's evaluation of the emergency plan.

### **6.3 Evaluation Findings**

Based on the review of the application, the NRC staff concludes that NFS adequately described and assessed chemical accident consequences and the effects that could result from the handling, storage, or processing of licensed materials. NFS prepared a hazard analysis that identifies and evaluates those chemical process hazards and potential accidents, and established safety controls providing reasonable assurance of safe facility operation. To ensure that the performance requirements in 10 CFR Part 70 are met, NFS performed a detailed building-by-building ISA that identifies defense-in-depth controls and IROFS as well as management measures to ensure that the IROFS are available and able to perform their safety-related functions when needed.

The staff concludes that NFS's plan for managing chemical process safety meets the following applicable requirements: 10 CFR 70.22, 70.61, 70.62, 70.64, and 70.65. The staff therefore finds that NFS has provided reasonable assurance that the public health and safety and environment will continue to be protected during the renewed license term.

### **6.4 References**

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|--------------|--|
| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.  |
| (NFS, 2009b) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469.        |
| (NRC, 1998a) | U.S. Nuclear Regulatory Commission, NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook," March 1998, ML072000468.                              |
| (NRC, 2001c) | U.S. Nuclear Regulatory Commission, NUREG-1513, "Integrated Safety Analysis Guidance Document," May 2001, ML011440260.   |
| (NRC, 2002a) | U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033. |

## **7.0 FIRE SAFETY**

### **7.1 Purpose of Review**

The NRC staff conducted this review to determine with reasonable assurance that the NFS facility is designed to adequately protect against fires and explosions that could affect the safety of licensed materials and thus present an increased radiological risk. The review also established that the application considered the radiological consequences of fires and instituted suitable safety controls to protect workers, the public, and the environment.

### **7.2 Staff Review and Analysis**

The fire protection review was performed relative to the guidance provided in NUREG-1520 (NRC, 2002a). The information to support this review was obtained from the original 2009 application (NFS, 2009a), an onsite review at NFS (NRC, 2010b), and additional information submitted in 2010 (NFS, 2010a) and 2011 (NFS, 2011d, 2011f). The site visit did not duplicate the detailed review of the ISA addressed in Chapter 3 of this report.

#### *7.2.1 Fire Safety Management Measures*

The application documented how the licensee administers and ensures fire safety at the licensed facility. The application reflects a commitment to ensuring that the IROFS, as identified in the ISA summary, are available and reliable, and that the facility maintains fire safety awareness among employees, controls transient ignition sources and combustibles, and maintains a readiness to extinguish or limit the consequences of fire.

The licensee committed to an adequate fire safety program with satisfactory management measures including, but not limited to, (1) a maintenance program to install, test, and maintain IROFS to ensure that they are available and reliable, (2) fire safety awareness training for employees, and (3) an approved hot work permit and combustible controls program.

#### *7.2.2 Fire Hazards Analysis*

The site fire hazard analyses were performed for all plant areas and are part of the ISA process. They are maintained current by the CM process.

Prefire plans have been developed using current information regarding building construction, operations, points of attack, and personnel. The plans discuss available fire protection features and utilities for each process area. Information is available on combustible loadings and firefighting strategy.

Fire hazards analyses and prefire plans conform to the guidance provided in National Fire Protection Association (NFPA) 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," (NFPA, 2008a).

#### *7.2.3 Facility Design*

The facility and its original fire protection systems were designed and constructed to industrial standards that were in effect at the time of construction. The licensee committed to meeting the current prevailing codes for new construction and for renovations affecting 25 percent or more

of the existing structure. Facilities are generally noncombustible masonry or metal construction. Facility exit routes are posted throughout and are unimpeded by physical security requirements. In addition, workers are trained in evacuation and periodic drills are conducted to verify the adequacy of egress.

#### *7.2.4 Process Fire Safety*

Flammable and combustible liquids are stored as required by NFPA 30, "Flammable and Combustible Liquids Code," (NFPA, 2008b). Fire hazards associated with processing uranium oxides and combustible metals have been evaluated and conform to prevention and suppression requirements required by NFPA 801 (NFPA, 2008a).

Because of the decommissioning of the existing incinerator, NFS withdrew the special authorization to incinerate waste and scrap material. If future waste disposal by incineration becomes a necessity, a separate special authorization must be requested through a license amendment.

License Condition 7 previously excluded possession of uranium and plutonium in pyrophoric forms. The SER for the 1992 license renewal states that the NRC staff changed Condition 7 to exclude pyrophoric forms because NFS did not propose fire protection requirements for such materials (NRC, 1992d). NFS has requested that the restriction on pyrophoric forms be removed from Condition 7 (NFS, 2009a). If the restriction on pyrophoric forms of uranium is removed, NFS could change its operations to receive and process uranium in pyrophoric forms, provided the change does not require prior NRC approval under 10 CFR 70.72.

The lack of fire protection requirements cited in the 1992 SER was addressed by programs NFS established to comply with 10 CFR Part 70, Subpart H requirements that became effective in 2000. The staff finds, for the reasons discussed below, that there are sufficient fire protection controls and the Condition 7 restriction may therefore be removed.

Consistent with 10 CFR part 70 requirements, the NFS license renewal application commits to programs and procedures that establish adequate fire protection controls. Specifically, in accordance with 10 CFR 70.61 and 70.62, Chapter 3 of the application commits to an ISA program which has evaluated accident scenarios, including fires involving pyrophoric material, and identified the fire protection controls that must be maintained available and reliable. In accordance with 10 CFR 70.22 and 70.65, Chapter 7 of the application commits to a fire safety program which implements and maintains fire protection requirements, including requirements associated with pyrophoric material. In accordance with 10 CFR 70.72, Chapter 11 of the application commits to a change control program which provides assurance that the fire hazards associated with any change involving pyrophoric material are evaluated and additional fire protection requirements are identified and implemented. These commitments are imposed by Condition S-1 of the renewed license which requires that NFS use licensed material in accordance with the statements, representations, and conditions in its application.

Under the existing Condition 7 restriction, the inadvertent receipt of uranium in pyrophoric form is the most likely accident scenario. Glovebox operation is the most likely location of fire involving pyrophoric material, given that this would be the material's first exposure to air. Upon exposure to air, pyrophoric material could react instantly; however, combustible materials inside gloveboxes are limited to only those materials necessary for processing. Therefore, the material would quickly self-extinguish because of the lack of available fuel to propagate the fire. Appropriate extinguishing agents are provided inside gloveboxes if deemed necessary because

of the material properties. Industry references, such as 1994 edition of the DOE Handbook 1081 (DOE-HDBK-1081-94), "Primer on Spontaneous Heating and Pyrophoricity" (DOE, 1994), are consulted for other safe handling practices. In addition, if literature cannot be located that defines the fire properties of the material when subjected to chemical processing, lab testing is conducted to establish or confirm the processing plans. Based on its review, the NRC staff finds that NFS has established adequate fire protection controls and procedures to prevent or mitigate the consequences of an inadvertent receipt of uranium in pyrophoric form.

The provisions in 10 CFR 70.72(c) enable NFS to make certain process changes without prior NRC approval, provided (among other things) that (a) the change does not create "new types of accident sequences that, unless mitigated or prevented, would exceed [the 10 CFR 70.61] performance requirements", and (b) the change is not otherwise prohibited by license condition. Before NFS could change the form of material it processes, NFS must prepare an evaluation in accordance with 10 CFR 70.72 to determine whether the processing plans are bounded by current analyses (e.g., how much material is planned for each addition to the glovebox). If the processing plans are bounded, then existing procedures and station limit cards will specify the glovebox limits and no further controls would be necessary. If the processing plans are not bounded, then design changes and/or additional procedural controls would be required. To ensure continued compliance with the 10 CFR 70.61 performance requirements, any process changes would be subject to evaluation under 10 CFR 70.72.

The safety bases for the NFS site have been upgraded to meet the 10 CFR Part 70, Subpart H, requirements. The ISA includes initiating events for various types of accident scenarios that could result in a fire, including potential fires in glovebox operations where the fire is initiated by a generic ignition source such as transient combustible materials or electrical sources. The ISA also includes the controls necessary to prevent or mitigate the consequences of potential fires. The ISA program established by NFS provides the methodology and documentation necessary to perform an adequate evaluation of proposed process changes.

As described above, the NRC staff finds that the NFS fire protection program includes procedures and controls that adequately address the inadvertent receipt of uranium in pyrophoric forms. In addition, the NRC staff finds that NFS has established adequate change control requirements consistent with 10 CFR 70.72 to address the fire hazards associated with handling uranium in pyrophoric forms. Therefore, the restriction on pyrophoric forms of uranium is no longer needed and it is not included in the renewed NFS license.

#### *7.2.5 Fire Protection and Emergency Response*

The facility maintains a plant emergency response team, made up of employees trained in firefighting techniques, first aid procedures, and emergency response. The team is organized, operated, trained, and equipped for firefighting capability in accordance with NFPA 600, "Standard on Industrial Fire Brigades" (NFPA, 2005a). NFS maintains a memorandum of understanding with offsite fire departments for response to plant fires when additional support is warranted.

Fire alarm pull stations and audible fire alarms are installed throughout the facility. Automatic fire detectors are installed in several areas throughout the plant and are detailed in written procedures. Portable fire extinguishers are installed throughout the facility and are maintained in accordance with NFPA 10, "Standard for Portable Fire Extinguishers" (NFPA, 2007a). Multipurpose fire extinguishers are provided generally for Class A, B, and C fires. Specialized

extinguishers are located in areas requiring protection from particular hazards, including water-exclusion areas.

The fire protection water is fed by a looped system, with two 8-inch connections to the City of Erwin Water Distribution System. Many fire hydrants are provided throughout the fire protection loop, in locations allowing quick use and access when the hydrants are needed for firefighting. Several hose stations are provided on major process building roofs and in areas inaccessible by hoses fed from hydrants. During the staff's onsite review (NRC, 2010b), the suppression equipment was verified to be in satisfactory condition and unimpaired.

The sprinkler systems and hydrants are operationally tested in accordance with testing frequencies specified by NFPA 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," (NFPA, 2008c). Hoses are hydrostatically tested and re-racked annually. Automatic sprinkler systems are designed and installed in accordance with industry standards.

### **7.3 Evaluation Findings**

The staff reviewed NFS's application with regard to fire safety management measures, fire hazards analysis, facility design, process fire safety, and fire protection and emergency response. NFS's submittals provided sufficient information, in accordance with the requirements of 10 CFR 70.22 and 10 CFR 70.65, on potential fire hazards, consequences, and required controls for the proposed processes.

Additionally, former license conditions S-12, S-16, S-17, S-18, and S-19 each required a response from NFS by a specific date. NRC staff confirmed that the actions were completed during the onsite review (NRC, 2010b). Therefore, the referenced license conditions no longer need to be carried forward in the renewed license. The staff finds that former License Conditions S-14 and S-15 should be retained and renumbered as follows:

Safety Condition S-4: The vaults will be protected by barriers with an equivalent 2-hour fire resistance rating.

Safety Condition S-5: Active and administrative controls for flammable liquids and gases must be operable in the fire area where flammable liquids and gases are present during KAST operations.

### **7.4 References**

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|---------------|---|
| (DOE, 1994)   | U.S. Department of Energy, Handbook 1081 (DOE-HDBK-1081-94), "Primer on Spontaneous Heating and Pyrophoricity," 1994 Edition.               |
| (NFPA, 2005a) | National Fire Protection Association, NFPA 600, "Standard on Industrial Fire Brigades," 2005 Edition.                                       |
| (NFPA, 2007a) | National Fire Protection Association, NFPA 10, "Standard for Portable Fire Extinguishers," 2007 Edition.                                    |
| (NFPA, 2008a) | National Fire Protection Association, NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," 2008 Edition. |

- (NFPA, 2008b) National Fire Protection Association, NFPA 30, "Flammable and Combustible Liquids Code," 2008 Edition.
- (NFPA, 2008c). National Fire Protection Association, NFPA 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2008 Edition.
- (NFS, 2009a) Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.
- (NFS, 2010a) Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.
- (NFS, 2011d) Nuclear Fuel Services, Inc., "Revised Chapters 2, 7, 10, and 11 for Renewal of SNM License 124," August 1, 2011, ML11221A286.
- (NFS, 2011f) Nuclear Fuel Services, Inc., "Revisions for Chapter 1, Addendum, Chapter 2, Chapter 5, Chapter 10, and Chapter 11 for Renewal of SNM License 124," September 9, 2011, ML11258A051.
- (NRC, 1992d) U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," June 9, 1992, ML11325A132.
- (NRC, 2002a) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.
- (NRC, 2010b) U.S. Nuclear Regulatory Commission, "Trip Summary of April 5-7, 2010, Site Visit at Nuclear Fuel Services," June 4, 2010, ML101530546.

## **8.0 EMERGENCY MANAGEMENT**

### **8.1 Purpose of Review**

The NRC conducted this review to determine whether the NFS emergency management program is adequate to protect public health and safety and the environment in the event of an emergency. In performing this review, the NRC staff used the acceptance criteria in Chapter 8 of NUREG-1520 (NRC, 2002a).

### **8.2 Staff Review and Analysis**

The application references the existing NFS emergency plan (NFS, 2009b). Pursuant to 10 CFR 70.22(i)(1)(ii), an emergency plan must address the response to radiological hazards of an accidental release of special nuclear material and any chemical hazards directly related to the release. Such plans must include the information specified in 10 CFR 70.22(i)(3). The NRC staff reviewed and approved the NFS emergency plan during the last license renewal (NRC, 1999a) and during more recent reviews of license amendments authorizing the operation of new facilities at the NFS site. The most recent license amendment requiring a revision of the emergency plan was Amendment 51 issued in 2004 (NRC, 2004a). No significant changes to the NFS emergency plan are proposed in 2009 license renewal application. NFS is authorized to make changes without prior NRC approval pursuant to 10 CFR 70.32(i) if the changes do not decrease the emergency plan's effectiveness. Typically, changes are made during annual reviews of the program and submitted to the NRC. The NRC staff reviews these changes to confirm that they are authorized under the regulation. The most recent review found changes in Revision 15 of the plan to be acceptable (NRC, 2011a).

The NRC staff continues to find the plan acceptable, and in accordance with 10 CFR 70.22(i). Based on a review of the emergency plan and previous licensing actions approving the plan, the staff made the following findings:

- The plan provides an adequate description of the facility and site, the area near the site, and the licensed activities.
- The plan provides an adequate description of the general types of accidents identified in the ISA summary for which protective actions may be needed.
- The plan provides an adequate emergency classification scheme for those accidents.
- The plan provides an adequate description of the means to detect accidents and alert the operating staff.
- The plan provides an adequate description of the measures and equipment to be used for safe shutdown and mitigation of consequences.
- The plan provides an adequate description of the procedures to be used to assess releases of hazardous material.

- The plan provides an adequate description of the emergency response organization including responsibilities for planning, implementing, and controlling emergency preparedness activities.
- The plan provides an adequate description of notification and coordination procedures which includes how important decisions will be made promptly and effectively.
- The plan provides an adequate description of the information to be communicated during an emergency.
- The plan provides an adequate description of the frequency, performance objectives, and plans for emergency response training.
- The plan provides an adequate description of plans to restore the facility and recover after an emergency.
- The plan includes adequate commitments to conducting drills and exercises.
- The plan includes a certification that NFS has met its responsibilities under the Emergency Planning and Community Right-To-Know Act of 1986.

In addition to the NFS emergency plan, Chapter 8 of the application (NFS, 2009a) includes the following commitments:

- Requirements of the emergency plan are implemented by approved, written procedures.
- NFS will not implement changes that decrease the effectiveness of the emergency management program without prior NRC approval.
- Changes made to the emergency plan without prior approval will be provided to the NRC and affected offsite response organizations within 6 months of implementing the changes.
- NFS will maintain agreements with offsite emergency response organizations to provide assistance during an emergency.

### **8.3 Evaluation Findings**

The NRC staff has evaluated the NFS emergency management program and finds that it meets the requirements of 10 CFR 70.22(i) and 10 CFR 70.32(i). The applicant committed to maintaining and executing an emergency plan for responding to releases of hazardous material incident to licensed activities. Based on its review of the emergency plan as documented above, the staff finds that the plan is acceptable. The staff recommends retaining and updating the following condition to the license:

- S-6     The licensee shall maintain and execute the response measures in the Emergency Plan, Revision 15, transmitted by letter dated February 7, 2011, or as further revised by the licensee consistent with 10 CFR 70.32(i).

## **8.4 References**

- (NFS, 2009a) Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.
- (NFS, 2009b) Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469.
- (NRC, 1999a) U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," July 2, 1999, Accession No. ML11325A131.
- (NRC, 2002a) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.
- (NRC, 2004a) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for Nuclear Fuel Services, Inc., License Amendment 51, Blended Low Enriched Uranium Oxide Conversion Building and Effluent Processing Building", July 30, 2004, ML042540349.
- (NRC, 2011a) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc. – Acceptance of Changes in Revision 15 of the Emergency Plan," May 9, 2011, ML111240014.

## **9.0 ENVIRONMENTAL PROTECTION**

### **9.1 Purpose of Review**

The NRC staff conducted this review to determine whether the environmental protection measures proposed by NFS are adequate to protect public health and safety and the environment, as required by 10 CFR Parts 20 and 70. This chapter does not address whether the NRC staff complied with the requirements of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The environmental review required by 10 CFR Part 51 is discussed in Chapter 15 of this SER.

### **9.2 Staff Review and Analysis**

In performing this review, the NRC staff used the guidance in Chapter 9 of NUREG-1520 (NRC, 2002a). The information to support this review was obtained from the original 2009 license application (NFS, 2009a), an onsite review at the NFS facility (NRC, 2010c), and additional information submitted in 2010 and 2011 (NFS, 2010a, 2010e, 2011e, and 2011i).

#### *9.2.1 Environmental Report*

The application contained an environmental report. The NRC staff reviewed and evaluated the environmental report, responses to requests for additional information, and supplemental information submitted by NFS. The NRC staff prepared an environmental assessment following NRC regulations in 10 CFR Part 51 which implement the National Environmental Policy Act of 1969, as amended (42 U.S.C. §4321), and NRC staff guidance in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," (NRC, 2003f). Chapter 15 of this report discusses the results of the environmental assessment.

#### *9.2.2 Effluent and Environmental Controls and Monitoring*

The application describes an existing program which has been reviewed and inspected for many years. The application proposes no significant changes to the environmental protection program. The NRC staff reviewed qualifications and training that the licensee has established for plant personnel who are associated with environmental protection. NFS has established minimum qualifications for the manager of the environmental protection function at the facility and for the supporting environmental protection analyst. The manager will have a bachelors of science or bachelors of art in science, or equivalent experience, and at least 3 years of experience in applied health physics or environmental protection. The analyst will have the same education as that required for the manager and will have at least 1 year of experience in applied health physics or environmental protection. The staff finds these requirements acceptable.

##### *9.2.2.1 Radiation Safety*

In accordance with 10 CFR 20.1101, NFS must implement a radiation protection program. Chapter 4 of this report discusses the radiation protection program for workers. The environmental review of the radiation protection program focuses on the applicant's methods to maintain public doses ALARA in accordance with 10 CFR 20.1101.

The NFS effluent control program is designed to keep airborne and liquid effluent releases ALARA and protect public health and safety and the environment. The program includes routine monitoring and measurement, comparison of results to action levels set by NFS

procedural guidance, and reporting of results to NFS management and the NRC, as appropriate. Section 9.2.2.2 of this report discusses the action levels for liquid and airborne effluents.

NFS has committed to annually reviewing its radiation protection program. Additionally, an NFS-generated ALARA report is provided to NFS management quarterly for use in a review of effluent release data, among other items. NFS also maintains performance metrics and makes reports periodically to its internal safety review committee to (1) determine if there are any developing upward trends in effluent releases, (2) determine if effluents might be lowered under the ALARA concept, (3) determine if effluent control equipment at the facility is being properly used, maintained, and inspected, and (4) review the radiation protection program, effluent control and monitoring data.

The environmental review of the radiation protection program also focuses on the NFS waste minimization practices. NFS uses waste minimization techniques to eliminate and minimize the generation of waste during planning, design, and operation of plant activities. Examples of techniques currently used at NFS include, (1) recycling or reuse of obsolete computer equipment and electronic components through donations to schools and disposal through licensed recycling facilities; (2) offsite shipment of out-of-specification diesel fuel for fuel blending and recycling, (3) shipment of nonhazardous oil for recycling, (4) offsite thermal destruction of mixed PCB waste burned for energy recovery, (5) reuse of isopropyl alcohol to the extent technically allowed, and (6) offsite shipment of universal waste (e.g., mercury lamps, ballasts, and batteries) for recycling. A hazardous and mixed waste reduction plan, which is updated annually, describes the waste minimization techniques used at the NFS facility.

Chapter 4 of this report discusses the NFS radiation protection program addressing occupational doses.

#### *9.2.2.2 Effluent and Environmental Monitoring*

NFS has developed programs for effluent and environmental monitoring. The program objectives include (1) ensuring public health and safety, (2) complying with NRC regulatory requirements, and (3) identifying mitigative measures as appropriate. The discussion below describes liquid and air effluent monitoring and controls to minimize process- and facility-related effluents. Environmental monitoring is described also.

NFS has established action levels for airborne and liquid effluents. If an action level for these effluents is exceeded, the NFS environmental protection manager and the responsible NFS process engineering control personnel would be notified, NFS would conduct an investigation to identify the cause of the exceedance, and NFS would initiate corrective actions to reduce observed levels and to minimize the likelihood of a reoccurrence.

