CSSG Response to Tasking 2009-03

Recommendations for the Future DOE NCSP Training and Education Infrastructure Program

October 16, 2009

Introduction

The Criticality Safety Support Group (CSSG) was directed in Tasking 2009-03 (see Attachment 1) to provide a position paper regarding the establishment of an integrated DOE Nuclear Criticality Safety Program (NCSP) Training and Education Infrastructure Program that is consistent with the mission and vision of the DOE NCSP. The objective is to assess and recommend DOE NCSP-funded and -managed training options that address all requirements of ANSI/ANS-8.26-2007 excluding those which are not appropriate for inclusion in the DOE NCSP Training Infrastructure (e.g., academic training, site-specific training).

A subgroup of the CSSG was formed to draft the position paper, which was then submitted to the entire CSSG for review and comment.

Consideration of ANSI/ANS-8.26-2007 Content

The review team examined the content of ANSI/ANS-8.26-2007, with particular focus on determining which NCS staff training objectives should be addressed by DOE training and education efforts.

The selected training objectives were prioritized to reflect where DOE NCSP involvement should focus, considering schedule drivers (e.g., impending deinventory of LLNL for security category 1 materials), existing availability of training resources, and potential for improvement of DOE contractor NCS program performance. These priorities resulted:

> Top Priority: Provide a hands-on training experience addressing important characteristics of neutron multiplying systems, along with discussion of the theory and implications for safety of fissionable material operations. Since there are criticality safety engineer positions within the DOE complex that do not require DOE security clearances, and new hires may have an extended waiting period before clearance is granted, it is essential that this hands-on training be available to uncleared individuals.
>
> > Basis: The requirement for this type of experience cannot readily be met through DOE contractors' individual actions and resources, thus DOE needs to assist in this area.

Second Priority: Provide a consistent level of understanding and awareness to individuals entering DOE contractor criticality safety positions regarding:

- application of rules, standards, and guides,
- performance of criticality safety evaluations, and
- hazards analysis methods and implementation/maintenance of NCS controls.

Basis: Due to the diversity of facilities, operations, and contractor management across the DOE complex, DOE needs to take action to assure that individuals entering criticality safety engineering positions are exposed to a common and adequate level of understanding of requirements and expectations.

Third Priority: Provide training in interpretation of data (NCS handbooks, experimental data), computational methods (hand calculations, NCS codes), and other "tools of the trade" for criticality safety engineers. Also, provide training regarding issues associated with criticality accident alarm systems and emergency preparedness.

Basis: While proficiency with tools of the trade is essential to performance of criticality safety work, there are many existing venues (e.g., NCSET modules, training classes provided by universities and laboratories such as the UNM NCS course, the UT NCS courses, and training classes provided by DOE contractors such as the LANL MCNP and ORNL SCALE training courses) that provide training to criticality safety engineers in these areas. Similarly, special-purpose workshops have periodically been offered to address criticality accident alarm systems and emergency preparedness.

Examination of Training Proposals

The review team examined the training-related proposals that were submitted to DOE as part of the most recent (spring 2009) annual proposal and funding review for DOE NCSP activities. Also, the team examined proposals provided in response to a specific invitation for NCS training- and education-related proposals (issued to multiple academic and DOE contractor organizations in January 2009).

The proposals available for review pre-date determination of most of the training and education recommendations identified below. Thus, new or revised proposals by organizations willing and able to support specific DOE NCSP training and education objectives are needed.

CSSG Recommendations for "Hands-On" Training

Criteria or considerations for hands-on training (ANSI/ANS-8.26-2007, primarily Section 7.4) include:

(1) the ease and speed that the training can be established,
(2) the cost to establish the training program, the cost to operate once established, and cost sharing opportunities with other DOE programs,
(3) the location (ease or difficulty for student/instructor travel),
(4) minimal or no restrictions related to DOE security clearance requirements,
(5) the ability to integrate with other parts of DOE NCSP training,
(6) fissile assembly/fissile material availability,
(7) DOE control of continued training availability,
(8) the effectiveness of the training,
(9) clear identification of training prerequisites,
(10) demonstration of student competency, and
(11) the use of formalized training development methods.

