Energy Facility Contractors Group (EFCOG)
Software Quality Assurance Task Group

White Paper

Recommendations for Streamlining the Toolbox Qualification Process

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TABLE OF CONTENTS

SUMMARY

The Department of Energy (DOE) Central Registry Toolbox provides applications and codes to support DOE contractors in performing calculations and in developing "*data used to establish the safety basis for DOE nuclear facilities and their operation, and to support the variety of safety analyses and safety evaluations developed for these facilities*" (https://www.energy.gov/ehss/safety-software-quality-assurance-central-registry; Dec 2019). For the purposes of simplification, the term "code" or "codes" is intended to be equivalent to applications and software in the context of this white paper. Toolbox codes meet DOE Safety Software Quality Assurance (SQA) requirements as defined in DOE Order 414.1D, *Quality Assurance*. In addition, to appropriately support DOE safety analyses and evaluations, the codes must use "sound engineering/scientific principles and appropriate standards" (DOE O 414.1D). In other words, they should meet current good or best practices for technical quality. It is not sufficient to use a code for a safety application if it meets SQA standards but does not meet current sound scientific principles and technical capabilities.

The DOE Central Registry Toolbox currently lists eight applications that have been vetted as meeting DOE software quality assurance standards. However, qualification assessments of updates to new and improved versions of the Toolbox's existing codes have taken up to a decade to be conducted. This often means that major revisions to the software have been in common use for many years, while the code listed on the Toolbox is a much earlier version. Since DOE Complex sites are encouraged to use the Toolbox applications, considered to be a "safe haven", they are reduced to using outdated applications unless they are willing and able to conduct a supplier/development group assessment/audit themselves.

Under these circumstances, DOE staff and contractors face a difficult decision when performing safety and safety-related assessments– do they use an old version of a code that is in the Toolbox, or use a new and substantially improved version that is in widespread use. This tradeoff between technical quality and SQA certification could negatively impact the technical quality and accuracy of safety analyses and evaluations. Unless DOE makes a commitment of resources to provide timely reviews of new versions of Toolbox codes (e.g., acceptance of new versions of a code within a year of that code's operational release), a significant change in the Toolbox process is required.

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PURPOSE

The Energy Facility Contractors Group (EFCOG) Software Quality Assurance (SQA) task

group, which is part of the Quality Assurance (QA) sub-group under the Safety working group, reviewed the DOE Central Registry Toolbox code qualification process. The goal was to recommend changes to improve and shorten the time and effort involved in approving new applications and updates to applications already in the Toolbox. Reductions and improved efficiencies in effort, focus, and participation in the code qualification process will allow DOE Complex sites access to more up-to-date options of the applications and versions listed on the Toolbox.

SCOPE

The scope of these recommendations is constrained to the Central Registry Toolbox qualification process and activities associated with it. Qualification of end users to appropriately use the applications is outside the scope of this white paper.

DEFINITIONS AND ACRONYMS

There are three types of "teams" or groups referenced within the recommendations:

1. The Central Registry Toolbox Code Review Team, also referred to as the Review Team or assessment team: This team is the group of federal and contractor employee subject matter experts (SMEs) who join together to evaluate the supplier/development group and software product under consideration for inclusion on the DOE Central Registry Toolbox. Different Review teams are assembled for each code being evaluated. Makeup of the team depends on the subject areas relevant to the software.
2. Supplier/Development Group. This is the company or group of individuals responsible for the development and maintenance of the software being evaluated. There should always be independence or separation between members of this team and members of the Review team.
3. EFCOG SQA Audit Task Force Team, also referred to as the Audit Task Force. This team is comprised of SQA SMEs from various DOE Complex sites. This team can be called upon to supplement SQA-related assessments at individual DOE sites, participate on a Central Registry Toolbox Code Review Team, or mentor a supplier/development group through the Central Registry Toolbox application activities. Participation in the Audit Task Force is voluntary and fluctuate as individual member's time commitments and regular job assignments permit.