An existing license condition requires notification to the NRC if the State identifies a violation of a discharge permit. This condition has been in the license since the last license renewal in 1999 (NRC, 1999a). The NRC staff recommends renumbering and retaining the condition as follows:

- S-7 NFS shall inform the U.S. Nuclear Regulatory Commission (NRC) within 30 days of receipt of a violation notice from the State of Tennessee Division of Air Pollution or Water Pollution Control, or receipt of modified requirements for a State-issued National Pollutant Discharge Elimination System permit.

#### 9.2.2.2.1 *Liquid Effluent Monitoring*

NFS treats process-related liquid effluents in the waste water treatment facility, before discharging the effluents on a batch basis to the Nolichucky River. Radionuclides expected in liquid effluents include isotopes of uranium (U-232, U-233, U-234, U-235, U-236, and U-238), thorium (Th-228, Th-230, Th-231, and Th-232), and plutonium (Pu-238, Pu-239, Pu-240, and Pu-241), as well as sodium (Na-22), technetium (Tc-99), cesium (Cs-137), lead (Pb-212), radium (Ra-224), neptunium (Np-237), and americium (Am-241). Before discharge, NFS samples each batch and analyzes it for gross alpha and gross beta radioactivity. NFS also takes a monthly composite sample and analyzes it for isotopes of uranium. NFS commits to analyze for other radionuclides if materials in addition to uranium are suspected to be present in the waste water at levels exceeding 10 percent of the concentration values in 10 CFR Part 20, Appendix B, Table 2, Column 2.

NFS has established action levels for liquid effluents before discharge. These action levels, set in NFS procedural guidance, are at or below the concentrations listed in 10 CFR Part 20, Appendix B, Table 2, Column 2. Batch concentrations meeting the action levels are released without further approval by the NFS environmental protection manager; however, waste solutions with alpha or beta concentrations exceeding one of the action levels are discharged only with approval. In Section 9.1.2.2 of the application, NFS commits to review discharges from the waste water treatment facility. If any discharges over a 12-month period caused the estimated dose to a member of the public to exceed 10 percent of the annual public dose limit of 0.1 rem (1 mSv) in 10 CFR 20.1301, "Dose Limits for Individual Members of the Public," NFS will notify the NRC of the event in writing within 30 days. The NRC staff considers this report commitment acceptable because it allows NRC inspectors to follow-up on investigations and actions to maintain public doses ALARA. Similar to Condition S-1 in the existing license, a renewed license will contain a Condition S-1 that requires NFS to operate in accordance with statements in its application.

Sanitary sewer wastes are discharged through two pathways (one for the BLEU complex and one for the remainder of the NFS plant site) into the City of Erwin publicly owned treatment works. NFS samples both of these sanitary waste streams continuously and analyzes them daily for gross alpha and gross beta. Section 9.1.2.1 of the application states that when process water containing radioactive materials is disposed by release into the sanitary sewer, in accordance with the provisions of 10 CFR 20.2003, "Disposal by Release into Sanitary Sewerage," samples representative of the total discharge from the applicable sanitary sewer discharge point are collected and analyzed. NFS has committed to analyze the sample for isotopic uranium and also for additional radionuclides when the concentrations of those radionuclides exceed 10 percent of the concentrations provided in 10 CFR Part 20, Appendix B, Table 2, Column 2. Grab samples of sludge are collected quarterly at the Erwin publicly owned treatment works and analyzed for isotopic uranium. As noted above, a renewed license will contain a Condition S-1 that requires NFS to operate in accordance with statements in its application.

To demonstrate compliance with solubility requirements for releases to the sanitary sewer specified in 10 CFR 20.2003, NFS compares the results of the insoluble radioactivity measurements performed on the sanitary sewer samples to the amount of insoluble radioactivity present in similarly processed background samples. If insoluble radioactive materials are present at concentrations statistically greater than the concentrations measured in the background samples, NFS will suspend discharges until corrective actions are taken.

Storm water from the eastern portion of the NFS site drains into Banner Spring Branch and then into Martin Creek, while storm water from the NFS main plant site and the BLEU complex drains into a culvert that parallels the northwest plant boundary and empties into Martin Creek. Weekly sampling of Martin Creek downstream of the plant site is performed in accordance with a State of Tennessee storm water permit, and samples are analyzed for constituents identified in the permit, including gross alpha and gross beta radioactivity. In addition, samples are taken quarterly, at the two storm water pathways – the Banner Spring Branch and the Perimeter North West Ditch location (NFS, 2011i).

The applicant's liquid effluent monitoring program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes in the program. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds that the proposed liquid effluent monitoring program provides assurance that the facility will meet the public dose limits in 10 CFR 20.1301 during the renewed license term. Therefore, the NRC staff finds that the program is acceptable.

#### *9.2.2.2.2 Air Effluent Monitoring*

Airborne effluents are discharged from process stacks in accordance with operating permits issued by the Tennessee Air Pollution Control Board and are required to meet the NRC radiological standards of 10 CFR Part 20.

NFS uses various controls to minimize airborne effluents. The main system, which consists of venturi and demisting scrubbers and HEPA filtration, removes radioactive particulates and chemicals from the effluents. The scrubbers remove chemical compounds, and the HEPA filters remove particulates before their release through the NFS main stack. Additional filters and scrubbers include (1) American Society of Heating, Refrigerating, and Air Conditioning Engineers prefilters that are used on heating, ventilation, and air conditioning recirculation room air handlers, (2) packed-bed or sieve tray scrubbers (sodium hydroxide, water, and sulfuric acid are used), and (3) multiple HEPA filters that are used throughout the plant to achieve higher removal efficiencies.

With the exception of equipment malfunctions, during the processing of radioactive materials, NFS samples continuously all process stacks and vents with the potential to release airborne radioactivity at concentrations greater than or equal to 10 percent of the values in 10 CFR Part 20, Appendix B, Table 2, Column 1. NFS collects samples daily from active processing areas and at least weekly from decommissioning areas and inactive processing areas.

NFS checks the flow rates on all process ventilation stacks annually and whenever any process changes occur that have the potential to significantly alter the flow rate. NFS also evaluates each individual effluent discharge point for isotopic distribution based on process knowledge and historical characterization data. NFS verifies the accuracy of characterization data using isotopic analysis whenever there is a significant change to the materials processed.

NFS analyzes samples from process stacks and vents for gross alpha and gross beta radioactivity and compares the results to NFS action levels established by procedural guidance. The stack action levels were derived using a dose-based approach with the intent of preventing the maximally exposed offsite receptor from receiving an annual total effective dose equivalent from air effluents greater than the ALARA dose constraint of 0.1 mSv (10 mrem) in 10 CFR

20.1101(d). The NRC staff reviewed this dose assessment methodology during the last license renewal and found it to be adequate (NRC, 1999a). NFS has not proposed any changes to this methodology. The NRC staff continues to find this methodology acceptable.

Radionuclides expected in airborne discharges include isotopes of uranium (U-234, U-235, and U-238), thorium (Th-228, Th-230, Th-231, and Th-232), and plutonium (Pu-238, Pu-239, Pu-240, and Pu-241), as well as Tc-99 and Am-241. Air samples are analyzed for isotopic uranium on a quarterly basis and isotopes of concern are measured annually.

Minimum detectable concentrations (MDCs) for gross alpha and gross beta air effluents are typically 10 percent of the action level. These limits are designed for early detection and to prevent exceedance of regulatory limits.

The applicant's air effluent monitoring program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes in the program. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds that the proposed air effluent monitoring program provides assurance that the facility will meet 10 CFR 20.1101(d) requirements and the public dose limits in 10 CFR 20.1301 during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

#### *9.2.2.2.3 Environmental Monitoring*

The NFS environmental monitoring program for ambient air, soil, silt/sediment, vegetation, ground water, and surface water is detailed in written procedures. Changes in the program may occur, based on changes in operation or the emergence of new information. If a sample cannot be taken, the NFS environmental protection function manager is notified, and an investigation is initiated to include an assessment of the significance of the event, the cause of the deviation from the plan, and a determination of any necessary corrective action to be performed at that time.

Ambient air monitoring is sampled continuously and analyzed weekly for gross alpha and gross beta. On a quarterly basis, a composite sample is taken and analyzed for isotopic uranium. Additionally, a composite sample is taken annually at the sampling station nearest the predicted maximally exposed offsite receptor and analyzed for additional isotopes of concern based on NFS characterization data of material processed. The samples are collected from eight air sampling stations that are concentrated along the predominant wind directions. NFS reviews air sampling results quarterly and compares results to internal action levels. If action levels are exceeded, then NFS would take appropriate corrective actions to determine the cause of the exceedance.

Surface soil samples are collected quarterly by a grab sample and analyzed for gross alpha and gross beta radioactivity. Four sampling locations concentrated along the predominant wind directions are routinely monitored. When analysis of the samples shows that action levels in the guidance have been exceeded, NFS will perform a specific isotopic analysis (based on materials and processes involved at the plant) on samples from the same sites.

Vegetation samples are collected routinely from four forage vegetation sites and analyzed quarterly for gross alpha and gross beta concentrations. When analysis of the samples shows that action levels in the guidance have been exceeded, NFS will perform a specific isotopic

analysis (based on materials and processes involved at the plant) on samples from the same sites.

Shallow silt/sediment samples are collected by grab sampling along streams potentially affected by plant operations and analyzed quarterly for gross alpha and gross beta radioactivity. Where appropriate, upstream samples are collected in addition to downstream samples. When analysis of the samples shows that action levels in the guidance have been exceeded, NFS will perform a specific isotopic analysis (based on materials and processes involved at the plant) on samples from the same sites.

Typical MDCs when analyzing gross alpha for soil, silt/sediment, and vegetation samples are 5 picocuries (pCi) per gram. These MDCs compared to background level demonstrate that NFS is able to quantify significant levels above background levels (NFS, 2011e). This demonstrates that MDCs are low enough to detect action limits and that the instrumentation being used is sensitive enough.

NFS monitors ground water quarterly using grab samples and analyzes for gross alpha and gross beta. NFS committed to monitoring a total of 11 wells – 1 upgradient well and 10 downgradient wells. In addition, NFS has additional wells available to sample if other monitoring data are needed.

If gross alpha activity in a well exceeds 15 pCi/liter, then an analysis for isotopic uranium will be performed. Isotopic plutonium and/ or isotopic thorium analysis will be performed when a well contains these contaminants at levels significantly higher than background levels or if potential contamination in the area indicates that these analyses should be performed. If gross beta activity in any well exceeds 50 pCi/liter, an analysis for Tc-99 will be performed.

A facility action plan is in place with the State of Tennessee to monitor ground water on site, as well as off site as part of the ground water remediation program. Several monitoring and injection wells in various locations are sampled on an annual, semiannual, and quarterly basis (NFS, 2010a).

NFS takes grab samples at upstream and downstream locations on Martin Creek and the Nolichucky River. Samples are taken weekly at the Martin Creek downstream location and quarterly at the other locations, and the samples are analyzed for gross alpha and gross beta (NFS, 2009a).

The applicant's air effluent monitoring program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes in the program. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds that the proposed environmental effluent monitoring program provides assurance that the facility will meet the public dose limits in 10 CFR 20.1301 during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

### *9.2.3 Integrated Safety Analysis Summary and Management Measures*

The NRC staff has previously reviewed the ISA summaries and management measures for compliance with the requirements in 10 CFR Part 70, Subpart H. The application proposes no changes with regard to these items. Therefore, the staff continues to find them acceptable. Chapter 3 of this report discusses the staff's previous evaluations and approvals of the ISA

summaries, which included onsite vertical slice reviews of the underlying ISA. Chapter 11 of this SER discusses the staff's evaluation of management measures.

### **9.3 Evaluation Findings**

As discussed in Section 9.2 above, the NFS environmental monitoring program has been reviewed and inspected for many years. If operations are authorized to continue, airborne and liquid effluents will continue to be treated before discharge and monitored in accordance with the applicable license and permits and are expected to remain within regulatory limits for nonradiological and radiological components. With respect to past NFS operations, the radiological dose associated with the exposure to airborne and liquid effluents, for the hypothetical maximally exposed individual located at the fence line, has been less than 1 percent of the annual limit of 1.0 mSv (100 mrem) in 10 CFR 20.1301. Public doses from continued NFS operations are expected to remain below 10 CFR Part 20 regulatory limits.

NFS has developed a program to implement adequate environmental protection measures during operation, which include: (1) effluent controls to maintain public doses ALARA as part of the radiation protection program, and (2) effluent and environmental monitoring. The NRC staff concludes that the NFS program, as described in the license renewal application, is adequate to protect the environment and the health and safety of the public during the license renewal term, and complies with the applicable regulatory requirements in 10 CFR 20.1101, 20.1301, 20.2003, and those in 10 CFR Part 70, Subpart H.

### **9.4 References**

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| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.(NFS, 2010a)  |
| (NFS, 2010a) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.  |
| (NFS, 2010e) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Regarding the Environmental Assessment for Nuclear Fuel Services, Inc. Materials License SNM-124 Renewal," May 27, 2010, ML101590160. |
| (NFS, 2011e) | Nuclear Fuel Services, Inc., "Supplemental Information to Support Chapter 9 and the Environmental Assessment for Renewal of SNM License 124," June 24, 2011, ML11180A188.  |
| (NFS, 2011i) | Nuclear Fuel Services, Inc., "Revised Chapter 9 for Renewal of License SNM-124," September 30, 2011, ML11278A079.  |
| (NRC, 1999a) | U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," July 2, 1999, Accession No. ML11325A131.   |
| (NRC, 2002a) | U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.   |

- (NRC, 2003f) U.S. Nuclear Regulatory Commission, NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," August 2003, ML032450279.
- (NRC, 2010c) U.S. Nuclear Regulatory Commission, "Meetings During Week of November 16, 2009, with Representatives from Nuclear Fuel Services and Other Stakeholders," February 17, 2010, ML100040445.

## **10.0 DECOMMISSIONING**

### **10.1 Purpose of Review**

The NRC staff conducted this review to determine with reasonable assurance that the applicant will be able to decommission the facility safely and in accordance with NRC regulations. Nuclear facilities licensed under 10 CFR Part 70 are required to comply with financial assurance and recordkeeping requirements in 10 CFR 70.25, "Financial Assurance and Recordkeeping for Decommissioning." In addition, licensees must submit decommissioning plans for NRC approval in accordance with 10 CFR 70.38(g).

### **10.2 Staff Review and Analysis**

The NRC staff performed this review using the guidance provided in NUREG-1520 (NRC, 2002a) and NUREG-1757, Volume 3, "Consolidated NMSS Decommissioning Guidance – Financial Assurance, Recordkeeping, and Timeliness" (NRC, 2003c). The information to support this review was obtained from the original renewal application (NFS, 2009a) and additional information submitted in 2010 (NFS, 2010a, 2010b, and 2010c) and 2011 (NFS, 2011c, 2011d, 2011f, 2011g, and 2011h).

#### *10.2.1 Financial Assurance for Decommissioning*

NFS submitted an updated decommissioning funding plan (DFP) and cost estimate to the NRC for review, as required by 10 CFR 70.25(e). The aggregate cost estimate is approximately \$338 million, and the financial responsibility for decontamination and decommissioning of the NFS site is broadly divided between NFS, DOE and a Joint Venture between NFS and Framatome ANP Richland, Inc. NFS stated that DOE would cover approximately \$306 million of the total cost estimate. In 2011, the NRC staff approved the amount of the updated cost estimate for decommissioning (NRC, 2011b). The NRC staff found that the submitted decommissioning cost estimate was based on reasonable and documented assumptions, was based on costs of a third-party contractor, did not take credit for any salvage value, included a 25-percent contingency factor, and adequately estimated the cost to carry out required decommissioning activities before license termination. Accordingly, the staff finds that the DFP and cost estimate satisfy the requirements of 10 CFR 70.25(e) and are consistent with NRC guidance (NRC, 2003c).

After the NRC's approval of the cost estimate (NRC, 2011b), NFS submitted revised financial instruments as financial assurance (CB, 2011; NFS, 2011g and 2011h). NFS relies on several financial instruments as financial assurance, and the staff finds these financial instruments acceptable on the basis that they meet the NRC's requirements in 10 CFR 70.25(f) and the exemption granted for statements of intent from government agencies. They are consistent with the NRC guidance (NRC, 2003c), and the aggregate amount of financial assurance provided by these instruments is equal to the cost estimate approved by NRC.

Pursuant to 10 CFR 70.25(e), NFS provided a Certification of Financial Assurance (NFS, 2011h). The NRC staff finds that it certifies that financial assurance is provided in the amount of the cost estimate approved by the NRC. The staff finds that the certification meets the requirements in 10 CFR 70.25(e), and the language of the certification is consistent with guidance in Appendix A of NUREG-1757, Volume 3 (NRC, 2003c); therefore, the certification is acceptable.

NFS committed to updating the cost estimate at least every 3 years, as required by 10 CFR 70.25(e).

### *10.2.2 Recordkeeping for Decommissioning*

In Section 10.4 of the renewal application, NFS committed to maintaining records important to decommissioning in accordance with 10 CFR 70.25(g). The NRC staff notes that extensive decommissioning work has already been conducted at the site. Previous decommissioning projects include the following:

- removal of Ponds 1, 2, 3, and 4 in the North Site
- removal of waste from a former burial ground in the North Site
- removal of waste from the southwest burial trenches
- decommissioning of former plutonium facilities (including Buildings 110 and 234)
- removal of soil contaminated by various activities at the site

The NRC staff notes that unresolved issues remained after the final status survey was completed for the southwest burial trenches (NRC, 2001d). These issues involved demonstrating that residual contamination remaining in the trenches after excavation of buried waste complies with release criteria for the eventual unrestricted use of the site. The small amount of radioactive material buried several feet below the surface of the soil now poses no significant hazard to workers or the public. Access to the area remains restricted. The NRC staff found in 2001, and continues to find, that no immediate action is required. However, the issues will need to be addressed before the license is terminated.

### *10.2.3 Decommissioning Plans*

NFS is conducting several projects to decommission parts of the site. The projects are expected to continue in the future. In Section 10.5 of the renewal application, NFS committed to evaluating the need for a decommissioning plan in accordance with the requirements of 10 CFR 70.38(g). The evaluation will be conducted as part of the change control process described in Chapter 11 of this report. Under the process, evaluations concluding that decommissioning-related activities may proceed without an NRC-approved decommissioning plan will be documented and submitted annually to the NRC with other internally-authorized changes. Chapter 1 of this report discusses a special authorization to conduct decommissioning-related activities without prior NRC approval. The special authorization was approved previously to acknowledge the extensive experience gained from conducting several complex decommissioning projects. The North Site decommissioning plan was the only decommissioning plan active when the application was reviewed.

## **10.3 Evaluation Findings**

The NRC staff has evaluated the licensee's plans and financial assurance for decommissioning using the guidance in NUREG-1757, Volume 3 (NRC, 2003c). As discussed in Section 10.2 above, the NRC staff finds that the licensee's plans and financial assurance for decommissioning are in accordance with 10 CFR 70.25(e), 70.25(g), and 70.38(g) and provide reasonable assurance of protection for workers, the public, and the environment during the renewed license term.

## **10.4 References**

- (CB, 2011) Compass Bank, "Amendment to Letter of Credit No. A30271T," June 30, 2011, ML11188A002.
- (NFS, 2009a) Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.
- (NFS, 2010a) Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.
- (NFS, 2010b) Nuclear Fuel Services, Inc., "Revision to the Updated Decommissioning Cost Estimate Submitted Per 10 CFR 70.25(e)," February 26, 2010, ML100780136.
- (NFS, 2010c) Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning the Updated Decommissioning Cost Estimate Submitted Per 10 CFR 70.25(e)," September 23, 2010, ML102810569.
- (NFS, 2011c) Nuclear Fuel Services, Inc., "Supplemental Information to Support the Response to Request for Additional Information Concerning the Updated Decommissioning Cost Estimate Submitted Per 10 CFR 70.25(e)," April 13, 2011, ML11109A081.
- (NFS, 2011d) Nuclear Fuel Services, Inc., "Revised Chapters 2, 7, 10, and 11 for Renewal of SNM License 124," August 1, 2011, ML11221A286.
- (NFS, 2011f) Nuclear Fuel Services, Inc., "Revisions for Chapter 1, Addendum, Chapter 2, Chapter 5, Chapter 10, and Chapter 11 for Renewal of SNM License 124," September 9, 2011, ML11258A051.
- (NFS, 2011g) Nuclear Fuel Services, Inc., "Letter of Credit No. TFTS-934413 Issued by JPMorgan Chase Bank," July 28, 2011, ML11215A028.
- (NFS, 2011h) Nuclear Fuel Services, Inc., "Standby Trust Agreements, Government Letters of Intent, and Certification of Financial Assurance to Support the Decommissioning Cost Estimate," September 27, 2011, ML11286A112.
- (NRC, 2001d) U.S. Nuclear Regulatory Commission, "Review of Southwest Burial Trenches Final Status Survey Actions," June 21, 2001, ML011730285.
- (NRC, 2002a) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.
- (NRC, 2003c) U.S. Nuclear Regulatory Commission, NUREG-1757, Volume 3, "Consolidated NMSS Decommissioning Guidance - Financial Assurance, Recordkeeping, and Timeliness," September 2003, ML032471471.

(NRC, 2011b) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc., – Interim Approval of Decommissioning Cost Estimate Amount," May 27, 2011, ML111460129.

## **11.0 MANAGEMENT MEASURES**

### **11.1 Purpose of Review**

The NRC staff conducted this review to evaluate whether NFS provided information to ensure that the management measures applied to IROFS, as documented in the ISA summaries previously reviewed, give adequate assurance that the IROFS will be available and reliable, consistent with the performance requirements of 10 CFR 70.61. Section 11.4.3 of NUREG-1520 (NRC, 2002a) contains the acceptance criteria for the review.

