DOCKET: 70-27

LICENSEE: BWX Technologies, Inc.
Nuclear Products division
Lynchburg, VA

SUBJECT: SAFETY EVALUATION REPORT - AMENDMENT 2; CONTAINER STORAGE FACILITY

BACKGROUND

By confidential letter, dated September 27, 2006, BWX Technologies, Inc., (BWXT) requested an amendment of SNM-42, to authorize long-term storage of [redacted] Reactors components in a new container storage facility (CSF) at the Lynchburg site. By letter dated October 16, 2006, the Nuclear Regulatory Commission (NRC) acknowledged receipt of the application. The amendment application (application) included: (1) a revision to Chapter 1 of the license renewal application; (2) an Integrated Safety Analysis Summary (ISA), in accordance with 10 CFR 70.65(b); (3) a basis for a categorical exclusion under the National Environmental Policy Act; and (4) a discussion of the baseline design criteria in 10 CFR 70.64. The NRC staff reviewed the amendment application and met with the licensee on January 23, 2007. BWXT provided the information requested at the January 23, 2007, meeting via a facsimile to William Gleaves on February 20, 2007. The NRC provided a list of preparatory questions dated March 21, 2007, for a site visit in April 2007, and prepared a request for additional information (RAI), dated May 24, 2007. BWXT responded to the preparatory questions and RAI questions via letters dated May 4, June 20, and July 31, 2007.

DISCUSSION

The application added a new subsection 1.5.23. to include authorization for long-term storage of [redacted] Reactors components in the CSF. Operations in the CSF will be subject to the current Special Nuclear Material License SNM-42, renewed on March 29, 2007, including subsequent amendments. The NRC staff reviewed the application and the ISA Summary in the technical areas of radiation protection, emergency capability, nuclear criticality safety, chemical safety, fire safety, and management measures. The reviews of each area are discussed below.

A. Radiation Protection

This section demonstrates the adequacy of the radiation protection program for the CSF. BWXT's radiation protection program describes equipment and procedures currently in use to protect health and minimize danger to life and property, consistent with CFR 70.22(a)(7) and (a)(8).

Since current licensed activities include limited storage of licensed material, the licensee's CSF. Based on radiation exposure records of the operation of the current facility and the physical form and packaging of the licensed material, doses to workers are expected to be well below the current limits in 10 CFR Part 20 and meet the performance requirements in 10 CFR 70.61.

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

1. Radiation Protection Program

   The radiation protection program for the CSF, including the ALARA commitment, organization and personnel qualifications, records and reporting, and safety procedures will be the same as those of the current facility. The radiation protection staff and director have been approved under the current license. These individuals will follow written procedures subject to the license.

   Based on the licensee's extensive experience in operating a similar storage facility, the staff determined that the current safety program consistent with 10 CFR 20.1101(a) and acceptable for the new CSF.

2. Posting and Labeling

   The posting and labeling program for the CSF area will be the same as that for the current facility. Since the type of radioactive materials that will be stored in this area is similar to what is stored in the rest of the facility, the staff finds this acceptable.

3. Minimization of Contamination

   The CSF will be used exclusively for the storage and shipping of [redacted]. The storage containers self-shielding of the uranium, and the minimal activity of the material, will result in very low external radiation dose rates in the work environment. Internal exposure from inhalation of airborne uranium is the primary radiological hazard, due to the large quantities of uranium present. However, the material will be doubly enclosed by a cladding and a Type-B shipping container. Airborne contamination from within this area is not possible without breaching the uranium's double encapsulation, which is a very remote possibility. Encapsulation failure due to fire is also deemed not credible, as discussed in Section II E of this Safety Evaluation Report (SER).

The staff determined that the storage conditions of the material in the CSF minimize the possibility of contamination consistent with the ALARA requirements in 10 CFR 20.1101(b) and good industry practices, and is therefore acceptable.

4. Training

The BWXT training program for staff in the CSF 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 planned activities in this area involve storage and preparation for shipment only, the staff finds this training program acceptable.

5. System of Exposure Controls

The licensee will conduct periodic sampling, monitoring, and surveillance to ensure exposures are maintained ALARA and are consistent with the requirements in 10 CFR Part 20, Subpart F. The parameters of airborne radioactivity, contamination level, radiation level, and environmental release will be monitored. The negative trends associated with these hazards will be investigated and controlled. Airborne radioactivity, contamination level, radiation level, and environmental release will be maintained within specified limits consistent with the approved radiation protection program, which the staff finds acceptable.

6. Radiation Protection Review Findings

Upon completion of the review of the radiation protection program for the CSF area, the NRC staff concludes that conformance by BWXT, to its current license is adequate to assure safe operations. The application meets the requirements of 10 CFR Parts 19, 20, and 70 with respect to radiation protection.

