QUALITY ASSURANCE EXCHANGE

Volume 6, Issue 1
Winter 2010

U.S. Department of Energy
Office of Quality Assurance Policy and Assistance

HSS
Office of Health, Safety and Security

INSIDE THIS ISSUE:

QA Quote of the Day

"The bitterness of poor quality is remembered long after the sweetness of low price has faded from memory."

– Aldo Gucci

Director's Note

A new decade is upon us and the Office of Quality Assurance Policy and Assistance (HS-23) is looking forward to accomplishing activities planned for FY 2010. For instance, the results of the 2009 Survey of Quality Assurance (QA) Implementation are in and the analysis of the data has begun. Information from the Survey responses will be used to help and improve QA program implementation and performance. Feedback from the Survey responses will be used to improve the questions for the next Survey, which is to be issued in 2011.

The Quality Council activities are ramping up with new activities being initiated, and improved interface with EFCOG is being pursued. Among others, Council initiatives include developing QA metrics to evaluate effectiveness of a QA program, and activities related to Commercial Grade Dedication. In 2009, the Quality Council developed a draft QA training for Department of Energy (DOE) Headquarters (HQ) staff. The Quality Council is currently working with the National Training Center (HS-50) to finalize the training format. This training is expected to be piloted at HQ in the summer of 2010.

Finally, HS-23 is expanding its staff to include experts in analytical laboratory QA and program analysis to support initiatives within the Department. As we move into 2010, we appreciate any feedback or requests for assistance from HS-23.

Finally, we appreciate your contribution of comments, articles and suggestions for future newsletter content.

– Colette Broussard, *Director, Office of Quality Assurance Policy and Assistance* (HS-23)

IN THE SPOTLIGHT: ROBERT MURRAY, Acting Director, *Office of Standards and Quality Assurance, EM-23*

A new year brings new challenges for DOE and the Office of Environmental Management (EM) is no exception, especially with the acceleration and revamping of projects due to the American Recovery and Reinvestment Act (ARRA). A recent reorganization which has restructured EM senior leadership by adding new positions and changing reporting lines for many EM offices has brought about new objectives and challenges.

In an effort to understand these changes and expectations, we spoke with Robert Murray, Acting Director of the Office of Standards and Quality Assurance (EM-23) within the Office of Safety and Security Program. In the following interview, Mr. Murray discusses the changes, challenges, and objectives for EM-23 in FY 2010.

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Short Biography

Robert (Bob) Murray has been with the Department of Energy for the last 18 years of his 29-year Federal career. Prior to joining DOE, he worked for the Army Corps of Engineers, and the Department of Army. He holds undergraduate and graduate degrees in both Chemistry and Computer Science.

Q: What are the top objectives for EM-23?

A: Dr. Steven L. Krahn, Deputy Assistant Secretary, Safety and Security Program, EM-20, has put forth his goals for FY 2010 in light of the increased visibility of quality within the organization. He has charged my organization (EM-23) to focus on the following objectives in FY 2010:

- Provide QA subject matter expertise and consultation, as needed, to support EM sites and projects establish and implement an effective QA program;
- Perform targeted and focused QA assessments and assist visits of high priority EM activities, including emphasis on major construction projects and ARRA funded activities;
- Proactively identify and assist the EM complex address and resolve generic and emerging QA issues; and to
- Continue to strengthen and build the corporate QA infrastructure, including the development, streamlining, and clarification of governing QA framework, requirements, and expectations.

Q: How will your organization execute these objectives?

A: The key strategy adopted by EM-23 to execute its FY 2010 mandate is by building and expanding on its existing partnership with EM sites and projects QA organizations, as well as with Federal Project Directors. The EM Corporate Quality Assurance Program (QAP) serves a vital and critical role in ensuring that EM mission gets done safely, correctly, and efficiently.

Q: In order to achieve its mission for 2010, what do you feel is the most important challenge for EM-23?

A: For EM-23 to carry out its function diligently and effectively, it depends on awareness of existing as well as emerging QA issues and needs. This can only successfully be accomplished when there is close communication, coordination, and collaboration between EM site/project and HQ QA organizations. Many of EM-23's planned FY 2010 activities are designed to foster and enhance open communications. Each EM-23 QA staff member has been assigned as a lead point of contact for a specific EM site. As part of their responsibilities, EM-23 staff will work closely with the site QA organization and the respective Federal Project Directors to coordinate the scope, context, and timing of assist visits, assessments, and the needed subject matter expertise. It should be noted that EM-23 has staff stationed at several of our sites. We have resident staff at OR, RL, ORP, and SR.