*Management measures* as defined in 10 CFR 70.4 means the actions that a licensee performs, generally on a continuing basis, which are applied to IROFS to ensure compliance with the performance requirements and to ensure that the IROFS are available and reliable to perform their functions when needed. In accordance with 10 CFR 70.62(d), management measures must be established to ensure compliance with performance requirements in 10 CFR 70.61. The management measures must ensure that IROFS are designed, implemented and maintained, as necessary, to ensure that they are available and reliable to perform their functions when needed. This chapter addresses each of the following management measures (as listed in the 10 CFR Part 70 definition of management measures): (1) CM, (2) maintenance, (3) training and qualifications, (4) procedures, (5) audits and assessments, (6) incident investigations, (7) records management, and (8) other QA elements. Together, these elements make up NFS's system of management measures that must be implemented in accordance with 10 CFR 70.62(d).

### **11.2 Staff Review and Analysis**

The NRC staff obtained information to support this review from the original application (NFS, 2009a and 2009c) and additional information submitted in 2010 (NFS, 2010a) and 2011 (NFS, 2011d and 2011f).

#### *11.2.1 Configuration Management*

The staff has reviewed the CM program for the NFS facility using the regulatory acceptance criteria of NUREG-1520 (NRC, 2002a). The staff evaluation of the CM program included the review of the CM policy, design requirements, document control, change control, and assessments.

The applicant has suitably and acceptably described its CM program, including the method for managing changes in procedures, facilities, activities, and equipment for IROFS. Management-level policies and procedures, including an analysis and independent safety review of any proposed activity involving an IROFS, are described that will provide reasonable assurance that consistency among design requirements, physical configuration, and facility documentation is maintained as part of a new activity or change in an existing activity involving licensed material.

NFS's CM program includes the elements described below:

#### **Configuration Management Policy**

The applicant described the overall CM functions. NFS requires the establishment of an effective CM program with clear objectives, defines the scope of the CM program, documents

NFS senior management commitment to CM, designates key NFS organizations with responsibility for implementing the CM program, and describes the key CM program functions. The applicant also stated that changes to IROFS will be evaluated in accordance with 10 CFR 70.72 before implementation. The applicant will provide a summary of major changes that required the revision of the applicable safety or environmental bases to the NRC within 30 days after the end of the calendar year during which the changes occurred. The license application also described the graded approach that is used for CM functions and activities.

Section 11.1.3 of the application describes the CM program scope and organizational structure.

#### Design Requirements

Section 11.1.4 of the application describes how design requirements and design bases for IROFS and other selected items are documented and supported by analyses, and how all the documentation is maintained current. The applicant also described the review and approval processes of design bases.

#### Change Control

Responsibilities and procedures, as presented in Section 11.1.5 of the application, adequately describe how NFS will achieve and maintain strict consistency among the design requirements, physical configuration and facility documentation. Methods are in place for suitable analysis, review, approval, and implementation of identified changes to IROFS. This includes appropriate CM controls to ensure configuration verification, functional tests, and accurate documentation for equipment or procedures that have been modified.

A Change Control Board (CCB), as described by the applicant in Section 11.1.3 of the application, reviews change requests to ensure a proper review and identification of the items affected by changes. The CCB, which is chaired by a senior manager and composed of other managers representing different disciplines, serves as a decisionmaker for changes. All CCB members are designated in writing and are required to have qualifications as specified for a discipline manager.

#### Document Control

Section 11.1.6 of the application describes a method whereby documents, including drawings, are appropriately created, stored, controlled, and accessible. The application also included a listing of the documents captured by the system.

#### Assessments

Section 11.1.7 of the application describes the assessment element of the CM program. It includes the assessment element objectives to detect, document, determine the cause of, and initiate correction of inconsistencies among design requirements, facility configuration information and physical configuration. The applicant also described the different methods and documentation that will be used to assess the CM program effectiveness.

The NFS license renewal application does not propose any significant changes to the CM program discussed above. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that NFS will maintain its existing CM program, and will meet the requirements of 10 CFR 70.62(d)

and 70.72 during the license renewal term. Therefore, the NRC staff finds that this program is acceptable.

### *11.2.2 Maintenance*

NFS described the maintenance program applicable to IROFS. NFS's maintenance commitments contain the basic elements to maintain availability and reliability: corrective maintenance, preventive maintenance (PM), functional testing, equipment calibration and work control for maintenance of IROFS. The surveillance and monitoring, PM, and functional testing activities described in the application provide assurance that IROFS will be available and reliable to prevent or mitigate accident consequences.

#### Surveillance/Monitoring

Section 11.2.1 of the application describes the surveillance activities and the applicant's commitments to the organization and conduct of established surveillance activities. The applicant also described how the documentation of IROFS failure reports and related documentation is used to evaluate IROFS, identify the cause of failure, and assign appropriate actions to be initiated.

#### Corrective Maintenance

NFS provided a documented approach to perform corrective actions or repairs on IROFS. As described, the maintenance program will provide a planned, systematic, integrated, and controlled approach. Section 11.2.2 of the application also describes how a functional test is conducted if necessary to provide reasonable assurance that the safety control performs as designed and provides the safety action expected.

#### Preventive Maintenance

The applicant provided a description of the PM program that includes activities to be performed in a preplanned and scheduled manner to refurbish or overhaul IROFS to ensure that they continue to perform their intended safety function. Section 11.2.3 of the application includes provisions for (1) appropriately balancing the PM activities against the objective of minimizing IROFS, (2) performing a functional test, if necessary, to provide reasonable assurance that the safety control performs as designed and provides the expected safety action, and (3) written procedures specifying the performance of PM at specified frequencies.

#### Functional Testing

Section 11.2.4 of the application includes a description of the methods used and the statement that functional testing will be performed as needed, after PM or corrective maintenance of IROFS. The applicant stated that compensatory measures will be provided while a functional test is performed on an IROFS.

The NFS license renewal application does not propose any significant changes to the maintenance program discussed above. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the maintenance program will meet the requirements of 10 CFR 70.62(d) during the license renewal term. Therefore, the NRC staff finds that this program is acceptable.

### *11.2.3 Training and Qualifications*

Section 11.3 of the application describes two training categories: general safety training and training for activities involving the handling of SNM. For activities involving the handling of SNM, the application provides a description that adequately addresses (1) training organization and management, (2) identification of activities requiring training, (3) position training requirements, (4) training basis and objectives, (5) training materials, (6) evaluation of trainee accomplishment, (7) on-the-job training, and (8) training program review. The NRC staff concludes that NFS has adequately described and assessed its personnel training and qualification in a manner that (1) satisfies regulatory requirements, (2) is consistent with the guidance in NUREG-1520 (NRC, 2002a), and (3) is acceptable.

There is reasonable assurance that implementation of the described training and qualifications will result in personnel who are qualified and competent to design, construct, start up, operate, maintain, modify, and decommission the facility safely.

The applicant's training and qualification program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose significant changes to the program. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the training and qualification program will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

### *11.2.4 Procedures*

Section 11.4 of the NFS license renewal application describes a suitably detailed process for development, approval, and implementation of procedures. This process has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to how procedures are developed, approved, and implemented. The applicant also described operating procedures, general safety procedures, support group procedures, maintenance procedures, and temporary procedures. The applicant addresses the procedures for the maintenance of IROFS, as well as items important to the health of facility workers and the public and to the protection of the environment. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the procedure program will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

### *11.2.5 Audits and Assessments*

Section 11.5 of the application describes the audits and assessments program. This description considers (1) the structure of the audits and assessments activities, (2) procedures, (3) personnel qualifications and independence from the area being reviewed, and (4) capture of findings in the corrective action program.

The applicant's audits and assessments program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose significant changes to the program. Based on the staff's evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the audits and assessments program will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

#### *11.2.6 Incident Investigations*

Section 11.6 of the application describes an organization responsible for (1) performing incident investigations of events that may occur during operation of the facility, (2) determining the root cause(s) and generic implications of the event, and (3) recommending corrective actions for ensuring a safe facility and safe facility operations in accordance with the acceptance criteria of Section 11.4 of NUREG-1520 (NRC, 2002a).

In addition, the application commits to monitor and document corrective actions through to completion and maintain documentation so that “lessons learned” may be applied to future operations of the facility.

The applicant’s incident investigation program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose significant changes to the program. Based on the staff’s evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the incident investigation program will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

#### *11.2.7 Records Management*

Section 11.7 of the application describes the records management system. The applicant described a system that (1) will be effective in collecting, verifying, protecting, and storing information regarding the facility and its design, operations, and maintenance and will be able to retrieve the information in readable form for the designated lifetimes of the records, (2) will provide records storage areas with the capability to protect and preserve health and safety records that are stored there during the mandated periods, including protection of the stored records against loss, theft, tampering, or damage during and after emergencies, and (3) will provide reasonable assurance that any deficiencies in the records management system or its implementation will be detected and corrected in a timely manner.

The applicant’s records management program discussed above has been reviewed and inspected for many years, and the license renewal application does not propose significant changes to the program. Based on the staff’s evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the records management program will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

#### *11.2.8 Other QA Elements*

NFS described other QA elements applied to IROFS and management measures in Section 11.8 of the application. The staff finds that the applicant provided an adequate description of its quality system and reasonable assurance that authorized activities will be carried out in compliance with the license requirements and that deviations from requirements will be promptly identified and corrected.

The applicant’s other QA elements discussed above have been reviewed and inspected for many years, and the license renewal application does not propose significant changes to these QA elements. Based on the staff’s evaluation of the application commitments using the guidance in NUREG-1520, the staff finds the commitments provide assurance that the QA

elements will meet the requirements of 10 CFR 70.62(d) during the renewed license term. Therefore, the NRC staff finds that this program is acceptable.

### **11.3 Evaluation Findings**

Based on the Section 11.2 evaluations above, the staff finds that the management measures, as applied to specific IROFS, provide reasonable assurance that the IROFS will be available and reliable to perform their safety functions during the license renewal term. The NRC staff reviewed the above information and finds that the licensee's management measures, as applied to the IROFS, provide reasonable assurance that the requirements of 10 CFR 70.62(d) will continue to be met.

The staff concludes that the NFS system of management measures, as described in the application, provides reasonable assurance that authorized activities will be carried out in compliance with the license requirements, and deviations from requirements will be promptly identified and corrected.

### **11.4 References**

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|--------------|--|
| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.  |
| (NFS, 2009c) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning Section 11.8 of SNM-124 License Renewal Application, September 18, 2009, ML092730118.      |
| (NFS, 2010a) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124," August 16, 2010, ML102440808.                            |
| (NFS, 2011d) | Nuclear Fuel Services, Inc., "Revised Chapters 2, 7, 10, and 11 for Renewal of SNM License 124," August 1, 2011, ML11221A286.  |
| (NFS, 2011f) | Nuclear Fuel Services, Inc., "Revisions for Chapter 1, Addendum, Chapter 2, Chapter 5, Chapter 10, and Chapter 11 for Renewal of SNM License 124," September 9, 2011, ML11258A051. |
| (NRC, 2002a) | U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, ML020930033.                 |

## **12.0 MATERIAL CONTROL AND ACCOUNTING**

### **12.1 Purpose of Review**

The NRC staff conducted this review to ensure that the NFS license renewal application complies with the requirements for MC&A of SNM and SSNM. These requirements are contained in 10 CFR Part 74. The acceptance criteria for the review are found in NUREG-1065, Revision 2, "Acceptable Standard Format and Content for the Fundamental Nuclear Material Control (FNMC) Plan Required for Low-Enriched Uranium Facilities" (NRC, 1995a) and NUREG-1280, Revision 1, "Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment" (NRC, 1995b).

### **12.2 Staff Review and Analysis**

The information to support this review was obtained from the original application (NFS, 2009b), an onsite review at NFS (NRC, 2010b), and additional information submitted in 2010 (NFS, 2010a) and 2011 (NFS, 2011k, 2011m, and 2011n).

The NRC staff notes that the NFS MC&A program has been reviewed and inspected for many years. The plans discussed below have been approved previously and the NFS license renewal application proposes no significant changes to the plans. Some recent changes were made as a result of NRC requests for additional information. NRC staff reviewed and confirmed that NFS was authorized under 10 CFR 70.32(c) to make those changes without prior NRC approval because they did not decrease the effectiveness of the program (NRC, 2011f, 2011g, and 2012a).

#### *12.2.1 Fundamental Nuclear Material Control Plans*

The staff reviewed the applicant's two fundamental nuclear material control (FNMC) plans. The first FNMC plan, entitled "Fundamental Nuclear Material Control Plan," details how the applicant will meet the requirements of 10 CFR 74.51, "Nuclear Material Control and Accounting for Strategic Special Nuclear Material," with respect to all NFS activities involving SSNM. The second FNMC plan, entitled "Fundamental Nuclear Material Control Plan for SNM of Low Enriched Uranium," details how the applicant will comply with the requirements of 10 CFR 74.31, "Nuclear Material Control and Accounting for Special Nuclear Material of Low Strategic Significance," with respect to all NFS activities involving SNM of low strategic significance.

Regarding the first FNMC plan referenced above, the staff finds that the plan is in accordance with 10 CFR 74.51, and describes the following:

- an acceptable process monitoring program to detect abrupt losses of material
- an acceptable item monitoring program
- an acceptable program for resolving and reporting alarms and allegations of theft
- an acceptable program for QA including independent management structure, training of personnel, measurement and measurement control programs, physical inventory, accounting, resolution of shipper-receiver differences, control of scrap material, systems to minimize human errors, and periodic assessment of the MC&A program

Regarding the second FNMC plan referenced above, the staff finds that the plan is in accordance with 10 CFR 74.31, and describes the following:

- an organizational structure that ensures the independence of the MC&A program
- a measurement program that provides accurate measurements of SNM
- a measurement control program that ensures that equipment used for MC&A measurements meets acceptable criteria
- accurate use of statistics to calculate measurement uncertainties
- an acceptable physical inventory program
- an acceptable item control program
- acceptable procedures for resolving shipper-receiver differences
- review and assessment of the MC&A program
- information to aid in the investigation and recovery of missing uranium
- acceptable practices for keeping accurate and reliable MC&A records

Both plans provide reasonable assurance that the requirements for MC&A of SNM and SSNM will be met. Accordingly, the staff recommends that existing safeguards (SG) license conditions be updated and renumbered as follows:

#### Section 1.0 – FNMC PLANS

SG-1.1: The licensee shall follow its “Fundamental Nuclear Material Control Plan” with respect to all activities involving strategic special nuclear material. The approved plan consists of the following revisions, or as further revised by the licensee in accordance with 10 CFR 70.32(c):

General Discussion, Rev. 9 (dated September 2009)  
 Section 1 – Process Monitoring, Rev. 26 (dated May 2011)  
 Section 2 – Item Monitoring, Rev. 10 (dated November 2011)  
 Section 3 – Alarm Resolution, Rev. 10 (dated May 2011)  
 Section 4 – QA & Accounting, Rev. 22 (dated November 2011)  
 Note: The plan may include examples in one or more annexes.

SG-1.2: The licensee shall follow its “Fundamental Nuclear Material Control Plan for SNM of Low Enriched Uranium” with respect to all activities involving special nuclear material of low strategic significance. The approved plan consists of the following revisions, or as further revised by the licensee in accordance with 10 CFR 70.32(c):

Section 1 – General Discussion, Rev. 7 (dated December 2010)  
 Section 2 – SNM Confirmation and Tracking, Rev. 5 (dated December 2010)  
 Section 3 – Management Structure, Rev. 10 (dated December 2010)  
 Section 4 – MC&A Measurements, Rev. 7 (dated December 2010)  
 Section 5 – Physical Inventories, Rev. 5 (dated December 2010)  
 Section 6 – Item Control, Rev. 6 (dated November 2011)  
 Section 7 – Resolving Shipper/Receiver Differences, Rev. 3 (dated December 2010)  
 Section 8 – Periodic Assessment of the MC&A System, Rev. 5 (dated December 2010)  
 Section 9 – Record Keeping, Rev. 1 (dated February 1993)  
 Note: The plan may include examples in one or more annexes.

### 12.2.2 Materials License – Safeguards Conditions

The staff reviewed the applicant's existing safeguards conditions to determine whether changes were necessary for the renewal period.

Non-applicable License Conditions - Exemptions and approvals are contained in existing Safeguards Conditions SG-2.1, SG-3.1, SG-4.3, SG-4.12, SG-4.21 through SG 4.36, and SG-5.3 through SG-5.5. During its review of the renewal application, the NRC staff identified (1) that Conditions SG-2.1, SG-3.1, SG-4.12, SG-4.21 through SG-4.23, and SG-5.3 through SG-5.5 addressed MC&A issues applicable to NFS operations before facility process changes and (2) that Conditions SG-4.3 and SG-4.24 through SG-4.36 granted either a one-time exceptions or a temporary approval that expired by their own terms. In response to a request for additional information (NFS, 2010a), NFS stated that the conditions did not apply to current operations and may be removed from the license. The NRC staff has reviewed the NFS response and finds that the deletion of these conditions is acceptable.

Procedural Conditions – Safeguards conditions are being removed from the NFS license. As described below, these conditions contain procedural requirements regarding the measurement and control of certain materials and waste. In response to a letter from NRC staff stating that the conditions may be removed from the license if the procedures are incorporated into FNMC plans, NFS stated that it intended to specify these procedures in its FNMC plans (NFS, 2010a). NFS has an approved FNMC plan regarding the strategic special nuclear material it holds onsite, and an approved FNMC plan regarding the special nuclear material of low strategic significance it holds onsite. Revisions to these FNMC plans were submitted in 2011 (NFS, 2011k, 2011m, and 2011n).

The NRC staff finds it is acceptable to control these activities through MC&A procedures described in the FNMC plans, and the procedural requirements need not be retained as individual license conditions in the renewed NFS license. Safeguards Condition SG-1.1 in the renewed license requires NFS to follow its approved FNMC plan regarding strategic special nuclear material (e.g. HEU), in accordance with 10 CFR 74.51(c). Similarly, Safeguards Condition SG-1.2 in the renewed license requires NFS to follow its approved FNMC plan regarding special nuclear material of low strategic significance (e.g. LEU), in accordance with 10 CFR 74.31(b). Any revisions to these FNMC plans are subject to 10 CFR 70.32(c) and 10 CFR 70.34. The provisions of 10 CFR 70.32(c) allow NFS to revise its FNMC plans without prior NRC approval only if the revisions do not decrease the effectiveness of its MC&A program. Any such revisions must be reported to the NRC within two or six months of the change depending on the type of SNM affected by the change. The NRC staff reviews such reports to verify the changes were authorized under 10 CFR 70.32(c), and NRC inspectors routinely verify any changes made to the FNMC plans since the last inspection. Also, 10 CFR 70.32(c) requires NFS to submit a license amendment request and obtain NRC approval prior to making any change that would decrease the effectiveness of its MC&A program or its measurement control program. Therefore, the NRC staff finds that these regulatory requirements for FNMC plans, together with SG-1.1 and SG-1.2, are sufficient to control the activities previously specified in the license conditions listed below.

- Existing Safeguards Condition SG-4.8 specifies acceptable methods of measuring liquid waste discarded from collection tanks. The NRC staff reviewed the HEU and LEU FNMC plan revisions and determined that the acceptable methods specified in this license condition are incorporated in the revised plans.

- Existing Safeguards Condition SG-4.9 specifies that NFS must determine any bias corrections using a method specified in one section of an FNMC plan instead of a second method specified in another section of the same plan. The NRC staff reviewed the LEU FNMC plan revisions and determined that the second method is deleted and the method now specified in the revised plan is acceptable.
- Existing Safeguards Conditions SG-4.15 and SG-4.15.1 specify where SNM not in transit will be physically located. The NRC staff reviewed the HEU and LEU FNMC plan revisions and determined that the SNM location restriction specified in this license condition is incorporated in the revised plans.
- Existing Safeguards Conditions SG-4.16 and SG-4.17 specify acceptable methods of collecting and measuring liquid waste containing HEU. The NRC staff reviewed the HEU FNMC plan revisions and determined that the acceptable methods specified in this license condition are incorporated in the revised plan.
- Existing Safeguards Condition SG-4.19 specifies that certain individuals must document the basis for any decision allowing an item or container to leave an area. The NRC staff reviewed the HEU FNMC plan revisions and determined that the acceptable procedures specified in this license condition are incorporated in the revised plan.

Based on the regulatory requirements in 10 CFR 70.32(c), 10 CFR 70.34, safeguards conditions SG-1.1 and SG-1.2, and the incorporation of acceptable methods in the revised FNMC plans, the NRC staff finds the deletion of existing license conditions SG-4.8, SG-4.9, SG-4.15, SG-4.15.1, SG-4.16, SG-4.17, and SG-4.19 acceptable.

Conditions Being Retained – Several existing safeguards conditions will be retained in the renewed license as discussed below:

- Existing Safeguards Condition SG-4.4 needs revision to reflect a change in the buildings involved in manufacturing. One building is no longer used for classified government processes. It is used for unclassified commercial processes. Safeguards Condition SG-4.4 sets forth an exemption from the 10 CFR 74.59(f)(2)(viii) remeasurement requirement that was granted as part of the previous NFS license renewal action (NRC, 1999a). The exemption allows NFS to omit an unnecessary measurement during the inventory process. The current regulatory requirement and guidance document do not address special circumstances involving process holdup and pre-listed materials already placed in process equipment. The staff finds a continued exemption acceptable during the license renewal term because (1) these types of materials have already been measured, (2) the quantity of material is small, and (3) tampering is unlikely because the access to the processing area is controlled. The measurements already taken can be applied to the inventory results without remeasurement. In addition, the licensee's accounting practice does not have any adverse impact on the facility's inventory reconciliation and inventory results. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. Safeguards Condition SG-4.4 is revised and renumbered as follows:

## Section 2.0 – ADDITIONAL SAFEGUARDS CONDITIONS

SG-2.1: Notwithstanding the requirements of 10 CFR 74.59(f)(2)(viii) to remeasure, at the time of physical inventory, any in-process SSNM for which the validity of a prior measurement has not been assured by tamper-safing, the licensee may book for high-enriched uranium (HEU) physical inventory purposes:

- (1) process holdup quantities determined by nondestructive assay measurements in manufacturing facilities performed prior to the start of an inventory, in accordance with the controls described in Section 4.5.2.3.2 of the plan identified in Condition SG-1.1; and
- (2) prelisted material introduced to process in the manufacturing facilities prior to the start of an inventory, in accordance with the controls described in Section 4.5.2.3.2 of the plan identified in Condition SG-1.1.