B. Emergency Capability, 10 CFR 70.64(a)(6)

The baseline design criteria, as stated in 10 CFR 70.64(a)(6) requires: (1) the design must provide for emergency capability to maintain control of licensed material and hazardous chemicals produced from licensed material; (2) evacuation of on-site personnel; and(3) onsite emergency facilities and services that facilitate the use of available offsite services.

The licensed material in the CSF will be doubly encapsulated by a cladding and a Type-B shipping container which will prevent uncontrolled use of the material. If the encapsulation becomes penetrated, which is non-credible, the radiation protection staff are trained and available to properly monitor and control the contamination. In addition, the physical form of the material within the cladding will naturally limit the loss of control of the material. The staff concludes, based on the above information, that the CSF has the emergency capability to maintain control of licensed material as required in 10 CFR 70.64(a)(6)(I).

The Special Nuclear Material license SNM-42 has an approved Emergency Plan. The licensee will be required to apply this Emergency Pan to the CSF, which is similar to the existing storage area. The Emergency Plan provides for the emergency evacuation of on-site personnel and the use of emergency services, both on and off-site. The staff concluded that the application of the current Emergency Plan to the CSF meets the emergency capability requirements in 10 CFR 70.64(a)(6)(ii) and (a)(6)(iii).

Based on the licensee's compliance with the site wide Emergency Plan, the information provided by the licensee's submittal, and the site visit, the staff has determined that the BWXT emergency capability meets the requirements set forth in 10 CFR Part 70.64(a)(6) for the new CSF.

C. Nuclear Criticality Safety

The application requested authorization to store a maximum of [redacted] Department of Energy-certified shipping containers in [redacted] storage racks, at a facility located in the controlled area. The CSF is designed to contain [redacted] racks of containers, and the containers may be stacked up to five high in each rack. The CSF site is above or protected from a 100-year flood plain per the International Building Code, and the CSF structure is designed to maintain structural integrity during a design basis event. The CSF has overall dimensions of [redacted]' long, by [redacted]' wide, by [redacted] high. Essentially, the CSF is a simple warehouse within which shipping containers are stored in a controlled environment.

The NRC staff evaluated the criticality safety impact of this change as discussed below, and has reasonable assurance that this operation will meet the nuclear criticality safety (NCS) requirements of 10 CFR Part 70. This evaluation is based on the staff's review of the licensee's submittals which included an ISA Summary for the new CSF, the Nuclear Criticality Safety Evaluations (NCSEs) for the amendment, BWXT's responses to staff's request for additional information, and other supporting documentation. The NRC staff also performed an on-site review of the ISA documentation on April 24-26, 2007.

The ISA Summary for the CSF identified: (1) potential accident sequences; (2) items relied on for safety (IROFS); and (3) the management measures needed to provide reasonable assurance of the availability and reliability of the IROFS, as required by 10 CFR 70.65(b). BWXT's demonstration of double contingency, as required by 10 CFR 70.64, is documented in the NCSEs for the CSF. To comply with the double contingency principle, administrative and engineered controls were developed to preclude conditions under which a criticality could occur.

The staff evaluated those portions of the ISA Summary and associated documentation that pertained to nuclear criticality safety of the CSF operations described above. The staff also reviewed the NCSE for the CSF (NCS-2006-168) and the criticality accident monitor coverage of CSF (NCS-2006-097) 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.

1. ISA and Management Measures

The staff's review of the management measures is discussed in Section F, of this SER. There were no changes to BWXT's management measures program that impacts this application request with respect to criticality safety.

The staff reviewed the potential criticality accident sequences for the CSF 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 10 CFR 70.61(b) and

thus, must be controlled such that they are highly unlikely. Additionally, the double contingency principle in 10 CFR 70.64(a)(9) must be met.

Based on this review, the NRC staff had questions regarding various moderation scenarios (e.g., Accident Sequence CSBR-1a). For example, during a fire scenario, the racks could potentially fail, allowing containers to come in contact with each other. With sufficient moderation from water sources, such as [redacted], this could lead to a criticality, if a large amount of the containers were in contact with each other due to the failure of the racks. To address this scenario, BWXT credited already [redacted] features as IROFS to ensure this scenario is "highly unlikely" to occur. The NRC staff considers it unlikely that a fire would occur in the CSF, due to the control of ignition sources in the facility. In the event of a fire, the staff also considers it unlikely that [redacted] before the racks were structurally damaged. Therefore, the NRC staff has reasonable assurance that this accident sequence is rendered highly unlikely. These dual controls are independent and sufficiently robust such that the NRC staff has determined that the double contingency principleis met.

