



Independent Assessment of Software Quality Assurance Program Implementation at Sandia National Laboratories – New Mexico

August 2024

Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

CFR	Code of Federal Regulations
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
NQA	Nuclear Quality Assurance
NTESS	National Technology and Engineering Solutions of Sandia, LLC
OFI	Opportunity for Improvement
QA	Quality Assurance
QAP	Quality Assurance Program
QMSD	Quality Management System Description
SDL	Solution Delivery Lifecycle
SFO	Sandia Field Office
SME	Subject Matter Expert
SNL-NM	Sandia National Laboratories – New Mexico
SQA	Software Quality Assurance
SSQAP	Sandia Software Quality Assurance Program
SSQMP	Safety Software Quality Management Procedure
TA-V	Technical Area V
WRC	Weapons Response Code

INDEPENDENT ASSESSMENT OF SOFTWARE QUALITY ASSURANCE PROGRAM IMPLEMENTATION AT SANDIA NATIONAL LABORATORIES – NEW MEXICO

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of software quality assurance (SQA) program implementation at the Sandia National Laboratories – New Mexico (SNL-NM) from December 2023 to May 2024. The purpose of this assessment was to evaluate the performance of the National Technology and Engineering Solutions of Sandia, LLC (NTESS) SQA program. The assessment focused primarily on software implemented at Technical Area V (TA-V), where the balance of SNL-NM's high-hazard nuclear facility operations is located. This assessment also evaluated the effectiveness of the National Nuclear Security Administration Sandia Field Office (SFO) in providing oversight of the SQA program.

EA identified the following strengths:

- NTESS self-identified needed improvements to the software governance process and Solution Delivery Lifecycle.
- NTESS conducts an annual review of the safety software inventory to verify its accuracy.
- NTESS quality assurance personnel, including the SQA subject matter expert, and the SFO SQA subject matter expert meet regularly to discuss TA-V activities.

EA also identified several weaknesses, as summarized below:

- NTESS does not review, revise, and approve all SQA program documentation in accordance with established program requirements.
- NTESS did not provide information to demonstrate compliance with all quality assurance criteria for all non-safety software.
- NTESS has not implemented its SQA program such that functional responsibilities and interfaces for maintaining the quality of software are consistently understood by all stakeholders.
- SFO does not review and approve all documents describing SQA requirements for TA-V.
- SFO does not evaluate NTESS quality management system implementation across all SNL organizations and for all types and grades of software.
- NTESS records management practices did not support timely retrieval of documents and records used to demonstrate SQA program implementation.

In summary, NTESS has implemented a generally adequate SQA program at SNL-NM for the software applications evaluated. Most safety and non-safety software applications are managed using processes that provide reasonable assurance of software quality and support nuclear safety and mission operations. However, weaknesses in NTESS SQA programs and program implementation, and limited contractor oversight of SQA implementation inhibit overall effectiveness. SFO has approved the NTESS SQA program and provides oversight of how NTESS implements it for safety software at TA-V. However, SFO has not reviewed all documentation that defines the SQA program, and its oversight does not inclusively evaluate program implementation for all grades of software. Addressing the weaknesses identified in this report will strengthen the performance of the SQA program and enhance assurance of initial and maintained software quality at SNL-NM.

INDEPENDENT ASSESSMENT OF SOFTWARE QUALITY ASSURANCE PROGRAM IMPLEMENTATION AT SANDIA NATIONAL LABORATORIES – NEW MEXICO

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Nuclear Engineering and Safety Basis Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of software quality assurance (SQA) program implementation at Sandia National Laboratories – New Mexico (SNL-NM) from December 2023 to May 2024. The purpose of this assessment was to evaluate the performance of the National Technology and Engineering Solutions of Sandia, LLC (NTESS) SQA program. This assessment also evaluated the effectiveness of the National Nuclear Security Administration Sandia Field Office (SFO) in providing oversight of the SQA program.