- Existing Safeguards Condition SG-1.1 is an exemption that was granted as part of the previous NFS license renewal action (NRC, 1999a). Although the regulations in 10 CFR 74.53(a)(1), (2), (3), and (4) specify exceptions to the process monitoring requirements in 74.53(b), these exceptions do not address all material types. NUREG-1280 (NRC, 1995b) contains a list of material types that can be exempted from the abrupt loss detection tests, and discusses the basis for the exemptions. The exemption allows NFS to omit the material types listed in NUREG-1280 from the unnecessary tests. The licensee's FNMC plan is consistent with the NUREG-1280 guidance. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.2: Notwithstanding the requirement of 10 CFR 74.53(b)(1) to have a process detection capability for each unit process, the process units listed in Section 1.1.5.2 of the plan identified in Condition SG-1.1 shall be exempt from such detection capability, and the licensee's process monitoring system shall comprise the control units described in Section 1.3 (and all subsections therein) of the above-mentioned plan.

- Existing Safeguards Condition SG-4.1 was approved in the last license renewal (NRC, 1999a). The condition allows NFS to omit an unnecessary measurement. The non-destructive assay (NDA) method does not measure the total element. However, the total element can be derived from the NDA isotope measurements. The requirements in 10 CFR 74.31(c)(2) for low-enriched uranium (LEU) materials and 74.59(d)(1) for high-enriched uranium (HEU) materials do not specify any particular measurement method or system for a licensee's measurement program. The staff finds the exemption from these provisions acceptable because it applies only to the total element measurement associated with the non-destructive assay (NDA) method. This is an acceptable measurement practice commonly used for standard industry applications. In addition, the licensee in the FNMC plan provides adequate and sufficient material control measures in its measurement program and associated measurement control program to meet the regulatory requirements and to ensure that all materials are based on measured values and measurement uncertainties are determined and evaluated. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from the requirements in 10 CFR 74.31(c)(2) and 74.59(d)(1) is granted for the renewal period. The exemption is renumbered and retained as follows:

- SG-2.3: Notwithstanding the requirements of 10 CFR 74.31(c)(2) for LEU and 10 CFR 74.59(d)(1) for SSNM to maintain a system of measurements to substantiate both the element and fissile isotope content of all SNM received, inventoried, shipped or discarded, SNM measured by the licensee for U-233, U-235, or Pu-239 by nondestructive assay techniques need not be measured for total element if the calculated element content is based on the measured isotope content which, in turn, is traceable to an isotopic abundance measurement at the area of generation.
- Existing Safeguards Condition SG-4.2 was approved in the last license renewal (NRC, 1999a), and contains an exemption from 10 CFR 74.59(e)(8). The condition allows NFS to use scale divisions as equivalent to the levels of significance specified in this provision. It is needed for the licensee's measurement control program with respect to the use of weighing systems (e.g., scales and balances) for material mass determinations. Using the one and two scale divisions means the licensee's established control limits are to be equivalent and set at the 0.05 and 0.001 levels of significance. The practice for using scale divisions as control limits are generally acceptable industry standards that the staff regards as providing adequate assurance of safety. The staff therefore finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. The exemption is renumbered and retained as follows:
- SG-2.4: Notwithstanding the requirement of 10 CFR 74.59(e)(8) to establish and maintain control limits at the 0.05 and 0.001 levels of significance for all HEU-related measurements, the licensee may use one and two scale divisions as being equivalent to the 0.05 and 0.001 control levels, respectively, for mass measurements.
- Existing Safeguards Condition SG-4.5 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the requirements in 10 CFR 74.59(f)(1) and 74.59(f)(2)(viii) to measure and inventory all SSNM. Neither the requirements in 10 CFR 74.59(f)(1) and (f)(2), nor the applicable NRC guidance document, address special circumstances involving materials in process exhaust ventilation systems which are difficult to measure. The staff finds the exemption acceptable because the licensee in Section 4.5.3.5 of the FNMC plan provides adequate and sufficient measurement methods and practices in determining the inventory quantities for the process exhaust ventilation systems, and these measurements can be applied to the inventory results without remeasurement. In addition, the licensee's accounting practice does not have any adverse impact on the facility's inventory reconciliation and inventory results. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. The exemption is renumbered and retained as follows:
- SG-2.5: Notwithstanding the requirements of 10 CFR 74.59(f)(1) and 10 CFR 74.59(f)(2)(viii) to measure and inventory all SSNM, the licensee may determine process exhaust ventilation system inventory quantities in accordance with Section 4.5.3.5 of the plan identified in Condition SG-1.1.

- Existing Safeguards Condition SG-4.10 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the requirements of 10 CFR 74.59(e)(8) relative to actions to be taken when replicate measurement data exceed a 0.001 control limit. The exemption addresses a single data point in a regular sampling measurement, rather than a single data point in a replicate measurement. However, NUREG-1280 provides guidelines for developing an acceptable replicate measurement program. The staff finds the exemption acceptable because in Section 4.4.1.7.3.4 of the FNMC plan the licensee provides adequate and sufficient measurement control limit practices in performing the replicate measurement program associated with an established statistical control system designed to monitor the quality of program measurements. These practices are consistent with the guidelines of Chapter 4.4, Measurement Control, of the NRC's NUREG-1280 guidance. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.6: Notwithstanding the requirements of 10 CFR 74.59(e)(8) relative to actions to be taken when replicate measurement data exceed a 0.001 control limit, the licensee shall comply with Section 4.4.1.7.3.4 of the plan identified in Condition SG-1.1.

- Existing Safeguards Condition SG-4.11 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the requirements of 10 CFR 74.59(e)(4) that allows NFS to pool data from equivalent scales without testing. This provision does not specify any particular statistical method for a licensee's measurement program in the determination of the standard error of inventory difference (SEID). However, NUREG-1280 provides guidelines for the SEID determination including methods that do not require statistical tests. The staff finds the exemption acceptable because the licensee uses an adequate and sufficient statistical method for pooling the measurement data and monitoring associated measurement uncertainties to meet the SEID regulatory limit defined in 10 CFR 74.59(e)(4) and (5). This NFS practice is commonly used for standard industry applications, and is consistent with the guidelines of Chapter 4.4, Measurement Control, of the NRC's NUREG-1280 guidance. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.7: Notwithstanding the requirement of 10 CFR 74.59(e)(4) that allows the pooling of data which have been shown to be not significantly different on the basis of appropriate statistical tests, the licensee may pool data from equivalent scales without testing.

- Existing Safeguards Condition SG-4.14 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the measurement requirements discussed below. The exemption excuses NFS from the need to measure and monitor control standards for point calibrated, bias-free systems. The requirements in 10 CFR 74.31(c)(3) and (4) for low-enriched uranium (LEU) materials and 74.59(e)(3)(i) and (e)(8) for high-enriched uranium (HEU) materials do not differentiate between measurement systems when applying a statistical control system to monitor control standards. However, NUREG-1280 provides guidelines for the licensee to apply control standards to its specific point calibrated, bias-free measurement systems. The staff

finds a continued exemption acceptable because in its FNMC plan, NFS uses an adequate and sufficient statistical control method for monitoring the measurement data associated control standards applicable to point calibrated, bias-free measurement systems. This acceptable practice is commonly used for standard industry applications, and is consistent with the guidelines of Chapter 4.4, Measurement Control, of the NRC's NUREG-1280 guidance. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from 10 CFR 74.31(c)(3) and (c)(4), and from 10 CFR 74.59(e)(3)(i) and (e)(8), is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.8: Notwithstanding the requirement of 10 CFR 74.31(c)(3) and of 10 CFR 74.59(e)(3)(i) to measure control standards for all measurement systems for the purpose of determining bias, and notwithstanding the requirement of 10 CFR 74.31(c)(4) and of 10 CFR 74.59(e)(8) to maintain a statistical control system to monitor such control standard measurements, the licensee need not measure nor monitor such control standards for point calibrated, bias-free systems. To be regarded as bias-free, a measurement system must be calibrated by one or more measurements of a representative standard(s) each time process unknowns are measured, and the measurement value assigned to a given unknown is based on the associated calibration.

- Existing Safeguards Condition SG-4.18 was approved in the last license renewal (NRC, 1999a), and contains an exemption from 10 CFR 74.15 reporting requirements. SG-4.18 regards reports made to the Nuclear Materials Management and Safeguards System (NMMSS) with respect to waste materials destined for burial sites. Neither the requirements in 10 CFR 74.15, nor the NRC's NUREG/BR-0006 guidance, specifically address the reporting of waste burial shipments. The staff finds that a continued exemption is acceptable because the methods used to measure waste materials are subject to the licensee's measurement program and measurement control program described in the FNMC plan, and limits of error associated with waste materials are insignificant and therefore negligible for reporting to the NMMSS. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from 10 CFR 74.15 is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.9: Notwithstanding the requirement of 10 CFR 74.15 to include limit of error data on U.S. Department of Energy/U.S. Nuclear Regulatory Commission Form-741 for all SNM shipments, the licensee is exempt from including such data on 741 Forms associated with waste burial shipments.

- Existing Safeguards Condition SG-4.13 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the calculation requirement in 10 CFR 74.59(f)(1)(i). SG-4.13 regards the licensee's measurement control program with respect to the SEID determination. Neither the requirement in 10 CFR 74.59(f)(1)(i), nor the NRC's NUREG-1280 guidance, specify any method of calculating any HEU inventory difference (ID) in any material balance area (MBA) which resulted in less than 300 grams of U-235. The staff finds that a continued exemption is acceptable because the licensee in the FNMC plan provides a sound process for inventory performance, and inventory reconciliation, including a well-defined system for evaluating ID limits and

taking response actions when IDs exceed predetermined thresholds and/or regulatory limits. An HEU ID of less than 300 grams of U-235 is below the regulatory limit for resolution and is not considered significant in the SEID calculations. Reliance on this exemption to date has not resulted in any anomaly in inventory result reporting and/or investigation. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from 10 CFR 74.59(f)(1)(i) is granted for the renewal period. The exemption is renumbered and retained as follows:

SG-2.10: Notwithstanding the requirement of 10 CFR 74.59(f)(1)(i) to calculate the standard error of inventory difference (SEID) associated with each HEU inventory difference (ID) value, the licensee need not determine such SEID for MBA-7 whenever its ID is less than 300 grams U-235.

- Existing Safeguards Condition SG-4.20 was approved in the last license renewal (NRC, 1999a), and contains an exemption from the calculation requirements in 10 CFR 74.31(c)(3) and (c)(4). SG-4.20 regards the licensee's measurement control program with respect to the SEID determination. Neither the requirements in 10 CFR 74.31(c)(3) and (c)(4), nor the NUREG-1280 guidance, specify a means to calculate LEU inventory difference (ID) in any material balance area (MBA) which resulted in less than 1,000 grams of U-235. The staff finds that a continued exemption is acceptable because the licensee in the FNMC plan provides a sound process for inventory performance, and inventory reconciliation, including a well-defined system for evaluating ID limits and taking response actions when IDs exceed predetermined thresholds and/or regulatory limits. An LEU ID of less than 1,000 grams of U-235 is below the regulatory limit for resolution and is not considered significant in the SEID calculations. Reliance on this exemption to date has not resulted in any anomaly in inventory result reporting and/or investigation. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption is granted. The exemption is renumbered and retained as follows:

SG-2.11: Notwithstanding the requirements of 10 CFR 74.31(c)(3) and (c)(4), the licensee is exempted from calculating the SEID and measurement system biases associated with LEU physical inventories provided that the calculated inventory difference does not exceed 1,000 grams U-235.

- Existing Safeguards Condition SG-4.38 was approved in Amendment 93 issued in 2011 (NRC, 2011h). This condition provides an exemption from the measurement requirements in 10 CFR 74.59(d)(1). Compliance with these requirements is difficult because the 2S cylinders are small (3.5-inch diameter x 8.5 inch tall) and the trace quantity of material remaining in each cylinder is difficult to measure. Processing of the cylinders leaves a small heel of material in each cylinder which includes uranium and its related isotopes. Under a contract with DOE, NFS still retains 5 of the 101 processed heel cylinders for possible future forensic analysis. The 5 cylinders have a total U content of 314 grams U, and 281 grams U-235. Because of the trace condition of heel material, it is difficult to perform destructive or nondestructive analyses to measure the uranium element and isotope content of the material remaining in these small 2S cylinders. It requires special equipment, which NFS does not possess, for measurement of the heel material.

Allowing NFS to use assigned values for each 2S cylinder is acceptable because the uranium element and isotope content should remain unchanged and cannot be altered. Further, as found by the staff in 2011, any errors in the assigned values would pose an insignificant risk of loss, theft, or diversion because the quantities of enriched uranium are small. The one-time exemption will expire when all of the 2S cylinders are shipped from the site. NFS expects to ship the remaining cylinders before the end of 2012. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption from 10 CFR 74.59(d)(1) is granted. The exemption is renumbered and retained as follows:

SG-2.12: Notwithstanding, the requirements of 10 CFR 74.59(d)(1) and Section 4.3 of the facility's FNMC Plan identified in Condition SG-1.1 to measure the uranium element and isotope content of all strategic SNM, the licensee shall provide assigned values for the 2S cylinder heels identified in the December 31, 2009, request letter. This one-time exemption will expire when all of these cylinders are shipped from the site.

### **12.3 Evaluation Findings**

Based on the knowledge that this is an existing program that has been reviewed and inspected for many years, and the staff's evaluation discussed above, the staff finds that the facility's MC&A programs, as delineated in its approved FNMC plans and related safeguards conditions, will continue to adequately protect public health and safety during the renewed NFS license term, and are therefore acceptable.

### **12.4 References**

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| (NFS, 2009b) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469.   |
| (NFS, 2010a) | Nuclear Fuel Services, Inc., "Response to the Request for Additional Information Concerning License Renewal for SNM-124", August 16, 2010, ML102440808.   |
| (NFS, 2011k) | Nuclear Fuel Services, Inc., "HEU FNMC Plan Changes," June 28, 2011, ML11215A232.   |
| (NFS, 2011m) | Nuclear Fuel Services, Inc., "HEU FNMC Plan Changes," November 14, 2011, ML113410151.   |
| (NFS, 2011n) | Nuclear Fuel Services, Inc., "LEU FNMC Plan Changes," November 14, 2011, ML11334A036.   |
| (NRC, 1995a) | U.S. Nuclear Regulatory Commission, NUREG-1065, Revision 2, "Acceptable Standard Format and Content for the Fundamental Nuclear Material Control (FNMC) Plan Required for Low Enriched Uranium Facilities," December 1995, ML031340288. |

- (NRC, 1995b) U.S. Nuclear Regulatory Commission. NUREG-1280, Revision 1, "Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment," April 1995, ML031340295.
- (NRC, 1999a) U.S. Nuclear Regulatory Commission, "Renewal of Materials License No. SNM-124," July 2, 1999, Accession No. ML11325A131.
- (NRC, 2010b) U.S. Nuclear Regulatory Commission, "Trip Summary of April 5 – 7, 2010, Site Visit at Nuclear Fuel Services," June 4, 2010, ML101530546.
- (NRC, 2011f) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc., – Acceptance of Revisions to Fundamental Nuclear Material Control Plan," December 13, 2011, ML11346A037.
- (NRC, 2011g) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc., – Acceptance of Revisions to Fundamental Nuclear Material Control Plans," December 20, 2011, ML113540412.
- (NRC, 2011h) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc, Amendment 93, One-Time Exemption from Measuring Heels in 2S Uranium Hexafluoride Cylinders," January 28, 2011, ML102250044.
- (NRC, 2012a) U.S. Nuclear Regulatory Commission, "Nuclear Fuel Services, Inc., – Acceptance of Changes to Fundamental Nuclear Material Control Plan for Low-Enriched Uranium," January 12, 2012, ML120100069.

## **13.0 PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIAL AT FIXED SITES**

### **13.1 Purpose of Review**

The NRC staff conducted this review to ensure that the NFS license renewal application (NFS, 2009a), NFS responses to requests for additional information (NFS, 2009b), and additional information supplementing the application (NFS, 2009d, 2009e, NFS, 2010d, 2010f, and 2010g, and NFS, 2011p), complies with several requirements for physical protection of SNM at fixed sites. These requirements include the following regulations:

- 10 CFR 70.22(h) – Physical Security Plan for Formula Quantities of SNM (Category I quantities of material)
- 10 CFR 70.22(j) – Safeguards Contingency Plan for Formula Quantities of SNM
- 10 CFR 70.22(k) – Physical Security Plan for SNM of Moderate Strategic Significance (Category II quantities of material) and Low Strategic Significance (Category III quantities of material)

These provisions in 10 CFR 70.22 require the licensee to comply with pertinent sections of 10 CFR Part 73. As discussed in Section 1.2.2.3 of this SER, NFS is authorized to possess several different types of SNM. The requirements for physical protection of SNM are graded (for example strategic SNM is subject to more stringent protection requirements than is SNM of low strategic significance). Category I quantities of material require the most protection (i.e., 10 CFR 73.20, 73.45 and 73.46) and Category III quantities of material require the least protection (10 CFR 73.67(f)). Category II quantities of material are protected in accordance with 10 CFR 73.67(d).

Separately, the NRC issued a series of Orders to fuel cycle facilities and other facilities possessing SNM and source material following the terrorist attacks of September 11, 2001. In the aftermath of these attacks, the NRC developed security Orders containing interim compensatory measures (ICMs) and Additional Security Measures (ASMs) that were applied to existing fuel cycle facilities. The security orders were issued due to the post 9/11 threat environment. The Orders contain classified information that is not discussed in this unclassified staff evaluation. Based on the NRC staff's review of NFS responses to the orders, the NRC staff finds that NFS met the intent of the orders and that its physical security program complies with the additional requirements imposed on NFS by the following orders:

- “Confirmatory Order Modifying License Requiring the Implementation of Additional Physical Protection Measures,” dated July 20, 2000 (NRC, 2000a)
- “Order Modifying License to Impose Interim Compensatory Measures (for Category I facilities),” dated August 21, 2002 (NRC, 2002b)
- “Order Requiring Compliance With Revised Design Basis Threat for Category I Facilities,” dated April 29, 2003 (NRC, 2003d)
- “Confirmatory Order Modifying License to Impose Interim Compensatory Measures for Category III Facilities,” dated July 8, 2003 (NRC, 2003e)
- “Order Imposing Fingerprinting and Criminal History Check Requirements for Access to Safeguards Information,” dated March 1, 2007 (NRC, 2007b)
- “Order Imposing Fingerprinting and Criminal History Records Check Requirements for Unescorted Access to Radioactive Material or Other Property,” dated April 30, 2007 (NRC, 2007c)

The following documents contain the acceptance criteria for the review of whether NFS meets the applicable 10 CFR Part 73 requirements that are discussed further below:

- RG 5.52, Revision 3, "Standard Format and Content of a Licensee Physical Protection Plan for Strategic Special Nuclear Material at Fixed Sites Other Than Nuclear Power Plants" (NRC, 1994a)
- RG 5.55, "Standard Format and Content of Safeguards Contingency Plans for Fuel Cycle Facilities" (NRC, 1978)
- RG 5.59, Revision 1, "Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance" (NRC, 1983)
- NUREG-1322, "Acceptance Criteria for the Evaluation of Category I Fuel Cycle Facility Physical Security Plans" (NRC, 1991b)
- NUREG-1456, "An Alternative Format for Category I Fuel Cycle Physical Protection Plans" (NRC, 1992a)
- NUREG/CR-6667, "Standard Review Plan for Safeguards Contingency Response Plans for Category I Fuel Facilities" (NRC, 2000b)
- NUREG/CR-6668, "Standard Review Plan for Training and Qualification Plans for Security Personnel at Category I Fuel Facilities" (NRC, 2000c)

### **13.2 Staff Review and Analysis**

The information to support this review was obtained from the NFS license renewal application (NFS, 2009a), NFS responses to requests for additional information (NFS, 2009b), and additional information supplementing the application (NFS, 2009d, 2009e, NFS, 2010d, 2010f, and 2010g, and NFS, 2011p).

The physical protection program consists of three levels of security with each level having corresponding security plans. A technical evaluation was conducted for each level. The three levels are as follows:

- Category I, Strategic Special Nuclear Material - consisting of a Physical Protection Plan (PPP), a Safeguards Contingency Response Plan (SCRCP), and a Training and Qualification Plan (T&QP).
- Category II, SNM of Moderate Strategic Significance - consisting of a PPP.
- Category III, SNM of Low Strategic Significance - consisting of a PPP.

The technical evaluation will be presented as three separate reviews by category. In some cases information which summarizes the contents or specific details of the plans is vague because these plans contain non-publicly available information.

