From:	Subosits, Stephen G
To:	Downs, James
Cc:	Terry, Chris T; Yates, Julian R; Branch, Bradley D; Wetzel, Larry L; Faidley, David W
Subject:	[External_Sender] Submittal of Page Change Updates to Chapter 5 of the SNM-42 License Application
Date:	Wednesday, October 20, 2021 2:21:06 PM
Attachments:	NCS Chapter 5 Page Updates.pdf

James,

BWXT NOG-L is providing the attached file with the Chapter 5 Page Updates in response to our phone call on 10/18/2021. Pages 5-1 and 5-2 of the NCS chapter contain minor changes in wording to address Jeremy Munson's questions.

Regards,

Steve Subosits
Group Lead, Licensing and Safety Analysis
BWXT NOG-Lynchburg
Phone: 434-522-5170

5.1 Nuclear Criticality Safety Program

NOG-L management has overall responsibility for the safety of all operations involving SNM. NOG-L management is committed to implementing a Nuclear Criticality Safety (NCS) program which incorporates the following objectives:

1. preventing an inadvertent nuclear criticality,
2. complying with the Double Contingency Principle as stated in ANSI/ANS-8.1-2014,
3. complying with the Process Analysis requirement of ANSI/ANS-8.1-2014,
4. complying with the NCS performance requirements of 10 CFR 70.61.

NOG-L management has established a Nuclear Criticality Safety program to implement these objectives. The program is led by the manager of Nuclear Criticality Safety who meets the requirements stated in Chapter 2. The Nuclear Criticality Safety manager has the overall authority and responsibility for the implementation of the Nuclear Criticality Safety program for the site. The Nuclear Criticality Safety manager is responsible for:

1. maintaining computational methods and practices,
2. determining the need for Nuclear Criticality Safety evaluations,
3. performing evaluations, and ensuring NCS controls are properly implemented,
4. maintaining Nuclear Criticality Safety inspection and audit programs,
5. training of the NCS staff to perform their duties,
6. overseeing of the Specialized Nuclear Criticality Safety Training Program and the NCS portion of the General Employee Safety Training

The NCS manager has the authority to terminate any operation deemed to be unsafe or contrary to license conditions or good safety practices.

The responsibilities of the Nuclear Criticality Safety manager do not relieve area management of their responsibility for ensuring that operations are conducted in compliance with Nuclear Criticality Safety requirements. Decisions of the Nuclear Criticality Safety manager are not to be compromised by direct pressures of time or production.

The NCS staff positions and minimum qualifications are provided in Chapter 2. NCS analyses shall be performed by a qualified NCS staff member and peer reviewed by an appropriately qualified NCS staff member. All NCS analyses shall be documented.

5.2 Nuclear Criticality Safety Control Philosophy

The risk of a criticality is minimized by controlling parameters within specified limits. There are twelve parameters of criticality control. These ~~controlled~~ parameters are defined as follows:

1. **Favorable Geometry Control** uses limiting dimensions of a piece of equipment or SNM arrangement to increasing neutron leakage.
2. **Spacing Control** decreases the neutron interaction by separating SNM.
3. **Volume Control** uses fixed volumes to limit the amount of SNM present and increase leakage.
4. **Fixed Neutron Absorber Control** uses a solid neutron absorber (poison) to reduce neutron multiplication.
5. **Piece Count Control** limits fuel mass and/or geometry by controlling the number of containers or components with known amounts of SNM and/or fixed geometries.
6. **Mass Control** limits the amount of SNM at a given location.
7. **Moderation Control** limits or excludes either interstitial (mixed with the SNM) or interspersed (between SNM units) moderating materials.
8. **Concentration Control** limits the mass of SNM per unit volume.
9. **Material Specification Control** is a control based on consideration of the physical or chemical composition of material (e.g. metal, nitrate) and may also include the shape and composition of other materials (e.g. ATR element).
10. **Uranium Enrichment Control** utilizes the inherent differences in critical attributes (critical dimensions, mass, etc.) of uranium at different enrichments of ^{235}U.
11. **Soluble Neutron Absorber Control** uses a neutron absorber in soluble form to increase neutron absorption in a system.
12. **Reflector Control** limits the reflection of neutrons to a SNM system from adjacent materials.

Controlled parameters for a system are established in an analysis. The bounding assumptions for controlled parameters are established based on engineering judgment and experience using physical properties and behaviors, experimental data, and historical operational data. When physical properties result in excessively conservative parameter bounds, experimental data and historical operational data may be used to establish more realistic, but still conservative bounding assumptions. Parameters that are not controlled shall be considered at their most reactive, credible values.

Three parameter limits are used in NCS analyses. These limits are defined below:

1. The **Safety Limit (SL)** is the value of the controlled parameter that will not be exceeded unless more than one unlikely, independent, and concurrent change in process conditions (contingency) has occurred.
2. The **Limiting Condition of Operation (LCO)** is the value of the controlled parameter that will not be exceeded unless a contingency has occurred.
3. The **Routine Operating Limit (ROL)** is the implementing value that is the same or more restrictive than the LCO and helps ensure that a violation of the LCO is unlikely.