Term or Acronym	Definition
Amentum	Amentum is an American multinational engineering firm and one of DOE's partner organizations.
ALOHA	Arial Locations of Hazardous Atmospheres – ALOHA is a code used primarily for the evaluations of the consequences of atmospheric releases of chemicals.
ANL	Argonne National Laboratory
ANS	American Nuclear Society
ASME	American Society of Mechanical Engineers, a body of professionals that developed and maintains the DOE Order 414 preferred standard for safety software, NQA-1
Assessment team	A group of federal and contractor employee subject matter experts

Term or Acronym	Definition
	joined to evaluate a supplier/development group and software product under consideration for inclusion on the DOE Central Registry Toolbox. Also referred to as the Central Registry Toolbox Review Team or Review Team.
AU	The central organization within the Department of Energy responsible for health, safety, environment, and security leadership and direction.
Audit Task Force	A team comprised of software quality assurance subject matter experts from various DOE Complex sites. This team can be called upon to supplement SQA-related assessments at individual DOE sites, participate on a Central Registry Toolbox Code Review team, or mentor a Supplier/Development Group through the Central Registry Toolbox application activities. Also referred to as the EFCOG SQA Audit Task Force.
Central Registry Toolbox	The Department of Energy maintains a list of "toolbox" codes that have been evaluated against DOE Safety Software Quality Assurance requirements of DOE Order 414.1D and the safety software guidance in DOE Guide 414.1-4 and accepted as toolbox codes. The toolbox codes are used by DOE contractors to perform calculations and to develop data used to establish the safety basis for DOE nuclear facilities and their operation, and to support the variety of safety analyses and safety evaluations developed for these facilities.
Central Registry Toolbox Review Team	A group of federal and contractor employee subject matter experts joined to evaluate a supplier/development group and software product under consideration for inclusion on the DOE Central Registry Toolbox. Also referred to as the Review Team or Assessment Team.
DOE	Department of Energy
DOE O 414.1x	Department of Energy's *Quality Assurance* Order
EFCOG	The Energy Facility Contractors Group
EFCOG SQA Audit Task Force	A team comprised of software quality assurance subject matter experts from various DOE Complex sites. This team can be called upon to supplement SQA-related assessments at individual DOE sites, participate on a Central Registry Toolbox Code Review team, or mentor a Supplier/Development Group through the Central Registry Toolbox application activities. Also referred to as the Audit Task Force.
EPIcode	Emergency Prediction Information Code – The EPIcode program was developed to provide emergency response personnel and emergency planners with a software tool to help evaluate the atmospheric release of toxic substances.
EPRI	Electric Power Research Institute, a body of professionals that conducts research and development related to the generation, delivery, and use of electricity.

Term or Acronym	Definition
Hanford	The Hanford Site is part of the Pacific Northwest National Laboratory (PNNL) and is a decommissioned nuclear production complex now charged with environmental cleanup and stewardship of the decommissioned nuclear components. Besides the cleanup project, Hanford also hosts a commercial nuclear power plant, and various centers for scientific research and development.
IEEE	Institute of Electrical and Electronics Engineers, a body of professionals that develops standards and guidance specific to software, among other things.
LLNL	Lawrence Livermore National Laboratory
NFS	Nuclear and Facility Safety Sub-Group of EFCOG; NFS is a child of the Safety Working Group; members of the NFS Sub-Group are heavy users of the Central Registry Toolbox codes
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NQA-1	Nuclear Quality Assurance-1, an industry consensus standard created and maintained by ASME for safety functions within a nuclear facility. NQA-1 is the preferred standard of DOE Order 414.
PNNL	Pacific Northwest National Laboratory
PRES	Presentation - designation for one type of product produced by EFCOG Task Groups
QA	Quality Assurance Sub-Group of EFCOG; QA is a child of the Safety Working Group; the SQA Task Group is a child of this Sub-Group
Review Team	A group of federal and contractor employee subject matter experts joined to evaluate a supplier/development group and software product under consideration for inclusion on the DOE Central Registry Toolbox. Also referred to as the Central Registry Toolbox Review Team or assessment team.
SAF	Safety Working Group of EFCOG; the SQA Task Group is a second-level child of this Working Group
SQA	Software Quality Assurance; also the Software Quality Assurance Task Group; SQA is a child of the EFCOG QA Sub-Group, which is a child of the Safety Working Group
Std	Standard
Supplier/Development Group	A company or group of individuals responsible for the development and maintenance of the software being evaluated for inclusion on the DOE Central Registry Toolbox.
WP	White Paper - designation for one type of product produced by EFCOG Task Groups