#### ***13.2.1 Category I Strategic Special Nuclear Materials***

In 10 CFR 73.20, the general performance objectives for strategic special nuclear material (SSNM) and requirements for fixed-site physical protection systems are defined. The performance capabilities for fixed-site physical protection systems are defined in 10 CFR 73.45. The provisions of 10 CFR 73.46(a) require a physical protection system be established in order to meet the general performance objectives and requirements of 10 CFR 73.20(a) and the performance capabilities in 10 CFR 73.45. The physical protection system must include the measures specified in 10 CFR 73.46(b) through (h). The physical protection system is designed

with sufficient redundancy and diversity to ensure maintenance of the capabilities described in 10 CFR 73.45. It includes a safeguards contingency capability that can meet the criteria in Appendix C of 10 CFR Part 73. It also includes a testing and maintenance program to assure control over all activities and devices affecting the effectiveness, reliability, and availability of the physical protection system including a demonstration that any defects of such activities and devices will be promptly detected and corrected.

The physical protection system has the capability to protect against the design basis threat (DBT) of theft or diversion of SSNM and radiological sabotage as described in 10 CFR 73.1. The DBT must be used to design safeguards systems to protect against act of radiological sabotage and to prevent the theft or diversion of SSNM.

**Security Organization. 10 CFR 73.46(b):**

The performance objective of the security organization is to manage, control, and implement the physical protection system in a manner that is consistent with the PPP and continuously maintains its effectiveness.

Requirement 10 CFR 73.46(b)(1): The provisions in 10 CFR 73.46(b)(1) and 10 CFR Part 73, Appendix B require the applicant to establish a security organization, including guards. If a contract guard force is utilized for site security, a written agreement with the contractor will clearly show that the licensee is responsible to the Commission for maintaining safeguards in accordance with Commission regulations and the licensee's security plan.

Section 4.1 of the PPP describes a security organization that includes guards and that is responsible to the Commission and Commission regulations and the licensee's security plan. The PPP states that the licensee will make available, upon request, copies of all documents required by Commission regulations, Orders, or license conditions and that all security personnel will demonstrate their ability to perform their assigned duties. The PPP states that no personnel will be assigned security duties without first being made aware of these requirements.

The NRC staff has reviewed the licensee's description in PPP Section 4.1 and finds that it meets the requirements in 10 CFR 73.46(b)(1).

Requirement 10 CFR 73.46(b)(2): The provisions in 10 CFR 73.46(b)(2) require that at least one full time member of the security organization with authority to direct the physical protection activities of the security organization be onsite at all times.

Section 4 of the PPP states that the licensee will have on-site at least one full-time member of the security organization with authority to direct the physical security activities of the security organization.

The NRC staff has reviewed the licensee's description in PPP Section 4 and finds that it meets the requirements in 10 CFR 73.46(b)(2).

Requirement 10 CFR 73.46(b)(3): The provisions in 10 CFR 73.46(b)(3) require a management system be provided for the development, revision, implementation and enforcement of security procedures. The management system must include written security procedures documenting the security organization structure and detail duties of the TRT, guard, watchmen, and other

individuals responsible for security. The individual with overall responsibility for security must approve such procedures and any revisions.

Section 4 of the PPP describes the structure of the security organization and states that the licensee will periodically review the security program and that the review will be approved by an individual at least one level above and outside of the security organization. Records of the security organization structure, duties, procedures, and changes thereof will be retained until license termination or for three years after each change, as applicable. Sections 3.5 of the T&QP describe the training and duties of each level of the security organization.

The NRC staff has reviewed the licensee's description in PPP Section 4 and T&QP Section 3.5, and finds that they meet the requirements in 10 CFR 73.46(b)(3).

Requirement 10 CFR 73.46(b)(4): The provisions in 10 CFR 73.46(b)(4) require that the licensee not permit an individual to act as a TRT member, armed response person, guard, or other member of the security organization unless the individual has been trained, equipped, and qualified to perform each assigned duty in accordance with 10 CFR Part 73, Appendix B. In addition, TRT member, armed response personnel, and guards must be trained, equipped, and qualified for use of their assigned weapons in accordance with paragraph (b)(6) and (b)(7). TRT members, armed response personnel, and guards must also be trained and qualified in accordance with either paragraph (b)(10) and (b)(11), or paragraph (b)(12).

Section 4 of the PPP and Section 3 of the T&QP state that an individual will not be assigned duties as a member of the security organization until they have been trained, equipped, and qualified to perform their assigned duties in accordance with the regulatory requirements commensurate with duty position that they are assigned. The Security Officers (i.e., TRT member, armed response personnel, and guards) will receive training on their assigned weapons and associated security equipment commensurate with their assigned duties. The licensee has opted to follow the requirements of 10 CFR 73.46(b)(12) for physical fitness training as discussed in greater detail below. Security Officers will undergo initial qualifications testing and quarterly and annual re-qualification in order to remain as a member of the security force. Each member of the security force is prepared to demonstrate his/her ability to perform their assigned duties upon the request of an authorized representative of the Commission. The qualification and requalification documentation will be maintained as a record for three years after each qualification and re-qualification.

The NRC staff has reviewed the licensee's description in PPP Section 4 and T&QP Section 3, and finds that they meet the requirements in 10 CFR 73.46(b)(4).

Requirement 10 CFR 73.46(b)(5): The provisions in 10 CFR 73.46(b)(5) require that for any given period of time a member of the security organization may not be assigned to, or have direct operational control over, more than one of the redundant elements of a physical protection subsystem if such assignment or control could result in the loss of effectiveness of the subsystem.

Section 4.3 of the PPP commits the licensee to not assigning a member of the security organization to a duty position that would have direct operational control over, more than one of the redundant elements of a physical protection subsystem if such assignment or control could result in the loss of effectiveness of the subsystem.

The NRC staff has reviewed the licensee's description in PPP Section 4.3 and finds that it meets the requirements in 10 CFR 73.46(b)(5).

Requirement 10 CFR 73.46(b)(6): The provisions in 10 CFR 73.46(b)(6) require each guard be armed with a handgun, as described in 10 CFR part 73 Appendix B. TRT members must be armed with a 9mm semiautomatic pistol. In addition, all but one TRT member must be armed with either a shotgun or semiautomatic rifle as described in 10 CFR Part 73, Appendix B. The remaining member of the TRT must be armed with a rifle no less than 30 caliber or 7.62mm.

Section 4.5 of the PPP and Section 3.5.8 of the T&QP describes weapons to be used by the Security Officers. The type of weapon will be dependent upon the Security Officer's duties. The weapons include 9mm handgun, semi-automatic rifle, and rifles of 30 caliber.

The NRC staff has reviewed the licensee's description in PPP Section 4.5 and T&QP Section 3.5.8, and finds that they meet the requirements in 10 CFR 73.46(b)(6).

Requirement 10 CFR 73.46(b)(7): The provisions of 10 CFR 73.46(b)(7) require that in addition to weapons qualification criteria of 10 CFR Part 73 Appendix B, TRT member, armed response personnel, and guards must qualify and requalify, at least every 12 months, for day and night firing with assigned weapons in accordance with 10 CFR Part 73, Appendix H.

Section 4.4 of the PPP and Section 3 of the T&QP describe the weapons qualification and re-qualification program for Security Officers. The plan describes the day and night qualifications for each type of weapon used. The plans describe the process for requalification and re-qualification failures. The licensee increased the passing rate on all firing tables from 70% to 80%. The licensee utilizes alternate handgun firing tables. The alternate firing tables were compared to those in Appendix H and were found to be more stringent. The licensee commits to having its Security Officers demonstrate their day and night weapons qualifications upon request by an authorized representative of the NRC. The licensee has been previously approved to change the 12-month requalification window to 13 months in case of events beyond the control of the licensee. This authority is to be used in instances where weather, illness, or other circumstance precludes the Security Officers from completing the re-qualification within the 12-month window.

The NRC staff has reviewed the licensee's description in PPP Section 4.4 and T&QP Section 3, and finds that they meet the requirements in 10 CFR 73.46(b)(7). The exemption from the 12-month requalification requirement was authorized in the T&QP when the license was renewed in 1999 (NRC, 1999a). The staff finds the exemption acceptable because required skills will not degrade significantly over the course of one month and it is reasonable to allow highly trained security officers extra time to requalify when events occur outside the licensee's control. The staff finds that a continued exemption will not endanger life or property or the common defense or security, and that it is in the public interest. Accordingly, a continuation of the exemption that allows requalification within 13 months is granted.

Requirement 10 CFR 73.46(b)(8): The provisions of 10 CFR 73.46(b)(8) require training for TRT members in addition to the training requirements of 10 CFR Part 73 Appendix B. TRT members must successfully complete training in response tactics. The licensee must document completion of the training and retain training records for three years after the training is completed.

Section 4.4 of the PPP and Section 3.5 of the T&QP commit the licensee to training its TRT members in response tactics.

The NRC staff has reviewed the licensee's description in PPP Section 4.4 and T&QP Section 3.5, and finds that they meet the requirements in 10 CFR 73.46(b)(8).

Requirement 10 CFR 73.46(b)(9): The provisions in 10 CFR 73.46(b)(9) require TRT and guard exercises be conducted to demonstrate the overall security system effectiveness and the ability of the security force to perform response and contingency plan responsibilities and to demonstrate individual skills in assigned team duties. These exercises must also demonstrate the capability to respond to attempts to steal SSNM.

Section 4.6 of the PPP and Section 3.7 of the T&QP commits to and describes how the licensee will conduct exercises at least every three months per shift of which half will be force-on-force. During each 12-month period commencing on the anniversary of the date, an exercise must be carried out at least every four months for each shift, one third of which are to be force-on-force. The licensee uses these exercises to demonstrate its capability to respond to attempts to steal SSNM. The PPP commits the licensee to notify the NRC of the scheduled exercise 60 days prior to that exercise. The licensee must document the results of all exercises. The licensee must retain the documentation of each exercise as a record for three years after each exercise is completed.

The NRC staff has reviewed the licensee's description in PPP Section 4.6 and T&QP Section 3.7, and finds that they meet the requirements in 10 CFR 73.46(b)(9).

Requirement 10 CFR 73.46(b)(12): The provisions of 10 CFR 73.46(b)(12) state that the licensee may elect to comply with the requirements of this paragraph instead of the requirements of paragraphs (b)(10) and (b)(11) of this section. In addition to the physical fitness qualifications of paragraph I.C of 10 CFR Part 73, Appendix B, each licensee subject to the requirement of 10 CFR Part 73.46(b)(12) must develop and submit to the NRC for approval site specific, content-based, physical fitness performance tests which will – when administered to each TRT member, armed response person, or guard – duplicate the response duties these individuals may need to perform during a strenuous tactical engagement.

Section 3.3 of the T&QP describes the site specific physical fitness training. The licensee has chosen to develop a physical fitness training and qualification program that is tailored to the response requirements based on the physical layout of the facility and the obstacles that would be encountered by the response force in a response situation. The program accounts for distances between obstacles, type of obstacles such as walls, stairs, and inclines as well as factoring in changes in response paths and obstacles due to construction. The program includes response times for each response path and includes factors such as the weight of the Officer's weapons and equipment.

The NRC staff has reviewed the licensee's description in T&QP Section 3.3 and finds that it meets the requirements in 10 CFR 73.46(b)(12).

#### **Physical Barrier Subsystems. 10 CFR 73.45(c):**

A performance objective of physical barriers is to define areas within which authorized activities and conditions are permitted. Other performance objectives of barriers are to channel persons,

vehicles, and material to or from entry/exit control points; to delay or deny unauthorized penetration attempts by persons, vehicles or materials; and to delay any unauthorized SSNM removal attempts sufficient to assist detection and assessment and permit a timely response by the security force to prevent the intended act.

Requirement 10 CFR 73.46(c)(1): The provisions of 10 CFR 73.46(c)(1) require vital equipment be located only within a vital area, and SSNM must be stored or processed only in a MAA. Both vital areas and MAAs must be located within a PA. The perimeter of the PA must be provided with two separate physical barriers with an IDS placed between the two. The inner barrier must enhance assessment of penetration attempts and delay attempts at unauthorized exit from the PA. The perimeter of the PA must also incorporate features and structures that prevent forcible vehicle entry.

Section 5.0 of the PPP describes the location of the MAA within a PA. The PPP describes the layout and construction of the two physical barriers of the PA and the one physical barrier of the MAA which are designed to protect the SSNM. The inner barrier is positioned and constructed to enhance assessment of penetration attempts and to delay attempts at unauthorized exit from the PA. The perimeter of the PA also incorporates features and structures that prevent forcible vehicle entry.

The NRC staff has reviewed the licensee's description in PPP Section 5 and finds that it meets the requirements in 10 CFR 73.46(c)(1).

Requirement 10 CFR 73.46(c)(2): The provisions in 10 CFR 73.46(c)(2) require physical barriers at the perimeter of the PA be separate from any other barrier designated as a physical barrier for a vital area or MAA within the PA.

Section 5.2 of the PPP describes physical barriers at the perimeter of the PA. The physical barriers are separate from any other barrier designated as a physical barrier for a vital area, or MAA.

The NRC staff has reviewed the licensee's description in PPP Section 5.2 and finds that it meets the requirements in 10 CFR 73.46(c)(2).

Requirement 10 CFR 73.46(c)(3): The provisions in 10 CFR 73.46(c)(3) require isolation zones be maintained in outdoor areas adjacent to the physical barrier at the PA. The isolation zone must be large enough to permit observation of the activities of people on either side of the PA barrier in the event of its penetration. Parking areas for employees and visitors must be located outside the isolation zone and exterior to the PA.

Section 5.6 of the PPP describes the PA isolation zones and the monitoring and assessment capabilities for routine and emergency situations. The PPP states that employee parking is exterior to the outer isolation zone on the east side of the PA.

The NRC staff has reviewed the licensee's description in PPP Section 5.6 and finds that it meets the requirements in 10 CFR 73.46(c)(3).

Requirement 10 CFR 73.46(c)(4): The provisions in 10 CFR 73.46(c)(4) require that isolation zones and exclusion zones must be illuminated to allow for monitoring, observation, and assessment activities.

Section 5.7 of the PPP describes the types of lighting used for the isolation zones and the internal PA illumination. The PPP states that the illumination levels at the isolation zones and PA measures 0.2 foot-candles measured horizontally at approximately 6 inches above ground level.

The NRC staff has reviewed the licensee's description in PPP Section 5.7 and finds that it meets the requirements in 10 CFR 73.46(c)(4).

Requirement 10 CFR 73.46(c)(5): The provisions in 10 CFR 73.46(c)(5) require that SSNM be stored in a vault when not undergoing processing. The vault must be capable of preventing entry to stored SSNM by a single action in a forced entry attempt, except as such single action would both destroy the barrier and render contained SSNM incapable of being removed and shall provide delay to prevent removal of stored SSNM until response forces can arrive. All SSNM must be stored in tamper indicating containers. Further, SSNM must be processed only in MAAs constructed with barriers that provide significant delay to penetration and be kept in locked compartments or locked process equipment while undergoing processing except when personally attended.

Section 5.8 of the PPP describes the storage of SSNM, fuel elements, or fuel assemblies when not undergoing processing. The SSNM will be stored in vaults designed to prevent unauthorized entry by a single action in a forced entry attempt, except as such action would both destroy the barrier and render stored SSNM incapable of being removed. The vaults are designed to provide sufficient delay to prevent removal of stored SSNM before arrival of response personnel.

The NRC staff has reviewed the licensee's description in PPP Section 5.8 and finds that it meets the requirements in 10 CFR 73.46(c)(5)

Requirement 10 CFR 73.46(c)(6): The provisions in 10 CFR 73.46(c)(6) require the licensee to store enriched uranium scrap (enriched to 20% or greater) with a uranium-235 content of less than 0.25 grams per liter within a locked and separately fenced area within a larger PA. The storage area when unoccupied must be protected by a guard or watchman who must patrol at intervals not exceeding 4 hours, or by intrusion alarms.

Section 5.9 of the PPP describes the storage of enriched uranium scraps. High enriched uranium scrap not in the MAA is stored in a separate controlled access Area (CAA) within the PA. The CAA is protected by the PA guard force and security systems.

The NRC staff has reviewed the licensee's description in PPP Section 5.9 and finds that it meets the requirements in 10 CFR 73.46(c)(6).

#### **Access Control Subsystems and Procedures. 10 CFR 73.46(d):**

The performance objective of access authorization controls and procedures is to provide current authorization lists and entry criteria. The performance objectives of entry controls and procedures are to verify the identity of persons, vehicles, and materials; assess such identities against current authorization lists and entry criteria before permitting entry; and initiate timely response measures to deny unauthorized entries.

Requirement 10 CFR 73.46(d)(1): The provisions in 10 CFR 73.46(d)(1) require a numbered picture badge identification subsystem be used for all individuals who are authorized access to PAs without escort.

Section 6.0 of the PPP describes access control subsystems and procedures for escorted and unescorted access to the PA and MAA. The “unescorted” badge contains a picture, employment affiliation, level of clearance, and expiration date. The “escorted” badges do not contain a picture or expiration date.

The NRC staff has reviewed the licensee’s description in PPP Section 6 and finds that it meets the requirements in 10 CFR 73.46(d)(1).

Requirement 10 CFR 73.46(d)(2): The provisions in 10 CFR 73.46(d)(2) require unescorted access to vital areas, MAAs and CAA be limited to individuals who are authorized access to the material and equipment in such areas, and who require such access to perform their duties. Access to MAAs must include at least two individuals. Authorization for such individuals shall be indicated by the issuance of specially coded numbered badges indicating vital areas, MAAs, and CAAs to which access is authorized. No activities other than those which require access to SSNM or to equipment used in the processing, use, or storage of SSNM, or necessary maintenance, can be permitted within a MAA.

Section 6.4 of the PPP describes the unescorted access controls and procedures to VA, MAA, and CAA. Access to MAAs requires a minimum of two persons and a specially coded badge that authorizes unescorted access to MAAs. PAs and CAAs will also have specially coded badges. Procedures are in place to ensure only authorized personnel gain unescorted access to these areas and no unauthorized activities take place.

The NRC staff has reviewed the licensee’s description in PPP Section 6.4 and finds that it meets the requirements in 10 CFR 73.46(d)(2).

Requirement 10 CFR 73.46(d)(3): The provisions in 10 CFR 73.46(d)(3) require written procedures that will permit access control personnel to identify those vehicles that are authorized and those materials that are not authorized entry to protected, material access, and vital areas be established and followed. A copy of the current procedures shall be retained until license termination for which the procedures were developed and, if any portion of the procedures is superseded, retain the superseded material for three years after each change.

Section 6.3.4 of the PPP contains the licensee’s commitment to follow written security operating procedures that will permit access control personnel to identify those vehicles and materials that are authorized entry into PAs.

The NRC staff has reviewed the licensee’s description in PPP Section 6.3.4 and finds that it meets the requirements in 10 CFR 73.46(d)(3).

Requirement 10 CFR 73.46(d)(4): The provisions in 10 CFR 73.46(d)(4) require that the licensee shall control all points of personnel and vehicle access into a PA. Identification and search of all individuals for firearms, explosives, and incendiary devices must be made and authorization must be checked at these points except for Federal, State, and local law enforcement (LLEA) personnel on official duty and United States Department of Energy couriers engaged in the transport of special nuclear material. The search function for detection of firearms, explosives, and incendiary devices must be accomplished through the use of detection

equipment capable of detecting both firearms and explosives. The individual responsible for the last access control function (controlling admission to the PA) shall be isolated within a structure with bullet resisting walls, doors, ceiling, floor, and windows. When the licensee has cause to suspect that an individual is attempting to introduce firearms, explosives, or incendiary devices into a PA, the licensee shall conduct a physical pat-down search of that individual. Whenever firearms or explosives detection equipment at a portal is out of service or not operating satisfactorily, the licensee shall conduct a physical pat-down search of all persons who would otherwise have been subject to search using the equipment.

Sections 6.3.1 and 6.3.4 of the PPP describe the policy and procedures that are in place and will continue to be used for access controls for personnel and vehicles at the PA. The licensee will search all vehicles and personnel, except for those specifically exempted from the search procedures, for firearms, explosives, and incendiary devices before allowing entry into PAs. Procedures are in place to confirm the identity and authorization of each individual attempting to enter the PA. Each personnel entrance will continue to be equipped with a portal explosives and metal detectors. When portal detectors are not in service or if there is cause to suspect that an individual is attempting to introduce firearms, explosives, or incendiary devices, a pat down search will be conducted. The last person that controls access to the PA will continue to be housed in a bullet resistant structure.

The NRC staff has reviewed the licensee's description in PPP Sections 6.3.1 and 6.3.4 and finds that they meet the requirements in 10 CFR 73.46(d)(4).

Requirement 10 CFR 73.46(d)(5): The provisions in 10 CFR 73.46(d)(5) require that at the point of personnel and vehicle access into a PA, all hand-carried packages except those carried by individuals exempted from personal search be searched for firearms, explosives, and incendiary devices.

Section 6.3.2 of the PPP describes the procedures for the search of hand carried packages into the PA. The search consists of visual searches and the use of fixed and portable x-ray equipment.

The NRC staff has reviewed the licensee's description in PPP Section 6.3.2 and finds that it meets the requirements in 10 CFR 73.46(d)(5).

Requirement 10 CFR 73.46(d)(6): The provisions in 10 CFR 73.46(d)(6) require packages and material for delivery into a PA must be checked for proper identification and authorization and searched for firearms, explosives, and incendiary devices prior to admittance into the PA, except those Commission-approved delivery and inspection activities specifically designated by the licensee to be carried out within material access, vital, or protected areas for reasons of safety, security, or operational necessity.

Section 6.3.3 of the PPP describes the methods and procedures that will continue to be used to check all packages and material for delivery into the PA. All packages and material will continue to be checked for proper identification and authorization against the purchase orders and packing slips and will continue to be checked for firearms, explosives, and incendiary devices prior to admittance into the PA.

