SAFETY EVALUATION REPORT

FOR

NUCLEAR FUEL SERVICES, INC.
LICENSE AMENDMENT 51
BLENDED LOW-ENRICHED URANIUM
OXIDE CONVERSION BUILDING
AND
EFFLUENT PROCESSING BUILDING

DOCKET NO. 70-143

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1.0 EXECUTIVE SUMMARY

On October 23, 2003, Nuclear Fuel Services, Inc., (NFS) requested an amendment to special nuclear materials (SNM) license SNM-124. In this amendment request, NFS asked for authorization to possess and use SNM in the Blended Low Enriched Uranium (BLEU) Oxide Conversion Building (OCB) and Effluent Processing Building (EPB) at its site in Erwin, TN. The OCB/EPB license amendment application is the third of three amendments that are associated with the BLEU Project. The first amendment was for the Uranyl Nitrate Building (UNB); the U. S. Nuclear Regulatory Commission (NRC) approved this amendment application and issued the license amendment on July 7, 2003 (68 FR 47108 August 7, 2003). The second was for the BLEU Preparation Facility (BPF). The NRC approved this amendment application and issued the license amendment on January 13, 2004 (68 FR 6701, February 11, 2004).

The OCB/EPB license amendment application included changed pages to NFS' existing license and Integrated Safety Analysis (ISA) Summaries for both the OCB and EPB. A Non-Proprietary version of the ISA Summary for both the OCB and EPB was submitted by NFS by letter dated November 14, 2003. This licensing action approves the license amendment application in accordance with 10 CFR 70.22 and 70.23 and approves the OCB/EPB ISA Summaries in accordance with 10 CFR 70.66.

NFS supplemented the original amendment request in subsequent submittals, Nuclear Criticality Safety Evaluations (NCSEs), responses to NRC requests for additional information, and other correspondence on the docket. The NRC staff reviewed the amendment request and supplemental information using the applicable regulations in 10 CFR Part 70, Domestic Licensing of Special Nuclear Material, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility (SRP)," and 10 CFR Part 20, Standards for Protection Against Radiation. Specifically, the staff used Section 70.23 requirements for the approval of applications, and Section 70.66 containing additional requirements for approval of a license application to determine whether to grant the amendment request.

As part of the OCB/EPB amendment request, but submitted separately on October 24, 2003, NFS requested changes to its Emergency Plan to include the proposed OCB/EPB. The NRC staff reviewed the proposed Emergency Plan changes using 10 CFR 70.22(i)(3) and determined that they are acceptable. We have documented the basis for this finding in Section 12 of this Safety Evaluation Report (SER).

As part of the OCB/EPB amendment request, but submitted separately on November 3, 2003, NFS requested changes to its Physical Protection Plan to address physical protection of the proposed OCB/EPB. The NRC staff reviewed the proposed plan using the regulations in 10 CFR Part 73, Physical Protection of Plants and Materials, and determined that these changes are acceptable. We have documented the basis for this finding in Section 15 of this SER.

As part of the OCB/EPB amendment request, but submitted separately on October 24, 2003, NFS requested changes to its Fundamental Nuclear Material Control (FNMC) Plan to support the OCB/EPB amendment request. The NRC staff reviewed these plan changes using the regulations in 10 CFR Part 74, Material Control and Accounting of Special Nuclear Material, and determined that the changes are acceptable. We have documented the basis for this finding in Section 15 of this SER.

In its amendment request dated October 23, 2003, NFS stated that no additional environmental information was submitted because a Supplemental Environmental Report (ER) supporting the request was submitted previously on November 9, 2001. We reviewed this supplement and additional information requested from NFS, and the staff prepared an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) for the OCB/EPB. The FONSI was published in the Federal Register on June 18, 2004 (69 FR 34198).

The NRC staff has determined that the amendment request for the OCB/EPB is complete and adequate to meet the regulatory requirements in 10 CFR Part 70 and that the request can be granted. We have also determined that the ISA Summary meets the requirements of 10 CFR 70.62 and can be approved. This SER documents our technical reviews and the bases for those determinations.

2.0 BACKGROUND

On October 23, 2003, NFS requested an amendment to license SNM-124 to authorize the modification of SNM processing operations in the OCB/EPB and other minor administrative changes to the license. This amendment application was the third of three license amendment applications that will support the BLEU Project at NFS. The license amendment application included changes to Parts I and II of the license, proprietary versions of the ISA Summary in the OCB/EPB, and a proprietary decommissioning cost estimate. The non-proprietary version of the ISA Summary was submitted by NFS on November 14, 2003. The NRC staff review of the ISA Summary is included in Section 7 of this SER.

The NRC staff performed several in-office focus reviews of additional ISA documentation at the NFS Rockville site and the Framatome Richland site on January 13, January 20, February 9, February 10, February 11 and February 12, 2004. As a result of the NRC reviews of the amendment application and ISA Summaries, the NRC identified additional information that was needed to complete the review, and requested that the amendment application and ISA Summaries be revised to include additional process information, additional accident sequence background information, and additional information concerning the reliability of Items Relied on for Safety (IROFS). NFS provided the additional information by commitment letters dated February 6, March 12, March 15, March 16, March 17, March 18 and March 19, 2004. On March 31, 2004, the NRC sent a letter to NFS requesting additional information, to which NFS responded by letter dated April 30, 2004. The NRC staff reviewed this additional information and by phone call on May 13, 2004, requested clarification on the information provided. NFS responded to this request in a letter dated May 21, 2004.

The NRC staff also reviewed the proprietary decommissioning cost estimate and determined that it was acceptable. NFS provided financial assurance for the amount of the cost estimate in the form of an irrevocable letter of credit, the NRC staff review of the cost estimate and funding methods is discussed in Section 14 of this SER.

In its amendment request dated October 23, 2003, NFS stated that no additional environmental information was submitted because a supplemental ER supporting the request was submitted on November 9, 2001. The NRC staff reviewed this supplement and requested additional information from NFS, which NFS provided in a letter dated April 30, 2004. The NRC staff prepared an EA pursuant to 10 CFR Part 51 which implements the requirements of the National Environmental Policy Act (NEPA) of 1969. The NRC issued a FONSI, which was published in the Federal Register on June 18, 2004 (69 FR 34198). The NRC staff review of the environmental protection program is discussed in Section 13 of this SER.

NFS submitted a revised FNMC Plan for the OCB/EPB dated October 24, 2003. The NRC staff review of the revised FNMC Plan is discussed in Section 15 of this SER.

NFS submitted revisions to its Emergency Plan dated October 24, 2003. The NRC staff review of the Emergency Plan revisions is discussed in Section 12 of this SER.

NFS submitted revisions to the Physical Protection Plan, dated November 3, 2003. The NRC staff review of the Physical Protection Plan revisions is discussed in Section 15 of this SER.

3.0 CONDUCT OF REVIEW

The NRC staff reviewed the license amendment application for compliance with the requirements of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," and specifically for compliance with the requirements of Subpart H to Part 70, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material." The NRC staff also reviewed the ISA Summaries for conformance with the commitments in NFS' ISA Plan, dated October 5, 2001, which was approved by license Amendment 31, dated October 30, 2001. The NRC staff used the guidance in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," March 2002, to ensure the quality and completeness of the technical review.

The amendment application review used an integrated team approach. The NRC review team members with expertise in chemical, electrical, mechanical, and fire protection engineering, occupational radiation protection, Nuclear Criticality Safety (NCS), environmental protection, material control and accounting, physical protection, decommissioning, and other disciplines reviewed the amendment application, ISA Summary, and other documentation and participated in the on-site reviews.

This SER documents the results of the NRC staff review.

4.0 BASELINE DESIGN CRITERIA AND DEFENSE-IN-DEPTH

4.1 Baseline Design Criteria, 70.64(a)

10 CFR 70.64(a) requires NFS to address the ten baseline design criteria (BDC) in the design of new processes. NFS must maintain the application of the following criteria unless the ISA demonstrates that a given item is not relied on for safety or does not require adherence to the specified criteria.

4.1.1 Quality Standards and Records, 70.64(a)(1)

The design must be developed and implemented in accordance with management measures to provide adequate assurance that IROFS will be available and reliable to perform their function when needed. See Section 16 of this SER for the staff's discussion and evaluation.

4.1.2 Natural Phenomena Hazards, 70.64(a)(2)

10 CFR 70.64(a)(2) requires that the design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site. In the ISA Summary and supplemented by letters dated March 12 and March 17, 2004, NFS provided information regarding natural phenomena hazards including: earthquake, high winds, hurricane, tornado, flood, meteorite impact, and lighting strike. NFS also provided information regarding other external events such as industrial accidents and transportation accidents.

4.1.2.1 Earthquake

The NFS BLEU complex, of which the OCB/EPB is a part, is located within the Southern Appalachian Tectonic Province that extends from central Virginia to central Alabama and from the western edge of the Piedmont Province to the Cumberland Plateau Province. The Southern Tectonic Province has a moderate level of activity, based on historical records. There is no evidence of capable faults in the immediate area of the NFS site.

NFS has identified the seismic design basis for the OCB/EPB to be based on an earthquake with a return frequency of 2E-3/yr. or a 2000-year earthquake. The NFS OCB/EPB buildings have been designed and constructed to meet the seismic zone "IIC" criteria specified in Section 1607 of the 1999 Edition of the Standard Building Code (SBC). As referenced in the 1999 SBC the NFS OCB/EPB were designed to meet the requirements of the American Society of Civil Engineers (ASCE) Code 7-98, "Minimum Design Load for Buildings and Other Structures." The ASCE code seismic design loads, according to which a building is designed, are based on an earthquake with a significantly higher return period than that evaluated in NFS' seismic analysis report, done by PTI, a structural engineering firm, the results of which are discussed below.

The ASCE code requires a higher maximum short period acceleration of 0.31 g. Based on historical factors for the NFS site, the ASCE code accelerations translates into a design for a 2,475 year return frequency earthquake.

In 2001, NFS commissioned PTI, a structural engineering firm, to conduct a seismic analysis of the NFS site. This analysis concluded that there was no evidence of geologically recent fault displacements on the site that would be associated with capable faults in the surrounding region. PTI concluded that the 1000-year earthquake yielded a 0.06 g effective peak horizontal and a 0.04 g peak vertical ground acceleration. The licensee has met the NRC's SRP Section 1.3.4.3(4) guidance for a summary description of the geology and seismicity of the area, and the staff notes that the licensee met requirements by designing the facility to withstand reasonable earthquake accelerations.

IROFS OCB-11 was assigned to prevent an assumed high consequence event that would result from a seismic event within the specified design basis event. This IROFS consists of the main OCB and EPB structures and internal components that are constructed in accordance with the 1999 edition of the SBC. Future modifications, if any, will be evaluated per NFS License Condition S-25. The staff finds that NFS provided an accurate description of the site seismic hazard, specified a design basis earthquake, and identified a high consequence event and IROFS, that will result in the facility's meeting the requirements of 10 CFR 70.61.

4.1.2.2 Lightning Strike Event

NFS performed a lightning risk analysis for the NFS site in accordance with Lightning Protection Code (National Fire Protection Association (NFPA) 780) and determined that the NFS OCB/EPB has a moderate to severe risk of being damaged by lightning. In its October 2003 submittal, NFS did not identify any credible lightning strike scenarios that would result in a high or intermediate consequence event. Therefore, IROFS have not been identified and are not required for this postulated event. However, the OCB/EPB will include lightning protection as specified in NFPA-780, "Standard for the Installation of Lightning Protection Systems," 2000 edition. The staff finds that NFS provided an accurate description of the lightning strike hazard and finds that the analysis of this event to be acceptable.

4.1.2.3 Flooding

There are four major surface water bodies: Banner Spring Branch, North Indian Creek, Martin Creek, and the Nolichucky River. Banner Spring Branch lies entirely within NFS property, North Indian Creek is north of the site, Martin Creek lies just north of the north site boundary, and the Nolichucky River is west of the site boundary. Surface water runoff from the NFS site and BLEU complex will be directed to Martin Creek via local branch streams and site drainage structures. Martin Creek empties into North Indian Creek and then into the Nolichucky River.

Only the northern portion of the NFS site is within the 100-year flood plain for Martin Creek. That flood plain extends to an elevation of 1,640 feet [500 meters] above sea level. Neither the OCB nor EPB building is adjacent to, or inside, the 100-year flood plain. In fact, NFS stated

that the lowest floor elevation for the buildings is 15 feet [4.6 meters] above the 100 year flood elevation, thus a large margin of safety exists. NFS has stated that its Process Hazards Analysis (PHA) found no credible accident scenarios resulting from local area flooding because the facility is above the 100-year flood plain Base Flood Elevation. Therefore, IROFS have not been identified and are not required for this postulated event. However, the staff notes that although IROFS are not required for this event, NFS stated in its March 17, 2004, letter that the IROFS-13 may be credited as a defense-in-depth control for system configuration during flood events. The staff has reviewed the use of the 100-year flood design basis, and the proposed location and elevation of the OCB/EPB, against the acceptance criteria given in the SRP and, based on the facility location, design basis, and consequences of an accident, finds that NFS provided an accurate description of the flooding hazard, and finds this analysis and IROFS to be acceptable.

4.1.2.4 High Wind/Hurricane/Tornado

The licensee discussed high wind occurrences at the proposed facility. According to records, National Oceanic and Atmospheric Administration (NOAA) data indicate that the maximum sustained wind speed and peak gust for the regional airport is 50 mph [22 m/s] (recorded in 1951) and 86 mph [38 m/s] (recorded in 1995), respectively. The average maximum sustained wind speeds during the past three years was 29 mph [13 m/s]. Wind speeds higher than the facility design basis are postulated to result in a high consequence event. In its February 14, 2004, letter, NFS committed to a 70 mph [31 m/s] wind speed as the facility design bases in accordance with the 1999 SBC. As a result, NFS has identified IROFS OCB-12 for the OCB/EPB to prevent high consequence accidents during the postulated design basis high wind event. The staff has reviewed NFS' analysis of the high wind hazard and finds the analysis to be acceptable because the high consequence design basis event is mitigated by the IROFS OCB-12 that is the design and construction of the facility to the appropriate national structural code, that the 70 mph [31 m/s] design basis is greater than the maximum sustained wind speed of 50 mph [22 m/s], and that future modifications of the facility will be per License Condition
S-25.

NFS stated in its October 23, 2003, submittal that due to the location of the facility, it is too far inland to be affected by hurricanes. NFS in its March 17, 2004, letter stated that no intermediate or high consequence events have been identified. The staff has reviewed NFS' analysis of the hurricane hazard, the previous discussion of wind hazard and facility design basis, and the SBC, and finds the NFS analysis of the hazard to be acceptable.

NFS stated in its October 23, 2003, submittal that there has been only one recorded tornado in Unicoi County, TN, in the last 50 years. The last tornado was recorded on July 10, 1980. The adjacent counties of Washington and Carter reported two tornados each in the last 50 years. This information supports the frequency information for Unicoi County. NFS estimated the likelihood of a tornado striking the NFS controlled area at 3.0E-7 occurrences per year. This estimate results in NFS finding the likelihood of a tornado striking the facility to be not credible. No intermediate or high consequence events or IROFS have been identified. The NRC staff has reviewed the licensees analysis and finds this to be acceptable.

4.1.2.5 Conclusion Regarding Natural Phenomena Hazards

Based on the staff's review of the ISA Summary, the supporting information provided by the licensee, and the applicable licensee commitments, the staff concludes that the design of the OCB/EBP for natural phenomena meets the requirements of 10 CFR 70.64(a)(2).