RECOMMENDATIONS

1 Qualify the development group's software quality assurance program, rather than specific software titles or versions

The EFCOG SQA task group recommends that AU-32 modify its Toolbox acceptance procedure to focus initial qualification assessments on the supplier/development group's quality assurance program (QAP) and, thus, its software quality assurance program and processes. Assessment and approval of the SQA program associated with a Toolbox code as appropriately meeting the software requirements of NQA-1 and confirming that the development organization of the applicant Toolbox software has implemented that program effectively, gives a level of confidence that the code itself will be in compliance with the DOE quality requirements for software. Once established, this approval can be used to expedite the review of any software produced by the supplier/development group, whether new applications or updated versions of tools already approved for the Toolbox. The expedited reviews would require a fraction of the effort of the current assessment process. This amended process would also keep the Toolbox current, support more accurate safety analysis and evaluations, avoid excessive delays in code reviews owing to a lack of funding, and provide for a more efficient use of AU-32's software quality assurance resources.

To support this overall recommendation, the following are a set of observations and suggestions that could be incorporated into the process for implementing this primary recommendation.

1. The current guidance from AU-32 is that this team must be led by a federal employee qualified to DOE Std 1172 (see recommendation 6).
2. The remaining assessment team members should be comprised of federal employees, SQA and Accident Analysis (AA) EFCOG task group volunteers, and safety software code development experts who have undergone some level of Toolbox qualification training (see recommendation 6).
3. Review the suppler/development group's SQA-related program, procedures, practices, and model/algorithms (i.e., the science behind the software).
4. Give credit for supplier/development group certifications (e.g. NQA-1 with Subpart 2.7; ISO 9001; other SQA-related certifications).
5. Suggest, if using this model, to include the typical 3-year on-site re-evaluation of the supplier/development group's QA program with annual desktop evaluations.
6. Develop guidance for the Toolbox Review Team on how to incorporate assessments and model evaluations from independent third-party assessors (see recommendation 2). Guidance should be provided on how to assess things such as:
   a. Independence of the third-party reviewer(s)
   b. Quality of assessment for SQA programs
   c. Verification and validation (V&V) of software and/or software output
   d. V&V of model or algorithms used
7. Review Team assesses gaps in available third-party assessments and focuses on filling those gaps.

8. Create a standard format and minimal criteria for the qualification assessments (i.e., which criteria *must* be met before inclusion on the Toolbox).
9. Create thresholds for what is required to "pass" the qualification process (e.g., okay with some deficiencies depending on where those fall in criteria; write those deficiencies or gaps into tool limitations or require supplier/development group to fix before inclusion).
10. Use a usage-risk-based graded approach when qualifying the supplier/development group (e.g., if Safety Class software, must meet higher number of criteria or have more formality/rigor).
11. Gather drivers/reasoning behind why the formula or model was used (e.g., work with EFCOG's AA group to determine if the chosen formula/model is appropriate).
12. The Review Team assessors must have independence from the supplier/development group (e.g., a LANL assessor could not participate in the qualification of a LANL application; qualification "mentor" [see Recommendation 7] could not be part of the qualification Review Team).

2 Use site or third-party assessments as a starting point for Toolbox qualifications

In the interest of saving time, money, and effort; taking advantage of available objective evidence from independent assessments where they overlap with Toolbox qualification objectives should be a consideration. These third-party assessments could be from DOE Complex sites or certified independent assessment bodies as long as the assessment up for consideration was based on NQA-1-2008 as stated in DOE O 414.1D.