The CSF is used for storing shipping containers in racks that are favorably spaced for NCS. Only one container at a time is allowed to be moved in the CSF. The main criticality hazards identified were: 1) minimum container spacing limits exceeded; 2) additional containers in area or excess material in containers; 3) moderation limits exceeded; 4) and reflection limits from concrete exceeded. In the ISA Summary, BWXT identified the IROFS necessary to control the criticality accident sequences such that they are "highly unlikely," as required by 10 CFR 70.61. The controls identified in the ISA Summary are administrative and engineered controls on spacing, material specification, piece count, moderation, and reflection.

The NRC staff determined 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 determine that each accident sequence is rendered "highly unlikely," and meets the double contingency principle.

The NRC staff also reviewed the NCSEs, as these form the NCS safety basis for the CSF. The staff found that the NCSEs provided an in-depth justification for each scenario being highly unlikely, as well as an adequate demonstration that the double contingency principle is met.

2. Criticality Accident Alarm System Requirements

   BWXT committed to installing six pairs of gamma detectors in the CSF, which can detect a nuclear criticality, in accordance with their current license commitments. The detectors and audible alarms will be connected to an uninterruptible power supply. The NRC staff also reviewed the NCSE for the criticality accident monitor coverage of CSF (NCS-2006-097), and the subject calculations for detector coverage. Based on this review, the NRC staff determined, with reasonable assurance, that BWXT's criticality alarm system coverage meets the requirements of 10 CFR 70.24 and can detect an inadvertent criticality.

3. Criticality Calculations

   BWXT performed criticality calculations for the CSF. The NRC staff reviewed BWXT's calculational models and agree that they are consistent with the description of the operation. The models used in the criticality calculations assume that for normal conditions the containers stored in the CSF have the most reactive components. The models also assumed conservative spacing between containers and concrete reflection where appropriate. BWXT utilized the SCALE 5 KENO V.a computer code using the 238-group cross-section libraries for the NCS calculations. BWXT's calculations show that the calculated k_{eff} + 2 sigma is less than the subcritical limit of 0.94 under normal conditions and less than 0.975 under credible abnormal conditions. The staff agrees that the codes and cross-section sets used are appropriate for this type of application and that the modeling is conservative.

4. Nuclear Criticality Safety Review Findings Conclusion

   The staff concurs that the BWXT's conduct of operations in the CSF will ensure that fissile material 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, and the environment.

D. Chemical Process Safety

The NRC is concerned with chemical hazards produced from licensed radioactive materials and plant conditions that could affect the safety of nuclear material processing, thus present an increase in radiation risk to workers, the public, and the environment. The NRC's regulatory authority over chemicals hazards is explained in the NRC memorandum, "Regulatory Authority Over Chemical Hazards At Fuel Cycle Facilities," dated March 10, 2003.

The NRC staff reviewed BWXT's application and the ISA Summary for the new CSF, submitted on September 27, 2006. The NRC staff considered the following areas:

(i) Process Description
(ii) Chemical Accident Sequences
(iii) Chemical Accident Consequences
(iv) Chemical Process IROFS and management measures
(v) Baseline Design Criteria (BDC)

The staff reviewed the licensee's ISA documents during the on-site review the week of April 23, 2007, and the letter providing additional information submitted on May 4, 2007, as necessary, to have a better understanding of the process and safety requirements.

1. Chemical Process Description

The NRC staff reviewed the process description provided in the ISA Summary and the SAR for the BWXT CSF application, toured the facility, and reviewed other documents supporting the ISA Summary and SAR. Sufficient information regarding the facility processes was acquired, using these resources, as well as discussions with licensee personnel.

The CSF will be used to store [redacted] assemblies packaged in shipping and storage containers. The process requires that each container be filled with nitrogen in order to maintain a moisture-free atmosphere. In addition, nitrogen is used to monitor and ensure that the internal pressure is maintained. The process is mainly physical in nature and does not involve major chemical processes.

The licensee identified nitrogen as the main chemical hazard that will be present in the CSF and assessed the consequences resulting from loss of containment within the building. Nitrogen gas introduces asphyxiation hazards as it displaces oxygen when present in high concentrations. Thus, an oxygen-deficient atmosphere within the building can affect the safety function of the administrative IROFS that the licensee has identified to prevent other high consequence events from occurring.

In addition to inert gases such as nitrogen, the licensee identified other chemicals handled and stored in the CSF and discussed the their health effects in the ISA Summary and SAR. Other chemicals include hydraulic and gear oil used for the loading forklifts. Further, the licensee assessed the incompatibilities between chemicals, as well as compatibility with the storage systems and containers. The staff reviewed the chemical interaction matrix discussed in the ISA Summary and SAR and finds that the licensee adequately assessed potential interactions among chemicals and materials that could result in hazardous situations.

The NRC staff determined that the licensee's process descriptions are sufficiently detailed to allow understanding of the chemical process hazards and allow adequate development of potential chemical accident sequences. The staff also finds that the licensee has adequately identified the chemicals and materials to be used, handled, and stored in the CSF, including detailed hazards that could result from the potential chemical interactions.

