5 December 2011

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

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

In response to your request, attached you will please find Revision 1 to the US DOE CSSG Tasking 2010-01. This revision provides an expansion or elaboration on our original response to 2010-01 by providing a thorough review of regulatory compliance issues and by providing recommendations for the application of a graded approach using sound practical judgment regarding risk and cost-benefit considerations.

The original drafting team consisted of the following CSSG members:

David Heinrichs, Writing Team Lead
Richard E. Anderson
Bradley Embrey (NA-1 Ex-officio)
Thomas P. McLaughlin
Fitz Trumble
R. Michael Westfall (Emeritus)
Robert E. Wilson

The attached Revision 1 had contributions from the following CSSG members:

Fitz Trumble, Writing Team Co- Lead
Calvin M. Hopper, Writing Team Co-Lead
David Heinrichs
Thomas P. McLaughlin
Robert E. Wilson
James A. Morman, Writing Team Co-Lead
David Erickson

The attached draft of the attached revised white paper was reviewed by the entire CSSG. Minor comments were incorporated into the final version of the paper that is attached to this memo. This version represents the consensus position by the entire CSSG.

Cc: CSSG Members
A. N. Ellis
G. Udenta
J. R. Felty
L. Scott

CSSG Response to Tasking 2010-01 Revision 1
Balanced Technical Approaches for
Addressing Potential Seismically Induced Criticality Accidents in New Facility Design
5 December 2011

Executive Summary

The Criticality Safety Support Group (CSSG) was directed in Tasking 2010-01 to develop a white paper on the use of balanced technical approaches for addressing the potential consequences of seismically induced criticality accidents in new non-reactor nuclear facility design (see Attachment 1). This white paper revision expands on the tasking by providing a summary of the underlying CSSG positions on criticality safety as well as a thorough review of regulatory compliance issues. This paper also provides recommendations for the application of a graded approach to the assignment of seismic design criteria for criticality accident prevention using sound, practical judgment regarding risk and cost-benefit considerations.

Generally, it is recommended that criticality safety engineers participate in all stages of the design process, including the conceptual design phase, to ensure proper hazard categorization of the facility based on radiological risks and to participate in the assignment of the appropriate seismic design criteria and limit states to structures, systems and components important for the prevention of criticality accidents.

While a criticality accident can involve political and economic risks, the relevant Order (DOE O 420.1), the ANSI/ANS-8 series of standards and the CSSG focus on the risk to human safety. Criticality accidents are expected to be worker safety issues and not pose significant risks to co-located workers or the public. Thus, based on the same radiological considerations used for other hazards (see Table 1), Seismic Design Criteria (SDC) 1 with Limit State (LS) B or C is appropriate for structures and equipment important to criticality accident prevention provided that the applicable nuclear criticality safety evaluations (NCSEs) do not identify more stringent criteria as being necessary to preclude a criticality accident. An NCSE in compliance with the core requirement of ANSI/ANS-8.1-1998 "*Before a new operation with fissionable material is begun, or before an existing operation is changed, it shall be determined that the entire process will be subcritical under both normal and credible abnormal conditions*" will identify the necessary structural requirements and/or assumptions that need to be protected and therefore evaluated for seismic design requirements. These NCSEs are written under the purview of a criticality safety program which documents the needed protections for the prevention and/or mitigation of the event.

DOE-STD-1189 provides guidance on the integration of safety and design for new facilities. Protection of the public, co-located workers and facility workers from seismic events are addressed in this standard based on a tiered system of requirements for selecting the seismic design criteria (SDC) and limits state (LS) for the prevention or mitigation of events. The standard requires more stringent requirements be placed on those events which could result in doses to the public or to co-located workers. DOE-STD-1189 recognizes that for those events requiring only worker protection the safety management programs (like criticality safety) which are comprised of program manuals, procedures, controls and limits are an effective means of controlling the event. These safety management programs are discussed in the Documented Safety Analysis and committed to typically at the Technical Surveillance Requirement (TSR) level. It is noted in DOE-STD-1189 however that if the elements of the safety management program are unable to protect the worker due to the immediate* nature of the event then a higher SDC designation is required. The CSSG's interpretation for such systems, structures and components (SSCs) is that SDC-2 with LS–B or –C (or –D in extreme cases) would be appropriate.