The NRC staff has reviewed the licensee's description in PPP Section 6.3.3 and finds that it meets the requirements in 10 CFR 73.46(d)(6).

Requirement 10 CFR 73.46(d)(7): The provisions in 10 CFR 73.46(d)(7) require vehicles, except United States Department of Energy vehicles engaged in transporting special nuclear material and emergency vehicles under emergency conditions, be searched for firearms, explosives, and incendiary devices prior to entry into the PA. Vehicle areas to be searched shall include the cab, engine compartment, undercarriage, and cargo area.

Section 6.3.4 of the PPP describes how the licensee will search all vehicles except for United States Department of Energy vehicles engaged in transporting special nuclear material and emergency vehicles under emergency conditions, for firearms, explosives, and incendiary devices prior to entry into the PA. Vehicle areas to be searched shall include the cab, engine compartment, undercarriage, and cargo area. The search will be conducted utilizing physical and visual methods to include the use of flashlights, mirrors, and other aids. Emergency vehicles and personnel will continue to be escorted.

The NRC staff has reviewed the licensee's description in PPP Section 6.3.4 and finds that it meets the requirements in 10 CFR 73.46(d)(7).

Requirement 10 CFR 73.46(d)(8): The provisions in 10 CFR 73.46(d)(8) require all vehicles, except designated licensee vehicles, requiring entry into the PA shall be escorted by a member of the security organization while within the PA, and to the extent practicable be off-loaded in an area that is not adjacent to a vital area. Designated licensee vehicles shall be limited in their use to onsite plant functions and shall remain in the PA except for operational, maintenance, security and emergency purposes. The licensee shall exercise positive control over all such designated vehicles to assure that they are used only by authorized persons and for authorized purposes.

Section 6.3.4 of the PPP describes the procedures in place for providing security escorts for all vehicles required to enter the PA except for designated licensee and contractor vehicles. To the extent practical, the licensee will continue to off-load vehicles in an area not adjacent to the MAA.

The NRC staff has reviewed the licensee's description in PPP Section 6.3.4 and finds that it meets the requirements in 10 CFR 73.46(d)(8).

Requirement 10 CFR 73.46(d)(9): The provisions in 10 CFR 73.46(d)(9) require control of all points of personnel and vehicle access to MAAs, vital areas, and CAAs. At least two armed guards trained in accordance 10 CFR 73.46(b)(7) and Appendix B shall be posted at each MAA control point.. Prior to entry into a MAA, packages must be searched for firearms, explosives, and incendiary devices. All vehicles, materials and packages, exiting from a MAA must be searched for concealed SSNM by a team of at least two individuals who are not authorized access to that MAA. Each individual exiting a MAA shall undergo at least two separate searches for concealed SSNM.

Sections 6.4.1 and 6.4.3 of the PPP describe the procedures in place for controlling access to MAAs and CAAs during the renewal period. The entry and exit control point (EECP) will be guarded by two security officers trained in accordance with 10 CFR 73.46(b)(7) and Part 73, Appendix B. Identification and authorization procedures are in place to confirm the identity of persons requiring access to the MAA. All packages and equipment will continue to be searched for firearms, explosives, and incendiary devices before admittance into the MAA. All individuals exiting the MAA will continue to undergo two separate searches for concealed SSNM. For individuals exiting an area that contains only encapsulated SSNM the second search will be

conducted in a random manner. All materials and packages to include trash, wastes, tools, and equipment exiting from the MAA will continue to be searched for concealed SNMM by a team of at least two armed security officers, who are not authorized access to packaging of the materials to be searched.

The NRC staff has reviewed the licensee's description in PPP Sections 6.4.1 and 6.4.3, and finds that they meet the requirements in 10 CFR 73.46(d)(9).

Requirement 10 CFR 73.46(d)(10): The provisions in 10 CFR 73.46(d)(10) require that before exiting from a MAA, containers of contaminated wastes must be drum scanned and tamper sealed by at least two individuals, working and recording their findings as a team, who do not have access to material processing and storage areas. The licensee shall retain the records of these findings for three years after the record is made.

Sections 6.5 and 6.9 of the PPP describe how containers of contaminated wastes will continue to be drum scanned and tamper sealed by at least three individuals working and recording as a team who will confirm that unauthorized SSNM is not contained in the packaged waste. This work will be accomplished in a CAA that is separate from the MAA processing and storage areas. Records of the findings will be kept for a period of three years after the record is made.

The NRC staff has reviewed the licensee's description in PPP Sections 6.5 and 6.9 and finds that they meet the requirements in 10 CFR 73.46(d)(10).

Requirement 10 CFR 73.46(d)(11): The provisions in 10 CFR 73.46(d)(11) require that SSNM being prepared for shipment offsite, including product, samples and scrap, shall be packed and placed in sealed containers in the presence of at least two individuals working as a team who shall verify and certify the content of each shipping container through the witnessing of gross weight measurements and nondestructive assay, and through the inspection of tamper seal integrity and associated seal records.

Section 6.6 of the PPP describes the procedures for packaging SSNM which includes product, samples, and scraps in sealed containers. The work will continue to be done by a team of at least three workers who will verify and certify the accuracy of the stated content of each container through the witnessing of gross weight measurements and through the inspection of tamper seal integrity and associated seal records.

The NRC staff has reviewed the licensee's description in PPP Section 6.6 and finds that it meets the requirements in 10 CFR 73.46(d)(11).

Requirement 10 CFR 73.46(d)(12): The provisions in 10 CFR 73.46(d)(12) require areas used for preparing SSNM for shipment and areas used for packaging and screening trash and wastes be CAAs and shall be separated from processing and storage areas.

Sections 6.5 and 6.6 of the PPP state that the areas used for preparing SSNM for shipment and areas used for packaging and screening trash and wastes are located in CAAs that are separate from storage and processing areas.

The NRC staff has reviewed the licensee's description in PPP Sections 6.5 and 6.6, and finds that it meets the requirements in 10 CFR 73.46(d)(12).

Requirement 10 CFR 73.46(d)(13): The provisions in 10 CFR 73.46(d)(13) require individuals not permitted by the licensee to enter PAs without escort must be escorted by a watchman or other individual designated by the licensee while in a PA and must be badged to indicate that an escort is required. In addition, the individual shall be required to register his or her name, date, time, purpose of visit and employment affiliation, citizenship, and name of the individual to be visited in a log. The licensee shall retain each log as a record for three years after the last entry is made in the log.

Section 6.7 of the PPP describes the procedures for escorts and escorted individuals. Individuals not authorized to enter the PA without an escort will be escorted by a security officer. The escorted individual will be required to wear an "escort required" badge and have to enter the following information onto a register log: Name, Date, Time, Purpose of Visit and Employment Affiliation, Citizenship, and Name of Individual to be Visited.

The NRC staff has reviewed the licensee's description in PPP Section 6.7 and finds that it meets the requirements in 10 CFR 73.46(d)(13).

Requirement 10 CFR 73.46(d)(14): The provisions in 10 CFR 73.46(d)(14) require that all keys, locks, combinations and related equipment used to control access to PA, MAA, vital, and CAAs be controlled to reduce the probability of compromise. Whenever there is evidence that a key, lock, combination, or related equipment may have been compromised it shall be changed. Upon termination of employment of any employee, keys, locks, combinations, and related equipment to which that employee had access, shall be changed.

Section 6.8 of the PPP describes the control procedures for all keys, lock, combinations, and related equipment used to control access to PAs, MAAs, and CAAs. The licensee will continue to change the keys, locks, or combinations whenever there is an indication that the aforementioned have been compromised.

The NRC staff has reviewed the licensee's description in PPP Section 6.8 and finds that it meets the requirements in 10 CFR 73.46(d)(14).

#### **Detection, Surveillance and Alarm Subsystems and Procedures. 10 CFR 73.46(e):**

The performance objectives of the detection, surveillance and alarm subsystem and procedures are to detect, assess, and communicate any unauthorized access or penetration or such attempts by persons, vehicles, or material at the time of the act or attempt so that the response can be such as to prevent unauthorized access or penetration.

Requirement 10 CFR 73.46(e)(1): The provisions in 10 CFR 73.46(e)(1) require an intrusion alarm subsystem with a capability to detect penetration through the isolation zone and to permit response action.

Section 7.1 of the PPP describes the intrusion detection alarm subsystem that has the capability to detect intrusion into the isolation zone to permit a response action. This system is supported by direct visual observation by security officers throughout the PA.

The NRC staff has reviewed the licensee's description in PPP Section 7.1 and finds that it meets the requirements in 10 CFR 73.46(e)(1).

Requirement 10 CFR 73.46(e)(2): The provisions in 10 CFR 73.46(e)(2) require all emergency exits in each PA, MAA, and vital area to be locked to prevent entry from the outside and alarmed to provide local visible and audible alarm annunciation.

Section 7.2 of the PPP states that all emergency exits from the MAA are locked, alarmed, and provide local visible and audible alarm annunciation to prevent unauthorized use.

The NRC staff has reviewed the licensee's description in PPP Section 7.2 and finds that it meets the requirements in 10 CFR 73.46(e)(2).

Requirement 10 CFR 73.46(e)(3): The provisions in 10 CFR 73.46(e)(3) require all unoccupied vital areas and MAAs to be locked and protected by an intrusion alarm subsystem which will alarm upon the entry of a person anywhere into the area, upon exit from the area, and upon movement of an individual within the area, except that for process MAAs only the location of the SSNM within the area is required to be so alarmed. Vaults and process areas that contain SSNM that has not been alloyed or encapsulated shall also be under the surveillance of closed circuit television that is monitored in both alarm stations. Means shall be employed which require that an individual other than an alarm station operator be present at or have knowledge of access to such unoccupied vaults or process areas.

Section 7.3 of the PPP describes the intrusion detection subsystem installed in the MAA to detect the entry of a person anywhere into the area, upon exit from the area, and upon movement of an individual within the area. Vaults and process areas are equipped with CCTV in addition to the IDS.

The NRC staff has reviewed the licensee's description in PPP Section 7.3 and finds that it meets the requirements in 10 CFR 73.46(e)(3).

Requirement 10 CFR 73.46(e)(4): The provisions in 10 CFR 73.46(e)(4) require duress alarms be provided in all manned access control points in the PA barrier, all security patrols and guard stations within the PA, and both alarm stations.

Section 7.4 of the PPP describes the use of duress alarms at the MAA EECP, all security officer stations within the PA, the CAS, and SAS, and security patrols.

The NRC staff has reviewed the licensee's description in PPP Section 7.4 and finds that it meets the requirements in 10 CFR 73.46(e)(4).

Requirement 10 CFR 73.46(e)(5): The provisions in 10 CFR 73.46(e)(5) require alarms to annunciate in a continuously manned CAS located within the PA and in at least one other independent continuously manned onsite station not necessarily within the PA, so that a single act cannot remove the capability of calling for assistance or responding to an alarm. The alarm stations shall be CAAs and their walls, doors, ceiling, floor, and windows shall be bullet-resisting. The location of the CAS shall not be visible from the perimeter of the PA. The CAS shall not contain any operational activities that would interfere with the execution of the alarm response function.

Section 7.5 of the PPP describes the independent CAS and SAS annunciation capabilities, fulltime manning, and bullet resisting construction that will continue to remain in place. The CAS and SAS are designed so that a single malevolent act cannot remove the capability to call for assistance or response to an alarm. The CAS is designed and located so that the interior is not

visible from the perimeter of the PA. The PPP commits the licensee to not having any operational activities within the CAS that will interfere with the execution of the alarm response functions.

The NRC staff has reviewed the licensee's description in PPP Section 7.5 and finds that it meets the requirements in 10 CFR 73.46(e)(5).

Requirement 10 CFR 73.46(e)(6): The provisions in 10 CFR 73.46(e)(6) require that alarms to remain operable from independent power sources in the event of the loss of normal power. Switchover to standby power shall be automatic and shall not cause false alarms on annunciator modules.

Section 7.6 of the PPP describes the independent backup power subsystem for the alarm subsystems. The switchover from main power to backup power will not cause false alarms.

The NRC staff has reviewed the licensee's description in PPP Section 7.6 and finds that it meets the requirements in 10 CFR 73.46(e)(6).

Requirement 10 CFR 73.46(e)(7): The provisions in 10 CFR 73.46(e)(7) require alarm device transmission lines to annunciators be tamper indicating and self-checking. The annunciation of an alarm at the alarm stations shall indicate the type of alarm and location. The status of all alarms and alarm zones shall be indicated in the alarm stations.

Section 7.7 of the PPP describes the protection and annunciation of the alarm subsystem. All devices to include the transmission lines are tamper indicating and self checking. Switchover from main to backup power is indicated. The annunciator panel indicates the type and location of each alarm. The alarm status is displayed at the CAS and SAS.

The NRC staff has reviewed the licensee's description in PPP Section 7.7 and finds that it meets the requirements in 10 CFR 73.46(e)(7).

Requirement 10 CFR 73.46(e)(8): The provisions in 10 CFR 73.46(e)(8) require exterior areas within the PA to be monitored or periodically checked to detect the presence of unauthorized persons, vehicles, materials, or unauthorized activities.

Section 7.8 of the PPP describes the procedures the licensee will continue to use in periodically checking all exterior areas within the PA to detect the presence of unauthorized persons, vehicles, materials, or unauthorized activities. Security Officers perform direct monitoring from guard posts, during roving patrols, and through the use of CCTV.

The NRC staff has reviewed the licensee's description in PPP Section 7.8 and finds that it meets the requirements in 10 CFR 73.46(e)(8).

Requirement 10 CFR 73.46(e)(9): The provisions in 10 CFR 73.46(e)(9) require methods to observe individuals within MAAs to assure that SSNM is not moved to unauthorized locations or in an unauthorized manner shall be provided and used on a continuing basis.

Section 7.9 of the PPP describes the methods used to observe individuals within the MAA to assure that SSNM is not moved to unauthorized locations or in an unauthorized manner.

The NRC staff has reviewed the licensee's description in PPP Section 7.9 and finds that it meets the requirements in 10 CFR 73.46(e)(9).

**Communication Subsystem 10 CFR 73.46(f):**

The performance objective of communication subsystems is to provide for notification of an attempted unauthorized or unconfirmed removal of SSNM or attempted act of radiological sabotage so that response can be such as to prevent the unauthorized act.

Requirement 10 CFR 73.46(f)(1): The provisions in 10 CFR 73.46(f)(1) require each guard, watchman, or armed response individual on duty to be capable of maintaining continuous communication with an individual in each continuously manned alarm station required by 10 CFR 73.46(e)(5), who shall be capable of calling for assistance from other guards, watchmen, and armed response personnel and from law enforcement authorities.

Section 8.1 of the PPP commits the licensee to equipping each security officer with the capability to maintain continuous communications with the CAS and SAS who shall be capable of calling for assistance from other guards, watchmen, and armed response personnel and from law enforcement authorities.

The NRC staff has reviewed the licensee's description in PPP Section 8.1 and finds that it meets the requirements in 10 CFR 73.46(f)(1).

Requirement 10 CFR 73.46(f)(2): The provisions in 10 CFR 73.46(f)(2) require each alarm station to have both conventional telephone service and radio or microwave transmitted two-way voice communication capability (either directly or through an intermediary) with the law enforcement authorities.

Section 8.2 of the PPP describes the redundant communications systems that the CAS and SAS can utilize to communicate with the LLEA.

The NRC staff has reviewed the licensee's description in PPP Section 8.2 and finds that it meets the requirements in 10 CFR 73.46(f)(2).

Requirement 10 CFR 73.46(f)(3): The provisions in 10 CFR 73.46(f)(3) require non-portable communications equipment to operable from independent power sources in the event of the loss of normal power.

Section 8.3 of the PPP describes the backup power systems used for the redundant communications systems in use by the CAS and SAS.

The NRC staff has reviewed the licensee's description in PPP Section 8.3 and finds that it meets the requirements in 10 CFR 73.46(f)(3).

**Test and Maintenance Programs. 10 CFR 73.46(g):**

The performance objective of test and maintenance programs is to provide confidence that security equipment will be available and reliable to perform its function when needed. A test and maintenance program shall include intrusion alarms, emergency exit alarms,

communication equipment, physical barriers, and other physical protection related devices and equipment.

Requirement 10 CFR 73.46(g)(1): The provisions in 10 CFR 73.46(g)(1) require the licensee to during installation and construction of physical protection related subsystems and components to assure that they comply with their respective design criteria and performance specifications.

Section 9.1 of the PPP describes the test and maintenance program for intrusion alarms, emergency exit alarms, communications equipment, physical barriers, and other physical protection related devices and equipment used at the NFS site. Installation of components and new construction will be monitored to ensure adherence to manufacturer's installation criteria and design specifications. Each step in the installation and construction will be inspected and/or tested for compliance with design criteria and performance specifications.

The NRC staff has reviewed the licensee's description in PPP Section 9.1 and finds that it meets the requirements in 10 CFR 73.46(g)(1).

Requirement 10 CFR 73.46(g)(2): The provisions in 10 CFR 73.46(g)(2) require the licensee to conduct preoperational tests and inspections of physical protection related subsystems and components to demonstrate their effectiveness and availability with respect to their respective design criteria and performance specifications.

Section 9.2 of the PPP describes the preoperational tests and inspections of physical protection related subsystems and components which are intended to demonstrate their effectiveness and availability. The PPP commits the licensee to completely inspect and test these subsystems and components using design criteria and the manufacturer's performance specifications before placed them in operation.

The NRC staff has reviewed the licensee's description in PPP Section 9.2 and finds that it meets the requirements in 10 CFR 73.46(g)(2).

Requirement 10 CFR 73.46(g)(3): The provisions in 10 CFR 73.46(g)(3) require the licensee to conduct operational tests and inspections of physical protection related subsystems and components to assure their maintenance in an operable and effective condition. Each intrusion alarm shall be tested at the beginning and end of any period that it is used or at least every seven days of continuous operation. Communications equipment required for communications onsite shall be tested for performance at the beginning of each work shift. Communications equipment required for communications offsite shall be tested for performance not less than once a day.

Section 9.3 of the PPP describes the operational testing of the intrusion alarm subsystems and communications equipment. The licensee will continue to test each intrusion alarm at the beginning of any period that it is used. If the period of continuous use is longer than seven days, the intrusion alarm will continue to be tested once every seven days. On-site communications equipment, which includes duress switches, will continue to be tested at the beginning of each shift. Off-site communications will be tested at least once per day.

The NRC staff has reviewed the licensee's description in PPP Section 9.3 and finds that it meets the requirements in 10 CFR 73.46(g)(3).

Requirement 10 CFR 73.46(g)(4): The provisions in 10 CFR 73.46(g)(4) require the licensee to establish preventive maintenance programs for physical protection related subsystems and components to assure their continued maintenance in an operable and effective condition.

Section 9.4 of the PPP commits the licensee to establish and maintain a preventative maintenance program for physical protection related subsystems and components to keep them in an operable and effective condition. If an operational test identifies a malfunctioning component, compensatory measures will be implemented if needed, until the component is repaired.

The NRC staff has reviewed the licensee's description in PPP Section 9.4 and finds that it meets the requirements in 10 CFR 73.46(g)(4).

Requirement 10 CFR 73.46(g)(5): The provisions in 10 CFR 73.46(g)(5) require the licensee to maintain all physical protection related subsystems and components in operable condition. Corrective action procedures and compensatory measures shall be developed to assure that the effectiveness of the physical protection system is not reduced by failure or other contingencies affecting the operation of the security related equipment or structures. Repairs and maintenance shall be performed by at least two individuals working as a team who have been trained in the operation and performance of the equipment. The security organization shall be notified before and after service is performed and shall conduct performance verification tests after the service has been completed.

Sections 9.4 and 9.5 of the PPP describe and commit the licensee to compensatory measures, if needed, during the repair of a physical protection subsystem or component. When maintenance is performed on the security system, a security supervisor or other individual who understands and has knowledge of the operation and performance of the security alarm system will continue to observe the individual who is performing the maintenance or repair. The system or subsystem under repair will continue to be tested after every modification or maintenance action. Performance verification testing will be accomplished by an individual other than the persons directly involved in the maintenance or repair, and such testing will continue to be performed under the supervision of the Security Director or designated representative.

The NRC staff has reviewed the licensee's description in PPP Sections 9.4 and 9.5, and finds that they meet the requirements in 10 CFR 73.46(g)(5).

Requirement 10 CFR 73.46(g)(6): The provisions in 10 CFR 73.46(g)(6) require the licensee to review the security program at least every 12 months by individuals independent of both security program management and personnel who have direct responsibility for implementation of the security program. This review must include an audit of security procedures and practices, an evaluation of the effectiveness of the physical protection system, an audit of the physical protection system testing and maintenance program, and an audit of commitments established for response by LLEA. The results and recommendations of the security program review, and any actions taken, must be documented in a report to the licensee's plant manager and to corporate management at least one level higher than that having responsibility for the day-to-day plant operations. These reports must be maintained in an auditable form for a period of three years.

Section 9.6 of the PPP describes the process and procedures for conducting the annual audit of the security program by individuals independent of security management and security supervision. The security program review will continue to include an audit of security

procedures and practices, an evaluation of the effectiveness of the physical protection system, an audit of the physical protection system testing and maintenance program, and an audit of commitments established for response by LLEA. The required report regarding the annual security program review will be available for inspection for a period of three years.

The NRC staff has reviewed the licensee's description in PPP Section 9.6 and finds that it meets the requirements in 10 CFR 73.46(g)(6).