4.1.3 Fire Protection, 70.64(a)(3)

The design must provide for adequate protection against fires and explosions. See Section 11 of this SER for the staff's discussion and evaluation.

4.1.4 Environmental and Dynamic Effects, 70.64(a)(4)

10 CFR 70.64(a)(4) requires that the design provide for adequate protection from environmental conditions and dynamic effects associated with normal operations, maintenance, testing, and postulated accidents that could lead to loss of safety functions. NFS stated in its ISA Summary that the OCB and EPB are designed to minimize problems from variations, both normal and credible upsets, in the ambient and process conditions in which IROFS equipment is expected to operate. To prevent loss of safety functions, NFS has considered the following in the design:

- Protection of pipes and vessels from vehicles and forklifts,
- Protection of fittings from external impact,
- Corrosion protection,
- Vibration from pumps, fans, etc.,
- Water discharge from sprinkler systems or other splashes,
- Weather, and
- Other facility siting factors such as railways, air traffic patterns, and nearby commercial facilities.

Also, NFS stated that IROFS will be qualified to demonstrate that they can perform their safety functions under the environmental and dynamic service conditions in which they will be required to function and for the length of time their function is required.

Additionally in the March 15, 2004, letter, NFS stated that non-IROFS will be able to withstand environmental stresses caused by environmental and dynamic service conditions under which their failure could prevent satisfactory accomplishment of safety functions by IROFS.

Based on the staff's review of the ISA Summary, the supporting information provided by NFS, and NFS' statements mentioned above, the staff concludes that the designs of the OCB and EPB meets the requirements of 10 CFR 70.64(a)(4).

4.1.5 Chemical Protection, 70.64(a)(5)

The design must provide for adequate protection against chemical risks produced from licensed material, facility conditions which affect the safety of licensed material, and hazardous chemicals produced from licensed material. See Section 10 of this SER for the staff's discussion and evaluation.

4.1.6 Emergency Capability, 70.64(a)(6)

The design must provide for emergency capability to maintain control of licensed material and hazardous chemicals produced from licensed material, evacuation of on-site personnel, and onsite emergency facilities and services that facilitate the use of available offsite services.

NFS stated that its design basis for emergency management at the OCB/EPB includes 1) security requirements, 2) an evacuation system and an emergency response organization, both in accordance with applicable sections of the American National Standards Institute (ANSI) Standard 8.23, and 3) a criticality accident monitoring system in accordance with the requirements of 10 CFR 70.24.

NFS' evacuation system, in accordance with ANSI Standard 8.23, includes the following elements:

a. Timely evacuation
b. Equipment and personnel available for radiological assessment of the assembly location and evacuated personnel
c. Sufficient exits from the immediate evacuation zone provided to enable rapid and unobstructed evacuation of personnel
d. Evacuation route and assembly area clearly posted
e. Evacuation route minimizes the total risk considering all potential hazards

NFS' onsite emergency facilities and services that facilitate the use of available offsite services, based on ANSI Standard 8.23, include the following elements:

a. An emergency response organization and support teams with appropriate expertise and experience
b. Appropriate monitoring equipment, emergency response documents, and protective clothing/equipment housed in the emergency facilities
c. Letters of agreement for support by off-site agencies present

d. Training and orientation to off-site agencies occurring on an annual basis, and
e. An emergency message information system for timely notification to off-site agencies established

NFS stated that its design basis for selection of offsite emergency facilities includes:

a. Ability to have a timely response
b. Sufficient trained personnel
c. Hospitals with level one trauma center capabilities
d. Hospitals equipped for radioactive contaminated persons

The security requirements for NFS are described in Chapter 2 of NFS' Security Plan and have been found acceptable by the NRC staff. See Section 15 of this SER for the staff's discussion and evaluation. The criticality monitoring system is described in Section 4.3 of the NFS license and was found to be acceptable by the NRC staff. See Section 9 of this SER for the staff's discussion and evaluation.

Based on the staff's review of the NFS Emergency Plan and supporting information provided by NFS, the staff concludes that NFS has provided for emergency capability to maintain control of licensed material and hazardous chemicals produced from licensed material, has provided for the evacuation of on-site personnel, and has provided sufficient onsite emergency facilities and services that facilitate the use of available offsite services. Accordingly the Emergency Management Program meets the requirements for the OCB/EPB set forth in 10 CFR 70.64(a)(6).

4.1.7 Utility Services, 70.64(a)(7)

10 CFR 70.64(a)(7) requires that the design provide for continued operation of essential utility services.

During an in-office review conducted by the staff on January 20, 2004, the staff asked NFS to discuss whether or not controls such as filters, scrubbers, heaters, and blowers listed throughout Section 3 of the ISA Summary as active engineered controls rely on electrical power to perform their safety functions. In a February 6, 2004, response, NFS committed to change the functional descriptions of two specific IROFS to better show how their safety functions do not rely on electrical power or other utilities and to remove low wattage heaters as active engineered controls in Section 3 of the ISA Summary. Also, in a March 15, 2004, letter, NFS stated that there are no IROFS in the OCB/EPB which rely on electrical power to perform their safety functions.

Based on the staff's review of the ISA Summary and the supporting information provided by NFS, the staff concludes that the essential utility service meets the BDC set forth in 10 CFR 70.64(a)(7).

4.1.8 Inspection, Testing, and Maintenance, 70.64(a)(8)

10 CFR 70.64(a)(8) requires that the design of IROFS must provide for adequate inspection, testing, and maintenance, to ensure their availability and reliability to perform their function when needed. See Section 16 of this SER for the staff's discussion and evaluation.

Section 2.12 of NFS' license, titled, "Management Measures for IROFS," describes in detail NFS' program for inspection, testing, and maintenance of IROFS. In addition, in Section 2.12 of its license, NFS committed to establish a Configuration Management (CM) program that includes design requirements for new and changed operations and for testing, inspection, and maintenance of IROFS. The staff notes that NFS intends to apply these management measures in a graded manner as indicated in its license application. In general, this graded manner is that IROFS designed to address high consequence events will be inspected, tested, and maintained on a more frequent basis and in a more thorough manner than IROFS identified for intermediate consequence events. The NRC staff reviewed the management measures commitments in detail and its proposed approach for grading management measures and determined that NFS has provided for adequate inspection, testing, and maintenance of IROFS to ensure their availability and reliability to perform their function when needed.

Based on the staff's review of the ISA Summary, and the NFS license including the license commitments, the staff concludes that the design of the OCB/EPB meets the requirements of 10 CFR 70.64(a)(8).

4.1.9 Criticality Control, 70.64(a)(9)

10 CFR 70.64(a)(9) requires that the design must provide for criticality control including adherence to the double contingency principle. See Section 9 of this SER for the staff's evaluation and conclusion.

4.1.10

4.1.11 Evaluation Findings

Based on the staff's review of the license amendment application, the ISA Summary, the NRC staff on-site review, and supporting information provided by NFS, the staff concludes that NFS has met the BDC set forth in 10 CFR 70.64(a).

4.2 Defense-in-Depth, 70.64(b)

4.2.1 Discussion

10 CFR 70.64(b) states that facility and system design and facility layout must be based on defense-in-depth practices. The design must incorporate, to the extent practicable: (1) preference for engineered controls over administrative controls to increase overall system reliability; and (2) features that enhance safety by reducing challenges to IROFS.

Defense-in-depth principles are addressed in OCB/EPB operations through the listed IROFS and supporting programs and analyses NCSEs and fire hazards analyses (FHAs). The listed IROFS provide successive levels of protection for postulated failures and events. The NCSEs and the FHA provide additional defense-in-depth practices to supplement the designated IROFS and provide an added degree of redundancy for fire and criticality protection controls. The Chemical and Radiological Safety programs in NFS' license for worker and public protection provide similar defense-in-depth protection. These programs and safety analyses will be implemented as part of the OCB/EPB design to ensure that defense-in-depth is adequately addressed, including preference for engineered controls over administrative controls and reduction of IROFS challenges. The NRC staff finds NFS' application of this principle acceptable. Defense-in-depth practices are discussed further in the criticality safety and fire safety sections of this SER, Sections 9 and 11, respectively.

4.2.2 Evaluation Findings

The staff concludes that the design of the OCB/EPB facilities, and the IROFS in particular, meet the defense-in-depth provisions and the preference for engineered controls over administrative controls stated in 10 CFR 70.64 (b).

5.0 GENERAL INFORMATION

10 CFR 70.22(a)(2) requires NFS to describe the activity for which the SNM is requested, the place at which the activity will be performed, and the general plan for carrying out that activity. NFS provided this information in its license amendment application dated October 23, 2003. The activities to be conducted in the OCB and EPB within the BLEU Complex area on the NFS Site in Erwin, TN, are the conversion of the low enriched uranium nitrate (LEUN) solution into UO_2 and U_3O_8 powder for off-site shipment (in the OCB) and the processing of the liquid waste streams from the OCB processes as well as the recovery of ammonia (in the EPB). The general plan is described in the amendment application. The NRC staff has determined that these activities are licensable by the Commission under Section 103 of the Atomic Energy Act, in accordance with 10 CFR 70.23(a).

This section describes the NFS OCB and EPB processes, institutional information (such as corporate identity; financial qualifications; and type, quantity, and form of SNM), and the NFS site (such as population, geology, meteorology, and hydrology). This section also describes the NRC staff's findings on licensee compliance with the regulatory requirements.

5.1 Facility and Process Description

NFS provided facility and process descriptions in its submittals dated October 23, 2003.

5.1.1 Discussion

This chapter of the SER contains the staff's discussion of the NFS OCB/EPB process descriptions provided by the licensee in its OCB/EPB submittals and responses to the NRC Request for Additional Information (RAI). The facility and process description were reviewed to determine the following: 1) that the application presented information at an appropriate level of detail for general familiarization and understanding of the proposed facility and processes, 2) that the application summarizes the information in the ISA Summary including drawings, geographical features, and facility structures and their relationships to the process, 3) that the major chemical and mechanical processes involving licensable quantities of SNM including waste processes and discharge points are adequately described, and 4) whether the application includes a summary of raw materials, by-products, wastes, and finished products of the facility including expected levels of trace impurities or contaminants and proposed possession of moderator or reflectors with special characteristics.

5.1.1.1 NFS Facility

5.1.1.2 Process

5.1.2 Evaluation Findings

The NRC staff has reviewed the general facility description for the proposed NFS OCB and EPB according to Section 1.1 of the SRP. NFS has adequately described (1) the facility and processes so that the staff has an overall understanding of the relationships of the facility features and (2) the function of each feature. NFS has cross-referenced its general description with the more detailed descriptions elsewhere in the application. The NRC staff concludes that NFS has complied with the general requirements of 10 CFR 70.22, "Contents of Applications," 10 CFR 70.60, "Applicability," and 10 CFR 70.65(b)(2) and (3), "Additional Content of Applications," as applicable to this section.

5.2 Site Description

NFS provided facility and process descriptions in its submittal dated October 23, 2003.

5.2.1 Discussion

This section of the SER contains the NRC staff's review of the site description provided by NFS in the OCB/EPB submittal. The site description is a summary of information presented in greater detail in NFS' ER, emergency plan, and ISA Summary. The description includes

geography, population information, meteorology, hydrology, and geology. The objective of the staff review is to: 1) ensure that site conditions, including site geography, demographics, meteorology, hydrology, and geology are accurately described in order to properly define potential accident conditions; and 2) determine whether the IROFS, identified by the licensee, provide reasonable assurance of protection against natural phenomena hazards and the consequences of potential credible accidents. The review of the site description was closely coordinated with the natural phenomena accident sequences, discussed in the ISA Summary, and the review of other plant systems. The staff evaluated the site description information provided by the licensee by reviewing Section 1.0 of the ISA Summary, other supplementary information, and relevant documents available at the licensee's offices but not submitted by the licensee.

5.2.1.1 Site Geography

The BLEU complex, and more specifically the proposed OCB/EPB, is intended to be built in Erwin, TN, which is located in the center of Unicoi County in the northeast portion of the state. The site is in the Banner Hill community within the Erwin town limits, approximately 50 miles [80,000 meters] north-northeast of Asheville, North Carolina, and approximately 20 miles [32,000 meters] south of Johnson City, TN.

The NFS site is located in a long, narrow valley located in the Appalachian range, whose peaks have a maximum elevation of 2480 feet [756 meters]. The valley is oriented in a southwest to northeast direction. The site is located at an elevation between 1638 to 1680 feet [499 to 512 meters] above sea level.

NFS provided a site boundary diagram, showing the Controlled Area that includes that main office, storage, waste handling, and production areas. The Controlled Area is surrounded by a fence and monitored by a security force. The NRC staff has visited the NFS site and reviewed the proposed description and finds this description of the site geography to be accurate and therefore acceptable.

5.2.1.2 Population Information (Demographics)

The 2000 U.S. Census recorded a population in Erwin of 5,610 persons and of 17,667 persons in Unicoi County. A one mile [2200 meters] radius around the site includes residential neighborhoods of Banner Hill, Love Station, and Evergreen. The estimated population within a

one mile radius is 2,800 people. The following public and industrial facilities, with occupancies greater than 10 persons, are located within 1 mile [2200 meters] of the site (with their anticipated occupancies): Gentry Stadium (2,500), Love Chapel Elementary School (250), Erwin Health Care Center (200), White's Plaza (200), A B Plastics (150), Impact Plastics, Inc., (80), Studsvik Processing Facility (60), Georgia Pacific (58), CSR Poly Pipe, Inc., (35), Erwin Modular Structures (20), CSX Transportation Railroad Yard (20), Integri-Seal Industries (13), Bear Mountain Outfitters (10), Preston Tool and Mold (10), NFS Industrial Park Facility (10). These land uses may be described as primarily residential and industrial. The staff has visited the site and reviewed the areas local at the site and finds this description to be accurate and therefore acceptable.

The primary use of the Nolichucky River is for public recreation. The recreational uses include fishing, wading, rafting, paddling, and camping.

5.2.1.3 Meteorology

NFS provided this description of the site meteorology: The climate in the vicinity is characterized by warm, humid summers and relatively mild winters. Cooler, drier weather in the area is usually associated with polar continental air masses, whereas warmer, wetter weather is generally associated with gulf maritime masses. The average annual temperature in 2000 was 55.1°F [12.8°C]. The average daily minimum temperature was 23.8°F [-4.6°C] in January and 83.4°F [28.6°C] in July.

The average annual precipitation in the Erwin area is 41 inches [104 cm] and the average snowfall is 16 inches [41 cm]. Data from 2000 indicated that the highest 24-hour precipitation was 2.31 inches [58 cm]. Prevailing winds tend to be from the southwest following the orientation of the valley. The 30 year average wind speed is 6.9 mph [3.1 m/s] from the southwest. The NRC staff reviewed the meteorological data provided by NFS for the Tri-Cities Regional Airport and for the NFS site. The NRC staff compared the data and finds that it reasonably represents the meteorological conditions (wind and precipitation) for the site.

Severe storm conditions are rare in the Erwin, TN area. This area is east of the center of tornado activity, south of blizzard areas, and too far inland to be affected by hurricane activity. NOAA regional data recorded a maximum wind speed of 50 mph [22 m/s] in 1951, and a peak wind gust of 86 mph [38 m/s] in 1995. Wind data from the NFS site collected over approximately the last three years indicate a maximum sustained wind speed of 29 mph [13 m/s]. A risk analysis of the site indicates a moderate to severe risk of facility damage due to lightning strike.