The CSSG acknowledges the fact that both DOE-STD-2010-2002 and DOE G 420.1-2 consider criticality accidents as a special case for assignment of SDC levels and both documents indicate that SDC-3 (previously Performance Category 3) should be assigned as the appropriate categorization for SSCs related to worker safety. While the CSSG position is that criticality safety considerations alone do not in general warrant assignment of SDC-3 levels to SSCs, the CSSG acknowledges that the current DOE regulatory structure may impose more stringent requirements on criticality than those required for other hazards. However, the CSSG recommends that DOE reassess and modify their regulatory structure and requirements to treat nuclear criticality safety and the protection of persons from criticality accidents as a radiological hazard.

The CSSG recommends that emergency plans and procedures associated with earthquakes address personnel evacuation. If personnel evacuation is envisioned, this could prevent large expenditures that might otherwise be spent on making a criticality accident alarm system seismically tolerant. If sheltering in place is a possibility during or following a seismic event, this should be factored in to the relative risk to the facility worker.

I. Summary of CSSG Positions

The following bullets provide the CSSG positions regarding nuclear criticality safety.

- Safety (worker protection) is the number one priority. As stated in ANSI/ANS-8.1-1998, nuclear criticality safety is the "Protection against the consequences of a criticality accident, preferably by prevention of the accident." That basic tenet is executed through adherence to both the Administrative and the Technical Practices enumerated in ANSI/ANS-8.1-1998. The paramount requirement from this standard is:

  Process Analysis. Before a new operation with fissionable material is begun, or before an existing operation is changed, it shall be determined that the entire process will be subcritical under both normal and credible abnormal conditions.
- Working with fissile material and other highly hazardous material brings with it inherent risks (i.e., frequencies times consequences).
- Criticality accident risks should be mitigated to the extent practical and in balance with mission need and cost.
- Several industries have developed consensus standards to identify, accept, and manage their characteristic risks. The non-reactor nuclear facility industry manages the risk of criticality accidents with well-established and effective consensus standards.
- The DOE Secretary of Energy has espoused the desire to use consensus industry standards to the extent possible and to only develop or use DOE STDs where necessary consensus standards are not available.
- When DOE adds new requirements, they must evaluate the gain or benefit versus the cost of implementation.
- In a limited budget, first priority on dollars spent should be on protecting people.

* Immediate refers to the occurrence in time of events for which safety management program protections (e.g., evacuation, shielding, etc.) would not be effective in protecting the worker from the effects of the event.

- ANSI/ANS-8 consensus standards explicitly address the need for balancing safety and economics.
- DOE standards also espouse the need for a graded approach based on hazard.
- DOE should address nuclear criticality safety and criticality accident hazards no differently than other radiation hazards.

II. Hazard Categorization

Early in the design process, DOE O 413.3A, Change 1, and DOE-STD-1189, require development of a Conceptual Safety Design Report that: (a) identifies and analyzes the primary facility hazards – including criticality hazards; (b) identifies and analyzes facility design basis accidents – including the design basis earthquake (DBE); (c) determines the preliminary seismic design category for the facility; (d) determines the safety class and safety significant structures, systems, and components (SSC); and (e) establishes the preliminary hazard categorization of the facility.

The CSSG Response to Tasking 2010-02 provides detailed guidance on the "Role of Criticality Safety in Facility Hazard Categorization". That CSSG guidance concludes that facilities with credible criticality accident risks should be classified no greater than Hazard Category 3 based on the localized radiological consequences of actual and realistically postulated criticality accidents. In particular, the CSSG Response to Tasking 2010-02 documents that historical criticality accidents and reasonably postulated potential accidents are highly likely to produce doses at 100 meters that are less than 0.5 rad and doses to the public that are negligible. These consequences for the postulated accidents do not take into consideration radiation shielding present in facility construction or process equipment that would further reduce radiological consequences. Therefore, for consistency with the recommended hazard categorization, the appropriate seismic design category for SSCs based solely on criticality safety is SDC-1 with no facility-level safety class or safety significant SSCs based on the criteria of DOE-STD-1189, Appendix A, §A.2.1, "Public Protection Criteria", and §A.2.2, "Collocated Worker Protection Criteria", respectively. If structural failure of the facility or components therein would cause an immediate† criticality accident, a higher SDC might be required in order to protect the facility worker. The SDC level evaluation should take into consideration expected personnel radiation exposures from the criticality accident.