2. Chemical Accident Sequences

The ISA Summary and SAR discuss the hazards identification method and process hazard analysis (PHA) used to identify chemical hazards and develop accident sequences. The licensee used the "What If" Analysis method, consistent with the methods described in the American Institute of Chemical Engineers (AICHE) *Guidelines for Hazard Evaluation Procedures* (AICHE 1992) and the level of complexity of the process. As part of the PHA phase, the licensee also identified controls to prevent and/or mitigate the consequences from the accident sequences. Historical incidents, including external and internal plant events, were used to develop the accident sequences.

The NRC staff requested additional information regarding the development of the accident sequences. During the on-site review, the licensee discussed the accident scenarios, as well as the evaluation performed to determine the consequences. The licensee indicated that the chemical accident sequences were developed as part of the PHA, which assessed the chemicals used, stored, and handled, as wells as the chemical inventory, chemical interactions, and processes performed in the facility. The chemical accident sequence that the licensee considered, was the loss of containment of inert gases, specifically, the release of nitrogen gas during normal operations, which can result in consequences to the worker that exceed the consequences defined in 10 CFR 70.61.

The NRC staff concluded that the licensee has adequately implemented an acceptable PHA method, to identify chemical hazards and develop accident sequences.

3. Chemical Accident Consequences

The chemical quantitative standards used to evaluate the consequences of the chemical accident sequences are discussed in the site-wide ISA Summary and the additional information the licensee provided in the letter dated May 4, 2007. The licensee uses the American Industrial Hygiene Association Emergency Response Planning Guidelines as the chemical quantitative standards. Further, in the case of nitrogen, the quantitative standards the licensee identified for high and intermediate consequences to the worker are the U.S. Department of Energy Temporary Emergency Exposure Limits. In addition, the licensee also used definitions and the safety information for oxygen-deficient

atmospheres provided by National Institute for Occupational Safety and Health and Occupational Safety & Health Administration. The NRC staff reviewed BWXT's chemical quantitative standards and, based on the aforementioned information, determined that these are acceptable.

In addition, the licensee discussed the methodology used to determine the chemical accident consequences during the on-site review and in the letter dated May 4, 2007. The licensee evaluated the chemical consequences for the nitrogen release accident sequence based on nitrogen concentration, as well as the concentration of oxygen available in the room, since a nitrogen-enriched atmosphere can present asphyxiation hazards. The nitrogen and oxygen concentrations calculated were then evaluated against the chemical quantitative standards to determine the necessary IROFS to meet the performance requirements.

As a result of the discussions during the on-site review, the licensee provided additional information in the letter dated May 4, 2007, regarding the methodology used to evaluate the consequences resulting from chemical accident sequences. The licensee described the assumptions used to calculate the consequences, including the maximum inventory of nitrogen gas available, gas flow rate into the building, chemical and physical characteristics of nitrogen, the volume of the facility, and the building ventilation. The licensee further explained that the concentration of nitrogen generated and accumulated within the building is limited by the maximum flow rate, as well as the volume of the room and the building ventilation system. The maximum flow rate is limited by the one-inch diameter pipe that delivers the nitrogen from the supply tank to the building. The calculations performed determined that an oxygen-deficient environment would not result from a release of nitrogen gas.

The NRC staff reviewed the calculations that the licensee performed and the assumptions considered to determine if an oxygen-deficient atmosphere could result from a nitrogen release. Based on this review, the NRC staff determined that the licensee identified, and used appropriate methods and valid assumptions, in estimating the consequence from the analyzed chemical accident sequence, and that the consequences have been adequately estimated.

4. Chemical Process IROFS and Management Measures

The accident sequences and need for IROFS were determined consistent with the performance requirements described in 10 CFR 70.61. Based on the consequence and likelihood of the accident sequences, administrative, enhanced administrative, active engineered, or passive engineered controls were identified to mitigate and/or prevent the accident sequence. Once an acceptable set of IROFSs was defined, management measures were identified to ensure that IROFSs are available and reliable to perform their required safety function. The licensee did not identify any IROFS as the sole item relied on for safety.

The loss of containment of nitrogen gas accident sequence resulted in low consequences to the worker and thus no IROFS were identified. However, in the letter dated May 4, 2007, the licensee discussed the consequence evaluation and recommended that an oxygen detection system and local alarm be installed in close proximity to the nitrogen distribution location within the building. Based on the review of the ISA documentation and the on-site review, the NRC staff concluded that the licensee has adequately assessed consequences and the need for IROFSs, consistent with the performance requirements in 10 CFR 70.61.

5. Commitment to Baseline Design Criteria

The baseline design criteria, as stated in 10 CFR 70.64(a)(5), requires that the design provide for adequate protection against chemical risks produced from licensed material, facility conditions which can affect the safety of the licensed material, and hazardous chemicals produced from licensed material.