Only one tornado has been recorded in the county since 1950. This tornado occurred on July 10, 1980. In this event, no deaths and 12 injuries were reported with damage concentrated in the north side of Erwin and in the Limestone Cove area of northwest Unicoi county. Two adjacent counties have reported two tornados each over the last 50 years. The topography of the area provides a measure of protection against tornados. For Unicoi County, data indicate a

probability of 2 tornados per 100 years over 186 sq. miles [48,174 hectares] or a probability of 2.5E-6 per year for a tornado striking a site the size of the NFS controlled area (0.047 sq. miles [12.2 hectares]). The staff has reviewed this meteorological data against its sources and finds that it is accurate and therefore is acceptable.

5.2.1.4 Hydrology

The majority of the hydrology information reviewed by the staff was found in the NFS ISA Summary and in the ER for the renewal of the NFS license, dated December 1996. There are four major surface water bodies: Banner Spring Branch, Martin Creek, North Indian Creek, and the Nolichucky River. Water surfacing in Banner Spring flows to Martin Creek, North Indian Creek, eventually emptying into the Nolichucky River. The average flow of the Nolichucky River is 1,222 ft^3/s [34.6 m^3/s]. The Banner Spring Branch lies entirely within NFS property, North Indian Creek is north of the site, Martin Creek lies just north of the north site boundary, and the Nolichucky River is west of the site boundary. Surface water runoff from the NFS site and BLEU complex will be directed into Martin Creek via local branch streams and site drainage structures.

Groundwater flows in a generally northwest direction toward the Nolichucky River, which is the major discharge zone for the groundwater. Groundwater quality is generally good with principal dissolved constituents being calcium, magnesium carbonate, and bicarbonate, regardless of production zone geology. The dolomitic host rock has the greatest influence on groundwater quality. There are no known household, public or industrial users of groundwater downgradient of the NFS site. Although most drinking water is municipal supply, wells and springs are an important source of water for individuals and communities in the area. Tennessee Department of Environment and Conservation records indicate that domestic wells are cased and installed in bedrock formations to tap water present in the deeper portions of the aquifer.

The NFS site is not within the 100 year flood plain for the Nolichucky River, however, it is within the 100 year flood plain for Martin Creek. The 100-year flood plain for Martin Creek extends to an elevation of 1,640 feet [500 meters] feet above sea level. NFS stated that the OCB and EPB buildings are well above the base flood elevation of the 100-year flood plain. A 100-year flood of Martin Creek would result in water depths over areas below 1640 feet [500 meters] above sea level of approximately 1-2 feet [0.3-0.6 meters] possibly resulting in the loss of power or other utility systems (such as public sewer) that support OCB and EPB operations. Recent changes in a drainage culvert by the CSX Railroad may have a positive effect on the 100 year flood elevation. The NRC staff has reviewed the submitted information and toured the site and finds that the information is accurate and therefore is acceptable.

5.2.1.5 Geology and Seismology

The NFS site is in the Blue Ridge physiographic province of northeastern Tennessee. The area topology consists of alternating valleys and ridges that have a northeast-southwest trend, with the NFS site located in a valley. This valley topology is primarily the result of stream erosion of the softer shales and limestones.

NFS, in its ER, provided additional information on the physiography and geology of the site. Three dolomite formations that underlie the valley are associated with a large band of sandstone, siltstone, shale, dolomite, and limestone. Large areas of these formations are covered by deep soils originating from adjacent mountains and from stream flooding. Consolidated bedrock underlying the site either provides firm foundations for buildings or for building footings. Structures constructed on unconsolidated alluvium in the former flood plains and terraces of the Nolichucky River are subject to settlement during the first 2-3 years following construction. The NFS site is not likely to experience slope failure or erosion or river bank slope failures due to its location on the former flood plain and its setback from the river.

The NFS site is located in the Southern Appalachian Tectonic Province, extending from central Virginia to central Alabama and from the western edge of the Piedmont Province to the Cumberland Plateau Province. This area has a moderate level of historical earthquake activity. The NFS site is designated as Seismic Zone 2, corresponding to damage associated with Intensity VII on the Modified Mercalli scale. The seismic design of the OCB/EPB is discussed in Section 4.1.2 of this SER. There is no evidence of capable faults (defined in 10 CFR Part 100) in the immediate area of NFS. NFS has done a seismic analysis of the site and determined that there is no evidence of geologically recent fault displacements on the site associated with capable faults on the NFS site or in the region. The analysis concluded that an effective peak horizontal ground acceleration of 0.06 g may be expected to occur at a 1000-year return period for a safe shutdown earthquake. The associated vertical component of this peak acceleration is two-thirds of the horizontal, or 0.04 g. The environmental review concluded that an earthquake with a peak horizontal acceleration of 0.18 g could occur once every 2000 years.

Slope stability was not specifically addressed in the general site description provided by NFS. In evaluating the natural phenomena applicable to the site, however, debris avalanching and landslides were determined not to be applicable to the site because the site is relatively flat and no significant quantities of soil or rock are available in the immediate area. An examination of the topographic contours provided in the ISA Summary confirms that the slopes of the facility site are gentle in nature and, therefore, pose no threat for instability or landslide. The staff site visit further confirmed that slope stability is not a safety concern for the NFS site.

The NRC staff reviewed the information about site geology and seismology presented by NFS for the proposed OCB and EPB and found it sufficient because all potentially significant seismic information has been identified and assessed. Information provided by NFS to determine tectonic setting of the facility was developed into a coherent, well-documented discussion that provided an adequate technical basis for evaluation of the seismic potential of the site. The staff reviewed the information in the license submittal, ISA Summary and other referenced documents and found it acceptable because the basic geologic and seismic characteristics of the site and vicinity were adequately described in sufficient detail to form a seismic design basis for the facility.

5.2.2 Evaluation Findings

The staff has reviewed the site description for the NFS OCB and EPB according to Section 1.3 of the SRP. NFS has adequately described and summarized general information pertaining to (1) site geography, including its location relative to prominent natural features and infrastructure such as mountains, rivers, airports, population centers, schools, and commercial and manufacturing facilities; (2) population distribution as a function of distance from the facility; (3) meteorology, hydrology, and geology for the site; and (4) applicable design basis events. The review verified that the site description is consistent with the information used as a basis for the ER, emergency management plan, and ISA Summary.

5.3 Institutional Information

5.3.1 Discussion

10 CFR 70.22(a) requires that a license application contain certain information. Section 1.2.4.3 of the SRP provides that the application will be deemed acceptable if it meets specified criteria related to the the licensee's corporate identity; its financial qualifications; the type, quantity, and form of licensed material; the authorized uses, and any special exemptions or special authorizations. Because NFS is not a new licensee, the NRC staff reviewed only the license changes related to the OCB/EPB amendment application, using the acceptance criteria in Section 1.2.4.3 of the SRP.

5.3.1.1 Corporate Identity

This section concerns the identification of NFS and its corporate ownership. Although Framatome, a corporation with some foreign ownership, is the prime contractor to the Tennessee Valley Authority (TVA) for the BLEU project, and NFS is a subcontractor to Framatome, the contract between Framatome and NFS does not convey any control or ownership of NFS to Framatome. Section 1.1 of the license renewal application describes NFS corporate ownership, and NFS' letter dated August 23, 2002, stated that no changes are necessary to Chapter 1 of the referenced license with respect to the requirements of 10 CFR 70.22(a)(1). The NRC staff finds this acceptable.

5.3.1.2 Financial Qualifications

The NRC staff has evaluated NFS' plans and financial assurance for decommissioning in accordance with NUREG-1727, "NMSS Decommissioning Standard Review Plan." On the basis of this evaluation, the NRC staff has determined that NFS' plans and financial assurance for decommissioning comply with the NRC's regulations and provide reasonable assurance of protection for workers, the public, and the environment. Further discussion of this review is found in Section 14 of this SER.

5.3.1.3 Type, Quantity, Form, and Authorized Use of Licensed Material

In the OCB/EPB amendment application, NFS did not request any changes to the types, forms, quantities, and proposed authorized uses of licensed materials to be permitted at this facility. NFS' current license, in Appendix B to Chapter 1, authorizes the possession of solid, liquid, and gaseous forms of uranium, and lists the uranium compounds that are authorized. The OCB/EPB material types, forms, and authorized uses are included in this existing authorization.

5.3.1.4 Security of Classified Information

This acceptance criterion is not applicable because no part of the BLEU project is classified.

5.3.2 Evaluation Findings

The staff has reviewed the institutional information for the NFS OCB and EPB according to Section 1.2 of the SRP. On the basis of the review, the NRC staff has determined that NFS has adequately described and documented the corporate structure and financial information, and is in compliance with those portions of 10 CFR 70.22 and 70.65 related to other institutional information. In addition, in accordance with 10 CFR 70.22(a)(2) and (4), NFS has adequately described the types, forms, quantities, and proposed authorized uses of licensed materials to be permitted at this facility.

NFS' proposed activities are consistent with the Atomic Energy Act. NFS has provided all institutional information necessary to understand the ownership, financial qualifications, location, planned activities, and nuclear materials to be handled in connection with the requested license.

6.0 ORGANIZATION AND ADMINISTRATION

This section reviews the organization and administration information presented in NFS' license amendment request. The objective of the review was to determine whether NFS staff are qualified by reason of training and experience to use the material for the purpose requested, in accordance with 10 CFR 70.22. This review also ensures that the qualifications for key management positions are adequate.

The NFS license amendment request, dated October 23, 2003, did not propose changes to the NFS organization and administration. However, by application dated January 9, 2004, NFS requested changes to it's organization structure. This request was approved by Amendment 49, License No. SNM-124 on March 15, 2004. NFS' current organization and administration is described in the license, SNM-124, Part I, Chapter 2. Section 2.2 identifies the key positions with safety- and quality-related responsibilities, and Section 2.3 describes minimum personnel education and experience requirements for these positions. Section 2.4 describes the membership and responsibilities of the Safety Review Committee. Part II, Chapter 11 of the NFS license includes a functional organization chart. The NRC staff has reviewed NFS'

management organization and management policies for providing adequate safety management for the safe operation of the OCB/EPB and concludes that NFS' existing management organization, administrative policies, and resources are sufficient to provide for the safe operation of the OCB/EPB under both normal and abnormal conditions.

7.0 SAFETY PROGRAM AND INTEGRATED SAFETY ANALYSIS

7.1 Safety Program, 70.62(a)

7.1.1 Discussion

10 CFR 70.62(a)(1) requires the licensee to establish and maintain a safety program that demonstrates compliance with the performance requirements of 10 CFR 70.61. The safety program may be graded such that management measures applied are graded commensurate with the reduction of the risk attributable to that IROFS. The safety program contains three elements: process safety information, ISA, and management measures. The process safety information and ISA are discussed in this section of this SER. Management measures are discussed in Section 16 of this SER.

10 CFR 70.62(a)(2) requires the licensee to establish and maintain records that demonstrate compliance with the process safety information, ISA, and management measures requirements of 10 CFR 70.62.

10 CFR 70.62(a)(3) requires the licensee to maintain records of failures readily retrievable and available for NRC inspection, documenting each discovery that an IROFS or management measure has failed to perform its intended function upon demand or has degraded such that the performance requirements of 10 CFR 70.61(b) or (c) are not satisfied. These records must identify the IROFS, or management measure that has failed and the safety function affected, the date of discovery, date (or estimated date) of the failure, duration (or estimated duration) of the time that the item was unable to perform its function, any other affected IROFS or management measures and their safety function, affected processes, cause of the failure, whether the failure was in the context of the performance requirements or upon demand or both, and any corrective or compensatory action that was taken. A failure must be recorded at the time of discovery and the record of that failure updated promptly upon the conclusion of each failure investigation of an IROFS or management measure.

7.1.2 Evaluation Findings

The OCB/EPB ISA Summary specifies the record-keeping requirements for the management measures designed to maintain the reliability of IROFS. NFS will maintain records of the safety program and of IROFS and management failures in accordance with the commitments in Section 2.12 of the license. The NRC staff has determined that this commitment is in compliance with 10 CFR 70.62(a) and is acceptable.

7.2 ISA and ISA Summary, 70.62(c) and 70.65(b)

7.2.1 Discussion

10 CFR 70.62(c) requires the licensee to conduct and maintain an ISA, that is of appropriate detail for the complexity of the process, that identifies:

(i) Radiological hazards related to possessing or processing licensed material;
(ii) Chemical hazards of licensed material and hazardous chemicals produced from licensed material;
(iii) Facility hazards that could affect the safety of licensed materials and thus present an increased radiological risk;
(iv) Potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena;
(v) The consequence and the likelihood of occurrence of each potential accident sequence identified pursuant to 70.62(c)(1)(iv) and the methods used to determine the consequences and likelihoods; and
(vi) Each item relied on for safety identified pursuant to 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 70.61.

10 CFR 70.65(b) requires that an ISA Summary be submitted with the amendment application and that the ISA Summary must contain nine items. These 9 items are discussed in Sections 7.3.1.1 through 7.3.1.9 of this SER.

7.2.1.1 General description of the site 70.65(b)(1)

10 CFR 70.65(b)(1) requires that NFS describe the OCB/EPB site with emphasis on those factors that could affect safety. NFS described the site in the OCB/EPB license amendment request and in the ISA Summary supporting the request and identified those factors that could affect safety. The OCB/EPB is constructed inside the controlled area boundary on the NFS Erwin site. Therefore, the addition of the OCB/EPB does not increase the total area of the NFS site.

7.2.1.2 General description of the facility 70.65(b)(2)

7.2.1.3 Process descriptions, hazards, types of accident sequences, 70.62(b), 70.62(c)(1)(iv), and 70.65(b)(3)

10 CFR 70.62(b) requires the licensee to maintain process safety information to enable the performance and maintenance of an ISA. This process safety information must include information pertaining to the hazards of the materials used or produced in the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process. 10 CFR 70.62(c)(1)(iv) requires that the ISA identify potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena. 10 CFR 70.65(b)(3) requires the ISA Summary to include a description of each process (defined as a single reasonably simple integrated unit operation within an overall production line) analyzed in the ISA in sufficient detail to understand the theory of operation, and, for each process, the hazards that were identified in the ISA and a general description of the types of accident sequences.

NFS described the processes in Section 3.0 of the ISA Summary. The process description is made up of nine sections: precipitation, dryer/calciner, oxide blending, uranium recovery, dissolution, ventilation, AR, liquid waste and bulk chemical storage. Each section except bulk chemical storage is divided into six sub-sections: process description, criticality safety, chemical safety, radiological safety, fire safety, and environmental safety. Bulk chemical storage is divided into chemical safety and environmental safety. NFS provided additional process information in the RAI replies, and the NRC staff reviewed the piping and instrumentation diagrams (P&IDs) during the on-site visit and subsequent meetings. The five safety evaluation subsections define the hazards and controls involved in the process from the applicable safety perspective. The chemical and radiological safety sections address hazards to the worker, and the environmental safety section addresses both chemical and radiological hazards to the public.

NFS provided a table at the end of each of the nine process descriptions to summarize the significant hazards and controls involved in the process for each of the five safety disciplines (ISA Summary Tables 3-1 through 3-9). These hazards included radiological hazards related to processing licensed material, chemical hazards of licensed material and hazardous chemicals produced from licensed material, and facility hazards that could affect the safety of licensed material and thus present an increased radiological risk. The controls listed in the tables

include system design features and safety program controls, in addition to IROFS controls. The NRC staff evaluation of these hazards is discussed in the individual safety discipline chapters.

