

October 3, 2011

To: J. N. McKamy Manager, US DOE NCSP

From: C. M. Hopper Chair, US DOE NCSP CSSG *Calvin M. Hopper*

In response to Tasking 2011-02 a representative of the Criticality Safety Support Group (CSSG) has participated in the various reviews and drafts of the DOE HS-21 revision to DOE-STD-3009. The HS-21 drafting process has continued to evolve since the February 11, 2011 CSSG Tasking 2011-02. Due to the protracted nature of the drafting we have selected the 59th HS-21 Draft of DOE-STD-3009 for our response to your Tasking. We understand that HS-21 has since produced a 65th Draft for which our comments may still have relevance.

The lead CSSG representative to the HS-21 drafting team was Mr. David Erickson with support from Mr. Fitz Trumble both of whom have participated in the US DOE Energy Facility Contractors Group Criticality Safety Subgroup that has contributed to the drafting processes. The enclosed *Response to CSSG Tasking 2011-02* provides the consensus of the CSSG answers to the Tasking 2011-02 questions and alternative language to DOE-STD-3009 revision Draft 59.

Cc: CSSG Members
A. N. Ellis
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Response to CSSG Tasking 2011-02

CSSG Participation in Drafting and Review of the Final DOE HS-21 Revision to DOE-STD-3009

The Criticality Safety Support Group (CSSG) was directed in Tasking 2011-02 to provide a review of the final DOE HS-21 Revision to DOE-STD-3009 with an emphasis on criticality safety and its interaction with the Documented Safety Analysis (DSA) process in regards to the four questions listed below. The entire statement of Tasking 2011-02 is included as Attachment 1.

Questions to address:

1. Is there wording in the new version of DOE STD 3009 (3009) that could be considered confusing or ambiguous? If so, please suggest alternate wording.
2. Are there new requirements in the 3009? If so,
 - a. should those requirements be incorporated elsewhere, and
 - b. can these requirements be executed in a cost effective manner such that they produce adequate safety for criticality safety operations?
3. Is there important information/direction that has been
 - a. removed from or
 - b. added to the new version of 3009 that decreases the safety of criticality safety operations?
4. Are there other changes to DOE Standards or Guides that need to take place for harmonization with the changes to 3009?

The CSSG was also requested to provide alternative language to any section that they deemed unacceptable in the revision of 3009.

Three CSSG members were assigned to conduct the review and prepare this response for subsequent review and concurrence by the entire CSSG. The review team members are:

David Erickson (Team Lead, 3009 drafting team member)
Fitz Trumble
Bob Wilson

Introduction and Approach to the Review

The CSSG initiated its review by reviewing and discussing the basis for the criticality safety related revision to 3009. Each team member then provided comments on 3009. A consolidated list of these comments is included as Attachment 2.

Based on the limited time frame for this tasking, once a suitable draft of 3009 was received, the general approach taken for this review was to address the four questions. The review was not meant to be an in-depth assessment of the applicability/reasonableness of 3009. Rather, this review provides a snapshot as to whether the draft of 3009 is meeting the needs of criticality safety within the framework of the requirements for defining the safety basis for a facility. It is understood that this review was performed on an interim draft of 3009, and that may change as the product matures.

The following sections of this report provide the results of the team review of each of the indicated review areas.

Results of the Review

1. Is there wording in the new version of DOE STD 3009 (3009) that could be considered confusing or ambiguous? If so, please suggest alternate wording.

Some of the draft language can be misinterpreted to indicate too severe an intent. See Attachment 2 for suggested/alternate wording.

2. Are there new requirements in the 3009? If so,
 - a. should those requirements be incorporated elsewhere, and
 - b. can these requirements be executed in a cost effective manner such that they produce adequate safety for criticality safety operations?
 - a. 3009 does incorporate requirements that were essentially previously included in DOE-STD-3007-2007 (3007). Based on the information gathered, the inclusion in 3009 will better satisfy the wishes of the regulators. Also, the guidance provided in the draft of 3009 better aligns with other requirements. No other locations for incorporation were identified.
 - b. These new requirements, if appropriately implemented, should not negatively impact criticality safety. However, it will take continued diligence on the part of the criticality safety practitioner to ensure the best control scheme is identified for all operations.
3. Is there important information/direction that has been
 - a. removed from or
 - b. added to the new version of 3009 that decreases the safety of criticality safety operations?
 - a. There was no information, of importance to criticality safety, which was identified as being removed, and not included in the revision.
 - b. There was no information, of importance to criticality safety, which was identified as being added, that should decrease the safety of criticality safety related operations.
4. Are there other changes to DOE Standards or Guides that need to take place for harmonization with the changes to 3009?

It is known that DOE O 420.1 (420.1) is undergoing a revision and that version (420.1C) may be approved prior to the 3009 revision being approved. Therefore, there needs to be an effort to ensure the new language in 3009 is not in conflict with 420.1. No specific issues were identified as a part of this review.