The staff reviewed the information provided in the ISA Summary and SAR addressing the design basis information for chemical process safety. The CSF will be used as a storage facility and does not involve major chemical processes. Further, the licensee identified chemicals that will be used, handled, and stored within the CSF, and has assessed the hazards these chemicals pose, as well as the chemical interactions. As a result, the licensee will minimize potential chemical interactions with licensed material, and the potential for operator impairment. In addition, the licensee addresses the proper handling, use, and storage of chemicals in the Health and Safety procedures and the Hazard Communication training. Based on the above information the staff concluded that the licensee's proposed design meets the requirements set forth in 10 CFR 70.64(a)(5).

6. Chemical Process Safety Review Findings

The staff evaluated the application ISA Summary, and SAR using the criteria listed in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (NUREG 1520). Based on this review, the NRC staff concluded that BWXT has adequately developed hazard analyses that identify and evaluate accident sequences that could result from the handling, storage, or processing of licensed materials, and that could have potentially significant chemical consequences. BWXT adequately assessed the accident consequences and established safety controls to provide reasonable assurance for the safe operation of the facility. The staff reviewed the licensee's chemical process safety management program and finds it acceptable and concluded that the program provides reasonable assurance that the public health and safety and the environment will be protected.

E. Fire Safety

The purpose of the fire safety review is to determine with reasonable, assurance that the licensee has designed a facility that provides adequate protection against fires and explosions that could affect the safety of licensed materials and thus present an increased radiological risk. The review established that the application has considered radiological consequences of the fires, and will institute suitable safety controls to protect workers, the public, and the environment.

1. Regulatory Requirements

   The regulatory basis for the fire safety review is the general and additional contents of applications as required by 10 CFR 70.22 and 70.65. In addition, the fire safety review must provide reasonable assurance of compliance with 10 CFR 70.61, 70.62, and 70.64.

2. Regulatory Acceptance Criteria

   The acceptance criteria that the NRC uses for review of fire safety are outlined in Sections 7.4.3.1 through 7.4.3.5 of NUREG-1520.

3. Fire Safety Management Measures

   Fire safety management measures are described, by the licensee, in the Renewal License Application for License SNM-42, submitted October 24, 2006. This information was evaluated by the staff in Section 7.3.1 of the staff SER, for the BWXT Nuclear Products Division site.

4. Fire Hazards Analysis

   The information that would normally be contained in the fire hazards anaylsis, in accordance with the Standard for Fire Protection for Facilities Handling Radioactive Materials (NFPA) 801 and NUREG-1520, was captured in the ISA documents associated with the ISA Summary for the CSF. During the April 2007 onsite review, the staff visited the CSF and verified the information contained in the ISA Summary. The staff determined that most of the fire hazard analysis steps, recommended in Appendix B of NFPA 801, were present in the SAR documents. The SAR descriptions contain fuel loading, fire scenarios, methods of consequence analysis, potential consequences, and a description of mitigative controls in accordance with the guidance in NUREG-1520.

   The staff concluded that the application meets the guidance provided in NUREG-1520 for Fire Hazards Analysis and is, therefore, acceptable.

5. Facility Design

The construction of the CSF is equivalent to that specified as NFPA Type II (0,0,0 non-combustible). The roofing materials are designated as Class I and assigned a flame spread index of 25 or less by the Factory Mutual Insurance Company.

The fire loading in the area consists of approximately 90 gallons of hydraulic fluid, and 100 lbs of polyurethane rubber associated with tires, hoses, and belts associated with two electrically powered fork lifts, as well as 491 lbs of polyurethane rubber used as railroad track filler. The staff estimated the resulting fire loading as 741 BTU/ft^{2,} which is not sufficient to result in a flashover fire and threaten the building integrity.

The facility is monitored by a smoke detection system which alarms in the [redacted] and [redacted] alarm stations. The facility is also properly equipped with appropriate portable fire extinguishers. In addition, the CSF is protected throughout by a wet pipe sprinkler system designed for Ordinary Hazard Group II, which is listed as an IROFS. Other fire protection measures are tested and maintained in accordance with procedures that are consistent with NFPA applicable NFPA codes and standards.

6. Process Fire Safety

Unmitigated fires were evaluated to determine if they could cause deviations leading to consequences of concern. Results of this evaluation determined that there was only one credible fire scenario associated with the CSF that could result in high or intermediate consequences as defined in 10 CFR 70.61. The scenario postulated was a fire caused by the collision and fire of the [redacted]. Such a fire would consist of combustibles such as [redacted] and could potentially produce enough heat to fail the container storage racks if the [redacted] was inoperable. If the storage racks collapsed, the [redacted] rods in the containers could be configured such that moderation could occur through fire fighting efforts involving the application of water. This scenario is prevented through operation of the [redacted]. The detection system, portable fire extinguishers, and fire brigade serve as defense-in-depth measures. Based on the low probability of the fire postulated and the high reliability of the [redacted], the staff considers the likelihood of a criticality resulting from collapse of the container storage racks, followed by moderation during fire fighting efforts, to be highly unlikely.