If dose assessment in or near specific facility structures is desired, guidance on criticality accident source terms and radiation dose estimations are available in American National Standard ANSI/ANS-8.23, Nuclear Criticality Accident Emergency Planning and Response.

III. Seismic Design Criteria, Performance Goals and Limit States

The primary guidance documents for assessing any seismic event – including criticality accidents induced by an earthquake – in new facility design are DOE-STD-1189, ANSI/ANS-2.26, ASCE/SEI 7-05 and ASCE/SEI 43-05. These standards provide a graded approach in the form of seismic design criteria, performance goals and limit states.

The seismic design criteria are based on total effective dose equivalent (TEDE) consequences to the public and collocated workers as shown in Table 1. Collocated workers are defined in DOE-STD-1189 as workers 100 meters distant from the criticality accident (i.e., "the release point") or from the building

† Immediate refers to the occurrence in time of events for which safety management program protections (e.g., evacuation, shielding, etc.) would not be effective in protecting the worker from the effects of the event.

perimeter.

Table 1. Seismic Design Criteria (SDC)

Unmitigated Consequence of SSC Failure from a Seismic Event		
Category	Collocated Worker at 100 m	Public
SDC-1	Dose < 5 rem	N/A
SDC-2	5 rem < Dose < 100 rem	5 rem < Dose < 25 rem
SDC-3	100 rem < Dose	25 rem < Dose

The target performance goal for each SDC, shown in Table 2, is the mean annual probability of exceeding the specified limit state of structures and equipment due to the design seismic event. The corresponding qualitative likelihood based on the criteria of DOE-STD-3009 is also provided in the table.

Table 2. Target Performance Goal for SDC

SDC	Target Performance Goal	Qualitative Likelihood
1	$< 1 \times 10^{-3}\ yr^{-1}$	Unlikely
2	$< 4 \times 10^{-4}\ yr^{-1}$	Unlikely
3	$\sim 1 \times 10^{-4}\ yr^{-1}$	Unlikely/Extremely Unlikely
4	$\sim 4 \times 10^{-5}\ yr^{-1}$	Extremely Unlikely
5	$\sim 1 \times 10^{-5}\ yr^{-1}$	Extremely Unlikely

Note that the target performance goal frequency (for facility structures and equipment) is different than the frequency of the design basis earthquake (DBE), which is specified as a 2500-year return (mean) event for SDC-1, SDC-2, SDC-3 and SDC-4. The principal difference being that the design methods are specified by the U.S. Geological Survey, International Building Code, and ASCE/SEI 7-05 for SDC-1 and SDC-2; and, ASCE/SEI 43-05, ANSI/ANS-2.26, ANSI/ANS-2.27 and ANSI/ANS-2.29 for SDC-3 and SDC-4. For SDC-5, the DBE is a 10,000-year (mean) event using the same design methods as SDC-4.

The limit states provided in Table 3 are deformation limits to be credited in safety analyses, including criticality safety evaluations, for the response of facility structures or equipment to the design basis earthquake. In criticality safety evaluations, such seismic- induced deformation should be considered the "credible abnormal conditions" for compliance with American National Standard ANSI/ANS-8.1-1998, "Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors", §4.1.2, "Process Analysis".

Table 3. Structural Deformation Limit States

LS	Structural Deformation Limits	Damage
A	Large permanent distortion, short of collapse	Significant damage
B	Moderate permanent distortion	Generally repairable damage
C	Limited permanent distortion	Minimal damage
D	Essentially elastic behavior	No damage

Together, the SDC, design basis earthquake, target performance goal, and limit state establish the design and construction practices to be applied to facility SSCs. In the case of SDC-1 and SDC-2, the seismic design criteria are provided in ASCE/SEI 7-05; whereas ASCE/SEI 43-05 applies to SDC-3, SDC-4 and SDC-5.