EM-23 is also placing greater emphasis on ensuring it communicates the formal assessment findings to the EM site/projects in a timely fashion. EM-23 has developed the QAHub, a web-based corrective action management system, to address the following legacy issues specific to QA oversight.

- The lack of real-time (or timely) operational awareness of implementation status of Corrective Action Plan (CAP) commitments.
- Onsite verification of CAP completion and conduct of effectiveness reviews are not consistently performed.
- Development of CAP commitments is not always based on effective root cause analysis.
- Frequent observation of similar or citing of repetitive QA issues raises corporate concerns in terms of soundness, effectiveness, and added value of the CAP development process.

One of the biggest challenges of the EM QA oversight program in the past has been the follow-up and resolution of assessment findings. The QAHub will also act as a catalyst for sharing lessons learned across the EM organization and to provide EM HQ with needed metrics to determine the effectiveness of QA implementation.

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Q: How will EM-23 assist the field in implementing its Quality Assurance Programs?

A: EM-23 stands ready to provide increased corporate assistance, training and technical support to enable effective integration of QA in both capital/construction and all other EM projects. This will be accomplished through technical assistance from EM-23 staff, focused QA assessments and assist visits. Over 2/3 of the EM-23 staff members are engineers with past construction experience. EM currently has five major construction projects where this expertise is put to use daily.

The intent and scope of the QA assessments, which can include effectiveness reviews of site-specific Quality Assurance Program/Implementation Plans (QAP/QIPs), will be shared well in advance of the visit with respective EM site/projects. The technical bases for the lines of inquiry are documented within the Standard Review Plan (SRP) QA Review Module and EM-HQ Protocol for Review of Site-Specific QAP/QIPs.

EM-23 will use several mechanisms to ensure more effective communication and to facilitate transfer of and dissemination of lessons learned and QA know-how, including updates on best practices and approaches to address cross-cutting QA issues. EM-23 will rely more heavily on the EM portal and issuance of "EM Interim Guidance," as a formal mechanism to communicate needed clarification and guidance on generic and institutional QA issues facing the EM complex. EM-23 has also embarked on reinvigorating its Quarterly QA Newsletter in 2010. The success and usefulness of the newsletter depend greatly on sites' willingness to share QA lessons learned and best practices that would benefit other EM sites and projects.

Q: How is EM-23 addressing the need for additional NQA-1 resources?

A: EM-23, in coordination with EM Consolidated Business Center (EMCBC) and QA Corporate Board, will be developing and sponsoring 40-hour lead auditor training courses aimed at increasing QA capabilities and resources at EM sites. To the extent practical, the classroom training is augmented by providing hands-on QA assessment experience. The objective is to encourage and facilitate QA professional development and experience to achieve NQA-1 Lead Auditor Certification. The training schedule and locations will be announced widely to accommodate participation by a diverse cross section of the EM community.

Q: What areas/issues will EM-23 primarily focus on for FY 2010?

A: The high priority QA areas that will receive the majority of EM-23's corporate resources in FY 2010 include: major construction and capital asset projects; ARRA-related work and activities; cross-cutting and generic QA issues, including Commercial Grade Dedication (CGD); Configuration Management; Suspect Counterfeit Items, Vendors and Subcontractors; and site-specific QAP/QIP.

HAS YOUR CONTACT INFORMATION CHANGED?

If so, please help us maintain the QA Point of Contact database with accurate information by forwarding the following information to: qaexchange@hq.doe.gov.

- Name
- Phone number
- E-mail address
- Federal or Contractor personnel
- DOE organization or company name
- and site name, if applicable

Newsletter Articles Needed

The *Quality Assurance Exchange* is intended to be a forum for the exchange of ideas and the sharing of experience among DOE field offices, contractors, and DOE HQ to foster continuous improvement in QA implementation.

Readers are strongly encouraged to contribute articles on the implementation of QA requirements, lessons learned, and other QA-related topics. We welcome your feedback and suggestions. Please forward your input to: qaexchange@hq.doe.gov.

