ENCLOSURE 1

Response to Questions from the NRC

BWXT Request for Supplemental Information for Generic Letter 2015-01

Regulatory Basis: The regulations in 10 CFR 70.62(c)(1), requires, in part, that each licensee shall conduct and maintain an ISA that is of appropriate detail for the complexity of the process that identifies, among other things, "potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena." The regulations in 10 CFR 70.62(c)(1) also require, in part, identification of the consequence and the likelihood of occurrence of each potential accident sequence, and the methods used to determine the consequences and likelihoods.

1. Regarding BWXT response to Generic Letter request (1) b.i.

   a. BWXT stated that it has assembled all pertinent original records and drawings to which the facility was constructed. BWXT also stated that it created a timeline that summarizes the year and code to which each building that contains regulated material was built. For buildings that contain regulated material, provide a description of the code of record, applicable design basis and design calculations for seismic and high wind events.

      Response:

      The timeline of building construction and the code of record is provided in Enclosure 2. The structural analysis for the Main and "A" bays is provided in Enclosure 2. The other buildings that handle SNM were analyzed using the qualitative method in Chapter 3 of SNM-42. This analysis was documented in NCS-TR-00008, Rev. 0 (Enclosure 3).

   b. BWXT stated that it used ASCE 31-03 (ASCE, 2003) methodology to conduct the seismic and wind response analysis of the Main Bays and "A" Bays of the facility which house regulated material, to determine the survivability of the facility when subjected to IBC 2009 (ICC, 2009) natural phenomena hazards. Provide information and/or analyses reports with descriptions of the records, drawings, design codes, idealizations and assumptions made to conduct the seismic and wind response analysis for the Main Bays and "A" Bays of the facility.

      Response:

      The timeline of building construction and the code of record is provided in Enclosure 2. The structural analysis for the Main and "A" bays is provided in Enclosure 2.

   c. BWXT stated that it performed a qualitative analysis of the buildings other than Main Bays and "A" Bays of the facility that contain regulated material. Provide this qualitative analysis report.

      Response:

      NCS-TR-00008, Rev. 0 (Enclosure 3) "Criticality Risk from NPH in Outlying Buildings" uses the information provided by the structural analysis for the Main and "A" bays as background information. The document provides the qualitative basis for outlying buildings regarding earthquakes and wind loads. The document then discusses the

impact to the buildings from the James River flooding and also consequences of lightning strikes.

2. Regarding BWXT response to Generic Letter request (1) b.ii.

   a. BWXT concluded that are no accident sequences as a result of natural phenomena;

      i. Provide the basis for the use of an initiating event frequency of $1x10^{-4}$/year. The use of this initiating event frequency assumes that the structures systems and components can withstand loads (e.g. ground motions) resulting from events having an occurrence of 1 in every 10,000 years.

      Response:

      In SNM-42, Chapter 3, the ISA methodology for BWXT NOG-L was approved. The method used is a qualitative approach. This was the approach used in NCS-TR-00002, Rev. 0 which was provided previously (Reference 2) to assess the likelihood of a criticality accident initiated by a seismic event. Using data available on the USGS website, the probability of a magnitude 5.0 or greater earthquake within 50 km of the NOG-L site is approximately 1×10^{-4}/year. The USGS provides a qualitative comparison of the Richter Scale and the Modified Mercalli Intensity (MMI) categories.

Richter Scale Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher

      Neither the Richter magnitude nor the MMI correlate to Peak Ground Acceleration (PGA) and spectral response used in analysis performed for the Main and "A" bays. The relationship between magnitude and the MMI provide a likelihood and qualitative description of different magnitude earthquakes. This information is used in accordance with the methodology described in Chapter 3 of SNM-42 and implementing procedures to demonstrate that criticality is not credible.

      ii. Provide the basis for the use of an initiating event frequency of $1x10^{-5}$/year for flooding events. In addition, provide the basis for using an optimum spacing factor of (1/10) in the Container Storage Building or Railyard Storage Building.

Response:

The basis for the magnitude and frequency of the flooding is documented NCS-TR-00008, Rev. 0 (Enclosure 3) and RPTWR 12-020 (Enclosure 4). The optimum spacing factor is based on a conservative estimate of a series of fuel components being dislodged and landing in a configuration that could possibly go critical. The Railyard Storage and Container Storage buildings handle fuel components in shipping containers or in sealed storage containers. The containers are secured in place in the building. The NCS analysis for these facility demonstrate that when flooded these buildings are subcritical.

iii. Provide the basis for using an optimum spacing factor of (1/10) and an optimum moderation factor of (1/10) to characterize the risk profile under dynamic events such as earthquakes and high winds events.