7. Fire Protection and Emergency Response

Fire protection and emergency response are described by the licensee in the Renewal License Application for License SNM-42, submitted October 24, 2006. This information was evaluated by the staff in Section 7.3.5 of the staff SER for the BWXT Nuclear Products Division site.

8. Fire Safety Review Findings

The staff reviewed the licensee's application for the CSF in regard to fire safety management measures, fire hazards analysis, facility fire protection, process fire safety, and fire safety and emergency response. The licensee's submittals provided sufficient information in accordance with requirements of 10 CFR 70.22, and 70.65 with regard to potential fire hazards, consequences, and required controls for the proposed CSF processes. The NRC staff determined that the licensee demonstrated compliance with the performance requirements of 10 CFR 70.61 for fire protection, related to postulated accident scenarios.

The licensee used NFPA 801 as guidance for the design of the facility. Design features for fire safety, as determined appropriate by a Fire Safety Analysis, include:

- Noncombustible and fire resistant building materials;
- Fire barrier separations;
- Ventilation controls and fire dampers;
- Explosive gas detection systems;
- Fire detection systems;
- Fire suppresion systems;
- Electrical installations; and
- Egress and exit considerations.

Based on this commitment to NFPA 801, the design proposed by the licensee also satisfies the requirements of 10 CFR 70.64(a), Baseline Design Criterion (3), "Fire Protection" as well as 10 CFR 70.64(b), defense-in-depth.

F. Management Measures

The NRC staff reviewed the BWXT plan and approach for implementing management measures during both an on-site and in-office review, conducted the week of April 23, 2007. Following the onsite review, the NRC staff issued a RAI, dated May 24, 2007.

Both on-site and in-office reviews for the new CSF application, including the ISA Summary and SAR, submitted on September 27, 2006, were examined. During the site visit, the NRC staff reviewed specific information to ensure that the ISA Summary demonstrates BWXT's compliance with the performance requirements of 10 CFR 70.61, including a description of the management measures that are applied to IROFS for each accident sequence for which the consequences could exceed the performance requirements of 10 CFR 70.61. The NRC staff performed a technical evaluation of the management measures and the commitments that support the reliability of IROFS contained in Chapter 11, "Management Measures" described in the BWXT application SNM-42. The NRC staff considered the functions performed by the licensee, applied to IROFS ,in the following areas:

- Configuration Management;
- Maintenance;
- Training and Qualifications;
- Procedures;
- Audits and Assessments;
- Incident Investigations;
- Records Management; and
- Other QA elements.

1. Configuration Management Description

The NRC staff reviewed the process description provided in the ISA Summary and SAR for the BWXT CSF application, toured the facility, and reviewed documents supporting the ISA Summary and SAR. Sufficient information, regarding the facility's processes and procedures, was acquired using these resources, as well as discussions with licensee personnel.

The existing CSF CM program will be used to maintain facility configuration during storage of [redacted] assemblies, packaged in shipping and storage containers. The licensee has established procedures providing a management system that will specify the documentation required to evaluate, implement, and track facility changes. The configuration change control and management implementing procedures are in place for use by the organization. The CSF, Safety Analysis Report, Appendix 15.42A, commits to the implementation of BDC as defined in 10 CFR 70.64. A combination of BWXT design reviews, safety evaluation requests, quality system procedures, quality work instructions, quality standards and records will be used in accordance with 10 CFR 70.62(d) to ensure compliance with performance requirements. Facility design requirements, change control provisions, and the processes used for the evaluation and approval of changes are described CSF SAR, Appendix 15.42A of the application. In accordance with 10 CFR 70.64, the requirements for BDC and defense-in-depth practices are addressed and applied to the facility design through the design review and change management process. Safe by design features and methods incorporating the BDC were used as safety design guidance for the new facility's processes, equipment, fixtures, and container storage.

In accordance with 10.CFR 70.72 "Facility Changes and Change Process", the NRC staff concluded that the licensee has adequately implemented an acceptable configuration management system for new processes for new facilities which include: (1) the technical basis for facility changes; (2) the impact of the change on safety and health or control of licensed material; (3) the revisions or modifications to existing operating procedures, which includes training, or retraining; (4) the source documents for the development of authorization requirements and approval authority; (5) the consistency among engineering requirements applied to SSCs; and (6) the analysis of impact of changes to the ISA, the ISA Summary, or other programmatic safety information.