The following external facility hazards were also evaluated:

Traffic Accident

Carolina Avenue runs parallel to the eastern property boundary of the NFS site, approximately 500 feet [114 meters] from the site Controlled Area. Although the hazard due to traffic has not been specifically evaluated, NFS does not consider normal vehicular traffic to be a significant concern for NFS operations. The NRC staff has reviewed this information and the site, and finds this evaluation to be acceptable and the consequences of this accident to be bounded by other more severe postulated accidents. The NRC staff evaluation of a traffic accident is discussed in the NRC SER for Nuclear Fuel Services, Inc., License Amendment 39.

Airplane Accident

An airplane accident has already been evaluated by the staff in The SER for Nuclear Fuel Services, Inc. License Amendment 39.

Accident at Studsvik Processing Facility

An accident at the Studsvik Processing Facility has already been evaluated by the staff in The SER for License Amendment 39.

Natural Phenomena Hazards

The effects of natural phenomena on the site are described in Section 4.1.2 (including subsections 4.1.2.1 through 4.1.2.5) of the NRC SER.

10 CFR 70.65(b)(4) requires that the ISA Summary contain information that demonstrates the licensee's compliance with the performance requirements of 70.61, including a description of the management measures, the requirements for criticality monitoring and alarms in 70.24, and the requirements of 70.64. 10 CFR 70.61(b) requires that the risk of each credible high-consequence event be limited. Engineered controls, administrative controls, or both, shall be applied to the extent needed to reduce the likelihood of the event so that, upon implementation of such controls, the event is highly unlikely or its consequences are less severe than those in paragraphs (b)(1)-(4) of 10 CFR 70.61. 10 CFR 70.61(c) requires that the risk of each credible intermediate-consequence event be limited. Engineered controls, administrative controls, or both, shall be applied to the extent needed to reduce the likelihood of the event so that, upon implementation of such controls, the event is unlikely or its consequences are less severe than those in paragraphs (c)(1)-(4) of 10 CFR 70.61. 10 CFR 70.61(d) requires that the risk of nuclear criticality accidents be limited by assuring that under normal and credible abnormal conditions, all nuclear processes are subcritical including an approved margin of subcriticality for safety. Preventive controls (as opposed to mitigative controls) must be the primary means of protection against nuclear criticality accidents.

The SRP Section 3.4.3.2 item (4) states that this demonstration of compliance with the performance requirements of 10 CFR 70.65(b)(4) is acceptable if it addresses the following three elements: (1) completeness, (2) consequences, and (3) likelihood. Completeness refers to the fact that the ISA must address each credible event. Consequences refer to the magnitude of the chemical and radiological doses of the accident and is the basis upon which an accident is classified in 10 CFR 70.61 to be a high or intermediate consequence event. Likelihood refers to the fact that 10 CFR 70.61 requires that intermediate consequence events be unlikely and high consequence events be highly unlikely. The NFS approach to each of these elements is discussed below.

Completeness

NFS conducted a PHA on each OCB/EPB process system with joint consideration of radiological, criticality, fire, and chemical hazards. NFS used the "What-if" methodology, described in NUREG-1513,"Integrated Safety Analysis Guidance Document," for the PHA in the OCB/EPB. This methodology involves a detailed evaluation by the ISA Team for each

OCB/EPB process, including the utility and auxiliary support systems, to determine the potential impact of specific component failures. Each credible failure is identified as a specific accident sequence and specific types of consequences are identified for each sequence (radiological release, chemical release, criticality, fire and explosion, environmental).

NFS integrated the OCB/EPB ISA to adequately consider common mode and common cause situations, impacts of IROFS that may be simultaneously beneficial and harmful with respect to different hazards, and interactions that may not have been considered in previously completed analyses. The multi-discipline team considered the potential interaction and integration issues for each process and utility system review and determined the ISA Summary to be complete.

Consequences

The ISA Team evaluated the consequences of all types of failure for each valve, tank, pipe, or control system identified on the system design drawings. After identification of the accident sequences, the specific sequences are evaluated and grouped to determine the consequences for worker or public exposure. The consequence calculations for specific accident sequences or groups of accident sequences are reviewed to determine those that exceed or equal the 10 CFR 70.61 intermediate or high-consequence levels. The results of the consequence analysis for the OCB/EPB are reported in Section 4.2 of the OCB/EPB ISA Summary.

Table 7-1 of the OCB/EPB ISA Summary identifies the radiological exposure levels from 10 CFR 70.61, along with the chemical exposure levels from the SRP. Table 7-2 of the OCB/EPB ISA Summary supplements Table 7-1 by specifically defining the limits required by 10 CFR 70.61(c)(3). Table 7-3 specifically defines the Emergency Response Planning Guidelines ERPG-1, ERPG-2, and ERPG-3 levels for each chemical used in the OCB/EPB processing operations. Where ERPG levels have not been established, Temporary Emergency Exposure Levels (TEELs) developed by the U.S. Department of Energy (DOE) Subcommittee on Consequence Assessment and Protective Actions have been adopted. For determining intermediate and high chemical exposures to the worker from soluble uranium, DOE-STD-1136-2000 *Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities*, was used as a basis for exposures that could endanger life or lead to serious health effects.

The exposure levels in these three tables are used as the basis for determining high, intermediate, and low consequence events identified in Section 4.2 of the OCB/EPB ISA Summary. They conform to the definitions of high and intermediate consequences as required in 10 CFR 70.61(b)(1-4) and 10 CFR 70.61(c)(1)-(4).

NCSEs are specialized studies that, along with defense in depth, assure that the risk of having a criticality accident is highly unlikely and that the double contingency principle as defined in 10 CFR 70.4 is satisfied. NCSEs provide the technical basis for limits and controls necessary to assure NCS. The criticality hazards and controls from the NCSEs are summarized in Section 3 of the OCB/EPB ISA Summary. The risk assessment is described in Section 4.3 of the ISA Summary, and the final IROFS defined in the NCSEs are listed in Section 6.1 of the ISA Summary.

NFS conducted an FHA for the OCB/EPB to evaluate the facility design with respect to fire safety codes and to ensure that the facility was built such as to ensure that there is an acceptable risk for postulated fire accident scenarios. The fire hazards and controls from the FHA are summarized in Section 3 of the ISA Summary for each OCB/EPB process. The NRC reviewed the consequences determined for the accident sequences and found them to be appropriate.

Likelihood

In Section 5.2.3, Risk Categorization, of the ISA Summary, NFS described the methodology for determining that events are unlikely or highly unlikely. The ISA Summary specifies the likelihood of each accident sequence that could exceed the performance requirements of 10 CFR 70.61(b) and (c). The likelihoods contained in the ISA Summary are derived using a method described in the ISA Summary. NFS' definitions of "unlikely" and "highly unlikely" are discussed in Section 7.3.1.9 of this SER.

For each credible accident sequence identified, NFS assigned a consequence category number (1, 2, or 3) based on the specific consequences of each sequence. The consequence categories and corresponding levels are defined in Table 5-3, Consequence Severity Categories Based on 10 CFR 70.61, of the OCB/EPB ISA Summary.

For each credible accident sequence, the initiating event leading to the accident is identified. If a single initiating event cannot be identified, the conditions that must be met to create the accident are analyzed. An Initiating Event Frequency Index is assigned to each credible accident scenario based on past experience, engineering judgement, analytical data, industry acceptable values, and/or any other applicable information. Initiating Event Frequency is defined as the probability of occurrence of the initiating event or initiating set of conditions. The index assignments range from -5, which represents 1 failure in 100,000 years, to +1, which represents several occurrences per year. These indexes are defined in Table 5-4, Initiating Event Frequency, of the OCB/EPB ISA Summary.

IROFS are identified and assigned to all high or intermediate consequence accident scenarios. The IROFS are designated engineered or administrative controls that provide reasonable assurance, through preventive or mitigative measures, that the safety performance requirements of 10 CFR 70.61 are met. In Section 5.2.3.3 of the OCB/EPB ISA Summary, NFS stated that the IROFS must be:

- Designed to prevent or mitigate specific potentially hazardous events. Each identified potential hazard should have corresponding specific protection strategies.
- Independent so that there is no dependence on components of other protection layers associated with an identified hazard. There must also be no linkage between the initiating event and the ability of the IROFS to perform as required.
- Dependable so that they can be relied on to operate in the prescribed manner. Both random and specific failure modes should be considered in the assessment if the probability exists of protection layers failing on demand or failing during their mission.

If human intervention is included as an IROFS, then the response time and corresponding human error probability must be considered.

- Auditable in that they are designed to facilitate regular validation, including testing, and maintenance of the protective functions.

As noted above, IROFS must be independent so that there is no dependence on components of other protective layers associated with an identified hazard. Various active engineered controls and enhanced administrative controls listed in Table 4-10 through 4-12 of the ISA Summary, as providing for the mitigation or prevention of specific event scenarios appeared to be possibly designed with shared components. During the vertical slice onsite review on February 10-11, 2004, (memorandum from R. Wescott to G. Janosko dated March 11, 2004) the staff asked NFS to discuss the independence of several IROFS which were representative of the concern for sharing of components. The staff found no shared components in the IROFS reviewed and concluded that the use of shared components for independent IROFS is not a staff concern for the OCB/EPB design.

When a failure of an IROFS is the initiating event, the IROFS Effectiveness of Protection Index is selected from Table 5-5 of the OCB/EPB ISA Summary. The IROFS that triggers the accident scenario may also be assigned a Duration Index as specified in Table 5-6 of the OCM/EPB ISA Summary. The Duration Index is a qualitative measurement of the time the system is vulnerable to the failure of a second IROFS when the second IROFS prevents a credible high or intermediate consequence accident sequence from occurring. As such, the accident sequence is also evaluated by reversing the sequence of failure to determine the system vulnerability based on failing the second IROFS first. The Failure Duration Index numbers range from -5, which indicates an average failure duration of 5 minutes, to +1, which indicates an average failure duration of more than 3 years.

The staff's primary focus in this review was the basic accident sequences starting with a credible initiator. The purpose of the review was to assure that the assumed initiator frequencies and IROFS effectiveness indices were reasonable and conservative. The duration index is considered to be a qualitative measure of system vulnerability and its determination is not a replacement for the comprehensive evaluation and formulation of management measures needed to assure the effectiveness of IROFS as used in the analyses.

A Controlled Likelihood (IROFS in place) and an Uncontrolled Likelihood (IROFS not in place) are calculated to demonstrate the relative importance of the IROFS in preventing or mitigating the accident sequence to meet the performance requirements. A Controlled Likelihood Index, T, is calculated by summing the Initiating Event Effectiveness of Protection Index and the IROFS Effectiveness of Protection Index(es). If the initiating event is an IROFS failure, then the Controlled Likelihood Index, T, is calculated by summing the IROFS Effectiveness of Protection Indexes and the Failure Duration Index. An Uncontrolled Likelihood Index, T, is calculated by using the Initiating Event Effectiveness of Protection Index or the IROFS Effectiveness of Protection Index as applicable. Controlled and Uncontrolled Likelihood Categories are then assigned from Table 5-7, Total Risk Likelihood Category, of the OCB/EPB ISA Summary.

Controlled and Uncontrolled Likelihood Indices and Likelihood Categories for all credible high or intermediate consequence accident scenarios are assigned and documented in Section 4.3 of the OCB/EPB ISA Summary.

Table 7-1 NFS Proposed Total Risk Likelihood Category

Likelihood Category	Likelihood Index (T) (sum of Index numbers)
1	$T \leq -4$
2	$-4 < T \leq -3$
3	$T > -3$

Qualitative values for the likelihood and consequence categories are plotted on the Risk Matrix, Table 5-8 of the OCB/EPB ISA Summary, for categorization of controlled and uncontrolled Risk. The controlled risk is calculated by multiplying the consequence category by the controlled likelihood category. The uncontrolled risk is calculated by multiplying the consequence category by the uncontrolled likelihood category. 10 CFR 70.61 performance requirement acceptability is determined by comparing the controlled Risk to Table 5-8. As shown in Table 5-8 of the ISA Summary, a risk greater than 4 is unacceptable and does not meet the performance requirements. Controlled and uncontrolled risk for all credible high or intermediate consequence accident scenarios are assigned and documented in Section 4.3 of the OCB/EPB ISA Summary.

Table 7-2 NFS Proposed RISK MATRIX

	Likelihood Cat. 1 Highly Unlikely	Likelihood Cat. 2 Unlikely	Likelihood Cat. 3 Not Unlikely
Consequence Cat. 3 High	3 Acceptable	6 Unacceptable	9 Unacceptable
Consequence Cat. 2 Intermediate	2 Acceptable	4 Acceptable	6 Unacceptable
Consequence Cat. 1 Low	1 Acceptable	2 Acceptable	3 Acceptable

Crediting management measures such as surveillance and maintenance as an independent IROFS. Related to the same sequences as listed in the above concern, the ISA Summary credited management measures such as periodic inspection and maintenance as an independent IROFS ID No. OCB-8. These periodic inspections and maintenance would normally be considered a part of the first IROFS making (IROFS ID No.) OCB-7 a sole IROFS. In its March 12, 2004, letter, the licensee described the second IROFS as a maintenance program which controls routine work on and around the pipelines and tanks to ensure that the integrity of containment is maintained. Routine inspections performed at a frequency appropriate to the system will be specifically listed as management measures in the ISA file for IROFS ID No. OCB-7. In that mechanical damage will be needed to turn a small corrosion weakness into a major rupture, the staff concludes that these scenarios have two independent IROFS as opposed to one IROFS and its management measure.

The frequency indices assigned to some initiators did not appear to be justified based on the nature of the initiator. A number of sequences, in addition to those listed in the first concern had initiator frequencies that appeared to be inconsistent with those used elsewhere in the ISA Summary for similar initiators or appeared to be too low for the type of failure being postulated. Examples are (1) a leak in the V-38 bottoms line (7.17.9.2) assigned an index of -2 where other leaks were assigned an index of -1; (2) a plugged vent line (17.1.1.1) is assigned an index of -2 where other plugging events were assigned an index of -1; and (3) a number of sequences (38.7.1.2, 43.1.3.1, and 43.18.1.1) which were initiated by human failures and assigned an index of -2. In its letter of March 12, 2004, the licensee committed to change the index of all of the above listed sequences to -1 or 0 except for sequence 43.18.1.1. The reason that sequence 43.18.1.1 was not changed is that starting the scrap dissolver under the conditions postulated requires more than violating a single administrative rule. The licensee's response is acceptable to the staff and did not change the likelihood classification of the sequences. All affected sequences remain highly unlikely.

The overall likelihood of consequences which are prevented by the same IROFS may be underestimated by the assumption of many discrete low probability events. On page 3-15 (NUREG-1520) the SRP states, "The ISA Summary need not list as a separate type of accident sequence, every conceivable permutation of an accident. Accidents having characteristics that all fall in the same categories can be grouped as a single type of accident in the ISA Summary, provided that the following conditions are fulfilled:

- The initiating events have the same effect on the system.
- They all consist of failures of the same IROFS or system of IROFS

- They all result in violation of the safety limit on the same parameter
- They all result in the same type and severity categories of consequences

The following sequences concerning calciner over pressure and having an initiator frequency of -1 appear to fit the above criteria: 5.1.5.2, 5.3.1.1, 5.12.1.1, 6.1.5.1, 6.1.6.1, 6.1.7.1, 6.1.11.1, 6.1.12.1, 6.1.13.1, 6.2.2.1, 6.2.3.1, 6.2.4.1, 6.2.5.5, 6.12.2.1, 7.18.2.2, 7.19.3.4, 7.19.3.7. If all of these initiators are summed, the actual initiation frequency of over-pressure accident sequences is at least an order of magnitude higher than what would be indicated by a single sequence alone and may not meet the performance objectives of 10 CFR 70.61. The licensee stated in its March 12, 2004, letter that, "combination of these scenarios into a single scenario or a handfull of scenarios was considered and rejected. Doing so would require some form of weighted initiating event index that would be very difficult to quantify, especially considering that the initiating event indexes were conservative estimates to begin with." The licensee provided additional information including the degree of conservatism in each of these sequences. The staff concludes from the information provided that if the identified sequences were combined, the actual likelihood of a consequence from calciner over pressure would still be highly unlikely.