#### **Contingency and Response Plans and Procedures. 10 CFR 73.46(h):**

The performance objective of contingency and response plans and procedures is to provide the predetermined response to safeguards contingency events so that the adversary will be engaged and impeded until offsite assistance arrives. The provisions in 10 CFR Part 73, Appendix C delineate the types of incidents that are covered in the Safeguards Contingency Response Plan (SCRP), how the onsite response effort is organized and coordinated to effectively respond to a safeguards contingency event and how the onsite response for safeguards contingency events has been integrated into other site emergency response procedures.

Requirement 10 CFR 73.46(h)(1): The provisions in 10 CFR 73.46(h)(1) require the licensee to establish, maintain, and follow an NRC-approved safeguards contingency plan for responding to threats, thefts, and radiological sabotage related to the SSNM, and the contingency plan is subject to the response requirements in 10 CFR 73.46(h)(2)-(5) that are discussed below.

Section 10.1 of the PPP and Section 3.0 of the SCRP provides information that conforms to the requirements of 10 CFR 73.46(h)(2)-(5) and Appendix C of Part 73. Detailed information regarding the safeguards contingency plan is not publically available.

The NRC staff has reviewed the licensee's description in PPP Section 10.1 and SCRP Section 3 and finds that they meet the requirements in 10 CFR 73.46(h)(1).

Requirement 10 CFR 73.46(h)(2): The provisions in 10 CFR 73.46(h)(2) require the licensee to establish and document response arrangements that have been made with LLEA.

Section 10.2 of the PPP describes the response arrangements made between the licensee and the local Police Department, the County Sheriff's Department, and the Tennessee Highway Patrol. The PPP provides information on the response times, number of officers who will respond and their armament.

The NRC staff has reviewed the licensee's description in PPP Section 10.2 and finds that it meets the requirements in 10 CFR 73.46(h)(2).

Requirement 10 CFR 73.46(h)(3): The provisions in 10 CFR 73.46(h)(3) require the licensee to provide a minimum of five (5) TRT members immediately available for response and the duties they will be assigned. The number of TRT must be determined on a site-specific basis and be sufficient to engage and impede the adversary force until offsite assistance arrives. The rationale for the total number and availability of onsite armed response personnel must be included in the physical protection plans submitted to the Commission for approval.

Section 10.3.2 of the PPP describes the make-up of the tactical response force and additional armed security forces that are available to provide assistance. The size and availability of the

TRF and additional response force has been determined on the basis of site-specific considerations that could affect the ability of the total onsite response force to engage and impede the adversary force until offsite assistance arrives.

The NRC staff has reviewed the licensee's description in PPP Section 10.3.2 and finds that it meets the requirements in 10 CFR 73.46(h)(3).

Requirement 10 CFR 73.46(h)(4): The provisions in 10 CFR 73.46(h)(4) require the licensee to describe its planned response procedures for dealing with detection of abnormal presence or activity of persons or vehicles within an isolation zone, a PA, a MAA, or a vital area; or evidence or indication of intrusion into a PA, a MAA, or a vital area. It also requires the security organization to provide the means for assessing the threat and responding to and neutralizing the threat, including informing LLEA of the threat and requesting assistance.

Section 10.4 of the PPP and Section 3.7 of the SCRP describe the procedures used upon detection of abnormal presence or activity of persons or vehicles within an isolation zone, PA, MAA, or CAA. The procedures provide direction to the security officers on how to determine whether or not a threat exists, assess the extent of the threat, taking measures to neutralize the threat by interposing guards between the adversary and locations where SSNM is located and contacting LLEA for assistance.

The NRC staff has reviewed the licensee's description in PPP Section 10.4 and SCRP Section 3.7, and finds that they meet the requirements in 10 CFR 73.46(h)(4).

Requirement 10 CFR 73.46(h)(5): The provisions in 10 CFR 73.46(h)(5) require the licensee to instruct guards and armed responders in the use of force including the use of deadly force in preventing or impeding theft of SSNM.

Section 10.5 of the PPP and Section 3.5 of the SCRP describes the rationale for the use of force to prevent or impede acts of radiological sabotage or theft of SSNM by using force sufficient to counter the force directed at them to include the use of deadly force when necessary in self-defense or in the defense of others.

The NRC staff has reviewed the licensee's description in PPP Section 10.5 and SCRP Section 3.5, and finds that they meet the requirements in 10 CFR 73.46(h)(5).

Requirement 10 CFR 73.46(h)(6): The provisions in 10 CFR 73.46(h)(6) require the licensee to observe isolation zones and PA physical barriers.

Section 10.6 of the PPP describes how the licensee will continue to facilitate an initial response to detection of penetration of the PA and assessment of the existence of a threat in the isolation zone and the physical barrier at the perimeter of the PA by use of a closed circuit television system and direct visual monitoring by security officers located at fixed posts within the PA.

The NRC staff has reviewed the licensee's description in PPP Section 10.6 and finds that it meets the requirements in 10 CFR 73.46(h)(6).

Requirement 10 CFR 73.46(h)(7): The provisions in 10 CFR 73.46(h)(7) requires the licensee to describe methods for assessing alarms occurring within unoccupied vaults and unoccupied MAAs containing unalloyed or unencapsulated SSNM, including assessment by at least two security personnel using closed circuit television (CCTV) or other remote means.

Section 10.7 of the PPP describes the methods used to assess alarms that occur within unoccupied vaults and unoccupied MAAs.

The NRC staff has reviewed the licensee's description in PPP Section 10.7 and finds that it meets the requirements in 10 CFR 73.46(h)(7).

Requirement 10 CFR 73.46(h)(8): The provisions in 10 CFR 73.46(h)(8) require the licensee to describe methods for assessing alarms occurring within unoccupied MAAs that contain only alloyed or encapsulated SSNM. The licensee must commit to using at least two security personnel to respond, who such persons must undergo a search before exiting the MAA.

Section 10.8 of the PPP describes the methods used to assess alarms occurring within unoccupied MAAs that contain only alloyed or encapsulated SSNM, and the use of security personnel.

The NRC staff has reviewed the licensee's description in PPP Section 10.8 and finds that it meets the requirements in 10 CFR 73.46(h)(8).

#### Review of Category I Physical Protection Program

The Category I PPP has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this PPP. Based on the prior NRC physical protection and security reviews and inspections at the NFS site, and the evaluation discussed above, the staff finds that the NFS program for the physical protection of Category I material at the NFS site will continue to provide adequate protection during the license renewal term. Accordingly, the existing license conditions for the program plans should be renumbered and revised as follows:

- SG-3.1: The licensee shall follow the physical security plan entitled "Physical Protection Plan for Protection of Category 1 High Enriched Uranium (SSNM)," Revision 10, and as the plan may be further revised in accordance with the provisions of 10 CFR 70.32(e).
- SG-3.2: The licensee shall follow the safeguards contingency plan entitled "Safeguards Contingency Response Plan," Revision 1, and as the plan may be further revised in accordance with the provisions of 10 CFR 70.32(g).
- SG-3.3: The licensee shall follow the training and qualification plan entitled "Site Security Training and Qualification Plan," Revision 2, and as the plan may be further revised in accordance with the provisions of 10 CFR 70.32(e).

### *13.2.2 Category II Special Nuclear Material of Moderate Strategic Significance*

The 10 CFR 73.67(a) general performance objectives applicable to special nuclear material of moderate strategic significance are to (i) minimize the possibilities for unauthorized removal of special nuclear material consistent with the potential consequences of such actions; and (ii) facilitate the location and recovery of missing special nuclear material. These objectives are achieved by establishing and maintaining a physical protection system that provides early detection and assessment of unauthorized access or activities by an external adversary within the CAA containing special nuclear material; provides early detection of removal of special nuclear material by an external adversary from a CAA; assures proper placement and transfer of custody of special nuclear material; and responds to indications of an unauthorized removal of special nuclear material and then notify the appropriate response forces of its removal in order to facilitate its recovery.

Requirement 10 CFR 73.67(d)(1): The provisions in 10 CFR 73.67(d)(1) require licensees to use the material only within a CAA which is illuminated sufficiently to allow detection and surveillance of unauthorized penetration or activities.

Section 1 and 2 of the PPP describes the CAA used to process SNM of moderate strategic significance and the interior and exterior CAA illumination.

The NRC staff has reviewed the licensee's description in PPP Sections 1 and 2 and finds that they meet the requirements in 10 CFR 73.67(d)(1).

Requirement 10 CFR 73.67(d)(2): The provisions in 10 CFR 73.67(d)(2) require licensees to store the material only within a CAA such as a vault-type room or approved security cabinet or their equivalent which is illuminated sufficiently to allow detection and surveillance of unauthorized penetration or activities.

Section 1 and 2 of the Physical Protection Plan (PPP) describes the CAA used to store special nuclear material (SNM) of moderate strategic significance and the interior and exterior CAA illumination.

The NRC staff has reviewed the licensee's description in PPP Sections 1 and 2 and finds that they meet the requirements in 10 CFR 73.67(d)(2).

Requirement 10 CFR 73.67(d)(3): The provisions in 10 CFR 73.67(d)(3) require licensees to monitor the CAA with an intrusion alarm or other device or procedures to detect unauthorized penetration or activities.

Section 2.2 of the PPP describes the methods and procedures used to monitor CAAs to detect unauthorized penetration or activities.

The NRC staff has reviewed the licensee's description in PPP Section 2.2 and finds that it meets the requirements in 10 CFR 73.67(d)(3).

Requirement 10 CFR 73.67(d)(4): The provisions of 10 CFR 73.67(d)(4) require licensees to conduct screening prior to granting an individual unescorted access to the CAA where the material is used or stored, in order to obtain information on which to base a decision to permit such access.

Section 3.1 of the PPP describes the procedures for conducting screening prior to granting unescorted access to CAAs where SNM is stored or used.

The NRC staff has reviewed the licensee's description in PPP Section 3.1 and finds that it meets the requirements in 10 CFR 73.67(d)(4).

Requirement 10 CFR 73.67(d)(5): The provisions in 10 CFR 73.67(d)(5) require licensees to develop and maintain a controlled badging and lock system to identify and limit access to CAAs to authorized individuals.

Sections 3.2 and 3.3 of the PPP describe the badging and lock systems in use to identify and limit access to CAAs to authorized individuals. Individuals requiring access will continue to receive a badge that allows unescorted access or a badge that denotes that an escort is required. Security personnel at the entry exit control point will continue to issue the appropriate badge after confirming the individual's identity, clearance, and access authorization. Keys, locks, and combinations are controlled by the security director or designated representative. Security personnel control access to and issuance of keys.

The NRC staff has reviewed the licensee's description in PPP Sections 3.2 and 3.3 and finds that they meet the requirements in 10 CFR 73.67(d)(5).

Requirement 10 CFR 73.67(d)(6): The provisions in 10 CFR 73.67(d)(6) require licensees to limit access to the CAAs to authorized or escorted individuals who require such access in order to perform their duties.

Section 3.4 of the PPP describes the personnel entry control system that is used to limit access to CAAs to authorized personnel.

The NRC staff has reviewed the licensee's description in PPP Section 3.4 and finds that it meets the requirements in 10 CFR 73.67(d)(6).

Requirement 10 CFR 73.67(d)(7): The provisions in 10 CFR 73.67(d)(7) require licensees to assure that all visitors to the CAAs are under the constant escort of an individual who has been authorized access to the area.

Section 3.5 of the PPP describes the escort system in use to ensure that all visitors to the CAA are under the constant escort of an individual who has authorized access to the area.

The NRC staff has reviewed the licensee's description in PPP Section 3.5 and finds that it meets the requirements in 10 CFR 73.67(d)(7).

Requirement 10 CFR 73.67(d)(8): The provisions in 10 CFR 73.67(d)(8) require licensees to establish a security organization or modify the current security organization to consist of at least one watchman per shift able to assess and respond to any unauthorized penetrations or activities in the CAAs.

Section 4.1 of the PPP describes the security organization that consists of the Security Director, Security Operations supervisor, and the Contract Security Personnel that has the capability to assess and respond to unauthorized penetrations or activities in the CAA.

The NRC staff has reviewed the licensee's description in PPP Section 4.1 and finds that it meets the requirements in 10 CFR 73.67(d)(8).

Requirement 10 CFR 73.67(d)(9): The provisions in 10 CFR 73.67(d)(9) require licensees to provide a communication capability between the security organization and appropriate response force.

Section 5.1 of the PPP describes the communications systems in use to provide a communications capability between the security organization and the response forces.

The NRC staff has reviewed the licensee's description in PPP Section 5.1 and finds that it meets the requirements in 10 CFR 73.67(d)(9).

Requirement 10 CFR 73.67(d)(10): The provisions in 10 CFR 73.67(d)(10) require licensees to conduct random searches of vehicles and packages leaving CAAs.

Section 3.6 of the PPP describes the procedures in use to conduct random searches of vehicles and packages leaving the CAA. The searches will continue to focus on classified matter and SNM.

The NRC staff has reviewed the licensee's description in PPP Section 3.6 and finds that it meets the requirements in 10 CFR 73.67(d)(10).

Requirement 10 CFR 73.67(d)(11): The provisions in 10 CFR 73.67(d)(11) requires licensees to establish and maintain written response procedures for dealing with threats of thefts or thefts of these materials.

Section 6 of the PPP describes the procedures that NFS will continue to use for dealing with threats of theft or thefts of SNM.

The NRC staff has reviewed the licensee's description in PPP Section 6 and finds that it meets the requirements in 10 CFR 73.67(d)(11).

#### Review of Category II Physical Security Plan

The Category II PPP has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this PPP. Based on prior NRC physical protection and security reviews and inspections at the NFS site, and the staff's evaluation discussed above, the staff finds that the NFS program for the physical protection of Category II material at the NFS site will continue to provide adequate protection during the license renewal term. The staff notes that the fixed site security measures in this plan are superseded by security measures in the Category I plan discussed in section 13.2.1 of this SER. The fixed site security measures in this plan will be implemented only if protection of Category 1 material at the NFS site is no longer required. The NRC staff's evaluation of the transportation security provisions in this plan is provided in Chapter 14 of this SER. Accordingly, the existing license condition for the plan should be renumbered and revised as follows:

- SG-3.4: The licensee shall comply with the provisions of the plan entitled "Physical Protection Plan for the Protection of Category II Moderate Enriched Uranium (Special Nuclear Material)," Revision 1, submitted by letter dated August 12,

2010, and as the plan may be further revised in accordance with the provisions of 10 CFR 70.32(e), as follows:

- a. The licensee may implement the fixed site security provisions (Chapters 1-6) only after notifying the NRC at least 90 days before implementation begins. The notice shall be made in writing to the Director, Division of Fuel Cycle Safety and Safeguards, NRC Headquarters, with a copy to the Director, Division of Fuel Facility Inspection, NRC Region II, and
- b. The licensee shall comply with the transportation security provisions (Chapters 7-13).

### *13.2.3 Category III Special Nuclear Material of Low Strategic Significance*

The 10 CFR 73.67(a) general performance objectives applicable to special nuclear material of low strategic significance are to (i) minimize the possibilities for unauthorized removal of special nuclear material consistent with the potential consequences of such actions; and (ii) facilitate the location and recovery of missing special nuclear material. These objectives are achieved by establishing and maintaining a physical protection system that provides early detection and assessment of unauthorized access or activities by an external adversary within the CAA containing special nuclear material; provides early detection of removal of special nuclear material by an external adversary from a CAA; assures proper placement and transfer of custody of special nuclear material; and responds to indications of an unauthorized removal of special nuclear material and then notify the appropriate response forces of its removal in order to facilitate its recovery.

Requirement 10 CFR 73.67(f)(1): The provisions in 10 CFR 73.67(f)(1) require licensees to store or use the material only within a CAA.

Section 1.4 of the PPP describes the location, construction characteristics, and use of the CAA where SNM of low strategic significance is processed and stored.

The NRC staff has reviewed the licensee's description in PPP Section 1.4 and finds that it meets the requirements in 10 CFR 73.67(f)(1).

Requirement 10 CFR 73.67(f)(2): The provisions in 10 CFR 73.67(f)(2) require licenses to monitor with an intrusion alarm or other device or procedures the CAAs to detect unauthorized penetrations or activities.

Section 2.0 of the PPP describes the systems and procedures in place at the CAA to monitor with an intrusion alarm or other device or procedures the CAAs to detect unauthorized penetrations or activities. The licensee will continue to use a combination of personnel oriented surveillance, perimeter barriers, access/egress controls, and other procedures to provide monitoring of the CAA.

The NRC staff has reviewed the licensee's description in PPP Section 2 and finds that it meets the requirements in 10 CFR 73.67(f)(2).

Requirement 10 CFR 73.67(f)(3): The provisions in 10 CFR 73.67(f)(3) require licensees to assure that a watchman or offsite response force will respond to all unauthorized penetrations or activities.

Section 3.1 of the PPP describes the security organization and the procedures for responding to all unauthorized penetrations or activities.

The NRC staff has reviewed the licensee's description in PPP Section 3.1 and finds that it meets the requirements in 10 CFR 73.67(f)(3).

Requirement 10 CFR 73.67(f)(4): The provisions in 10 CFR 73.67(f)(4) require licensees to establish and maintain response procedures for dealing with threats of theft or thefts of this material

Section 4.1 of the PPP describes procedures to respond to theft or attempted theft of SNM.

The NRC staff has reviewed the licensee's description in PPP Section 4.1 and finds that it meets the requirements in 10 CFR 73.67(f)(4).

#### Review of Category III Physical Protection Plan

The Category III PPP has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this PPP. Based on the prior NRC physical protection and security reviews and inspections at the NFS site, and the staff's evaluation discussed above, the staff finds that the NFS program for the physical protection of Category III material at the NFS site will continue to provide adequate protection during the license renewal term. Accordingly, the existing license condition for the plan should be renumbered and revised as follows:

- SG-3.5: The licensee shall comply with the provisions of the plan entitled "Physical Protection Plan for Protection of Category III Low Enriched Uranium (Special Nuclear Material)," Revision 3, submitted by letter dated August 12, 2010, and supplemented by letter dated November 10, 2010, and as the plan may be further revised in accordance with the provisions of 10 CFR 70.32(e).

### **13.3 Evaluation Findings**

The staff finds that the NFS license renewal application referenced the security plans required under 10 CFR 70.22(h) and (k), that are evaluated in section 13.2 of this SER. The security plans referenced in the application are clear and specific and in the proper format. As discussed above, the staff reviewed the NFS plans against the requirements of 10 CFR Part 73 and applicable security orders. The staff finds that these plans for the physical protection of Category I, II, and III material at the NFS site provide reasonable assurance that NFS will continue to provide adequate protection during the license renewal term.

### **13.4 References**

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| (NFS, 2006a) | Nuclear Fuel Services, Inc., "NFS Safeguards Contingency Plan, Revision 1," March 31, 2006, ML061670320.  |
| (NFS, 2009b) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469. |

- (NFS, 2009d) Nuclear Fuel Services, Inc., "NFS Physical Protection Plan," Revision 8, August 18, 2009, ML092380293.
- (NFS, 2009e) Nuclear Fuel Services, Inc., "NFS Site Security Training and Qualification Plan," Revision 2, July 2, 2009.
- (NFS, 2010d) Nuclear Fuel Services, Inc., "Response to NRC Request for Additional Information Concerning Security Portions of License Renewal," August 12, 2010.
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## **14.0 PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIAL IN TRANSIT**

### **14.1 Purpose of Review**

The NRC staff conducted this review to ensure that the NFS application complies with the requirements in 10 CFR 70.22(g) regarding physical protection of SNM in transit. The acceptance criteria for the review appear in the guidance documents listed in Chapter 13 of this SER, and NRC Regulatory Issue Summary 2005-22, "Requirements for Physical Protection During Transportation of Special Nuclear Material of Moderate and Low Strategic Significance: 10 CFR Part 73 vs. Regulatory Guide 5.59 (1983)" (NRC, 2005c).

### **14.2 Staff Review and Analysis**

The information to support this review was obtained from the NFS license renewal application (NFS, 2009a), NFS responses to requests for additional information (NFS, 2009b), and additional information supplementing the application (NFS, 2010d and 2010g).

The physical protection program consists of three levels of security. A technical evaluation of a physical protection plan (PPP) was conducted for two of the three levels. The three levels are as follows:

- Category I, Strategic Special Nuclear Material – Pursuant to 10 CFR 73.6(d), NFS is exempt from the physical security requirements for Category I material in transit because such material is always transported to and from the NFS site by the U.S. Department of Energy transportation system.
- Category II, Special Nuclear Material of Moderate Strategic Significance - consisting of transportation security commitments in a PPP.
- Category III, Special Nuclear Material of Low Strategic Significance - consisting of transportation security commitments in a PPP.

The technical evaluation will be presented as two separate reviews by category. In some cases information which summarizes the contents or specific details of the plans is vague because these plans contain non-publically available information.

#### ***14.2.1 Category II Transportation Security for Special Nuclear Material of Moderate Strategic Significance***

As summarized below, the requirements of 10 CFR 73.67(e) apply to the transportation of SNM of moderate strategic significance.

**Requirement 10 CFR 73.67(e)(1):** The provisions in 10 CFR 73.67(e)(1) require licensees shipping SNM of moderate strategic significance to (i) provide advance notification to the receiver of any planned shipments; (ii) receive confirmation from the receiver prior to commencement of the planned shipment that the receiver is ready to accept the shipment; (iii) check the integrity of the container and locks or seals prior to shipment; and (iv) arrange for the in-transit physical protection of the material in accordance with the requirements of 10 CFR 73.67(e)(3), unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

Section 7.1 of the PPP provides a description of the processes in place to provide advance notification of any planned shipments. The notification will continue to contain the following: mode of transport, estimated time of arrival, location of transfer of the shipment to the receiver, and name of carrier and transport information. Section 7.2 of the PPP provides a procedure to receive confirmation from the receiver prior to commencement of a shipment. Sections 7.3 and 7.4 of the PPP provide a procedure to ensure that all material is transported in sealed containers that are tamper sealed and to check the integrity of the containers and seals prior to shipment. Section 7.5 of the PPP provides a commitment that the licensee will continue to be responsible for the in-transit physical protection of all SNM shipments until they have been accepted by the receiver.