Due to the expected, very limited consequences of a seismically induced criticality accident, safety class SSCs for protection of the public and safety significant SSCs for protection of the collocated worker are not expected to be identified in hazard analysis documentation addressing the criticality hazard. However, hazard analyses, including NCSEs, may identify SSCs as called out in DOE-STD-3007-2007 for specific aspects of defense-in-depth and worker safety.

The limit state to address equipment-distortion related criticality concerns should be no more restrictive than limit state B or C in most cases. The structures or vessels evaluated for designation as safety significant SSCs would be selected from the control set identified in the NCSEs and the documented safety analysis for each accident of concern. The SSC safety function described in the safety basis documentation would prevent fissile material from reaching the critical state. SSCs may suffer some loss of stiffness and strength in a seismic event, but still maintain the ability to provide the safety function described in the safety basis. The design team should carefully consider the increased cost of a more conservative design before specifying criteria beyond limit state B.

Equipment distortion/breakage leading to a potential criticality accident would primarily involve vessels that contain larger volumes and fissile masses in liquid forms or possibly large quantity vault storage. For example, fissile-bearing liquid leaking from pipes and process vessels could potentially flow into a sump or other unfavorable geometry location. Usually this is readily foreseen as a possibility and precluded with relatively inexpensive measures involving the application of neutron absorbers. Criticality concerns associated with loss of container spacing in vault storage subsequent to a seismic event are also often readily precluded by either seismic qualification of the shelving arrangement or by fissile density measures associated with container sizes and fissile mass limits.

Specifically, and consistent with the recent CSSG response to tasking 2010-02, it is concluded that criticality accidents are expected to be worker safety issues and not pose significant risks to co-located workers or the public. Thus, based on using the same radiological considerations for other events (see Table 1), Seismic Design Criteria (SDC) 1 with Limit State (LS) B or C is appropriate for most structures and equipment important to criticality accident prevention. However, as noted in DOE-STD-1020-2002, Appendix B:

> Performance Category 2 SSCs are of greater importance due to mission-dependent considerations. In addition, failure of these SSCs may pose a greater danger to on-site personnel than Performance Category 1 SSCs because of operations or materials involved…
>
> Performance Category 2 SSCs should allow relatively minor structural damage in the event of natural phenomena hazards. This is damage that results in minimal interruption to operations and that can be easily and readily repaired following the event.

According to this excerpt, other considerations in addition to radiological consequences may be considered in assigning SDC levels to SSCs related to criticality safety. DOE-STD-1189 recognizes that for worker protection events, safety management programs are the primary means of defense, however there may be events which occur so quickly that safety management program protections would not be effective. For example if failure of a component during a design basis earthquake (DBE) would create the potential for an immediate criticality accident, that component might require a higher SDC. Based on the excerpt from DOE-STD-2010-2002 given above, SDC-2 with LS–B or -C (or –D in certain cases) might be appropriate.

According to the citation above, assignment of SDC-2, LS-B or –C might be appropriate for SSCs important to criticality safety. However, the CSSG acknowledges the fact that both DOE-STD-2010-2002 and DOE G 420.1-2 consider criticality accidents as a special case for assignment of SDC levels. It is further noted that while both documents indicate that SDC-3 (previously Performance Category 3) should be assigned (no LS values cited in the documents) to SSCs relied on for criticality safety there is not consistency between the standards on what cases would require SDC-3.
While the CSSG position is that the dose consequence from a criticality safety accident does not in general warrant assignment of SDC-3 levels to SSCs, the CSSG acknowledges the fact that the application of other than consequence criteria may result in assignment of SDC-3. The CSSG recommends that DOE evaluate the basis and justification for treating criticality differently from other radiological hazards.

IV. Cost-Benefit

Balance of Risk and Benefits

The CSSG embraces the introductory statement of ANSI/ANS-8.1-1998:

> *1. Introduction*
> *Operations with some fissionable materials introduce risks of a criticality accident resulting in a release of radiation that can be lethal to nearby personnel. However, experience has shown that extensive operations can be performed safely and economically when proper precautions are exercised. The few criticality accidents that have occurred show frequency and severity rates far below those typical of non-nuclear accidents. This favorable record can be maintained only by continued adherence to good operating practices such as are embodied in this standard; however, the standard, by itself, cannot establish safe processes in an absolute sense. Good safety practices must recognize economic considerations, but the protection of operating personnel and the public must be the dominant consideration.*

and recognizes there are both tangible and intangible risks and cost-benefit considerations regarding the conduct of fissionable material operations.