The following considerations act as additional support for this recommendation.

1. Several sites have already "qualified" or assessed the SQA program of and software produced by a supplier/development group. These assessments would need to be a safety-usage level assessment following the requirements of NQA-1-2008.
2. The Toolbox Review team, led by a DOE Std 1172 qualified federal employee (if that requirement is continued) should start with the qualification documentation of the third-party assessment and do a gap analysis against the Toolbox qualification criteria. Where gaps or deficiencies exist, assess the supplier/development group only on those gaps.
3. The site or third-party assessment conclusions and the gap assessment can form the basis of Toolbox qualification approval once any deficiencies or issues have been corrected.

3 Submit and review delta information for new versions of previously qualified codes

New applications are added to the Toolbox after successfully passing an assessment of the supplier/development group's QA/SQA program. As with Supply Chain evaluations, approval of the supplier/development group's QA/SQA program can be trusted for up to three years with an annual desktop evaluation before a new evaluation needs to be conducted. If a new version of

an evaluated and approved Toolbox code is released within that three-year window, the qualification scope of the new version may be limited to the requirements, design, and code that have been modified, added or deleted, and any dependent elements affected by the revisions rather than a full assessment. Similar considerations and assessment scope should be considered for new applications produced by the supplier/development group if within the three-year assessment window.

The following set of considerations detail this recommendation.

1. Start with the previous version's qualification package.
2. Verify the supplier/development group is following the same processes.
3. Ensure all gaps and findings have been corrected.
4. Determine what was updated for the new version and what assessment artifacts or activities need to be reviewed or assessed.
5. Perhaps a DOE Std 1172-qualified federal employee would not need to lead this Review Team (but may at a minimum, be a signatory to the approval of the update). This would increase the number of version update assessments that could be done in a given time period.
6. These assessments would focus on testing the new version including testing for potential breakage.

4 Have the Central Registry Toolbox Review Team run general tests for the submitted code

Testing involves systematic execution of the code under specified conditions, usually identified within a test-case suite. This recommendation has the Central Registry Toolbox Review Team being responsible for developing and running the test-case suite and making the suite (with results) accessible to user sites. The broad purpose of testing is to ensure that the code functions as designed for its intended purposes. Thus, an important element of testing is to support validating the scientific model(s) within the code to ensure accurate representation of real-world phenomena. The Review Team will collaborate with the EFCOG's AA group to develop "science verification and validation (V&V) tests" that evaluate these models.

The following activities help implement this recommendation.

1. Run supplier/development group supplied tests.
2. Gather relevant tests written/produced by user sites (e.g., science V&V tests).
3. Work with EFCOG's AA group to come up with science V&V tests.
4. Create a test suite attached to the software that is downloadable and can be run by user sites.
5. Document limitations of the software's use for safety purposes based on test results and assessments.

6. Provide evidence of general testing (e.g., done by the Toolbox Review team) on the Central Registry site.

5 Require user sites to run installation tests and at least one site-specific test for which the acceptable answer is known by an alternate method

The Central Registry Toolbox Code Review team is responsible for the V&V of the science (e.g., model, formula, etc.) behind the software and general testing of the software (as detailed in recommendation 5.4). The user-site is responsible for conducting two types of tests once the software has been downloaded onto their workstation(s) or server(s): (i) Installation Tests and (ii) Site-specific Validation Tests. The installation test suite is generally supplied by the supplier/development group (or otherwise by the Central Registry) and includes example input files and corresponding reference output files and reports. Users execute the example problems on their workstation as test cases in their V&V testing and compare their output against the reference output to demonstrate no significant differences as part of installation verification.

In addition, each site must ensure that the proposed application of the software is within the code's capabilities and limitations. The site would then develop a test problem consistent with its intended use, including any site-specific data used as inputs. The output results are compared against the results of an alternate method such as hand calculations or use of an independent, qualified application. The magnitude of the differences between the two sets of results will vary according to the complexity of the scientific models within the software and the availability of an alternate approach that addresses these complexities with similar rigor.