The NRC staff has reviewed the licensee's descriptions in PPP Sections 7.1 through 7.5, and finds that they meet the requirements in 10 CFR 73.67(e)(1).

Requirement 10 CFR 73.67(e)(2): The provisions in 10 CFR 73.67(e)(2) require licensees who receive SNM of moderate strategic significance to (i) check the integrity of the containers and seals upon receipt of the shipment; (ii) notify the shipper of receipt of the material as required in 10 CFR 74.15; and (iii) arrange for the in-transit physical protection of the material in accordance with the requirements of 10 CFR 73.67(e)(3), unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

Section 8.1 of the PPP provides a process to ensure that when shipments are received the integrity of the containers and tamper indicating seals are confirmed by the shipping supervisor or his designate. Section 8.2 of the PPP provides a continuing commitment to have a procedure in place to notify the shipper that the shipment has been received. Section 8.3 of the PPP states that until the licensee accepts the shipment, the shipper will be responsible for the in-transit security for each shipment. The licensee shall arrange for the in-transit physical protection of the material in accordance with the requirements of 10 CFR 73.67(e)(3), unless the shipper is a licensee and has agreed in writing to arrange for the in-transit physical protection.

The NRC staff has reviewed the licensee's descriptions in PPP Sections 8.1, 8.2 and 8.3, and finds that they meet the requirements in 10 CFR 73.67(e)(2).

Requirement 10 CFR 73.67(e)(3): The provisions in 10 CFR 73.67(e)(3) require licensees to arrange for telephone or radio communications between the transport and the licensee or its designee. The communications should periodically confirm the status of the shipment, provide notification of any delays in the scheduled shipment, and request appropriate local law enforcement agency (LLEA) response in the event of an emergency. The licensee shall minimize the time that the material is in transit by reducing the number and duration of nuclear material transfers and by routing the material in the most safe and direct manner. The licensee shall conduct screening of all licensee employees involved in the transportation of the material. The licensee shall establish and maintain written response procedures for dealing with threats of thefts or thefts of this material. If any shipment is lost or unaccounted for after the estimated arrival time, the licensee shall conduct immediately a trace investigation and notify the NRC Operations Center within one hour after the discovery of the loss of the shipment and within one hour after recovery of or accounting for such lost shipment.

Section 9.1 of the PPP provides processes to conduct periodic communications checks with the transport to confirm shipment status, report delays, or to request LLEA support. Unscheduled delays are to be reported by the carrier to the licensee. Section 9.2 of the PPP commits the licensee to make shipments using exclusive use carriers to reduce or eliminate cargo transfers.

Carriers are instructed to use the Interstate highway system to reduce transit times. Section 9.3 of the PPP describes the procedures for pre-authorization screening of all licensee employees involved in the transportation of SNM. All personnel involved in the shipping process hold an NRC "U" and DOE "L" or "Q" clearance. Sections 9.4 and 9.6 of the PPP describe the response procedures for dealing with threats of theft or theft of SNM. Section 9.5 of the PPP describes the requirement to have the receiver provide notification of arrival of a shipment or the loss of or a shipment that does not arrive after the estimated time of arrival at its destination. Sections 9.6 and 9.7 of the PPP describe the procedure in place to conduct immediate trace investigations of lost or unaccounted for shipments, and notify the NRC Operations Center.

The NRC staff has reviewed the licensee's description in PPP Sections 9.1 through 9.7, and finds that they meet the requirements in 10 CFR 73.67(e)(3).

Existing License Condition TR-1.2: Amendment 73 added transportation condition TR-1.2 to the license (NRC, 2006a). The condition granted an exemption from certain physical security requirements to low-level waste shipments. The NRC staff's evaluation and approval of this continued exemption is provided in Chapter 1 of this SER. The NRC staff grouped this physical security condition with the other physical security conditions in the renewed license. This condition is renumbered and retained in the license as safeguards condition SG-3.6. The specific provisions of this exemption are considered sensitive, unclassified information which is withheld from the public.

Requirement 10 CFR 73.67(e)(4): The provisions in 10 CFR 73.67(e)(4) require licensees to retain required records for three years after the close of the period licensee possesses special nuclear material. Copies of superseded material must be retained for three years after each change. All shipments of the material must be made either (A) in dedicated transports with no intermediate stops to load or unload other cargo and with no carrier or vehicle transfers or temporary storage in-transit, or (B) under arrangements whereby the custody of the shipment and all custody transfers are acknowledged by signature.

Chapter 11 of this SER provides the NRC staff's evaluation of the NFS records management system. The staff considers the records management system adequate for retaining security records. PPP Section 10.1 states that Category II material will continue to be shipped only by pre-approved, exclusive-use carriers. Section 10.2 of the PPP describes the process for the control of shipments. Vehicles will continue to be locked and sealed, and constantly attended by a qualified representative.

The NRC staff has reviewed the licensee's description in PPP Sections 7, 8 and 9, and finds that they meet the requirements in 10 CFR 73.67(e)(4). The staff has determined that the procedure described in Section 10.2 of the PPP meets the requirements of 10 CFR 73.67(e)(4)(ii).

Requirement 10 CFR 73.67(e)(5): The provisions in 10 CFR 73.67(e)(5) require licensees who export special nuclear material of moderate strategic significance to retain each required record for three years after the close of the period for which the licensee possesses the special nuclear material. Copies of superseded material must be retained for three years after each change.

Section 11 of the PPP states that NFS does not export Category II material. Condition SG-3.4 will require NFS to comply with this commitment.

The staff has determined that the requirements of 10 CFR 73.67(e)(5) do not apply to NFS.

Requirement 10 CFR 73.67(e)(6): The provisions in 10 CFR 73.67(e)(6) require licensees who import special nuclear material of moderate strategic significance to retain each required record for three years after the close of the period for which the licensee possesses the special nuclear. Copies of superseded material must be retained for three years after each change. The licensee shall notify the exporter who delivered the material to a carrier for transport of the arrival of such material.

Section 12 of PPP describes the procedure in place for physical protection of imported material. NFS will continue to accept responsibility for imported material at the United States border. NFS will follow the same procedures discussed above for in-transit physical protection and records management. NFS will continue to notify the exporter when the shipment is received.

The NRC staff has reviewed the licensee's description in PPP Section 12, and finds that it meets the requirements in 10 CFR 73.67(e)(6).

Requirement 10 CFR 73.67(e)(7): The provisions in 10 CFR 73.67(e)(7) describe actions the Commission may order if two or more shipments of special nuclear material of moderate strategic significance, constituting in the aggregate an amount equal to or greater than a formula quantity of strategic special nuclear material, may be en route at the same time.

Section 13 of the PPP describes the procedures in place for providing advance notification to NRC of all shipments of Category II material, and notification to NRC of all shipment arrivals.

The NRC staff has reviewed the licensee's description in PPP Section 13, and finds that the commitments provide assurance the requirements in 10 CFR 73.67(e)(7) can be met.

#### Review of Physical Protection Requirements for Category II Material In Transit

The Category II PPP has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this PPP. Based on the staff's evaluation discussed above, the staff finds that the NFS program for the physical protection of Category II material in transit will continue to provide adequate protection during the license renewal term. The staff notes that the commitments for transportation security are contained in the same PPP that contains the commitments for fixed site security. Therefore, the renumbered and revised Condition SG-3.4 set forth in Chapter 13 of this SER is sufficient and no additional license condition is necessary.

#### *14.2.2 Category III Transportation Security for Special Nuclear Material of Low Strategic Significance*

As summarized below, the requirements of 10 CFR 73.67(g) apply to the transportation of SNM of low strategic significance.

Requirement 10 CFR 73.67(g)(1): The provisions in 10 CFR 73.67(g)(1) require licensees shipping SNM of low strategic significance to (i) provide advance notification to the receiver of any planned shipments; (ii) receive confirmation from the receiver prior to commencement of the planned shipment that the receiver is ready to accept the shipment; (iii) transport the material in a tamper indicating sealed container; (iv) check the integrity of the container and locks or seals prior to shipment; and (v) arrange for the in-transit physical protection of the material in

accordance with the requirements of 10 CFR 73.67(g)(3), unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

Section 5.1 of the PPP describes the procedure to provide advance notification of any planned shipments. The advanced notification will include the mode of transport, estimated time of arrival, location of transfer of the shipment to the receiver, and the name of the carrier and transport information. Section 5.2 of the PPP describes the procedure to receive confirmation from the receiver prior to commencement of a shipment. Section 5.3 of the PPP describes the procedure to ensure that all material is transported in sealed containers that are tamper sealed. Section 5.4 of the PPP describes the procedure to check the integrity of the shipping containers and seals prior to shipping. Section 5.5 of the PPP states that the licensee will provide in-transit physical security for all shipments. The responsibility for the in-transit physical security ends when the shipment has been delivered and the receiver accepts said delivery.

The NRC staff has reviewed the licensee's description in PPP Sections 5.1 through 5.5, and finds that they meet the requirements in 10 CFR 73.67(g)(1).

Requirement 10 CFR 73.67(g)(2): The provisions in 10 CFR 73.67(g)(2) require licensees who receive SNM of low strategic significance to (i) check the integrity of the containers and seals upon receipt of the shipment; (ii) notify the shipper of receipt of the material as required in 10 CFR 74.15; and (iii) arrange for the in-transit physical protection of the material in accordance with the requirements of 10 CFR 73.67(g)(3), unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

Section 6.1 of the PPP describes the procedure in place to ensure that when shipments are received the integrity of the containers and tamper indicating seals are confirmed. Section 6.2 of the PPP describes the procedure in place to notify the shipper that the shipment has been received. Section 6.3 of the PPP states that until the licensee accepts the shipment, the shipper will be responsible for the in-transit security for each shipment.

The NRC staff has reviewed the licensee's description in PPP Sections 6.1 through 6.3, and finds that they meet the requirements in 10 CFR 73.67(g)(2).

Requirement 10 CFR 73.67(g)(3): The provisions in 10 CFR 73.67(g)(3) require licensees who arrange for the physical protection of special nuclear material of low strategic significance to establish and maintain response procedures for dealing with threats or thefts of this material, and to make arrangements to be notified immediately of the arrival of the shipment at its destination, or of any such shipment that is lost or unaccounted for after the estimated time of arrival at its destination. Licensees shall conduct immediately a trace investigation of any shipment that is lost or unaccounted for after the estimated arrival time and notify the NRC Operations Center within one hour after the discovery of the loss of the shipment and within one hour after recovery of or accounting for such loss.

Sections 7.1 and 7.3 of the PPP describe the response procedures in place for dealing with threats of theft or theft of SNM. Section 7.2 of the PPP describes the procedure in place to ensure notification of arrival of a shipment or the loss of or a shipment that does not arrive after the estimated time of arrival at its destination. Section 7.3 of the PPP describes the procedure in place to ensure that the shipper will provide in-transit security which includes notification of the NRC Operations Center and conducting trace investigations on lost or unaccounted for shipments.

The NRC staff has reviewed the licensee's description in PPP Sections 7.1 through 7.3, and finds that they meet the requirements in 10 CFR 73.67(g)(3).

Requirement 10 CFR 73.67(g)(4): The provisions in 10 CFR 73.67(g)(4) require licensees who export special nuclear material of low strategic significance to comply with 10 CFR 73.67(c) and (g)(1) and (3).

Section 8 of the PPP describes the procedures in place for: advanced notification to the receiver prior to the shipment, obtaining receiver confirmation that they will accept the shipment before it is shipped, ship SNM in sealed containers that are tamper sealed, inspecting the tamper seals before the container is shipped, providing in-transit physical protection until it is delivered to and accepted by the receiver, having response procedures to deal with threats of theft and theft of SNM, and notification of lost and recovered shipments.

The NRC staff has reviewed the licensee's description in PPP Section 8, and finds that it meets the requirements in 10 CFR 73.67(g)(4).

Requirement 10 CFR 73.67(g)(5): The provisions in 10 CFR 73.67(g)(5) require licensees who import special nuclear material of low strategic significance to comply with the requirements specified in 10 CFR 73.67(c) and (g)(2) and (3), and to notify the person who delivered the material to a carrier for transport of the arrival of such material.

Section 9 of the PPP describes the procedure in place for inspecting the integrity of the containers and seals for all imported shipments. Notification of arrival or non-arrival after a reasonable delay, will be reported to the shipper. The shipper is responsible for the in-transit physical security of the shipment until it is delivered to and accepted by the licensee.

The NRC staff has reviewed the licensee's description in PPP Section 9, and finds that it meets the requirements in 10 CFR 73.67(g)(5).

Existing License Condition TR-1.2: Amendment 73 added transportation condition TR-1.2 to the license (NRC, 2006a). The condition granted an exemption from certain physical security requirements to low-level waste shipments. The NRC staff's evaluation and approval of this continued exemption is provided in Chapter 1 of this SER. The NRC staff grouped this physical security condition with the other physical security conditions in the renewed license. This condition is renumbered and retained in the license as safeguards condition SG-3.6. The specific provisions of this exemption are considered sensitive, unclassified information which is withheld from the public.

#### Review of Physical Protection Requirements for Category III Material In Transit

The Category III PPP discussed above has been reviewed and inspected for many years, and the license renewal application does not propose any significant changes to this PPP. Based on the staff's evaluation discussed above, the staff finds that the NFS program for the physical protection of Category III material in transit will continue to provide adequate protection during the license renewal term. The staff notes that the commitments for transportation security are contained in the same PPP that contains the commitments for fixed site security. Therefore, the renumbered and revised Condition SG-3.5 provided in Chapter 13 of this SER is sufficient and no additional license condition is necessary.

### **14.3 Evaluation Findings**

The staff finds that the NFS license renewal application referenced the security plans required by 10 CFR 70.22(g) that are evaluated in section 14.2 of this SER. These security plans are clear and specific and in the proper format. As discussed above, the staff reviewed NFS security plans against the transportation security requirements of 10 CFR Parts 70 and 73, and applicable security orders. The staff finds these security plans for the physical protection of Category II and III material in transit provide assurance that NFS will continue to provide adequate protection during the license renewal term.

### **14.4 References**

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| (NFS, 2009b) | Nuclear Fuel Services, Inc., "Response to Request for Additional Information Concerning License SNM-124 Renewal Application," August 28, 2009, ML092450469.  |
| (NFS, 2010d) | Nuclear Fuel Services, Inc., "Response to NRC Request for Additional Information Concerning Security Portions of License Renewal," August 12, 2010, ML102420274.   |
| (NFS, 2010g) | Nuclear Fuel Services, Inc., "Response to NRC Request for Additional Information Concerning Security Portions of License Renewal," November 10, 2010, ML103440091.   |
| (NRC, 2005c) | U.S. Nuclear Regulatory Commission, Regulatory Issue Summary 2005-22, "Requirements for Physical Protection During Transportation of Special Nuclear Material of Moderate and Low Strategic Significance: 10 CFR Part 73 vs. Regulatory Guide 5.59 (1983)," October 28, 2005, ML052000423. |
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## **15.0 ENVIRONMENTAL REVIEW**

### **15.1 Purpose of Review**

The NRC staff conducted this review to examine the potential environmental impacts of renewing the NFS operating license. NRC regulations for environmental reviews are provided in 10 CFR Part 51. The NRC staff conducted the review using the guidance in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2003f).

### **15.2 Staff Review and Analysis**

On June 30, 2009, NFS submitted an application to renew Materials License SNM-124 (NFS, 2009a). The application included an environmental report containing information to support the NRC staff's review and analysis. On October 6, 2009, the NRC published in the *Federal Register* its acceptance of the NFS application for detailed review (NRC, 2009b).

The NRC staff prepared an environmental assessment to document its analysis of the potential environmental impacts associated with the NFS proposal to renew its NRC license. On October 15, 2010, the NRC published a draft environmental assessment for public comment (NRC, 2010d). On October 26, 2010, the NRC staff hosted a public meeting in Erwin, TN, to accept oral and written comments and continued to accept comments until December 31, 2010. After considering the comments on the draft environmental assessment, the NRC staff published the final environmental assessment and a finding of no significant impact on October 26, 2011 (NRC, 2011d).

### **15.3 Evaluation Findings**

Based on the final environmental assessment, the NRC staff concludes that the proposed continuation of currently approved activities at the NFS site would not result in a significant impact to the environment. Airborne effluents released through facility process stacks and liquid effluents released to the Nolichucky River are below regulatory limits for radiological and nonradiological contaminants. The radiological dose associated with the exposure to airborne and liquid effluents, for the hypothetical maximally exposed individual located at the fence line, is less than 1 percent of the annual 10 CFR 20.1301 public dose limit of 1.0 mSv (100 mrem). Additionally, radiological doses to workers on the NFS site are well below the NRC's annual regulatory limit of 0.05 sievert (5 rem) in 10 CFR 20.1201, "Occupational Dose Limit for Adults." Gaseous emissions and liquid effluents generated by the facility are presently controlled and monitored by permit, and would continue to be required to meet regulatory limits for radiological and nonradiological components. During the renewed license term, the annual 10 CFR Part 20 dose limits would continue to be applicable to the NFS site.

The NRC staff also concludes that the proposed action would not adversely affect federally-listed endangered or threatened species or federally-designated critical habitat for such species. No historic or cultural properties would be affected by the proposed action. The final environmental assessment documented that no such properties are located on the NFS site, that the nearest historic sites are more than one mile from the NFS site, and that such historic sites would not be affected by NFS operations during the renewed license term. NFS is

proposing no changes in how it processes enriched uranium and no significant changes in NFS' authorized operations are planned.

The NRC evaluated the potential environmental impacts of the proposed action in accordance with the requirements in 10 CFR Part 51. Regarding the continuation of the exemptions discussed in this SER, the NRC finds that (i) there is no significant hazards consideration; (ii) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; (iii) there is no significant increase in individual or cumulative public or occupational radiation exposure; (iv) there is no significant construction impact; (v) there is no significant increase in the potential for or consequences from radiological accidents; and (vi) the requirements from which the exemptions are sought involve either (A) 10 CFR Part 73 safeguards or 10 CFR Part 74 MC&A requirements or (B) other requirements of an administrative, managerial, or organizational nature. Accordingly, the exemptions discussed in this SER are categorically excluded from the need for further environmental review pursuant to 10 CFR 51.22(c)(25).

On the basis of the final environmental assessment, the NRC concludes that the proposed action has no significant environmental impacts and the preparation of an environmental impact statement is not necessary.

On November 21, 2011, NFS reduced the requested length of the proposed license renewal term from 40 years to 25 years (NFS, 2011j), but did not otherwise identify any change to the activities it plans to conduct under a renewed NRC license. As such, (1) there would be no changes to the types or amounts of gaseous and liquid effluents annually discharged from the site; (2) discharges of these effluents would still be required to meet annual regulatory limits for radiological and non-radiological components; and (3) the calculated annual radiological doses to onsite workers or to offsite members of the public would still be required to meet dose limits in 10 CFR Part 20. Therefore, the NRC staff finds that the potential environmental impacts of renewing the NFS license for 25 years are bounded by the staff's analysis in the final environmental assessment which evaluated potential environmental impacts over 40 years of continued operations. The NRC continues to find that there are no significant environmental impacts from the proposed action and that preparation of an EIS is not warranted.

## **15.4 References**

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| (NFS, 2009a) | Nuclear Fuel Services, Inc., "Renewal of Special Nuclear Material (SNM) License 124," June 30, 2009, ML091900061.   |
| (NFS, 2011j) | Nuclear Fuel Services, Inc., "Supplemental Information to Support the NFS Response to RAI Question 1.9 for Renewal of License SNM-124," November 21, 2011, ML11333A264.   |
| (NRC, 2003f) | U.S. Nuclear Regulatory Commission, NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," August 2003, ML032450279.  |
| (NRC, 2009b) | U.S. Nuclear Regulatory Commission, "Notice of Receipt of License Renewal Application from Nuclear Fuel Services, Erwin, Tennessee, and Opportunity to Request a Hearing, and Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information (SUNSI) for |

Contention Preparation,” Federal Register, Volume 74, page 51323, October 6, 2009.

(NRC, 2010d) U.S. Nuclear Regulatory Commission, “Notice of Availability of Draft Environmental Assessment and Draft Finding of No Significant Impact and Notice of Public Meeting for the Proposed License Renewal for Nuclear Fuel Services, Inc. in Erwin, TN,” Federal Register, Volume 75, page 63519, October 15, 2010.

(NRC, 2011d) U.S. Nuclear Regulatory Commission, “Notice of Availability of Final Environmental Assessment and Finding of No Significant Impact for the Proposed License Renewal for Nuclear Fuel Services, Inc. in Erwin, TN,” Federal Register, Volume 76, page 66334, October 26, 2011.

## **16.0 CONCLUSION**

Based on the reviews documented in this SER regarding the NFS license renewal application, the staff concludes that there is reasonable assurance that the activities to be authorized by the issuance of a renewed license will not constitute an undue risk to public health and safety. Furthermore, the staff finds that the renewal application meets the requirements of 10 CFR 70.23, "Requirements for the Approval of Applications," and 10 CFR 70.66, "Additional Requirements for the Approval of License Applications."

The staff finds that the license for NFS should be renewed for a 25-year term in accordance with the statements, representations, and conditions in the license renewal application dated June 30, 2009, as amended, subject to the identified license conditions detailed in this SER.

## **17.0 PRINCIPAL CONTRIBUTORS**

The individuals and organizations listed below are the principal contributors to the preparation of this SER.

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