ISA Vertical Slice and other In-Office Reviews by Staff

In addition to the review of the ISA Summary, the staff also participated in a vertical slice review on February 10-11, 2004. Many of the issues addressed in the licensee's March 12, 2004, letter were discussed in the vertical slice in-office review. The vertical slice review resulted in an in-depth review of sequences 38.7.1.2, 43.1.3.1, 40.3.2.4, and 5.1.5.2. During the review of these sequences, the staff reviewed applicable P&IDs and Hazard and Operability (HAZOP) method results and met with the licensee to obtain further explanations when required. As discussed earlier, the staff questioned the initiator frequency in sequence 38.7.1.2 and the licensee committed to re-evaluate it. The licensee did re-evaluate this frequency and raised it in its March 12, 2004, letter. The staff concluded that the licensee's ISA analysis was properly performed.

7.2.1.5 ISA Team, qualifications, and methods 70.62(c)(2), 70.65(b)(5)

10 CFR 70.62(c)(2) requires that, to assure the adequacy of the ISA, the analysis must be performed by a team with expertise in engineering and process operations. The team must include at least one person who has experience and knowledge specific to each process being evaluated, and persons who have experience in NCS, radiation safety, fire safety, and chemical process safety. One member of the team must be knowledgeable in the specific ISA methodology being used.

In Section 5.1 of the OCB/EPB ISA Summary, NFS provided a list of the ISA team members and their qualifications. The NRC staff reviewed the training, qualifications, and specialties of the ISA team. The NRC staff found that the team leader has the appropriate formal training and knowledge of the ISA methodology and an adequate understanding of the process

operations to lead the ISA team. The staff also found that the ISA team included at least one member with specific, detailed knowledge of each process, and persons with experience in NCS, radiation safety, fire safety, and chemical process safety. Based on the review of the ISA team description, the staff finds this to be acceptable.

7.2.1.6 IROFS list 70.65(b)(6)

10 CFR 70.65(b)(6) requires that the ISA Summary include a list briefly describing each IROFS which is identified pursuant to 10 CFR 70.61(e) in sufficient detail to understand their functions in relation to the performance requirements of 10 CFR 70.61.

In the OCB/EPB ISA Summary proprietary Tables 6-1, 6-2, 6-3, 6-4, and 6-5, NFS provided lists of IROFS for the five accident types, criticality safety, chemical safety - worker, radiological safety - worker, environmental chemical safety - public, and environmental radiological safety - public, respectively. The tables included an IROFS identifier, safety function description, accident sequence identifier, consequence level, and management measures level (A or B). In response to the NRC questions related to worker exposures to chemicals and soluble uranium, discussed in the Chemical Safety Section 10 of this SER, NFS provided additional IROFS to achieve the performance requirements. The NRC staff reviewed these IROFS lists in view of the accident sequences and determined that the list of IROFS provides sufficient detail to understand their functions in relation to the performance requirements of 70.61 and are acceptable.

7.2.1.7 Quantitative chemical consequence standards 70.65(b)(7)

In addition to the contents of the contents of an application, 10 CFR 70.65(b)(7) requires that the ISA Summary include 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 which are on-site, or expected to be on-site as described in 10 CFR 70.61(b)(4) and (c)(4).

The quantitative chemical consequence levels which NFS used to determine whether a consequence was intermediate or high are provided in Section 7.0 of the ISA Summary. The licensee has chosen Emergency Response Planning Guidance (ERPGs) as consequence levels, or TEELs as action levels when there were no ERPGs yet developed. Due to the constant evolution of TEELs, NFS, in the September 3, 2003, RAI reply for the BPF and during in-office review, has committed to update the TEELs utilized during the annual updates of the ISA Summary.

In the case of soluble uranium intake, 10 CFR 70.61(b)(3) specifies a high consequence to be one involving greater than 30 mg for off-site personnel with no specific level identified for the worker or for intermediate consequences. However, the intake must still meet the requirements of 10 CFR 70.61(b)(4)(i) and (c)(4)(i) when setting high and intermediate consequence levels for soluble uranium. In the NFS response to questions dated October 31, 2003 related to the BPF, NFS chose an intake of 40 mg soluble uranium, which corresponds to the threshold for

permanent renal damage, for determination of high consequence events for workers and 30 mg soluble uranium for intermediate consequence events for workers. In letter dated March 16, 2004, NFS agreed to use the same uranium intake level for the chemical assessment of the OCB and EPB amendment.

The proposed chemical exposure levels are depicted in Table 7-3 of the ISA Summary. In the case of nitrogen oxides, the exposure level for a high and an intermediate consequence to the public were the same. In a March 16, 2004, letter NFS committed to update the limits with new values for nitrogen oxides to provide differentiation between the possible impacts to the receptor. The licensee also states in its March 16, 2004, letter that in instances where a high and an intermediate consequence is defined by the same exposure level, NFS commits to apply controls for a high consequence event.

7.2.1.8 Sole IROFS list 70.65(b)(8)

10 CFR 70.65(b)(8) requires that the ISA Summary include a descriptive list that identifies all IROFS that are the sole item preventing or mitigating an accident sequence that exceeds the performance requirements of 70.61.

7.2.1.9 Definitions of unlikely, highly unlikely, and credible, 70.65(b)(9)

10 CFR 70.65(b)(9) requires the ISA Summary to contain a description of the definitions of unlikely, highly unlikely, and credible as used in the evaluations in the ISA.

In Section 9.0 of the ISA Summary, NFS provided definitions of highly unlikely, unlikely and credible.

NFS defined "highly unlikely" as physically possible or credible, but not expected to occur and as a credible accident scenario/sequence that, based upon a graded combination of IROFS, mitigate or prevent the accident from occurring such that a Qualitative Likelihood Category 1 (per Table 5-6 of the ISA Summary) or a quantifiable probability of less than or equal to 10^{-4} per accident per year exists. Chapter 9 of this SER contains further details on the details of "highly unlikely" with regards to nuclear criticality.

NFS defined "unlikely" as not expected to occur during the plant lifetime. A Credible Accident Scenario/Sequence that, based upon a graded combination of IROFS mitigate or prevent the accident from occurring such that a Qualitative Likelihood Category 1 or 2 (per Table 5-7 of the ISA Summary) or a quantifiable probability of less than or equal to 10^{-3} per accident per year exists.

NFS defined "credible" such that an event or accident sequence is considered "credible" unless it is determined "not credible" by meeting one of the three criteria specified below:

- An event whose frequency of occurrence can conservatively be estimated as 1E-5 events per year or less.
- A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive, excluding intent to cause harm. In order to be considered not credible, no such sequence of events can actually have happened in any fuel cycle facility.
- Process deviations for which there is a convincing argument, based on physical laws or engineering principles, that the deviations are not possible, or unquestionably extremely unlikely. The validity of the argument must not be dependent on any feature of the design or materials which is controlled by the plant's system of IROFS.

The NRC staff reviewed NFS' proposed definitions of "highly unlikely", "unlikely", and "credible" and determined that they are reasonably clear and based on objective criteria and can reasonably be expected to consistently distinguish accidents that are highly unlikely from those that are merely unlikely.

7.2.2 Evaluation Findings

Many hazards and potential accidents can result in unintended exposure of people to radiation, radioactive materials, or toxic chemicals incident to the processing of licensed materials. The NRC staff finds that NFS has performed an ISA to identify and evaluate those hazards in the OCB/EPB and potential accidents as required by 10 CFR 70 Subpart H. The NRC staff has reviewed the OCB/EPB ISA Summary and other information, and finds that it provides reasonable assurance that NFS has identified IROFS and established engineered and administrative controls to ensure compliance with the performance requirements of 10 CFR 70.61. Specifically, the NRC staff finds that the ISA results, as documented in the ISA Summary, provide reasonable assurance that the IROFS, management measures, and NFS' programmatic commitments will make all credible intermediate consequence accidents unlikely and all credible high consequence accidents highly unlikely.

However, in order to assure that the NRC has the most up-to-date ISA Summary prior to performing its Operational Readiness Review, the staff recommends a new Safety Condition, S51, that reads as follows:

S-51 The licensee shall submit a revised OCB/EPB Integrated Safety Analysis Summary that incorporates all changes to date, at least fifteen (15) days prior to the NRC's Operational Readiness Review.

8.0 RADIATION PROTECTION

10 CFR 70.22(a)(7) requires NFS to provide a description of equipment and facilities which will be used by NFS to protect health and minimize danger to life or property, and 10 CFR 70.22 (a)(8) requires NFS to provide proposed procedures to protect health and minimize danger to life or property. 10 CFR 20.1101(a) requires NFS to develop, document, and implement a radiation protection program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of 10 CFR Part 20. The licensee is currently conducting fuel manufacturing under current Materials License SNM-124. Therefore, the licensee's radiation protection program will only need minor changes to incorporate the OCB/EPB activities. Based on radiation exposure records from the operation of the current facilities, doses to workers are expected to be well below the current limits in 10 CFR Part 20 and the performance requirements in 10 CFR 70.61. Also, the OCB/EPB facilities have been designed to keep worker doses as low as reasonably achievable (ALARA).

8.1 Discussion

The significant features of the radiation protection program are discussed in the following subsections.

8.1.1 Radiation Safety Administration

The radiation safety administration program for the OCB/EPB including the ALARA commitment, organization and personnel qualifications, records and reporting, radiation work permit system, and safety procedures will be the same as the current facility. Since the types of radioactive material that will be used at the OCB/EPB are similar to the rest of the facility, the staff finds this safety program acceptable.

8.1.2 Training

The NFS training program for the OCB/EPB will be the same as that for the current facility, which complies with the training requirements in 10 CFR Parts 19 and 20. Since the types of radioactive material that will be used at the OCB/EPB are similar to the rest of the facility, the staff finds this training program acceptable.

8.1.3 System of Exposure Controls

NFS will use the same external exposure controls, internal exposure controls, and administrative action levels for the OCB/EPB as used at the rest of the facility. This will include the personnel radiation dose monitoring program, bioassay program, facility ventilation systems criteria, air sampling program, surface contamination program, and action levels. Since the type

of radioactive material that will be used at the OCB/EPB is similar to the rest of the facility, the staff finds this acceptable.

8.1.4 Instrumentation and Calibration

In Sections 3.2.4 and 12.6 of the NFS license, NFS provides commitments for radiation detection instruments and calibration criteria. Tables 3.2 and 12.2 in these sections list the types and models of instrumentation. In the renewal SER dated July 2, 1999, the staff found NFS' instrumentation and calibration program consistent with the NRC requirements and good industry practices and acceptable. Since the type of radioactive materials that will be used at the OCB/EPB is similar to the rest of the facility, the staff finds this acceptable.

8.1.5 Posting and Labeling

The posting and labeling program for the OCB/EPB will be the same as that for the current facility. Since the type of radioactive materials that will be used at the OCB/EPB is similar to the rest of the facility, the staff finds this acceptable.

8.1.6 Minimization of Contamination

In order to meet the requirements of 10 CFR 20.1406 " Minimization of Contamination," NFS performed an ALARA Design Guidance and Dose Rate Profile review for the OCB/EPB. The staff audited the ALARA review for the OCB/EPB and determined that:

1. NFS considered the general layout of the facility with attention to traffic patterns for ease of decontamination.

2. The designs provided for the control of liquid, solid, and gaseous effluents.

3. The hoods and glove boxes were designed for ease of decontamination.

4. Interior and exterior surfaces were designed to be smooth and free of cracks and crevices to ease future decontamination.

The staff finds the design of the OCB/EPB with respect to the minimization of contamination to be consistent with the NRC requirements and good industry practices, and therefore acceptable.

8.1.7 Controlled Area

70.61(f) requires the licensee to establish a controlled area, as defined in 10 CFR 20.1003, and to retain the authority to exclude or remove personnel and property from the area. NFS has chosen to define the controlled area to be the same as the restricted area for the purposes of compliance with 10 CFR 20.1003. The NRC staff reviewed the boundaries of this controlled area against the regulatory requirements and determined that it is acceptable.

8.2 Evaluation Findings

Upon completion of the review of the radiation protection program for the OCB/EPB, the NRC staff concludes that conformance by NFS to its current license will provide reasonable assurance of safe operation and that the OCB/EPB will meet the requirements of the NRC regulations with respect to radiation protection.

9.0 NUCLEAR CRITICALITY SAFETY

9.1 BACKGROUND/INTRODUCTION

9.2 DISCUSSION

9.2.1 Description of NFS Submittal

9.2.1.1 Definitions of Credible, Unlikely, and Highly Unlikely

Section 9.0 of the ISA Summary gives NFS definitions for highly unlikely, unlikely, and credible. Since these definitions are consistent with the definitions given in the amendment requests for

9.2.1.21

9.2.1.3 Designation of Criticality Safety IROFS

The licensee has committed to the double contingency principle as required by 10 CFR 70.64(a)(9). Table 6-1 of NFS' OCB/EPB ISA Summary identified the IROFS necessary to control the criticality accident sequences such that they are highly unlikely as required by 10 CFR 70.61. These include both engineered and administrative IROFS. The IROFS were assigned an IROFS failure index as identified in Table 4-9 of NFS' OCB/EPB ISA Summary. IROFS failure indices are assigned by category of IROFS as given in Table 5-5 of the ISA Summary, however, more conservative indices may be assigned to an IROFS as appropriate. The index is based on the expectation that IROFS will not fail outside the bounds established by the assigned index with the applied management measures. NFS states that these are based on industry accepted values, past experience, engineering judgment, or analytical data. If failure of an IROFS is the initiating event, a duration index may also be assigned as specified in Table 5-6. A duration index is a measurement of the time the system is vulnerable to the failure of a second IROFS.

The ISA Summary states that set points for interlocks or alarms used in controls will be based on safety limits, instrument and system accuracy, response time, anticipated drift, and other performance factors as appropriate. Calibration and functional test frequencies will also be based on manufacturer's data as appropriate.

Controlled likelihood and uncontrolled likelihood indices are calculated for each accident sequence to demonstrate the relative importance of the IROFS in preventing the accident sequence. An uncontrolled likelihood index is simply the initiating event likelihood index or the IROFS failure index. The controlled likelihood index is calculated by summing the initiating event failure frequency index with the IROFS failure index.

9.2.1.4 Identification of Management Measures

NFS management measures are described in Section 4.4 of the ISA Summary, as well as in the NFS license. The type of IROFS control, along with the risk reduction level credited in the ISA, determines the specific management measures applied to a particular IROFS. IROFS credited with a high level of risk reduction (level A) require a high level of management measures to ensure a high level of reliability. All criticality safety IROFS given in the ISA Summary are considered level A. These management measures include CM, maintenance, training and qualification, procedures, audits and assessments, incidents and investigations, records management, and other quality assurance (QA) elements.

9.2.1.6 Criticality Calculations

9.2.2 NRC Review of NFS Submittal

The staff evaluated those portions of the ISA Summary and associated documentation that pertained to criticality safety of the OCB operations described above. The staff also reviewed select NCSEs for the OCB/EPB. The staff reviewed this information to ensure that the criticality safety requirements of 10 CFR Part 70, specifically 70.24, 70.61(b) and (d), 70.62 and 70.64(a)(9), were met.

