

CSSG TASKING 2015-04
Date Issued: February 13, 2015

Task Title: *DOE-STD-1020 Nexus to Criticality Safety*

Task Statement:

A handbook for DOE-STD-1020 is currently in preparation, which may lead to revision of the standard. Section 2.3.7 of the standard is discussed in the draft handbook and has been problematic for some sites. The CSSG will assist in ensuring that Section 2.3.b of the Handbook (attached), that discusses Section 2.3.7 of the STD, appropriately incorporates criticality safety during facility design, in concert with other safety disciplines during NPH events.

The CSSG is tasked with providing input/comments to a provided draft of Handbook Section 2.3.b to ensure it includes appropriate/applicable criticality safety related requirements/guidance utilizing a graded approach. Special emphasis should be placed on ensuring that the expectations for performing detailed Criticality Safety Evaluations (performed according to DOE-STD-3007-2007) meeting the ANSI/ANS-8.1 process analysis requirement is consistent with that used in the initial triage of SSC's utilizing guidance from the NNSA Central Technical Authority (i.e. incorporation of written, qualitative, peer reviewable, engineering judgment).

The team is encouraged to pay particular attention to the possibility of unintended consequences of potentially missapplied terms across disciplines involved with the nexus of NCS and NPH in the safety basis realm and from unintended consequences of placing requirements on SSC's in the name of NCS that add no safety benefit from a NCS perspective. The team should also consider the CSSG response documented in Tasking 2014-05 regarding NPH (a seismic event) and evacuation.

Resources:

CSSG Task 2015-04 Team Members:

- Kevin Kimball (Team Leader)
- Dave Hayes
- Dave Heinrichs

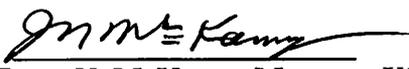
- NNSA Charles Keilers, NA-511
- NNSA CSCT member, Jerry Hicks

Contractor CSSG members of the team will use their FY15 NCSP CSSG support funding as appropriate; DOE CSSG members of the team will utilize support from their site offices. It is up to the team members to utilize other expertise, or include other interested parties, as can be made available to support the tasking, without incurring additional CSSG expenses. No travel is anticipated to be necessary to support this tasking.

Task Deliverables:

1. CSSG Subgroup to hold task 'kickoff' telecom by February 18, 2015.
2. CSSG Subgroup to provide draft guidance/interpretation to full CSSG for review:
March 3, 2015
3. Full CSSG to provide review comments to Task Team Leader: March 9, 2015
4. CSSG Subgroup to provide finalized guidance/interpretation to NCSP Manager:
March 13, 2015

Task Completion Date: March 20, 2015

Signed: 
Jerry N. McKamy, Manager US DOE NCSP
Office of the Chief of Defense Nuclear Safety, NA-511

Attachment:

From Section 2.3.b of the draft NPH Handbook that complements STD 1020-2012 (rev.1, 2/10/15)

Section 2.3.7 of the Standard provides special NPH design categorization methods and criteria from the standpoint of criticality mitigation. SSCs, whose NPH-initiated failure alone does not lead directly to a criticality accident, can be designated NDCs based on the dose consequences calculated per DOE-STD-1020-2012 (Section 2.2.2.1) using the criteria in DOE-STD-1189-2008 Appendix A. DOE Order 420.1C requires DOE approval, via the criticality safety program document, if ANSI/ANS-8.1 recommendations for double contingency cannot be met due to an NPH-initiated event (see DOE Order 420.1C, Chapter III). The following guidance applies:

- One of the major purposes of Section 2.3.7 is to put an upper limit on what needs to be addressed in the design and analysis, and effectively put an upper limit on the magnitude of natural phenomena that are considered credible for criticality prevention purposes.
- For safety SSCs relied on for criticality safety, design criteria are established for criticality safety hazards in the same way that they are for all other radiological hazards, based on consequence alone, using the DOE-STD-1189 Table A-1. This would generally limit the NDC level to NDC-1 or NDC-2. In addition to the NDC, an associated limit state is established based on what is needed to perform the safety function. When performing an analysis to ensure that processes remain subcritical in credible abnormal conditions, SSCs that meet their structural performance criteria are generally assumed not to fail in the credible abnormal event. Qualitative engineering judgment is sufficient to adjudicate those process conditions initiated by a credible NPH event, in accord with the ANSI/ANS-8.1 process analysis requirement
- There is an exception to the general rule of treating SSCs relied upon for criticality safety like other radiological hazards. The exception should be a very rare circumstance that should be avoided when designing facilities. The exception is stated in two different ways in Sect. 2.3.7, first in terms of contingencies and second in terms of SSC failures. The intent is that if there is an SSC relied upon for criticality safety and the failure of that SSC alone will directly and almost certainly lead to a criticality event, then that SSC will be designated NDC-3.
- The words "alone" and "directly can lead to" are intended to limit the analysis to the failure of the SSC alone, not considering the failure in conjunction with other SSC failures that may or may not also happen in the NPH event. If the failure of one structure would inevitably lead to the failure of a second, those two failures would be

considered a single failure. However, when a second failure is conditional (i.e., may or may not happen given the first failure), that would not be considered part of a single failure that “alone could lead directly to a criticality accident.”

- The intent of the exception is to provide added rigor to guard against a rare and unusual vulnerability that cannot be designed out of the system. In evaluating an NPH event, it can be difficult to determine true causality when determining failure sequences, and when determining which failures were unavoidable. It is often a matter of engineering judgment to determine whether a set of SSCs should be considered as failing unconditionally, given the first failure.. In all cases dealing with design basis NPH initiators, qualitative engineering judgment, amenable to peer review, is sufficient to fulfill the ANSI/ANS-8.1 process analysis requirement. In such circumstances, the project team should consider the consensus of criticality safety and structural experts, when determining which sequences of failures are conditional and which are unconditional.