2. Maintenance

The licensee's commitments to ensure IROFS are designed, maintained, and perform their safety functions to a level commensurate with the items' importance to safety are described in procedures and checklists. BWXT will perform maintenance of IROFS in accordance with the Preventative/Predictive Maintenance and Safety Related Controls Testing Program. Aspects of this program include surveillance monitoring and functional testing, and corrective and preventive maintenance. When implemented, the various aspects of the maintenance program will ensure that the engineered features identified in the ISA and SAR are functional and reliable over extended periods of operation, through the application of management measures.

The staff finds that the application included an adequate description of the maintenance function. The information provided by BWXT, as described above, meets the guidance in Section 11.4.3.2 of NUREG-1520, and is therefore acceptable.

3. Training and Qualification

BWXT's training and qualification program structure is described in Section 11.3. of the application. The training and qualification program includes radiological safety, on-the-job safety instruction, nuclear criticality safety, fire protection, and chemical and hazardous materials safety training. The NRC staff reviewed the commitments in SAR 15.42A of the CSF application, which fully describes how operators and rely on operator actions will be communicated to the operator through procedures and postings as described in SAR 15.42A. The records attesting to evidence of training and qualification are documented and maintained in accordance with the licensee's records management program.

The staff finds that BWXT has provided an adequate description of the training and qualification function. The information provided by BWXT, as described above, meets the guidance in Section 11.4.3.3(1) of NUREG-1520, and is therefore acceptable.

4. Procedures Development and Implementation

In Section 11.4. of the license application, BWXT committed to use, maintain, and control approved procedures through a procedures development and implementation system. BWXT mandates that all activities at the CSF, involving licensed nuclear material, be conducted in accordance with written and approved procedures. Section 11.4 of the application outlines BWXT's policy commitment that administrative procedures are the formal mechanism to implement IROFS controls, that rely on the actions of individuals.

BWXT commits to a formal process that will be used to manage and maintain operating and safety procedures. Operating procedures, used to implement IROFS controls, will include provisions to ensure procedure consistency through evaluation, validation, and verification of changes. Procedure reviews (either random sampling

or every 5 years) are conducted at intervals specified by the Nuclear Safety & Licensing Section and Environmental & Industrial Safety Section.

Supplemental operating procedures include the nuclear criticality safety manual, radiation protection manual, nuclear criticality postings, and radiation protection posting, pursuant to the requirements outlined in 10. CFR 20.1902. If a procedural step can not be performed as written, SAR 15.42A of the application has, in place, provisions for placement of operations into a safe condition.

The NRC staff determined that the licensee's procedures development and implementation process is sufficiently detailed to identify, develop, approve, implement, and control the operation of facility IROFS and management measures. The staff also determined that the licensee has committed to procedure adherence regarding activities involving licensed SNM and/or IROFS and these activities will be conducted in accordance with approved procedures.

5. Audits and Assessments

The ISA Summary and SAR, supporting the CSF application, discusses BWXT's commitment to conduct audits and inspections. BWXT states, in the ISA Summary, that safety personnel will perform periodic inspections and audits of IROFS. Additionally, BWXT's audit and assessment commitments are fully described in SNM-42, Section 11.5 of their application. Audits and inspections will be conducted to verify that operations are conducted in accordance with regulatory requirements and commitments set forth in the application.

The staff finds that BWXT has provided reasonable assurance that audits, assessments and inspections will be adequately performed and documented. The information provided by BWXT, as described above, meets the guidance in Sections 11.4.3.5(1) through (6) of NUREG-1520, and is therefore acceptable.

6. Incident Investigations

BWXT's CSF maintains an organizational structure supported by approved procedures and programs that provide a formal mechanism for systematic investigation and reporting of abnormal events and occurrences. BWXT's approved procedures and programs, for investigation and reporting of abnormal events and unusual occurrences, comply with the reporting requirements of 10 CFR 70.50, 10 CFR 70.62, and 10 CFR 70.74. BWXT's formal root cause analysis process, investigative techniques, tracking, and reporting of abnormal events include the appropriate corrective actions to prevent recurrence of similar occurrences. Follow-up actions will be completed and tracked through the corrective action and commitment tracking system.
The staff determined that BWXT has provided an adequate description of its incident investigation process. The information provided by BWXT, as described above, meets the guidance in Sections 11.4.3.6 (1) through (3) of NUREG-1520, and is therefore acceptable.

7. Records Management

The BWXT ISA Summary and SAR, supporting the CSF application, discusses the records management process, which includes responsibility and records retention times. Records of the IROFS failures documenting the discovery of an IROFS or management measure failure to perform upon demand, are maintained and updated in accordance with 10 CFR 70.62(a)(3). As part of the failure analysis process, the licensee documents IROFS failures and degradations in their corrective action system or safety audit program.

The licensee has also provided assurance that any deficiencies in the records management system, or its implementation, will be detected and corrected in a timely manner. Based on this evaluation, the staff determined that BWXT has provided an adequate description of its records management and reporting program. The information provided by BWXT, as described above, meets the guidance in Sections 11.4.3.7(1) through (5) of NUREG-1520, and is therefore acceptable.