9.2.2.1 Review of Potential Criticality Accident Sequences

The NRC staff reviewed the potential criticality accident sequences for the OCB/EPB to ensure that the requirements of 10 CFR 70.61(b) and (d) and 70.64(a) (9) are met. All potential criticality accidents are considered high consequence events per 70.61(b) and thus must be controlled such that they are highly unlikely. Additionally, the double contingency principle (70.64(a)(9)) must be met.

NFS performed a process hazard analysis for each process and used the HAZOP method to evaluate the process hazards. The NRC staff finds that this is an acceptable industry standard methodology for identifying accident sequences. The NRC staff reviewed NFS' list of sequences and finds that the licensee adequately identified or bounded all accidents for which the consequences could exceed the performance requirements of 10 CFR 70.61.

The NRC staff also reviewed the NCSEs as this is the NCS basis for the OCB. The NCSEs provide the in-depth justification for the assignment of the indices for the initiating event and IROFS for each scenario as well as the demonstration that the double contingency principle is met. These are referred to as cases in the NCSE.

The licensee uses a -4 index for many of its criticality passive engineered controls. According to NFS' methodology as described in the ISA Summary, a -4 index "rarely can be justified by evidence" and is "protected by an exceptionally robust inspected passive engineered control" and also requires "exceptionally Robust Management Measures to ensure availability." The NRC staff finds that the IROFS were described in sufficient detail to understand their safety function and for the NRC staff to make a positive finding that the overall accident sequence was highly unlikely. Table 6-1 in the ISA Summary and the NCSEs describe which IROFS are applicable to which accident sequences.

For administrative controls, the staff found that NFS has developed a process to determine if administrative controls used as IROFS are independent of each other. The staff finds that the process to determine if administrative controls used as IROFS are independent provides reasonable assurance that administrative IROFS will be independent of each other and that the revised IROFS will provide reasonable assurance that the accident sequences are highly unlikely and doubly contingent.

The NRC staff finds that the licensee adequately identified all accidents for which the consequences could exceed the performance requirements of 10 CFR 70.61. Also, the licensee has adequately identified each scenario and the associated IROFS such that the NRC

staff could find that each accident sequence is rendered highly unlikely and meets the double contingency principle. The staff finds that the IROFS are sufficiently independent of each other and that the IROFS provide reasonable assurance that the criticality safety requirements of 10 CFR Part 70 are met such that each accident is controlled to highly unlikely.

9.2.2.2 Management Measures

The staff's review of the management measures is discussed in Section 16 of this SER. There were no changes to NFS' management measure program that impacts this amendment request with respect to criticality safety.

9.2.2.4 Criticality Calculations

The NRC staff reviewed the licensee's calculational models and agrees that they are consistent with the description of the operation. The licensee utilized the SCALE 4.4 CSAS25 computer code using the 238 and 44-group cross-section libraries for the NCS calculations. The staff agrees that the codes and cross-section sets used are appropriate for this type of application.

The staff performed confirmatory analyses using the information provided in the amendment and the NCSE. The staff's results were comparable with those of the licensee. Specifically the NRC staff performed calculations to verify that the favorable geometry tanks were subcritical given their interaction with each other.

9.3 Evaluation Findings

The staff evaluated those portions of the ISA Summary and associated documentation that pertained to criticality safety of the OCB operations described above, using the criteria listed in the SRP. The staff also reviewed select NCSEs for the OCB/EPB. The staff has concluded that NFS has adequately described and assessed accident consequences that could result in a criticality. To ensure that the performance requirements in 10 CFR Part 70 are met, NFS has provided reasonable assurance that controls are maintained available and reliable when required to perform their safety functions. The staff has reviewed these safety controls and NFS' plan for managing criticality safety and finds them to be acceptable.

The staff concludes that the licensee's conduct of operations in the OCB/EPB will ensure that material that could result in a criticality, will be possessed, stored, and used safely according to the requirements in 10 CFR Part 70. Based on this review, the staff concluded that the

licensee's NCS program meets the requirements of 10 CFR Part 70 and provides reasonable assurance for the protection of public health and safety, including workers and the environment.

10.0 CHEMICAL PROCESS SAFETY

10.1 Discussion

The NRC recognizes that hazardous chemicals are also regulated by other Federal and State agencies. At the Federal level, the Occupational Safety and Health Administration (OSHA) has promulgated 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals PSM Standard," and the Environmental Protection Agency (EPA), under requirements of the Clean Air Act of 1990, has published 40 CFR Part 68, "Risk Management Plan." The NRC's objective is to ensure safe operations involving licensed radioactive material and chemicals in contact with or produced from licensed material as codified in 10 CFR Part 70, Subpart H.

NFS trains all persons at the facility who handle or could be exposed to hazardous chemicals in accordance with OSHA requirements. These OSHA requirements also allow personnel access to material safety data sheets.

The NRC staff reviewed the October 23, 2003, submittal related to the OCB/EPB license amendment request. The submittal provided technical information on the facility, processes, hazards, accident analysis, risk evaluations, and safety programs, and other supporting information related to chemical protection. The submittal described NFS' plans to provide protection measures to assure that the risks and/or consequences of chemicals for the OCB are minimized and acceptable. During in-office review, the NRC staff reviewed additional ISA supporting information on the facility, processes, and radiological consequence evaluations related to chemical protection.

10.1.1 Chemical Process Description

10.1.2 Chemical Accident Sequences

The accident sequences were developed by the licensee using the HAZOP methodology. This involved evaluation of each process including the utility and auxiliary support systems to determine the potential impact of specific component failures. The ISA Summary explained the chemical processes identifying possible accident scenarios and causes for component failures.

10.1.3 Chemical Accident Sequences Likelihood

The likelihood of the accident sequences were evaluated in the ISA Summary both with and without controls in place to either prevent or mitigate the accident. The uncontrolled likelihood was identified as the initiating event failure frequency index or the IROFS failure frequency index if the accident was associated with the failure of an IROFS. The initiating event frequency and IROFS failure frequency index are based on NFS' past experience, engineering judgement, analytical data, industry acceptable values, and/or any other applicable information.

10.1.4 Chemical Accident Consequences

In the ISA Summary, NFS developed computer spreadsheet models using the NRC and other federal agencies guidance, such as EPA, and incorporated hand calculations to evaluate the magnitude of the consequences to the receptor. General assumptions used for these computations were provided in the ISA and ISA Summary. The NRC staff has determined that these are appropriate techniques and assumptions in estimating the concentrations or predicting releases of hazardous chemicals produced from licensed material or by abnormal plant conditions that could affect the safety of licensed materials.

The consequence evaluations for chemical exposures utilized ERPGs or TEELs as action levels when there were no ERPGs yet developed. Due to the constant evolution of TEELs, NFS has committed to update the proposed TEELs during the annual update of the ISA Summary.

In the case of soluble uranium intake, 10 CFR 70.61(b)(3) specifies a high consequence to be greater than 30 mg [0.00007 lb] for off-site personnel with no specific level identified for the worker or for intermediate consequences. However, the intake must still meet the requirements of 10 CFR 70.61(b)(4)(i) and (c)(4)(i) when setting high and intermediate consequence levels for soluble uranium. In the NFS response to questions dated October 31, 2003, in regard to the BPF, NFS chose an intake of 40 mg [0.00009 lb] soluble uranium, which corresponds to the threshold for permanent renal damage, for determination of high consequence events for workers and 30 mg [0.00007] soluble uranium for intermediate consequence events for workers. In a letter dated March 16, 2004, NFS states that the same approach will be used for the chemical assessment of the OCB and EPB amendment.

BLEU complex. The NRC staff reviewed the calculations provided by NFS and found that the oxygen content in the working atmosphere would be greater than 19.5% (volume) which was in agreement with OSHA regulations.

The proposed chemical exposure levels are depicted in Table 7-3 of the ISA Summary. In the case of nitrogen oxides, the exposure level for a high and an intermediate consequence to the public were the same. In a March 16, 2004, letter NFS committed to update the limits with new limits for nitrogen oxides and to differentiate between the possible impacts to the receptors. The licensee also stated in its March 16, 2004, letter that in instances where a high and an intermediate consequence were defined by the same exposure level, NFS committed to apply controls for a high consequence event.

10.1.5 Chemical Process IROFS

The ISA Summary lists a number of chemical safety scenarios evaluated as well as corresponding accident sequences. Determination of the consequences was based on the performance requirements of 10 CFR 70.61. Based on the consequence level of the scenario, administrative, enhanced administrative, active engineered, or passive engineered IROFS were identified to mitigate or prevent the accident sequence to either unlikely or highly unlikely as defined in the ISA Summary. Once an acceptable set of controls was defined, management measures were identified to ensure that the credited controls are available and reliable to perform their required function when needed.

10.1.6 Chemical Process Management Measures

All of the chemical process safety related scenarios were either evaluated to be of high, intermediate, or low consequence. The IROFS were assigned depending on the level of risk reduction, management measures, which was defined in the ISA Summary. (See Section 10.1.7 of this SER)

10.1.7 Safety Grading of Management Measures

The ISA Summary states that management measures are defined for IROFS to ensure they are available and reliable to perform their required function when needed. The summary also identifies the management measures associated with active engineered, passive engineered administrative, and enhanced administrative IROFS. The management measures were applied in a graded approach based on risk reduction levels as follows:

Level A	IROFS credited with a high level of risk reduction will require a high level of management measures to ensure a high level of reliability.
Level B	IROFS credited with an intermediate level of risk reduction, or intermediate failure likelihood, will require an intermediate level of management measures.

All chemical process safety and chemical toxicity scenarios assigned IROFS were evaluated as high consequence requiring a risk reduction level A management measures.

10.1.8 Coordination of Chemical Process Safety and Emergency Management

The NFS Emergency Plan states that the facility is in compliance with Title III of the Superfund Amendment and Reauthorization Act of 1986, Emergency Planning and Community Right-To-Know Act as required by Part 70.22(i)(3)(xiii). NFS participates in local emergency planning with the Unicoi County Emergency Planning Commission by assisting in the development and implementation of the Unicoi County Emergency Plan. NFS maintains a material safety data sheet information system for hazardous chemicals on-site and provides a list of such chemicals to the Tennessee Occupational Safety and Health Administration and local fire departments. NFS also provides information to state and local emergency planning committees and the local fire departments regarding OSHA hazardous chemicals stored at the NFS site. NFS reports on stored quantities greater than ten thousand pounds or for extremely hazardous substances, as defined by the EPA, and stored quantities greater than the threshold planning quantities of five hundred pounds or less.

NFS provides training in contamination control and monitoring to fire department personnel and ambulance personnel so they may respond to emergency situations at the NFS facility.

10.1.9 Commitment to Baseline Design Criteria

NFS applied the BDC specified in 10 CFR 70.64 in establishing design principles, features, and control systems of the OCB and EPB facilities. Changes are reviewed against the approved chemical safety bases. IROFS were assigned by NFS to prevent or mitigate high or intermediate consequences of chemical safety accident sequences with the potential of commingling with licensed material or affecting the safety of licensed material. The proposed IROFS were designed to maintain their safety function under normal or worst case chemical exposure conditions. Materials of construction were specified along with initial verification, configuration control, and periodic inspections, to ensure that chemical exposure does not degrade the safety function of the IROFS.

10.2 Evaluation Findings

The staff has evaluated the application and ISA Summary using the criteria listed in the SRP. Based on this review, the NRC staff has concluded that NFS has adequately described and assessed accident consequences that could result from the handling, storage, or processing of licensed materials and that could have potentially significant chemical consequences and effects. NFS has constructed hazard analyses that identified and evaluated those chemical process hazards and potential accidents and established safety controls to provide reasonable assurance of safe facility operation. To ensure that the performance requirements in 10 CFR Part 70 are met, NFS has provided reasonable assurance that controls are maintained available and reliable when required to perform their safety functions. The staff has reviewed these safety controls and NFS' plan for managing chemical process safety and finds them to be acceptable.

The staff concludes that NFS' plan for managing chemical process safety and the chemical process safety controls meet the requirements of 10 CFR Part 70 and provides reasonable assurance that the health and safety of the public will be protected.

11.0 FIRE SAFETY

NFS is required by 10 CFR Part 70 to provide adequate protection to ensure the safety and health of public and workers and protect the environment. The regulations in 10 CFR 70.61 through 70.76 are applicable to each licensee that plans to possess greater than a critical mass of SNM and engage in uranium enrichment. The regulations require that engineered or administrative controls, or both, shall be applied to the extent needed to reduce the likelihood of occurrence of credible high and intermediate consequence events. Upon implementation of such controls, the risk-significant events are either highly unlikely or unlikely or their consequences are within established regulatory limits.

The NRC staff reviewed the October 23, 2003, March 18, 2004, and April 30, 2004, submittals related to the OCB/EPB license amendment request. The submittals provide technical information on the facility, processes, hazards, accident analysis, risk evaluations, and safety programs, and other supporting information related to fire protection. The submittals describe NFS plans to provide protection measures to assure that the risks and/or consequences of fires for the OCB are minimized and acceptable. During in office review, the NRC staff reviewed additional ISA supporting information on the facility, processes, FHAs, and, safety and radiological consequence evaluations related to fire protection.

11.1 Discussion

The ISA Summary, and the supporting FHA, also described postulated external events near the OCB/EPB and evaluated the potential consequences of exposure fires for the proposed operations.

The NRC staff concludes that NFS has adequately identified the dominant fire and explosion hazards for the proposed operations. Section 11.2 discusses mitigation and/or preventive measures to reduce the risks for the identified hazards. In accordance with the guidance provided by the SRP, NFS has reasonably identified and evaluated the facility and process hazards and associated risks for the proposed operations. The identification of fire hazards and the related analysis are documented in the NFS ISA Summary, and referenced FHA, which provides the supporting safety basis for the license amendment.

11.1.2 IROFS and Defense-in-Depth Fire Protection Measures

NFS established bounding accident sequences for the postulated scenarios and determined mitigation and/or preventive systems for achieving acceptable performances. The ISA Summary identified the IROFS necessary to achieve acceptable performance and minimize potential consequences, along with defense-in-depth mitigation and preventive measures, which form the safety basis for the proposed operations.

described in the ISA Summary and described in the license application/amendment provide defense-in-depth fire protection for the proposed operations and meets license commitments. The NFS ISA Summary has adequately addressed fire risks in accordance with the 10 CFR Part 70 and the acceptance criteria in the SRP. The NRC staff concludes that NFS' identified fire protection and process safety features will provide reasonable assurance for safety of operations.

11.1.3 Fire Protection Program

In Chapter 6 of the license, NFS has committed to provide and implement a fire protection program (through implementing procedures and controls) that will reduce the occurrence, the potential fire severity, and the consequences of a fire. The fire protection program assures the required level of safety, through provisions to provide engineered controls, along with administrative controls and emergency response, such that a fire does not cause an unacceptable release of hazardous material.

NFS fire protection procedures describe implementation of administrative controls such as the following to reduce the occurrences of fires and severity of fires: (1) training on and communication of fire safety requirements, (2) inspection for fire safety performance, (3) controlling ignition sources to minimize the occurrence of fires, (4) controlling the accumulation of combustibles, (5) controlling the use and storage of flammable and combustible liquids and gases, and (6) investigating fire to prevent or minimize occurrence of fires. In addition, NFS' fire protection program requires maintenance of engineered safety features to assure the availability and reliability safety systems to limit the severity and spread of a fire. Provisions for maintaining an onsite emergency response capability and equipment (including coordination and planning for offsite fire department assistance) are provided to respond promptly and effectively to extinguish fires and mitigate their possible consequences.