DOE-STD-3007-2007 (3007) currently included discussion regarding the inclusion of criticality safety into the safety basis. That discussion is not consistent with the draft language in 3009. Therefore, once 3009 is revised, an effort needs to be undertaken to revise 3007 and ensure any needed discussion is consistent with the 3009 language.

DOE-STD-1027-1992 (1027) has been identified as being in need of an update. The CSSG has previously provided input in this regard for 1027. Also, a technical bulletin was published by NNSA that included the CSSG recommendations.

Conclusion

Overall the review indicates that criticality safety is being appropriately represented in the new language in 3009. Suggested wording changes, or other thoughts, to the primary criticality safety related sections are included in Attachment 2.

Attachment 1
CSSG Tasking 2011-04

CSSG TASKING 2011-02

Date Issued: February 11, 2011

Task Title: *CSSG Participation in Drafting and Review of the Final DOE HS-21 Revision to DOE-STD-3009***Task Statement:**

The CSSG is directed to participate in the drafting and review of the final DOE HS-21 revision to DOE-STD-3009 with an emphasis on criticality safety and its interaction with the Documented Safety Analysis (DSA) process.

The following questions should be considered as part of the CSSG review following the drafting effort.

1. Is there wording in the new version of DOE STD 3009 (3009) that could be considered confusing or ambiguous? If so, please suggest alternate wording.
2. Are there new requirements in the 3009? If so,
 - a. should those requirements be incorporated elsewhere, and
 - b. can these requirements be executed in a cost effective manner such that they produce adequate safety for criticality safety operations?
3. Is there important information/direction that has been
 - a. removed from or
 - b. added tothe new version of 3009 that decreases the safety of criticality safety operations?
4. Are there other changes to DOE Standards or Guides that need to take place for harmonization with the changes to 3009?

The CSSG is requested to provide alternative language to any section that they deem unacceptable in the revision of 3009.

Resources:

Upon DOE HS-21 invitation or permission, a CSSG member shall be appointed by the CSSG Deputy Chair to participate with the HS-21 drafting team in writing a revision to 3009. Following the finalization of the revised draft of 3009, the CSSG Deputy Chair will form a CSSG member Review Team and with Lead member to answer the above 4 questions and supply any appropriate alternative language for the revised standard. Contractor CSSG members of the team will use their FY11 NCSP CSSG support funding as appropriate; DOE CSSG members of the team will utilize support from their site offices. CSSG emeritus members may be included in the team on a voluntary basis.

Task Deliverables:

The following deliverables are dependent upon the progress of the HS-21 3009 drafting team revision.

1. The CSSG member assigned to participate with HS-21 drafting team shall provide the completed draft revision of 3009 to the CSSG and NCSP Manager.
2. The CSSG member assigned to the HS-21 drafting team will bring before the CSSG and NCSP Manager any potentially contentious or policy changing issues that arise as they arise in a timely fashion to solicit informal feedback to inform the drafting process.
3. Four weeks after the receipt of the HS-21 draft revision of 3009 the Review Team Lead shall provide the Review Team Tasking Response to the CSSG for their review and comment/concurrence.
4. One week after the CSSG receives the Review Team Tasking Response the CSSG Deputy Chair shall resolve, develop, and report a CSSG consensus Tasking Response to the CSSG Chair for informal transmittal to the NCSP Manager.
5. One week following the informal transmittal the final consensus CSSG Tasking Response shall be provided to the NCSP Manager.

Task Due Date: Six weeks following the release of the HS-21 drafting team revision to 3009.

Signed: Original signature on file
Jerry N. McKamy, Manager US DOE NCSP

Attachment 2

Suggested editorial/wording changes to DOE-STD-3009

(Based on Draft Revision 59 provided by 3009 CS working group)

DOE-STD-3009-2011 Rev 59 comments

Definitions:

Credible is not defined – Proposed definition: *the attribute of being believable on the basis of commonly acceptable engineering judgment. Due to the general lack of statistically reliable data, assigning numerical probabilities to events is not usually justifiable and when used should be backed up with references.*

Unmitigated release – need to add the footnote from the bottom of Page 3-3 to this definition (*Unmitigated scenario consequences do account for physical reality, basic process/activity geometry, and a competent work force, but no specific controls are presumed to function. The intent is to identify the maximum consequence physically plausible.*)

Page 2-2 last bullet – this indicates that all SMPs previously described in chapters 6-15 may be summarized in a single chapter. This is inconsistent with the current draft with Chapter 6 remaining a stand-alone chapter. Suggest the last bullet be re-worded to account for this.

Page 2-3, Figure 2: DSA Preparation Process – this also indicates that all SMPs are in individual chapters.

Page 3-4, Section 3.1.3, added text – current statement is that “The criticality safety process is based on identifying multiple layers of defense with the objective that *subcriticality is always ensured*”. This wording needs to be changed to “...based on identifying multiple layers of defense with the objective that *no credible change in a process parameter can lead to a criticality accident*”.