The following recommendations are offered:

(1) Hands-on training should be established at the Critical Experiments Facility (CEF) at the Nevada Test Site and also at Sandia National Laboratory (SNL).
(2) At the CEF:
- Uncleared student access should be established.
- The experiments/training exercises should involve the same assemblies as used in prior LANL training (e.g., Flattop, the 93%-enriched U foils/Plexiglas™ plates).
- The TACS shell experiments (part of current LLNL training) should be included.
- One or more experiments representing overmoderated configurations should be included.
- The training should include demonstration of student competency.

(3) At SNL:
- The tank assembly for fuel rod lattice experiments should be modified to allow control of critical conditions based on water level control.
- An assembly using 19%-enriched U plates/foils should be made available and included in the training program.
- One or more experiments representing overmoderated configurations should be included.
- The training should include demonstration of student competency.

(4) The same fundamental learning objectives for hands-on training should be addressed at both sites (CEF and SNL), regardless of the exercises performed or the particular assemblies used for the exercises. The developers for the two training sites should collaborate during training development, to ensure agreement on the specific learning objectives and to ensure that the final training modules address those objectives.

CSSG Recommendations for Classroom Training

The primary criterion for classroom/academic training (ANSI/ANS-8.26-2007, mainly Sections 7.5, 7.6, and 7.7) is the ability to foster consistency, throughout the DOE complex, of

- student understanding of NCS orders/guidance/standards,
- performance of NCS evaluations,
- use of formalized hazards analysis techniques,
- selection of appropriate NCS controls, and
- effective implementation and monitoring of NCS controls.

The following recommendations are offered:

(1) Formalized methods to develop the training (e.g., systematic approach to training, testing methods) should be used.

(2) The training content should be vetted for consistency (e.g., by the CSSG) with regard to
- DOE orders/guidance and ANS-8 standards,
- DOE expectations for NCS evaluations, and
- safety analysis techniques and control specification.

(These three topics should be covered concurrently, in a collocated setting.)

(3) Multiple NCS subject matter experts (SMEs) from multiple sites should provide the training.

(4) Prerequisite training using established resources should be required (e.g., student self-study of pertinent NCSETs).

(5) Practical exercises (e.g., application of standards, performing evaluations) should be included.

(6) For effectiveness of the NCS evaluation exercises, at least one of the following (listed in order of preference) is needed:
(a) access to an operating facility,
(b) use of a mockup facility, or
(c) some other means to illustrate on-the-floor issues that affect the development of NCS controls.

(7) The training should include demonstration of student competency.

(8) As the initial action during training development, the training developer(s) should document all learning objectives to be addressed during the classroom training. Assuming that multiple organizations may be involved in this development, the developers should collaborate throughout the training development to ensure the final training modules address all identified learning objectives.

CSSG Recommendations for Other Training, Other Training Resources

The primary criterion or objective may be stated as: Use NCSET modules, the NCSP website, special topic workshops and tutorials, and distance education methods to augment or to increase the overall effectiveness of DOE-managed NCS hands-on and classroom training.

The following recommendations are offered:

(1) Consider development of NCSET modules, NCSP website information, or distance education products addressing these topic areas:
    - human factors,
    - equipment reliability,
    - formalized hazards analysis techniques,
    - handbook usage,
    - direct use of benchmark data, and
    - criticality accident analysis.

(2) Consider periodic DOE/NCSP funding/support of ANS (or other) workshops/tutorials for
    - criticality alarm systems/emergency preparedness, and
    - NCS issues related to Material Control and Accountability (MC&A) and non-destructive assay/evaluation (NDA/NDE).