NFS commits to management measures as described in the ISA Summary (e.g., configuration control, maintenance programs, corrective actions reporting program, safety review committees, procedures, audits and assessments, incident investigations) and in accordance with Section 2.12 of the license to ensure that design basis requirements are maintained for safety of nuclear operations. NFS is required to manage changes (modifications, additions, or removals) to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel in accordance with established license Safety Condition S-25. Proposed changes requiring revision of applicable safety or environmental bases, but not requiring an amendment to the license in accordance with the above criteria, are reviewed and approved by the NFS safety review committee. Proposed changes involving site structures, equipment, processes, and procedures are submitted to the safety review committee for approval to ensure identification of fire and explosion concerns from operations and facility changes. The internally authorized change documentation requires the basis for determining that changes are consistent with the criteria in Safety Condition S-25.

The implementation of NFS' fire protection program and related management measures ensure the defense-in-depth protection and safety performance necessary to minimize the likelihood of fires in the process facilities and site area. These fire protection and management measures provide assurance that nuclear operations will be performed safely and minimize the potential of a fire that could involve licensed material, or cause a loss of safety controls. NFS plans to implement CM, maintenance, training, procedures, audit and assessments, record management and document control, and QA measures to ensure the fire protection design, safety assumptions, and programmatic requirements are maintained and implemented to provide adequate fire safety performance for the proposed OCB/EP operations.

The NRC staff concludes that the adequate implementation of NFS' fire protection program and related management measures will ensure that the identified IROFS and defense-in-depth protective measures, and the associated safety performance, protect against the likelihood of a fire. The NFS license application and the amendment request commits to reasonable programmatic requirements for fire protection that are commensurate with the fire hazards and risks of the proposed processes, in accordance with guidelines established in the SRP.

11.2 Evaluation Findings

The NRC staff concludes that the dominant fire risk to the safety and health of workers and the public for the proposed operations is a fire that could involve low enriched nuclear material. NFS submittals provide sufficient information in accordance with requirements of 10 CFR 70.65 regarding potential fire hazards, consequences, and required controls for the proposed OCB/EPB processes. The NRC staff determined that NFS demonstrated compliance with performance requirements of 10 CFR 70.61 for fire protection related postulated accident scenarios. NFS has identified a reasonable set of IROFS and defense-in-depth protection measures to ensure acceptable risks within the performance requirements of Section 70.61 and defense-in-depth approach for fire safety.

NFS commits to reasonable administrative and engineered controls to minimize the risk of fires and protect against potential exposure to fires and explosion hazards for safe operation of the processes in the OCB and EPB. The NRC staff concludes that, if the IROFS and defense-in-depth protection measures discussed in NFS' ISA Summary, along with design and safety basis assumptions as described, and the planned programmatic commitments in the license, are adequately implemented to achieve their intended safety performances, reasonable assurance is provided that the health and safety of workers, the public and the environment will be protected from potential consequences from fires.

12.0 EMERGENCY MANAGEMENT

This section requires NFS to provide an emergency plan for responding to the radiological hazards of an accidental release of SNM and to any associated chemical hazards directly incident thereto. NFS currently maintains an NRC-approved emergency plan in accordance with 70.22(i)(1)(ii).

12.1 Discussion

NFS provided proposed changes to its Emergency Plan in a submittal dated October 24, 2003, to address the OCB/EPB amendment application. Changes included the following:

1. Global changes throughout the Plan included updates to reflect operations and accidents associated with the OCB/EPB.

2. Fire protection system summary revised to include the OCB/EPB fire protection equipment.

3. Chapter 2.0 Types of Accidents, Section 2.1.1 Nuclear Criticality, Table 2-1 Postulated Accident Summary, Page 2-4

4. Updated permits including National Pollutant Discharge Elimination System (NPDES) and POTW permit for BLEU Complex

Changes as identified above are considered updates with no effect on the Plan or the emergency preparedness program.

NFS demonstrated that it submitted the Emergency Plan to offsite response organizations expected to respond in case of an accident 60 days prior to submitting the Emergency Plan to the NRC, and that it received no comments from the response organizations.

12.2 Evaluation Findings

Based on the review of the proposed changes in support of the OCB/EPB (dated October 24, 2003) to the NFS Plan, the NRC staff has determined that changes do not decrease the effectiveness of the Plan because they are only updates with no effect on the Plan or the emergency preparedness program. In accordance with 10 CFR 70.32(i) the changes are acceptable.

Accordingly, Safety Condition S-24 should be revised to reads as follows:

S-24: The licensee shall maintain and execute the response measures in the Emergency Plan, Revision 7, transmitted by letter dated June 3, 2003, and the proposed revisions to the NFS Emergency Plan to support the Blended Low Enriched Uranium (BLEU) Oxide Conversion Building (OCB) and Effluent Process Building (EPB) dated October 24, 2003, or as further revised by the licensee consistent with 10 CFR 70.32(i).

13.0 ENVIRONMENTAL PROTECTION

13.1 Discussion

The NRC staff evaluated the effects of the construction and operation of the OCB/EPB on the environment in accordance with the SRP. The results of the evaluation are summarized below.

13.1.1 Environmental Report

In its amendment application dated October 23, 2003, NFS stated that no additional ER information was provided in the application because the information was submitted previously to support environmental reviews of the BLEU Project. The environmental impacts of OCB/EPB operations were addressed in a 2001 Supplemental ER and additional information submitted on January 15, March 15 and April 12, 2002; and May 28 and August 7, 2003. After the application was received, additional environmental information was submitted on April 30, 2004.

The NFS environmental documentation was used by the NRC staff to prepare an EA pursuant to 10 CFR Part 51 which implements the requirements of NEPA.

Surface water is currently protected from site activities by enforcing release limits and monitoring programs required by the NRC and the State of Tennessee. The OCB/EPB are expected to produce liquid waste streams. Liquid waste from OCB operations will be treated with filters and ion exchange resin to remove residual uranium before it is transferred to the EPB. In the EPB, liquid waste will be treated to remove the ammonia, and then fed to an evaporator. Water vapor from the evaporator will be condensed, sampled and discharged to the sanitary sewer in accordance with a pretreatment permit issued by Erwin Utilities. The evaporator bottoms will be solidified and shipped to a licensed disposal facility.

Previous operations at the main NFS site (not the BLEU Complex) have resulted in localized chemical and radiological contamination of groundwater. Groundwater monitoring conducted by NFS indicates plumes of uranium, tetrachloroethylene, trichloroethylene, 1,2-dichloroethylene, and vinyl chloride, from past operations that could migrate offsite in the direction of the Nolichucky River. To address potential environmental impacts from this contamination, NFS has removed much of the source contamination through extensive remediation projects including excavation of contaminated areas in the North Site. In addition, NFS is decommissioning the Radiological Burial Ground and the North Site to remove more of the source of this contamination. NFS also is working with the Tennessee Department of Environment and Conservation and the U.S. EPA to design remedial strategies and to investigate the off-site extent of existing plumes.

For normal operations, the proposed action will not discharge any effluents to the groundwater; therefore, no adverse impacts to groundwater are expected. Accidental releases of contaminants to groundwater appear unlikely due to design and control measures implemented by NFS.

13.1.3 Radiation Safety

OCB/EPB operations are not expected to increase the dose to workers at the NFS facility because the types and quantities of materials and the processing will be similar to what is already licensed at the site. NFS is committed to keeping doses ALARA by maintaining a radiation protection program that minimizes radiation exposures and releases of radioactive material to the environment. In order to accomplish this, NFS has procedures for working with radioactive materials and monitoring programs to determine the doses received by employees.

The potential for increase in dose to the maximally exposed offsite individual due to the construction and operation of the new facilities was evaluated. While some effluents are expected to increase, the total annual dose estimate for the maximally exposed individual from all planned effluents is estimated to be well below the annual public dose limit of 100 mrem (1 mSv) in 10 CFR 20.1301, and the constraint on air emissions to the environment of 10 mrem (0.1 mSv) in 10 CFR 20.1101. NFS has controls and monitoring programs in place to minimize releases of radioactive materials to the environment.

13.1.4 Effluent and Environmental Monitoring

Airborne, liquid, and solid effluent streams that contain radioactive material are monitored to ensure compliance with 10 CFR Part 20. Each effluent is monitored at or just before the point of release. The results of effluent monitoring are reported on a semi-annual basis to the NRC in accordance with 10 CFR 70.59. Airborne and liquid effluents are also monitored for nonradiological constituents in accordance with State discharge permits.

Airborne effluents from the OCB/EPB stacks will be monitored in accordance with NFS procedures. All airborne effluent samples will be analyzed for gross alpha and gross beta radioactivity.

Ambient air is continuously monitored at onsite and offsite locations. All environmental ambient air samples are analyzed for gross alpha and gross beta radioactivity, and are composited and analyzed for specific radionuclides.

Liquid effluents from the OCB will be sent to the EPB for processing. After processing, liquid effluents from the EPB will exit the BLEU Complex by the sanitary sewer to the Erwin Utilities POTW. Liquid effluents will be monitored in accordance with 10 CFR Part 20 and a pre-treatment permit from Erwin Utilities POTW. Storm water run-off exits the BLEU Complex to Martin Creek. Storm water monitoring is conducted in accordance with a NPDES water discharge permit.

Solid wastes generated by OCB/EPB operations will be packaged into drums or boxes. Each container will be assayed for uranium content to verify that storage, shipment, and disposal requirements are met. Solid waste is then shipped to a permitted disposal site for final disposition.

No effluents from OCB/EPB operations will be discharged to the ground water. However, NFS has installed one up-gradient and four down-gradient wells at the BLEU Complex. A baseline groundwater monitoring program was conducted using the five wells. All sample results were well below the EPA drinking water maximum contaminant levels. NFS will collect samples from one of the down-gradient wells after OCB/EPB operations begin. NFS will adjust the sampling program based on operational history and trends in monitoring data.

NFS conducts a sampling program of ambient soil, vegetation, surface water, and sediment to monitor impacts from the Erwin Plant to the surrounding area. Details of the monitoring program are described in the 1999 EA for license renewal and the 2002 EA for the first BLEU amendment. Also, environmental dosimeters are at onsite and offsite locations to monitor ambient external dose rates and to assist with the assessment of potential accidents. In the additional information submitted on April 30, 2004, NFS committed to add several new sampling and monitoring locations to assess impacts from OCB/EPB operations.

13.2 Evaluation Findings

The licensee has committed to adequate environmental protection measures, including (1) effluent controls to maintain public doses ALARA as part of the radiation protection program, and (2) environmental and effluent monitoring. The NRC staff concludes that the licensee's conformance to the application and license conditions provides reasonable assurance that the health and safety of workers and the public will be protected, the environment will be protected, and the licensee will comply with the regulatory requirements imposed by the Commission in 10 CFR Parts 20, 51, and 70.

The basis for these conclusions is documented above and in an EA. The EA was prepared for this licensing action as required by 10 CFR Part 51. On June 18, 2004, the NRC staff published a FONSI in the Federal Register (69 FR 34198).

14.0 DECOMMISSIONING

14.1 Discussion

10 CFR 70.25 requires NFS to provide a decommissioning funding plan for the OCB/EPB.

NFS provided a cost estimate for decommissioning the OCB/EPB in proprietary Attachment III to the OCB/EPB license amendment request dated October 23, 2003. The estimate included costs for labor, materials, and services expected to be used for decommissioning and a description of NFS' basis for the cost estimate. The NRC staff reviewed the cost estimate for conformance to NUREG-1757, "Consolidated NMSS Decommissioning Guidance, Vol. 3, Financial Assurance, Recordkeeping, and Timeliness." The licensee estimated $6,116,785 to decommission the OCB, and $2,608,560 to decommission the EPB. The cost estimate was found to be acceptable, since it followed the guidance of NUREG-1757.

By letter dated May 20, 2004, NFS submitted a Letter of Credit to cover the estimated cost of decommissioning the equipment associated with the OCB/EPB Operations. The NRC staff determined that the letter of credit conforms to the standard content and format provided in NUREG-1757, "Consolidated NMSS Decommissioning Guidance, Vol. 3, Financial Assurance, Recordkeeping, and Timeliness," and is acceptable.

14.2 Evaluation Findings

The NRC staff has evaluated NFS' plans and financial assurance for decommissioning in accordance with NMSS' "Decommissioning Program Standard Review Plan," NUREG-1727. On the basis of this evaluation, the NRC staff has determined that NFS' plans and financial assurance for decommissioning comply with the NRC's regulations and provide reasonable assurance that funds for decommissioning will be available when needed.

15.0 SAFEGUARDS

15.1 Material Control and Accounting

10 CFR 70.22(b) requires that a license application to possess SNM must contain a full description of the licensee's program for control and accounting of SNM. The licensee currently has an approved LEU FNMC Plan, which complies with the requirements set forth in 10 CFR 74.31 for SNM.

15.1.1 Discussion

By letter dated October 24, 2003 (NFS Reference #30G-03-2023), NFS submitted two changes to Section 1 of its LEU FNMC Plan. The revisions to the Plan are necessary for incorporating changes to the BLEU complex. The revisions of the Plan were processed by the NRC pursuant to the provisions of 10 CFR 70.32 since the submitted changes did not represent a decrease in effectiveness relative to the regulatory requirements in the existing approved Plan.

The Plan changes affect the text in Section 1 of the licensee's LEU FNMC Plan. The subject section was submitted in its entirety with a new designated date and revision number.

The Plan changes are summarized as follows:

Section 1 - General Discussion

- Revised to incorporate solidification of uranyl nitrate hexahydrate (UNH) evaporator bottoms for burial waste in the oxide conversion facility.
- Updated Figure 1 to add the UNH storage/oxide conversion facility for the BLEU complex.

15.1.2 Evaluation Findings

Upon review of the revised sections and annex of the licensee's FNMC Plan, the staff found that the Plan, with the revisions and proposed changes, continues to provide the necessary elements and commitments for an adequate Material Control & Accounting (MC&A) program at NFS.

The staff concludes that the FNMC Plan revisions contain appropriate and necessary commitments to satisfy applicable MC&A regulations specified in 10 CFR 74.31. The staff has determined that approving the submitted Plan revisions will maintain the effectiveness of NFS' safeguards program because the changes incorporate the BLEU facility processes and other enhancements discussed in Section 15.1.1 above. Thus, the existing Safeguards License Condition SG-5.2 is being reissued to update the requested Plan revision, and to read as follows:

SG-5.2 In order to achieve the performance objectives of 10 CFR 74.31(a) and maintain the system capabilities identified in 10 CFR 74.31(c), the licensee shall follow its "Fundamental Nuclear Material Control Plan for SNM of Low Enriched Uranium" with respect to all activities involving SNM of low strategic significance. The Plan, as currently revised and approved, consists of:

Section 1 ----------	Rev. 5 (dated October 2003)
Section 2 ----------	Rev. 3 (dated January 2002)
Section 3 ----------	Rev. 4 (dated January 2002)
Section 4, 5 and 6 ----------	Rev. 3 (dated January 2002)
Section 7 and 8 ----------	Rev. 2 (dated January 2002)
Section 9 ----------	Rev. 1 (dated February 1993)
Annex ----------	Rev. 4 (dated January 2002)

Revisions to this Plan shall be made only in accordance with, and pursuant to, either 10 CFR 70.32(c) or 70.34.