Cost Considerations

Participation by criticality safety engineers in the safety design strategy ensures criticality safety issues are addressed through all stages of the design process and included in the development of key safety documentation. Significant cost savings may be realized though the appropriate assignment of seismic design criteria and limit states such as assigning LS-A for equipment that may be assumed to fail (no performance criteria credited in a criticality safety evaluation) or considering moderate (LS-B) or limited distortion (LS-C) based on crediting realism in the criticality safety evaluation rather than requiring no damage (LS-D) for reasons of convenience to the analyst. In any case, credited performance based on limited damage should be clearly identified in NCSEs as key assumptions per DOE-STD-3007-2007.

When evaluating the cost of implementing different limit states, consideration must be given to the risk reduction provided by the SSC. In particular, if the fissile material can be shown to remain in the subcritical state subsequent to a seismic event then assigning the least costly limit state, A, is appropriate. Applying increasingly stringent seismic design requirements beyond those derived from applying the DOE-STD-1189 process for new facilities should not be pursued without a comprehensive assessment documenting cost versus benefit. DOE should evaluate whether the special treatment of criticality hazards beyond the criteria used for other worker safety hazards provides significant risk reduction for the additional cost.

DOE O 420.1B, Change 1, requires facilities or sites with hazardous materials to "have instrumentation or other means to detect and record the occurrence and severity of seismic events". Such instrumentation, if equipped with an abrupt evacuation alarm or procedurally coupled with emergency evacuation procedures, would obviate the need for (costly) seismic tolerance of an installed criticality accident alarm system (CAAS). If a seismic instrument is credited with initiating a prompt evacuation function, the Criticality Safety Program Description Document should describe compliance with ANSI/ANS-8.3, §5.3, "Seismic Tolerance". Guidance on responding to a criticality accident including re-entry following an accident is provided in ANSI/ANS-8.23-2007. If a CAAS is used to protect workers from the impacts of a criticality accident, then the CAAS system should be designed to the same SDC as the components of the process being monitored.

While both DOE-O-420.1 and ANSI/ANS-8.1 require that a system should be designed such that no single credible event can cause a criticality accident, it should be noted that this does not equate to a zero risk policy. Although an earthquake larger than the design basis earthquake may be credible, seismic design considerations similar to those used for other hazards provide an adequate measure of risk reduction. Thus this requirement does not imply that a system must be designed so as to remain subcritical following any credible earthquake. There is no upper limit on the severity of earthquakes that individuals may judge as "credible." Systems should be designed to remain subcritical for earthquakes that are within a specified design basis, but not for events that exceed the design basis. The CSSG recommends that this clarification be placed in the next revision of DOE-STD-3007 and be provided to the ANS/ANS-8.1 working group for consideration in the next revision of ANSI/ANS-8.1 as well.

V. Conclusions

Criticality safety engineers should participate throughout all facility design stages to ensure appropriate hazard categorization of the facility based on the guidance provided in the CSSG Response to Tasking 2010-02. The corresponding seismic design criterion for structures and equipment important to criticality safety would be SDC-1, limit state –B or –C provided that the applicable NCSEs do not identify more stringent criteria (safety function) as being necessary to preclude a criticality accident. For example, if failure of a component during a DBE would cause a criticality accident prior to the implementation of safety management program protections (e.g., emergency evacuation and response actions, shielding, etc.) that component would require a higher SDC categorization.

The principal role of the criticality safety engineer throughout the design process is to identify SSCs for defense-in-depth and worker safety based on their required function following an earthquake as credited in NCSEs.

The purpose of a CAAS is to provide a prompt evacuation alarm to protect facility workers. Additional, often very large, costs associated with the seismic tolerance of criticality accident alarm systems may be avoided if emergency evacuation is provided by seismic instrumentation or earthquake evacuation procedures. If the facility posture is to shelter in place during and or following a seismic event, this should be considered in the evaluation of the CAAS system including the assignment of SDC.

Criticality safety engineers are encouraged to work closely with structural analysts to consider possible cost savings by suggesting innovative and inexpensive preventive measures such that seismic damage does not result in a criticality accident. This would permit limit states A, B and C and not require designing to the "no damage" limit state D.