These six activities implement this recommendation, especially related to the site-specific validation testing.

1. The site-specific validation test must be specific to the way in which the site proposes to use the software.
2. The "correct" answer(s) must be known via hand calculations, experience, experiments, output from similar software, etc.
3. Differences between the "correct" answer and software output must be reasonable and explainable (e.g., due to model complexities, round up differences, random number generators, etc.).
4. The Review team will be responsible for V&V of the science (e.g., model, formula, etc.) behind the software.
5. Users must agree to abide by limitations associated with the application as stated on the Central Registry's Toolbox page.
6. Over time, the Review Team and site-specific tests would be accumulated into a test suite available on the Central Registry for download and use at the sites.

6 Use EFCOG's SQA Audit Task Force to help conduct qualification assessments

The EFCOG SQA Audit Task Force Team provides access to experts trained in software quality assurance principles and techniques representing various DOE Complex sites. These individuals possess the experience and skills to conduct software-related assessments that meet DOE's quality requirements. By allowing these members to participate on the Central Registry Toolbox Code Review teams, impediments to performing qualification assessments are decreased because the pool of qualified individuals to perform these assessments are increased. With a larger pool of QA auditor candidates, alternatives are more readily available when schedule conflicts make specific team members unavailable. In addition, travel expenses may be reduced for participants who are more regionally localized to the desired assessment location.

Considerations for this recommendation are as follows.

1. Everyone on the SQA Audit Task Force would need training in the qualification assessment criteria, procedures, etc.
2. LANL already has a quality audit task force (perhaps look at their program for ideas).
3. Each Audit Task Force member's site would cover time/travel/expenses for:
    a. training time
    b. assessment time
4. DOE's AU organization should socialize the value of the Toolbox to Environmental Management (EM), Office of Science (OS), and other impacted organizations, coordinating efforts such that SQA Audit Task Force members from all sites are authorized to participate in these assessments.
5. The current bottleneck is the position that Review Team leads must be federal employees qualified to DOE Std 1172-2011. This would only allow one or two qualification assessments a year.
    a. How firm is this requirement?
    b. If the application being qualified is low risk safety or non-safety, could an EFCOG SQA Audit Task Force team member lead the team?
    c. Could non-Headquarters federal employees lead Review Teams to help conduct more assessments each year?

7 Use the EFCOG's SQA group to help supplier/development groups prepare for the qualification process

Toolbox qualification assessments can be very costly endeavors for both the supplier/development group and the Review Team. It is highly desirable that the Review Team's time and effort be as efficient as possible. During the assessment itself, the supplier/development group needs to understand and produce specific objective evidence for each requirement or criterion in a timely and concise manner for the qualification assessment to succeed. Having an EFCOG SQA Audit Task Force member assist the supplier/development group with a "dress rehearsal" of the qualification assessment provides for an essential gap analysis and readiness

determination.

The result of this pre-screen, as described below, is to allow the supplier/development group to preemptively address identified gaps, be better prepared, and increase the productivity of the actual qualification assessment activities.

1. Someone trained on the Central Registry Toolbox Qualification process would do a "desk check" review of the supplier/development group's qualification documentation to determine if they are ready for a Toolbox qualification assessment.
2. If the desk check review concluded that the code and supplier/development group was ready to pass a Toolbox qualification review, the desk check reviewer would not be part of the official qualification assessment.
3. If the desk check review concluded that the code and supplier/development group was NOT ready to pass a Toolbox qualification review, make individuals from the EFCOG SQA Audit Task Force available to the supplier/development group to mentor them through the necessary SQA so they could pass a Toolbox Review qualification assessment. Whether or not the supplier/development group availed themselves to the services of this group would be their choice.
4. The supplier/development group would pay for any time/travel/expenses of the "mentor(s)"/consultants.