Software Quality Assurance Work Activity #10: Design of Safety Software

by Scott Matthews, Los Alamos National Laboratory

(This article is the tenth and final of the series addressing how the software quality assurance 10 work activities in the DOE O 414.1C relate to ASME NQA-1-2000 and other consensus standards. DOE G 414.1-4 provides details for implementing the 10 work activities to meet the SQA requirements in the DOE O 414.1C.)

The appropriate design of safety software systems is probably the single most challenging task of the ten quality criteria listed within 10 CFR 830 Subpart A[1] and DOE Order 414.1C[2] because of the many complexities and abstractions associated with design, and especially so for safety software. The analyst(s) and developer(s) must consider a wide range of topics and issues when developing the design and implementation basis. Many of these challenges are discussed using the five design assessment criteria as guidance for the design of safety software applications.

The first design assessment criterion is: "*Design items and processes using sound engineering/scientific principles and appropriate standards.*"

Using sound engineering/scientific principles implies many applicable design principles such as: whether commercial off-the-shelf programs will be used, what source language is intended for implementation, what hardware dependencies might exist, what potential technologies might be used or are required to be used, how anomalies, i.e., exceptions, will be handled, what assumptions are made as part of the design basis, and what standards will be used for guidance.

The caveat with using commercial off-the-shelf programs to support a safety software application is whether or not the manufacturer releases the source code. The rationale for this concern is that the safety software developer will not have the assurance that no unintended functions could occur due to side effects or atypical functionality. Furthermore, the analyst would not be able to study and assess the execution paths or determine how appropriately the functionality had been tested.

The expressed engineering concern regarding what source language is intended is that the developer, once again, cannot be assured that "no unintended functions" might occur if the target language for implementation of the safety software application is an object-oriented language. Polymorphic[3] features, such as inheritance, and virtual functions leave the developer and tester very much uncertain what functionality could occur because of the dynamic aspects of polymorphic behavior.[4] If possible, procedural[5] languages should be used just because the developer has more certainty regarding the executable functionality versus the challenging design attributes that accompanies most object-oriented language implementations.

Cautions to consider the hardware dependencies and required technologies, also known as *design* constraints, are driven by the uncertainties and risks associated with the timing and hardware-software interactions. Mitigation of these risks and uncertainties will require the safety software analyst to identify and analyze the potential software design issues *before* deriving the safety software design and concomitant risks and hazards. Hardware dependencies such as programmable logic controllers, analog-to-digital converters, or digital-to-analog converters will require the safety software design analyst to fully assess the risks, trade-offs, and nuances associated with the operational environment.

If the required technology is a mandated operating system, the analyst must be assured that the designated operating system is certified for performance, reliability, security, and safety. Similarly, the software safety design analyst must assess the design and execution risks when specific technologies are required, i.e., design constraints, or might be used to support the safety software application. These technologies might range across the spectrum from operating systems to user interface tools. As in the hardware dependencies noted above, the safety software design analyst must be cognizant of the risks and trade-offs. Any constraint or hardware dependency that might compromise the integrity or safety software application performance should either not be used or be thoroughly analyzed using such techniques as software fault trees or Petri nets to assist in the discovery process of potential defects that will result in a safety software fault. If no other options are viable, mitigation strategies should be discussed with management and appropriate waivers must be authorized.

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("Design of Safety Software"...continued from page 4)

Effective exception handling is probably the most critical aspect of software design but becomes even more important and relevant for a safety software application. The safety software analyst should never assume how any execution fault will be managed. Anomaly management must be an important attribute of every requirement's elicitation analysis and is even more vital for safety software applications.

The assumptions made must be documented to form the basis for design. Consequently, it is imperative that these assumptions are realistic in terms of technology and available resources, including people and time. Furthermore, both management and subject matter experts should thoroughly evaluate the documented assumptions.

Lastly, the design analyst for the safety software application must employ some guidance to assure all the relevant design topics are addressed within the design of the safety software application. Use of such standards as ASME NQA-1-2008[6] supplemented by other consensus standards is highly recommended.[7]

The second design assessment criterion supporting safety software design is "*Incorporate applicable requirements and design bases in design work and design changes.*"

The ramifications of this design assessment criterion require that the design is consistent with mission requirements, unambiguous, and not based upon any unrealistic or optimistic assumptions. If the applicable requirements are not verifiable[8] and acceptance criteria cannot be specified and documented, no design for the safety software system should even be attempted until verifiable requirements can be elicited and documented. Although the following design attributes for safety software applications are implicit, they are nonetheless important and relevant for basis in design work and design changes.