Response:

The one in ten factor for optimum spacing is a conservative estimate of a series of fuel components being dislodged and landing in a configuration that could possibly go critical, if properly moderated. The one in ten factor for optimum moderation is a conservative estimate of water lines rupturing and providing the proper amount of moderation for the dislodged and properly arranged components to go critical. These factors are based on engineering judgment.

3. Regarding BWXT response to Generic Letter request (1) b.iii.

a. Provide the basis to conclude that there are no accidents as a result of natural phenomena on the basis of the likelihood of the events. Natural phenomena hazards are characterized by a likelihood and a magnitude of loading (dynamic loading, flood levels, etc.).

Response:

The structural analyses demonstrate that the facility is "well built." Most of the Main and "A" bays meet the 2009 IBC requirements and all structures were designed in accordance with the building code in effect at the time of the design. This information along with data from the qualitative analyses, which are consistent with the methodology in Chapter 3 of SNM-42, demonstrates that there are no accidents as a result of natural phenomena.

b. Provide a description of the safety assessments for natural phenomena event describing the capacity of internal systems structures and components to withstand the design basis loads, or the safety assessments of the potential consequences as a result of failures of internal components. This assessment should demonstrate that the consequences of failures of internal components do not exceed the performance requirements of 10 CFR 70.61.

Response:

Using the ISA methodology described in Chapter 3 of SNM-42, independent failures of independent internal components have been analyzed as process upsets.

4. BWXT referenced a letter dated February 14, 2014, CA England (B&W) to MN Baker (NRC),B&W NOG-L progress update on URI 70-27/2012-006-001, from Temporary Inspection Report No. 70-27/2012-006 as part of the information to respond to the generic letter.

   a. Regarding Technical Work Record NCS-TR-0001, Rev. 0 Probability of a Tornado Strike at NOG-L

      i. Provide a description of how the values of Table 5, "Total probabilities," were obtained.

      Response:

      During the conference call on December 14, 2015, this item was clarified and no response is required.

      ii. Consistent with the concept of defense in depth, and considering the potential range of wind speed that can be expected at the site under a tornado event, provide a description of preventative and/or mitigation measures to limit the potential consequences under an imminent tornado event. In addition, provide a description of the assessment for the potential for tornado missile impacts at the site.

      Response:

      Emergency Response procedure, EPR-03-07 (Enclosure 5) describes the actions if a tornado warning is issued or a tornado is spotted in the vicinity of NOG-L. The tornado warning alarm is activated, and personnel take shelter in pre-designated areas of the facility.

      In addition to penetrating the building, a tornado missile would have to then strike a process in such a way to optimally arrange fuel and then optimally moderate the fuel. The probability of an EF1 tornado (minimum winds of 86 mph) is 8.8×10^{-5} per year at the 95% confidence level. Assuming a missile created by an EF1 tornado would penetrate the walls of the facility, the likelihood of the missile striking a process of consequence would be no greater than the likelihood of the tornado itself.

      Consistent with other analyses, an optimum spacing factor of (1/10) and an optimum moderation factor of (1/10) conservatively bounds the likelihood of the configuration given the missile strikes a SNM system. As such, the likelihood of a criticality from a tornado missile is less than 1×10^{-6} per year and is therefore not credible.

b. Regarding Technical Work Record NCS-TR-00002, Rev. 0 "Likelihood of a Criticality Accident Initiated by a Seismic Event at Mt. Athos"

i. Provide the basis for the use of the Modified Mercalli (MM) Intensity Scale as a methodology to assess the impacts of earthquakes at the facility. The MM Intensity Scale, composed of increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

Response:

See response to 2.a.i.

ii. Page 10 of the report list two conclusions drawn from a comparison of the design/evaluation criteria for natural phenomena hazards in DOE-STD-1020. These conclusions do not correlate to the definition of performance categories as defined in DOE-STD-1020. A Performance Category correlates to a specific performance goal (in terms of a mean annual probability of failure) and they are based on a combination of the seismic hazard exceedance levels and accounting for the level of conservatism used in the design/evaluation.

Response:

The performance category (PC) is the probability of failure based on a combination of the seismic hazard exceedance levels and accounting for the level of conservatism used in the evaluation. For a PC 3, the annual probability of exceeding the acceptable behavior limits is 10^{-4}. In NCS-TR-00002, Rev. 0, the estimation of the likelihood of an earthquake that could cause damage based on USGS data is 1×10^{-4} per year.

The conclusions drawn in NCS-TR-00002, Rev. 0 are consistent with Chapter 3 of SNM-42. A criticality (a high consequence event) is highly unlikely.

NCS-TR-00002, Rev. 0 was shared with a technical expert at Y-12 who works with DOE-STD-1020. He found the conclusions to be consistent with DOE-STD-1020.