8. Other Quality Assurance Elements

During the onsite review, the week of April 23, 2007, the licensee discussed the quality assurance program used to apply additional quality assurance elements to the CSF IROFS. In a letter dated May 24, 2007, the NRC staff requested additional information regarding how the grading of management measures and other QA elements are applied commensurate with the reduction to the risk of an accident. In the licensee's response, dated June 20, 2007, BWXT discussed the methodology used to apply the graded approach to management measures in SAR 15.42. The licensee states that management measures are applied to all IROFS, as necessary, to ensure reliability. In the ISA Summary, BWXT provided qualitative tables that identify IROFS credited for analysis in the ISA. To provide clarity to BWXT's implementation of IROFS evaluated and credited in the ISA, the introductory Chapter of the ISA Summary was revised to list which management measures are appropriately applied to all IROFS credited in the ISA Summary.

BWXT's other QA elements are applied in accordance with a quality assurance program, derived and structured to meet the International Standards Organization (ISO 9001). The licensee's ISO 9001 quality system uses Quality System Procedures and Quality Work Instructions in a manner that will be contingent upon the nature and scope of the work to be performed, and the relative safety significance of the equipment, structure, system or component, and the impact on the safety, safeguards and protection of the worker, the public, and the environment.

As a result of the onsite discussions during the onsite review, and in response to the staff's RAI, dated June 20, 2007, the licensee adequately described the application of other QA elements and management measures that will be applied to the CSF.

G. Emergency Plan

The NRC staff reviewed changes to the BWXT Emergency Plan, necessitated by the

addition of the CSF, and determined that the changes do not decrease the effectiveness of the Emergency Plan. This determination is documented in a letter to BWXT, dated August 9, 2007.

License Condition S-2 is revised to read as follows:

> The licensee shall maintain and execute the response measures in the Emergency Plan, Revision 19, dated April 15, 2007, or as further revised in accordance with 10 CFR 70.32(i).

H. Physical Security Plan

The NRC staff reviewed changes to the BWXT Physical Protection Plan, necessitated by the addition of the CSF, and determined that the changes do not decrease the effectiveness of the Physical Protection Plan. This determination is documented in a letter to BWXT, dated August 9, 2007.

Safeguards Condition SG-6.1 is revised to read as follows:

> The licensee shall follow the measures described in "BWX Technologies Nuclear Products Division, Physical Protection Plan (Plan)," dated March 15, 2007, submitted as Revision 9, and security procedures that are used to comply with the Plan as it may be further revised, in accordance with the provisions of 10 CFR 70.32(e).

ENVIRONMENTAL REVIEW

In (Confidential) Enclosure 5 to the application, BWXT provided an evaluation of the CSF addition, with respect to the NRC's regulations in 10 CFR Part 51, " Environmental Protection Regulations for Domestic Licensing and Related Licensing Functions." The NRC staff reviewed the evaluation and has determined that the addition of the CSF does not adversely affect public health and safety, common defense and security, or the environment, and is otherwise in the public interest. The addition of the CSF meets the following requirements:

1. There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.
2. There is no significant increase in individual or cumulative occupational radiation exposure.

3. There is no significant construction impact.
4. There is no significant increase in the potential for or consequences from radiological accidents.

Accordingly, the NRC staff determined that the criteria from 10 CFR 51.22(c)(11) for a categorical exclusion have been met. Therefore, neither an environmental assessment nor an environmental impact statement is warranted for this action.

CONCLUSION

Based on the review of the application and supplemental information, the NRC staff has determined that the licensee's equipment and facilities, related to the CSF, are adequate to protect health and to minimize danger to life or property, and the licensee's proposed procedures to protect health and to minimize danger to health and to minimize danger to life or property are adequate, in accordance with 10 CFR 70.23(a)(3) and (a)(4), respectively. The NRC staff has concluded that the revised physical security plan and emergency plans are adequate in accordance with 10 CFR 70.23(a)(10) and (a)(11). NRC staff also concluded that the licensee has complied with the requirement in 10 CFR 70.66(a) to provide a description of the safety program established under 10 CFR 70.62, as it will be applied to the CSF, as required by 10 CFR 70.65(a), and an ISA Summary for the CSF processes as required by 10 CFR 70.65(b).

Based on the preceding discussion, the staff concluded that there is reasonable assurance that the changes to be authorized by the issuance of the requested amendment will not constitute an undue risk to the health and safety of the public, workers, or the environment. In addition, they do not have a negative effect on the licensee's compliance with the regulatory requirements imposed by the Commission in 10 CFR Parts 20, 51, and 70. Therefore, the staff recommends approval of the application.

The Region II inspection staff has no objections to the proposed action.

PRINCIPAL CONTRIBUTORS

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