Design considerations for safety software applications must address the following topics.

- How to avoid the use of global parameters to reduce the number of potential side-effects.
- How to ensure that the design does not implement code that is unreachable.
- How to determine whether or not memory allocation schemes and optimization should be included within the safety software application design.
- How to ensure the design requirements are traceable throughout the life cycle of the safety software application.
- How to design the safety software application to support the objective of simplified code maintenance.
- How and when to include static and dynamic data type checking.
- How and where to include dynamic error checking.
- How to ensure the data definitions match and are compatible with all assignment statements.
- How to ensure invalid data is captured and managed appropriately.
- How to determine what processes should be used to ensure that all computer and software technologies, tools, and programming languages are appropriate and sufficiently proven to support the safety software application.
- How to ensure all algorithms incorporated within the safety software application are traceable to valid and appropriate algorithms. Simplifying algorithms may mean the operational domain may or may not be valid for the safety software application operation.
- How to ensure system load and timing issues are addressed and managed within the design.
- How to ensure the safety software application has a basis of requirements, thus limiting latent defects or residual code functionality and reducing the amount of volatile requirements or design changes that occur during the development process.

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("Design of Safety Software"...continued from page 5)

Another important consideration of design basis is the human factor aspect of a safety software design. Such topics as the target environment, ambient lighting, required user responses, and timing considerations of user responses all must be considered as tacit requirements, if not explicit requirements, for safety software applications. For example, 7% percent of American men are color-blind.[9] Therefore, the design analyst for the safety software application must consider color blindness issues when addressing screen display designs. The font size, screen position, and color might impact an operator's response time and understanding.

> The third design assessment criterion for supporting design of safety software applications is "*identify and control design interfaces.*"

The identification and control of design interfaces require proper management when designing a safety software application over and above the interface issues of typical software applications. Incomplete or undefined interfaces are a great source of risks when developing the design for safety software applications.

The risks associated with either incomplete or incorrect definitions of *"design interfaces"* present several potential hazards. For example, two applications may individually comply with an interface standard but this is no assurance that the two applications will interoperate. With unknown or ill-defined interfaces, defects can be introduced into the safety software application and thus, result in unknown outcomes. If a legacy application is being used for the safety software application, only minimal interface modifications should be made to ensure that incorrect values cannot be entered for use in the safety software application.

> The fourth and fifth design assessment criteria are "*verify/validate the adequacy of design products using individuals or groups other than those who performed the work*," and "*verify/validate work before approval and implementation of the design,*" respectfully.

Having objective subject matter experts review the safety software design and implementation is especially important to ensure the design/application addresses the safety software requirements and assessment criteria. The design analyst certainly cannot afford to develop an ambiguous or incomplete safety software design; therefore, having a formalized design review and approval process will help minimize defects propagating through to the implemented source code.

Proper analyses and well-defined processes ensure that the safety software design will meet the objectives of a robust safety software application and will function as intended with traceability to the safety software requirements without performing any unintended applications that might compromise either the integrity or safety of the executing application.

Footnotes

[1] 10 CFR 830 Subpart A, *The Rule, Nuclear Safety Management*

[2] DOE Order 414.1C, *Quality Assurance*

[3] The polymorphic attribute of an instantiated object allows values of different data types to be handled using a uniform interface. The concept of parametric polymorphism applies to both data types and functions.

[4] Procedural (or imperative) programming defines each step the program must take to reach the desired state.

[5] Some object-oriented paradigms can have as many as twenty-five (25) layers of inheritance so testing becomes impractical.

[6] ASME NQA-1-2008, *Quality Assurance Requirements for Nuclear Facility Applications.*

[7] Other such consensus standards could include recognized standards from IEEE, ANS, NASA or other acceptable standards.

[8] Verifiability is the process of objective assessment such that either the test case results or a consensus and common understanding can be achieved among the subject matter experts.