(3) For the NCSP website:
    - Post important NCS reference documents, past tutorials, etc.
    - Provide links to NCS reference documents that are posted elsewhere.
    - Provide order or contact information for reference documents that cannot be posted on the web.
    - Under training-related information, provide a road-map to documents useful for NCS staff to find information/training regarding ANS-8.26 Section 7 topics.

Additional Observations

The CSSG review effort is consistent with the subject of ANSI/ANS-8.26-2007: training and education of NCS staff. Students in such a program may appropriately include DOE technical (regulatory) staff who are, or will be, tasked with NCS oversight.

Some program elements (e.g., periodic workshops, "advanced" courses for NCS codes) may be suitable for continuing education of more experienced NCS staff. More in-depth hands-on and classroom training events may be established for more experienced NCS staff, using the entry-level training programs as models.

Development of training recommendations for non-NCS staff is outside the scope of this CSSG position paper. However, as for current and past DOE-sponsored NCS training classes, the training classes and materials for NCS staff should be adaptable to students who have similar (but less technical) NCS training needs (e.g., production managers, operations supervisors, criticality safety officers/representatives).

Some training program content (e.g., regulatory guidance, state-of-the-art techniques for NCS computations) will change over time. The recommendations include a suggestion to use NCS SMEs from multiple sites for classroom training. These factors result in the need for careful documentation of training program content (including instructor notes and guidance) and periodic review of training for currency of content and effectiveness of training delivery.

Attachment 1

CSSG TASKING 2009-03
Date Issued: July 1, 2009

Task Title:

CSSG Recommendations for the Future DOE NCSP Training and Education Infrastructure Program

Task Statement:

The CSSG is directed to provide a position paper regarding the establishment of an integrated DOE NCSP Training and Education Infrastructure Program based upon the review and recommendation of existing or solicited proposals that are consistent with the vision and mission of the DOE Nuclear Criticality Safety Program (NCSP). The objective is to assess and recommend DOE NCSP-funded and -managed training options that address all requirements of ANSI/ANS-8.26 excluding those which are not appropriate for inclusion in the DOE NCSP Training Infrastructure (e.g., academic training, site-specific training).

Points to be addressed include, but are not limited to:

- Establishment of one or more hands-on training courses to incorporate and/or replace the current LLNL training course. At a minimum, the target audience must include uncleared personnel who are defined as "engineers in training" by ANSI/ANS-8.26-2007.
- Establishment of one or more classroom training courses (may or may not be included with the hands-on training curriculum(s); same minimum target audience as for hands-on training).
- Utilization of the NCSET and other self-directed study resources in a manner coordinated with the overall objective of the DOE NCSP Training Infrastructure.
- Means to demonstrate and document a defined minimal level of student competency.

Period of Performance:

The position paper will be developed by September 30, 2009.

Resources:

The CSSG will form a review and writing team composed of CSSG members. Contractor CSSG members of the writing team will use their FY09 and FY10 NCSP CSSG support funding; DOE CSSG members of the team will provide funding from their site offices. CSSG emeritus members may be included in the team on a voluntary basis.

An initial assessment of training proposals and options for consideration will by developed by ORNL staff as part of an existing (separate from the CSSG) NCSP effort. The assessment will be provided to the CSSG writing team in mid-August, and will be

presented at a writing team meeting to be held on August 24-25, 2009 at the Nevada DOE Office.

The writing team will consider training proposals submitted as part of the FY10 solicitation process, and may elect to further solicit training proposals (or refinement of existing training proposals already collected as part of the ORNL training evaluation effort) from various sites or organizations.

Task Deliverables:

By September 30, 2009, the writing team will forward a draft position paper to the entire CSSG for comments.

Within fifteen days of the date the draft position paper is distributed to the CSSG the writing team will address all comments from the CSSG and incorporate any comments that are accepted. The writing team lead will submit the position paper to the CSSG Chair for transmittal to the NCSP Manager.

Task Due Date: October 31, 2009