References

1. ANSI/ANS-2.26-2004, Categorization of Nuclear Facility Structures, Systems
2. ANSI/ANS-2.27-2008, Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments
3. ANSI/ANS-2.29-2008, Probabilistic Seismic Hazard Analysis
4. ANSI/ANS-8.1-1998, Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors
4. ANSI/ANS-8.3-1997, Criticality Accident Alarm Systems
5. ANSI/ANS-8.23-2007, Nuclear Criticality Accident Emergency Planning and Response
6. ASCE/SEI 7-05, Minimum Design Loads for Buildings and Other Structures
7. ASCE/SEI 43-05, Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities
8. CSSG Response to Tasking 2010-02, Role of Criticality Safety in Facility Hazard Categorization
9. DOE O 413.3A, Change 1, Program and Project Management for the Acquisition of Capital Assets
10. DOE O 420.1B, Change 1, Facility Safety
11. DOE-STD-1189-2008, Integration of Safety into Design Process
12. DOE-STD-3007-2007, Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Nonreactor Nuclear Facilities
13. DOE-STD-3009, Change 3, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses
14. International Building Code, International Code Council, Falls Church, Virginia
15. DOE STD-1020-2002 Design Criteria for NPH Events; DOE-STD-1020-2002
16. DOE G 420.1-2 Guide for the Mitigation of Natural Phenomenon Hazards for DOE Nuclear Facilities

Attachment 1

CSSG TASKING 2010-01

Date Issued: April 23, 2010

Task Title:

Balanced Technical Approaches for Addressing Potential Seismically Induced Criticality Accidents in New Facility Design

Task Statement:

The CSSG is directed to develop a white paper on the use of balanced technical approaches for addressing the potential consequences of seismically-induced criticality accidents within the context of regulatory seismic design requirements for non-reactor nuclear facilities. The objective of the white paper is to provide guidance for technical approaches during new facility design phases to assessing criticality accident risk relative to seismic initiated events that balances the need to prevent potential criticality accidents with cost, regulatory compliance, and relative impact of a criticality accident in light of the overall consequence of the initiating event. The approach should include an evaluation of the extent to which seismic design criteria specified by DOE should be applied to facilities based solely on criticality safety risk. The CSSG is encouraged to indicate how the criticality safety philosophy inherent in the ANSI/ANS-8 Nuclear Criticality Safety Standards should influence the development of criticality controls in design of new facilities and how such an approach fits into the overall regulatory framework for new facility design. Hazards and risks that are to be addressed include:

- Potential process and operations equipment distortion that could lead to the potential for a criticality accident
- Loss of material separation and/or containment to the facility and/or environment resulting in the potential for a criticality accident
- Presence of employees during the seismic event, evacuation, and mustering
- Anticipated radiation exposures to employees, public, and the environment in the event of a seismically induced criticality accident
- Generalized cost-benefit evaluation on the use of seismically-qualified SSCs only to meet regulatory requirements without any significant risk reduction

Resources:

The CSSG Deputy Chair will form writing and review teams composed of CSSG members. Contractor CSSG members of the teams will use their FY10 NCSP CSSG support funding; DOE CSSG members of the teams will provide funding from their site offices. CSSG emeritus members may be included in the teams on a voluntary basis. In addition, staff members from the office of the NNSA Chief of Defense Nuclear Safety (CDNS), Brad Embrey, and the NNSA Engineering and Analysis Division, Andrew (Andy) F. Delapaz, shall participate on the team as ad hoc CSSG members on the writing team.

Task Deliverables:

CSSG Chair briefs the NCSP Manager on the proposed technical approaches and also highlights any emergent issues requiring disposition by the NCSP Manager on or before May 28, 2010.
Draft white paper issued to the entire CSSG for comments by June 25, 2010.
CSSG members submit comments on the draft white paper to the writing team lead by July 9, 2010.
Writing team addresses all comments from the CSSG and incorporates any comments that are accepted by August 6.
CSSG chair briefs the NCSP Manager on the comment resolution and the major recommendations of the writing team by August 20.
The writing team lead will submit the white paper to the CSSG Chair for transmittal to the NCSP Manager.

Task Due Date: August 27, 2010