[9] *Color Blindness: More Prevalent Among Males*, Geoffrey Montgomery, 2008, Howard Hughes Medical Institute

LESSONS LEARNED: LESSONS LEARNED DURING THE FABRICATION OF 9975 TYPE B SHIPPING CONTAINERS *By Kyle Rankin, QA/SQA Subject Matter Expert, Richland Operations*

In September of 2007, DOE announced its decision to consolidate surplus plutonium into one centralized location at the Savannah River Site (SRS). Richland Operations Office (RL) possessed half of the required containers to carry out this decision by the project completion date of September 30, 2009. It was decided that RL would contract the services of National Nuclear Security Administration (NNSA) Kansas City Plant (KCP) as the Procurement Authority (PA) to procure 1100 Type B shipping containers, designated as 9975s, and provide funding to SRS to continue its function as Design Authority (DA) per the Safety Analysis Report for Packaging. KCP in turn contracted two separate fabricators to produce the containers. During fabrication, QA issues with the fabricators caused DOE to question container adequacy. This led to a QA audit by DOE's Environmental Management Safety Management and Operations (EM-60). The audit found that the fabrication and delivery of the 9975s was affected by a lack of essential communication, a failure to clearly define roles and responsibilities, and the organizational separation of the DA and the PA.

Communication

The EM-60 audit found that during the fabrication and procurement many communication issues were present which created fabrication problems and potential noncompliant containers. Examples included: limited sharing of information among the fabricators, limited interaction among the fabricators and the DA, and issues found during in-process audits were not shared with impacted fabricators. The contract structure for this project inhibited many aspects of communication among the organizations. For instance, it was established contractually that the two fabricators would communicate with the DA through the PA in order to deal with design issues. Lengthy formal communication back and forth between the PA and the DA before the PA could formally communicate the answer to the fabricators impeded the project schedule. To ensure adequate project flow, effective communication among all organizations involved must be facilitated and maintained. Watch that you have not created contractual barriers to critical communications.

Lesson Learned: Good communications are essential for effective project management and should not be inhibited by contractual barriers.

Roles & Responsibilities

To set up the contract structure for the procurement, RL established two Inter-Entity Work Orders (IEWOs) to support the fabrication of the 9975s. Through the IEWOs, RL incorrectly attempted to pass both authority and responsibility to KCP while maintaining the position of "buyer." The IEWO between RL and KCP had specific language as to how KCP was "responsible" for management of the procurement of the 9975s along with management of all aspects of the QA program supporting the 9975 fabrication. The EM-60 audit team found there was a misunderstanding between SRS and RL as to what tasks within the IEWO were funded. This led to needed DA reviews not being performed. For example, one task stated the DA would witness hold points at the vendor on an "as needed" basis. SRS understood this task as meaning it would provide support when requested to do so while RL expected SRS to provide continuous direct oversight without additional direction or prompting.

Lesson Learned: To avoid costly misunderstandings, the roles and responsibilities of all organizations involved in the procurement should be well documented and followed.

Design Authority/Procurement Authority

In previous 9975 procurements the DA and PA were the same organization. Due to schedule and manpower issues, this was not the case for the most recent procurement. This separation between DA and PA prevented essential communications among all organizations involved and created delays in the schedule due to the extra step between the fabricators and DA.

Lesson Learned: When possible, the DA and PA should be the same entity to help facilitate timely communication.

Conclusion

Ultimately it is the Federal Project Director's (FPD's) responsibility to ensure success of the project. In doing so he/she has a significant challenge of balancing cost, schedule, production, environmental, safety, and QA responsibilities. The FPD must ensure the Integrated Project Team works together effectively to minimize communication issues, the project documentation properly and accurately depicts the roles and responsibilities of all organizations involved in the procurement, and the contract structure is designed such that it minimizes impacts on the procurement.

IMPLEMENTING A GRADED APPROACH

by Bill Kerley, Idaho Cleanup Project Chief Engineer, CH2M-WG Idaho

All DOE sites implement a graded approach to quality assurance in the various quality implementing processes applied to purchasing, building, operating, maintaining, inspecting, and accepting items and services. Most often this grading is based on safety significance as defined within the safety analysis for the facility and by the relative importance that an item or activity may pose for the facility mission. The grading process will normally result in two, three, or four levels which then are used to tailor the application of the quality assurance program based on this graded level.

At the Idaho Cleanup Project (ICP), CH2M-WG Idaho, LLC (CWI) has implemented an electronic questionnaire to determine the appropriate quality level out of four levels for items and activities. This process is available across the ICP through an intranet based application which can be accessed to view prior determinations or perform new ones. The advantages provided by this application include consistent determinations of appropriate quality levels, documented results which provide the basis for the determined quality level, electronic notification for reviews and approvals, and a searchable database of all previously performed determinations.