8 Other recommendations

These general recommendations are to assist users of the DOE Toolbox and its constituent software with greater clarity and understanding. In addition, software contributors may benefit from the consideration and implementation regarding the clarification of the software information provided within the DOE Toolbox.

1. Define what "safe haven" means for the sites – be specific as to what individual sites need to do to use the Toolbox codes.
2. Add limitations and known problems to the application-specific page of the Central Registry (e.g., guidance documents).
    a. Add these to the top of the page in bold (or at least the title "Limitations and Known Problems" and "Guidance" in bold).
    b. Add a place to file problem reports discovered by the DOE users.
    c. Include work-around information if it exists.
    d. List the minimum requirements for testing at the site level (especially if there are known problems and limitations).
3. List which functions or features of the software are "qualified".
4. Add a workflow diagram of the qualification process and links to associated templates to the Central Registry main page. The current documents and templates are hard to find, and links are often broken.

5. Make the qualification reports available for download on the Central Registry Toolbox's code-specific page.
6. Add disclaimers to software packages if possible.
7. Develop a qualification process all sites can agree to and follow.
    a. This qualification process could be based on the Central Registry Toolbox Qualification process and/or developed by the EFCOG SQA Task Group and approved by AU-32 and the EFCOG SQA Membership.
    b. Once training is created for the Toolbox Review Team, offer it to other SQA and/or assessment personnel at the Complex sites.
    c. At this point, perhaps individual sites could assess a supplier/development group's software quality assurance program and create a pre-qualification package, which the Central Registry Toolbox Code Review Team could review and fill in the gaps (as per Recommendation 5.2).

CONCLUSION

The DOE Central Registry Toolbox offers a safe haven of safety-related design and analysis codes. These applications can be downloaded and quickly used without requiring multiple individual sites to conduct time consuming and expensive commercial grade dedication assessments. However, unless the current Toolbox Code qualification process can be streamlined and made more efficient, in terms of time, resources needed, and cost, the Toolbox cannot keep up with version updates as they become available. The recommendations outlined in this White Paper offer suggestions for decreasing the time and effort of the qualification assessments, guidance on testing, a population of qualified assessors from which to draw, and ideas for better preparing candidate software to pass the Toolbox Review.

REFERENCES

- DOE O 414.1D Admin Chg 1, Quality Assurance
- ASME NQA-1-2008, Quality Assurance Requirements for Nuclear Facility Applications

TEAM MEMBERS

Vicki Pope (LLNL), Team Leader

Vicki Pope is an American Society of Quality Certified Software Quality Engineer and the SQA Manager for Lawrence Livermore National Laboratory (LLNL). In this position, she analyses legal and contractual SQA requirements and translates those into meaningful and usable information for software development and user teams at her site. She also is a certified lead assessor, leading assessments and audits at LLNL and other DOE Complex sites to evaluate level, completeness, and implementation of SQA requirements and practices as specified through DOE O 414.1D. In addition, Ms. Pope is the Chairperson for the EFCOG SQA Task Group. In these two capacities, she frequently interacts with senior LLNL and project management, local and national external oversight, and other DOE site SQA offices.

Cliff Glantz (PNNL)

Clifford Glantz is a project manager and senior staff scientist at Pacific Northwest National Laboratory (PNNL). His 37-year tenure at PNNL has focused on research in consequence assessment, emergency management, risk assessment, atmospheric dispersion modeling, and critical infrastructure protection. He is a longtime leader in the DOE emergency management community – including more than a decade chairing or co-chairing the DOE *Subcommittee on Technical Analysis and Response Support.* Mr. Glantz has participated or lead projects for the DOE, National Nuclear Security Administration, Nuclear Regulatory Commission, Department of Defense, Department of Homeland Security, State Department, and other government agencies. He has authored over 90 publications, given ~150 conference presentations, and has won numerous awards for his work.