Page 3-5, Section 3.1.3, added text last paragraph – Need to address where in the DSA this summary table of hazard scenarios along with preventative and mitigative features should go. If they are to go into Chapter 3, then should there be discussion in Section 4 of any controls that roll up to the TSR level (and then TSR discussion in Chapter 5). The other option is changing the wording to Chapter 6 to have the summary of hazards for criticality as well as selected controls be put in Chapter 6.

Page 3-14, Section 3.2.7 - Based on this “Evaluation of a BDBA should be performed when the accident analysis indicates that safety class controls are needed or when a building collapse coincident with a large fire may cause releases exceeding the public EG”. This would state that BDBA are not required for criticality analysis as the hazard does not warrant it. This should be explicit both in 3009 and in a change to this section (BDBA) of 3007-2007.

Page 4-12, Sections 3.3.2.2, 3.3.2.3 and 3.3.2.4 – does there need to be a specific reference to what to put in here for criticality? Can words be added to 3.1.3 which directs that criticality information (hazards, evaluation, controls, SSCs) should be treated and discussed in the appropriate sections of the DSA (per section 3.3.1, 4.4 or 4.5 and 5.3)

Some of the above comments are incorporated into the following 3009 excerpt, including some other editorial suggestions.

From Section 3.1.3 Hazard Evaluation:

Criticality represents a special case for hazard evaluation. The criticality safety program controls are derived from the hazard analysis process established in the ANSI/ANS-8 series of national standards. These standards require a documented evaluation that demonstrates all fissionable materials operations will be maintained subcritical under both normal and credible abnormal conditions. The standards require consideration of all credible initiating events (e.g., operator errors, NPH events, etc.). All necessary controls are identified in Criticality Safety Evaluations that meet the requirements of ANSI/ANS-8 standards and DOE-STD-3007, *Guideline for Preparing Criticality Safety Evaluations at Department of Energy Nonreactor Nuclear Facilities*, and are not selected based on an evaluation of likelihood or consequence. The criticality safety process is based on identifying multiple layers of defense with the objective that ~~no credible change in a process parameter can lead to a criticality accident~~ ~~subcriticality is always ensured~~. Failure of any single control may diminish the overall effectiveness of the multilayered defense, but will not lead to a criticality accident. In addition to hazard evaluation and control identification, the ANSI/ANS-8 criticality safety standards identify numerous requirements and recommendations which result in a robust criticality safety program. These include elements such as training and qualification of criticality safety engineers and operators, control implementation verification, configuration management of controls, and periodic assessment and control implementation validation. DOE O 420.1 requires contractors to document how all the requirements and recommendations of applicable ANSI/ANS-8 series national standards will be implemented, or provide justification for why they will not be implemented, in a Criticality Safety Program description document and submit it for DOE approval.

Even considering the robust criticality safety program elements described above, there may be instances where the specific ~~inadvertent~~-criticality ~~accident~~ risk is unusually high and the associated preventive and mitigative features have sufficient safety importance that they should be considered for inclusion into the DSA. These ~~instances~~ are expected to be the exception rather than the norm. The evaluation process shall consider the following criteria when determining whether a particular scenario and associated control(s) should be explicitly ~~identified-analyzed~~ in the DSA hazard evaluation:

- Credible scenarios where an unmitigated criticality ~~accident~~ would result in either high consequence to a collocated worker, or consequences that exceed the evaluation guideline for the public ~~would normally, should~~ be identified.
- Processes (scenarios) that do not incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible would normally be identified.
- For scenarios where a failed passive engineered feature would result in the reliance ~~of-on~~ only administrative controls, and ~~for~~ all scenarios where active engineered features are used, consideration should be given to the following when determining if the scenario is discussed in the DSA:

1. The relative worth (evaluated either qualitatively or quantitatively) of the engineered feature to ensuring subcriticality; and
 2. The robustness (e.g., number of defense in depth layers, feature reliability, and feature effectiveness) of other controls/conditions that contribute to defense in depth for ensuring subcriticality.
- The hazard evaluation should also consider other administrative controls of high significance, as opposed to routine aspects of scenario definition, that:
 1. Form the basis for initial conditions in the NCS evaluation, or
 2. Have broad applicability across multiple fissionable material operations, with potential for defeating NCS defense in depth.

For those criticality hazard scenarios included as a result of the screening process described above, the DSA may present simple summaries of the scenarios along with the identification of those significant preventative and mitigative features identified through the criticality safety evaluation process. If inclusion into the hazard tables is chosen, frequency estimates are not required due to the differences in hazard evaluation technique.

Section 3.3.2 Facility Worker

As described in Section 3.1.3, the criticality safety hazard evaluation process using the ANSI/ANS-8 national standards series is such that failure of a SSC or a control will not result in ~~an inadvertent~~ criticality accident. Therefore, using the above criteria for safety significant designation, the identification of criticality safety controls as safety significant for facility worker protection is expected to be the exception rather than the norm.