To implement the requirements found in DOE O 414.1C and 10 CFR 830 for applying a graded approach, the questionnaire includes four primary sections:

1. Items or activities specifically described in the facility DSA;
2. Failure consequence level;
3. Failure potential level; and
4. Items deemed as mission critical which might not be identified in the previous questions.

Safety Class and Safety Significant items and activities will be categorized as Quality Level (QL) 1 and 2, respectively within the first section. The questions within the next two sections are used to establish a risk for failure of the item or activity to perform its intended function. Based on a predefined algorithm which uses this input, QL-2 through 4 results are obtained. The last section provides a final screen for key industrial safety item identification, regulatory compliance items and activities, and other areas of concern based on lessons learned which would be treated as a QL-3. Unless the questionnaire determines that the item or activity is QL-1 through 3, the QL will be set at a 4 which does not require the application of any quality controls beyond commercial standards.

A graded approach is not used to waive requirements, but rather allows for varying levels of managerial controls to be applied which will provide adequate assurance, commensurate with risk, that the requirements are being met. At ICP, the grading process is the responsibility of the assigned system engineer with review by the assigned QA organization and final approval by the engineering manager. The electronic questionnaire is an effective tool to enable the application of a graded approach in a consistent, defensible manner for DOE facilities. CWI will provide the associated procedures and electronic application as requested to other sites for their additional review and potential adoption.

HSS QA Activity Corner: 2009 Annual Face-to-Face Quality Council Meeting *by Sonya Barnette, DOE-HQ, HS-23*

The DOE Quality Council met for an annual Face-to-Face meeting on November 3-5, 2009 in Germantown, Maryland. At the conclusion of the meeting, the participants had positive comments on the information shared at the meeting and its usefulness.

Information provided at the meeting included a status on all current Quality Council task planning documents (TPDs) which included updates on the DOE quality assurance survey, efforts on incorporating integrated safety management requirements with quality assurance requirements, the review of NQA-1 Part II, and the pilot for quality assurance training. The length of the meeting limited discussions on these status updates and future Face-to-Face meetings will allow more time for break out sessions for the individual TPD topics.

In addition, status updates were provided by Quality Council members on quality assurance programs at some of the DOE sites. Also, status on the FY 2009 progress of DOE Order 414.1X, *Quality Assurance,* was provided as well as an informal notice to the Council members that the DOE Technical Qualification Program for Quality Assurance will be reviewed for revision in FY 2010.

Staff from the Defense Nuclear Facilities Safety Board provided a presentation of Commercial Grade Dedication (CGD) at the meeting. The Quality Council was encouraged to learn more about other DOE efforts in the area of CGD. The Quality Council members took action at the meeting and initiated a new TPD to develop guidance on CGD.

The Quality Council discussed a total of six potential TPD topics for FY 2010:

- Graded Approach Guidance;
- Commercial Grade Dedication Guidance;
- Review of new addenda for NQA-1 (2009);
- Development of Quality Assurance Metrics;
- Guidance on transition of research and development to production phase; and
- Applicability of NQA-1 Part 3 and 4.

The 2010 annual Quality Council Face-to-Face meeting will be a joint meeting with the Energy Facility Contractors Group (EFCOG) QA subgroup to enable Quality Council members to facilitate collaborate efforts and directly work with EFCOG on their initiatives.

Minutes form the Face-to-Face Meeting as well as all monthly conference call minutes are posted on the Quality Council website (http://www.hss.energy.gov/nuclearsafety/qa/council/).

U.S. Department of Energy

Office of Nuclear Safety, Quality Assurance and Environment (HS-20)

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QA-Related Meetings & Conferences

ASME 2010 Leadership Training Conference: Conferences, Knowledge and Community
When: March 11–14, 2010
Where: Dallas, TX
For more information: www.asmeconferences.org/ltc10/

20th Annual EFCOG Safety Analysis Workshop
When: April 24–29, 2010
Where: Knoxville, TN
For more information: https://www.ornl.gov/efcogWorkshop/index.shtml

26th SQA Annual Meeting
When: April 25–30, 2010
Where: Cincinnati, OH
For more information: http://www.sqa.org/events-education/annual-meetings/Future-Annual-Meetings.html

2010 ANS Annual Meeting: Nuclear Science and Technology — The Right Fit. The Right Time.
When: June 13–17, 2010
Where: San Diego, CA
For more information: http://www.new.ans.org/meetings/c_1

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