15.2 Physical Protection

10 CFR 70.22(k) requires a Physical Security Plan (PSP) for an application for a license to possess or use SNM of Low Strategic Significance. By letter dated November 3, 2003, NFS submitted Revision 1 to the "Physical Security Plan for Special Nuclear Material of Low Strategic Significance." This plan was submitted to address the newly constructed BLEU Complex located adjacent to the Category I facility operated by NFS in Erwin, TN. On April 28, 2004, NFS submitted Revision 2 to the subject plan. On May 26, 2004, NFS submitted Revision 2, Change 1, to correct minor errors, inconsistences, and omissions identified by the NRC staff.

15.2.1 Discussion

The plan was reviewed by the NRC staff using guidance published in NUREG-1615, "Physical Protection Requirements for Categories I, II, and III Materials at Fuel Cycle Facilities and Regulatory Guide 5.59, Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance."

The PSP states how NFS will comply with the criteria in 10 CFR 73.67 (f) and (g) which requires the licensee to (1) store the material in a controlled access area, (2) monitor the area to detect unauthorized penetration or activities,(3) assure that a watchman or an offsite response force will respond to unauthorized penetration or activities, (4) establish and maintain response procedures for dealing with threats of thefts or thefts of this material, and (5) comply with in-transit requirements for physical protection, notification, and confirmation of transported SNM. The staff has reviewed this plan and concludes that it adequately satisfies the regulatory requirements of 10 CFR 73.67 (f) and (g).

15.2.2 Evaluation Findings

The staff concludes that the revised "Physical Security Plan for Special Nuclear Material of Low Strategic Significance," contains appropriate and necessary commitments to satisfy applicable physical protection regulations specified in 10 CFR 73.67 and that the submitted PSP revision does not reduce the effectiveness of the licensee's physical protection program. Thus, the existing Safeguards License Condition SG-6.4 is being reissued to update the PSP revision and to read as follows:

SG-6.4 Notwithstanding the above Safeguards License Conditions (SG-6.1, SG-6.2, SG-6.3), upon possession of less than Category I levels of SNM, the licensee shall follow the measures described in the physical protection plans titled "Physical Security Plan for the Protection of Special Nuclear Material of Moderate Strategic Significance," Revision 5, dated June 23, 1994 (letter dated June 22, 1994), and Revision 6, dated February 6, 1996; and in the "Physical Security Plan for Special Nuclear Material of Low Strategic Significance," Revision 2, dated May 26, 2004; and as they may be further revised in accordance with the provisions of 10 CFR 70.32(e).

16.0 MANAGEMENT MEASURES

10 CFR 70.62(d) requires that each licensee establish management measures to ensure compliance with the performance requirements of 10 CFR 70.61. The measures applied to a particular engineered or administrative control or control system may be graded commensurate with the reduction of the risk attributable to that control or control system. Management measures ensure that engineered and administrative controls and control systems, identified as IROFS, are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed. Chapter 11 of the SRP, titled,

"Management Measures," includes acceptance criteria for the eight areas of management measures: CM, maintenance, training and qualifications, procedures, audits and assessments, incident investigations, records management, and other QA elements. Section 2.12 of the current license application that has been incorporated into NFS' license titled, "Management Measures for IROFS," contains commitments addressing each of these eight areas.

16.1 Evaluation Findings

16.1.1 Configuration Management

The NRC staff has reviewed the CM function for NFS' OCB/EPB facility according to Section 11 of the SRP. In its current license application that has been incorporated into NFS' license, NFS has acceptably described its commitment to a CM system, 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 IROFS, are described that will provide reasonable assurance that consistency among design requirements, physical configuration, and facility documentation will be maintained as part of a new activity or change in an existing activity involving licensed material. The management measures include the following elements of CM:

1. Configuration Management. The organizational structure, procedures, and responsibilities necessary to implement CM are in place and committed to.
2. Design Requirements. The design requirements and bases are documented and supported by analyses, and the documentation is maintained current.
3. Document Control. Documents, including drawings, are appropriately stored and accessible. Drawings and related documents captured by the system are those necessary and sufficient to adequately describe IROFS.
4. Change Control. Responsibilities and procedures adequately describe how NFS will achieve and maintain strict consistency among the design requirements, the physical configuration, and the facility documentation. Methods are in place for suitable analysis, review, approval, and implementation of identified changes to IROFS. This includes appropriate CM controls to assure configuration verification, functional tests, and accurate documentation for equipment or procedures that have been modified.
5. Assessments. NFS has committed to an adequate assessment function that includes both initial and periodic assessments as described in the acceptance criteria in the SRP. The assessments are expected to verify and assure the adequacy of the CM function.

The staff concludes, based on the discussion in this section that the CM program meets the requirements of 10 CFR 70.62(d), and provides reasonable assurance that those functions protect the health and safety of the workers the public, and the environment.

16.1.2 Maintenance

NFS has committed to the maintenance of IROFS in its current license. NFS' maintenance commitments contain the basic elements to ensure availability and reliability of IROFS: corrective maintenance, preventive maintenance (PM), functional testing, equipment calibration, and work control for IROFS. NFS' maintenance function is proactive, using maintenance records, PM records, and surveillance tests to analyze equipment performance and to seek the root causes of repetitive failures.

The surveillance/monitoring, PM and functional testing activities described in the Management Measures amendment application provide reasonable assurance that IROFS identified in the ISA Summary will be available and reliable to prevent or mitigate accident consequences.

The maintenance function: (1) is based on approved procedures, (2) employs work-control methods that properly consider personnel safety, awareness of facility operating groups, QA, and the rules of CM, (3) ISA Summary identifies IROFS that require maintenance and identifies at what level, (4) justifies the PM intervals in the terms of equipment reliability goals, (5) provides for training that emphasizes importance of ISA or ISA Summary identified controls, regulations, codes, and personal safety, and (6) creates documentation that includes records of all surveillance, inspections, equipment failures, repairs, and replacements of IROFS.

The staff concludes, based on the discussion in this section, that NFS' maintenance functions meet the requirements of 10 CFR Part 70, and provide reasonable assurance that those functions protect the health and safety of the workers and the public.

16.1.3 Training and Qualification

Based on its review of Section 2.12.3, "Training and Qualification," of NFS' license, the NRC staff has concluded that NFS has adequately described and assessed its personnel training and qualification in a manner that satisfies regulatory requirements, and is consistent with the acceptance criteria in the SRP, and is therefore acceptable.

There is reasonable assurance that implementation of the described training and qualification will result in personnel who are qualified and competent to design, construct, startup, operate, maintain, modify, and decommission the facility safely. The staff concludes, based on the discussion in this section, that NFS' plan for personnel training and qualification meets the requirements of 10 CFR 70.23(a)(2).

16.1.4 Procedures

Section 2.12.4 of NFS' curent license describes a suitably detailed process for the development, approval and implementation of CM procedures. IROFS have been addressed, as well as items important to health of facility workers and the public and to the protection of the environment. The staff concludes, based on the discussion in this section, that NFS' plan for CM procedures meets the requirements of 10 CFR 70.62(d).

16.1.5 Audits and Assessments

Based on its review of NFS' current license, the NRC staff has concluded that NFS has adequately described its audits and assessments. In the current license Section 2.12.5, NFS has described the procedures covering the audit and assessment function, and committed to conduct internal audits and independent assessments. The audits will verify compliance with regulatory requirements and license commitments. The staff has reviewed NFS' plan for audits and assessments and finds it acceptable.

The staff concludes, based on the discussion in this section, that NFS' plan for audits and assessments meets the requirements of 10 CFR 70.62(d) and provides a reasonable assurance of protection of the health and safety of the workers and the public and for protection of the environment.

16.1.6 Incident Investigations

NFS has committed in its current license to establish an organization responsible for (1) performing incident investigations of abnormal operational events, (2) determining the root cause and generic implications of an event, and (3) recommending corrective actions for ensuring safe facility operations, in accordance with the acceptance criteria of Section 11.4 of the SRP.

NFS has committed in its current license to monitoring and documenting corrective actions. NFS has committed to the maintenance of documentation so that "lessons learned" may be applied to future facility operations. Accordingly, the staff concludes, based on the discussion in this section, that NFS' description of the incident investigation process complies with 10 CFR 70.62(d) and is adequate.

16.1.7 Records Management

The staff has reviewed NFS' records management system against the SRP's acceptance criteria and concludes that the system: (1) will be effective in collecting, verifying, protecting, and storing information about 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 a records storage area 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 staff concludes, based on the discussion in this section, that NFS' records management functions meet the requirements of 10 CFR 70.62(d), and provide reasonable assurance that those functions protect the health and safety of the workers and the public, and the environment.

16.1.8 Other QA Elements

Based on its review of the NFS current license, the NRC staff concludes that NFS has adequately described the application of other QA elements (and the applicable QA elements of its principal contractors). The staff concludes further that:

1. NFS has established and documented a commitment to an organization responsible for developing, implementing, and assessing the management measures for providing reasonable assurance of safe facility operations in accordance with the acceptance criteria in Section 11.4 of the SRP,
2. NFS has established and documented a commitment to QA elements and the administrative measures for staffing, performance, assessing findings, and implementing corrective actions are in place,
3. NFS has developed a process for preparation and control of written plant procedures, including procedures for evaluating changes to procedures, IROFS, and tests. A process for review, approval, and documentation of procedures will be implemented and maintained,
4. NFS has established and documented surveillance, tests, and inspections to provided reasonable assurance of satisfactory performance of IROFS. Specified standards or criteria and testing steps have been provided,
5. periodic independent audits are conducted to determine the effectiveness of the management measures. Management measures will provide for documentation of audit findings and implementation of corrective actions,
6. training requirements have been established and documented to provide employees with the skills to perform their jobs safely. Management measures have been provided for evaluating the effectiveness of training against predetermined objectives and criteria,
7. the organizations and persons performing QA element functions have the required independence and authority to effectively carry out their QA element functions without undue influence from those directly responsible for process operations,
8. QA elements cover the IROFS, as identified in the ISA Summary, and measures are established to prevent hazards from becoming pathways to higher risks and accidents.

Accordingly, the NRC staff concludes, based on the discussion in this section, that NFS' application of other QA elements (and the applicable QA elements of its principal contractors) meets the requirements of 10 CFR 70.62(d) and provides reasonable assurance of protection of worker and public health and safety and of the environment.

17.0 LICENSE CONDITIONS

New and revised current license conditions for SNM-124 are as follows:

S-1 The following dates will be added to Safety Condition S-1: October 23, 2003(Attachment 1); February 6, February 11, February 25, March 12, March 15, March 16, March 17, March 18, March 19, April 30, and May 21, 2004.

S-24 The licensee shall maintain and execute the response measures in the Emergency Plan, Revision 7, transmitted by letter dated June 3, 2003, and the proposed revisions to the NFS Emergency Plan to support the Blended Low Enriched Uranium (BLEU) Oxide Conversion Building (OCB) and Effluent Process Building (EPB) dated October 24, 2003, or as further revised by the licensee consistent with 10 CFR 70.32(i).

S-51 The licensee shall submit a revised OCB/EPB ISA Summary that incorporates all changes to date, at least fifteen (15) days prior to the NRC's Operational Readiness Review.

SG-5.2 In order to achieve the performance objectives of 10 CFR 74.31(a) and maintain the system capabilities identified in 10 CFR 74.31(c), the licensee shall follow its "Fundamental Nuclear Material Control Plan for SNM of Low Enriched Uranium" with respect to all activities involving SNM of low strategic significance. The Plan, as currently revised and approved, consists of:

Section 1 ----------	Rev. 5 (dated October 2003)
Section 2 ----------	Rev. 3 (dated January 2002)
Section 3 ----------	Rev. 4 (dated January 2002)
Section 4, 5 and 6 ----------	Rev. 3 (dated January 2002)
Section 7 and 8 ----------	Rev. 2 (dated January 2002)
Section 9 ----------	Rev. 1 (dated February 1993)
Annex ----------	Rev. 4 (dated January 2002)

Revisions to this Plan shall be made only in accordance with, and pursuant to, either 10 CFR 70.32(c) or 70.34.

SG-6.4 Notwithstanding the above Safeguards License Conditions (SG-6.1, SG-6.2, SG-6.3), upon possession of less than Category I levels of SNM, the licensee shall follow the measures described in the physical protection plans titled "Physical Security Plan for the Protection of Special Nuclear Material of Moderate Strategic Significance," Revision 5 dated June 23, 1994 (letter dated June 22, 1994), and Revision 6, dated February 6, 1996; and in the "Physical Security Plan for Special Nuclear Material of Low Strategic Significance," Revision 2, dated May 26, 2004; and as they may be further revised in accordance with the provisions of 10 CFR 70.32(e).

18.0 CONCLUSION

Based on the previous discussion, the staff concludes that there is reasonable assurance that the activities to be authorized by the issuance of an amended license to NFS will not constitute an undue risk to the health and safety of the public, workers, and the environment. Furthermore the staff determined that the license amendment request satisfies the requirements of 10 CFR 70.23, "Requirements for the Approval of Applications."

Approval of the amendment application is recommended.

The NRC Region II inspection staff has no objection to this proposed action.

19.0 PRINCIPAL CONTRIBUTORS

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21.0 ACRONYMS AND ABBREVIATIONS

ADU	Ammonium Diuranate
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
AR	Ammonia Recovery
ASCE	American Society of Civil Engineers
ATS	Automatic Transfer Switch
BDC	Baseline Design Criteria
BLEU	Blended Low Enriched Uranium
BPF	BLEU Preparation Facility
Cat.	Category
CCS	Central Control System
CM	Configuration Management
Current License	Current License Application that has been Incorporated into NFS' License
DOE	U. S. Department of Energy
EA	Environmental Assessment
EPA	U. S. Environmental Protection Agency
EPB	Effluent Processing Building
ER	Environmental Report
ERPG	Emergency Response Planning Guidelines
FHA	Fire Hazards Analysis
FNMC	Fundamental Nuclear Material Control
FONSI	Finding of No Significant Impact
FR	Federal Register
g	gravitational constant, or gram, depending on context
HAZOP	Hazard and Operability

HEPA	High Efficiency Particulate Air
IROFS	Items Relied On For Safety
ISA	Integrated Safety Analysis
kVA	kilovolt amp
LEU	Low Enriched Uranium
LEUN	Low-Enriched Uranium Nitrate
MC&A	Material Control & Accounting
NCS	Nuclear Criticality Safety
NCSE	Nuclear Criticality Safety Evaluation
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NFS	Nuclear Fuel Services
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U. S. Nuclear Regulatory Commission
NUN	Natural Uranium Nitrate
OBS	Oxide Blending System
OCB	Oxide Conversion Building
ODS	Oxide Dissolution System
OSHA	Occupational Safety and Health Administration
P&ID	Piping and Instrumentation Diagram
PHA	Process Hazards Analysis
PM	Preventive Maintenance
POG	Process Offgas
POTW	Publicly-Owned Treatment Works

PSP	Physical Security Plan
QA	Quality Assurance
RAI	Request for Additional Information
SBC	Standard Building Code
SER	Safety Evaluation Report
SIC	Safety Independent Controller
SNM	Special Nuclear Material
SRP	Standard Review Plan
T	Likelihood Index
TEEL	Temporary Emergency Exposure Levels
TN	Tennessee
TVA	Tennessee Valley Authority
U	uranium
UN	Uranyl Nitrate
UNB	Uranyl Nitrate Building
UNH	Uranyl Nitrate Hexahydrate
UO_2	Uranium Dioxide
U_xO_x	Uranium Oxide
UPS	Uninterruptible Power Supply
wt%	weight percent