Roger Lanning (Hanford)

Roger Lanning is a member of the EFCOG Nuclear and Facility Safety Subgroup, previously serving as the chair of the Accident Analysis Task Group for several years. Mr. Lanning supported DOE as an active member of the Central Registry Safety Software Expert Working Group (SSEWG) and participated in the DOE-HQ SQA review to update the GENII software in the Central Registry. Over the past 20 years, he has supported the Hanford DOE site Waste Treatment Plant and Tank Farms projects as a nuclear safety specialist, utilizing Central Registry codes in accident and consequence analysis. Mr. Lanning served as the SQA Project Program Sponsor for the Waste Treatment Plant for GENII, MACCS2, CFAST, and ALOHA. He was a contributor to the current draft revision of the SQA guide DOE G 414.1-4.

Keith Morrell (NNSS)

Software Quality Assurance Program, Nuclear Quality Assurance Program and Auditor. Work with internal and external organizations to assure requirements, policies and standards are implemented, maintained and improved. Most recent past Savannah River Site: Software Quality Assurance Program, Process Control Automation Engineering activities, Nuclear Quality Assurance Program, and Qualified ASME NQA-1 Auditor. Involved in industry standards and related business areas: ASME NQA-1 Main Committee and ASME NQA-1 Waste Management Sub-Committee, Nuclear Information Technology Strategic Leadership - Commercial Nuclear, American Nuclear Society (ANS) Standards (Past Chair of ANS 10 Standards Team), EPRI Technical Guidance Development for Commercial Grade Dedication, writing team and DOE Order 414 and related guides, writing teams. Involved in internal and external audits / assessments, teaching, and presentations. Developed and taught Quality Assurance Courses (Ex. Software Quality and Commercial Grade Dedication) and presented at ANS, ASME NQA-1, Nuclear Information Technology Strategic Leadership, Department of Energy, and Defense Nuclear Facility Safety Board on related topics.

Carol Olijar (ANL)

Carol Olijar is an American Society of Quality Certified Software Quality Engineer and the Software Quality Engineer for Argonne National Laboratory (ANL). Carol is the Safety Software Manager for the entire lab also. She is responsible for the Argonne Safety Software

Quality Assurance Program Plan, as well as for the Nuclear and Waste Management division's Safety SQA Program Plan, and their related SQA procedures and forms. Carol provides support to the lab divisions for SQA. She is the SQA point of contact for ANL for matters such as audits. Carol is an active member of the EFCOG SQA Task Group.

Russell Swannack (PNNL)

Russell Swannack is an American Society of Quality Certified Software Quality Engineer and Project Management Institute Project Management Professional for Pacific Northwest National Laboratory (PNNL). He provides SQA services to numerous PNNL projects large and small, from basic research to applied technologies regarding the analysis, interpretation and implementation of QA requirements throughout all software development life cycle work activities. He is an author for the SQA procedures for PNNL's Nuclear Quality Assurance Program. In addition, Mr. Swannack is the Project Manager for a PNNL safety software project, safety software developer and tester, performs audits, assessments, independent technical reviews and is a Computer Science Professor at Washington State University. Russell is an active member of the EFCOF SQA Task Group.

Dave Thoman (Amentum)

Dr. David Thoman is the current co-chair of the EFCOG Accident Analysis Task Group. He supports various DOE sites as an analyst with Amentum. He specializes in plume dispersion modeling, including the use of applicable Central Registry toolbox codes, to support chemical and radiological consequence analyses. In addition, Dr. Thoman was the lead author of the gap-analysis and the user-guidance reports for EPIcode and ALOHA as part of the 2004 establishment of the Central Registry. He was also the lead author for the model evaluation section for the current draft revision of the SQA guide DOE Guide 414.-4 and contributed to other sections.

Ashley Toth (Hanford)

Ashley Toth is an American Society of Quality Certified Software Quality Engineer and the Quality Assurance Group's SQA lead at Mission Support Alliance at the Hanford Site. She has provided SQA oversight for the group for several years as well as project management and software development activities until transitioning into a joint task team with Information Management's SQA office on the rebuild of the Alliance's SQA program in 2019. Ashley has a Bachelor of Science degree in Computer Science and is working toward the IEEE Professional Software Engineering Master certification.