This assessment was performed consistent with the *EA Plan for Phase 2 of the Enterprise-wide Independent Assessment of Software Quality Assurance Process Implementation, January 2023*, which describes the second phase of a two-phase, enterprise-wide, targeted assessment of SQA processes. The first phase of this targeted assessment process examined and analyzed the design of SQA programs implemented throughout the DOE enterprise, helping to identify general, complex-wide strengths and weaknesses. The first phase also helped inform the development of an EA plan for conducting assessments of SQA program implementation at selected DOE sites. Accordingly, this second phase of the assessment evaluated SQA program implementation by examining NTESS SQA processes. The assessment evaluated a sample of both safety and non-safety software, software that has been assigned varying grading levels, and software that is implemented for a variety of functions (e.g., nuclear safety analyses, security, radiological safety, and administrative activities). The assessment focused primarily on software implemented at Technical Area V (TA-V), where the balance of SNL-NM’s high-hazard nuclear facility operations is located.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms “best practices, deficiencies, findings, and opportunities for improvement (OFIs)” as defined in the order.

As identified in the assessment plan, this assessment considered requirements related to software, as presented in 10 CFR 830, *Nuclear Safety Management*, subpart A, *Quality Assurance Requirements*, and DOE Order 414.1D, *Quality Assurance*, and applicable consensus standards, including American Society of Mechanical Engineers Nuclear Quality Assurance (NQA)-1, *Quality Assurance Requirements for Nuclear Facility Applications*. EA used criteria and review approach document (CRAD) EA CRAD 30-10, Revision 0, *Software Quality Assurance*, to guide this assessment.

EA examined key documents, such as program plans and descriptions, implementing procedures, software lifecycle management documentation, assessment reports, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs, and observed meetings and activities that support SQA program implementation. The members of the assessment team, the Quality Review Board, and the management responsible for this assessment are listed in appendix A.

There were no previous findings for follow-up addressed during this assessment.

3.0 RESULTS

3.1 Quality Assurance Program

This portion of the assessment evaluated the NTESS quality assurance program (QAP) for safety and non-safety software.

Safety Software

NTESS has established a generally adequate *QAP* for safety software, as described in the DOE-approved document SAND2023-041370, *Quality Management System – Description* [QMSD], and associated implementing documents in accordance with DOE Order 414.1D, attachments 2 and 4. The QMSD references IT008, *Provide Quality Software Policy*, and SS-R89727, *Sandia Software Quality Assurance Program* (SSQAP), Issue J. IT008 provides high-level software requirements, and SS-R89727 provides guidance on the software grading methodology, grading levels, and work activities and was approved by SFO. SAND2023-041370 requires that both IT008 and SS-R89727 be reviewed every two years and any major updates approved by SFO. IT008 and SS-R89727 appropriately identify the Solution Delivery Lifecycle (SDL) management process and risk-informed grading using practice levels P0 (lowest) through P4 (highest) for selecting recommended software quality management practices and associated templates as an acceptable approach. NTESS identifies these assigned practice levels in a safety software inventory, which is appropriately maintained. All safety software owners are required to perform annual self-assessments on the graded safety software for which they are responsible.

SAND2023-041370 and IT008 allow the use of alternative, organization-specific QAPs and implementing documents. TA-V implements such an alternative QAP described in a document entitled, *TA-V Management System*. *TA-V Management System*, Revision 14, the effective version of the organization-specific QAP, appropriately includes a citation on the cover page identifying the date the SFO approval letter was issued; however, not all reviewed QAP documents identified the date of approval. (See **OFI-NTESS-1**.) *TA-V Management System* invokes the plan entitled, *Center 1300 Software Quality Assurance Plan* (Center 1300 QAP), which, in turn, requires TAV-AP-034, *Safety Software Quality Management Procedure*, (SSQMP) to be followed for safety software in lieu of the SDL.

The NTESS Information Engineering (IE) organization is led by the Chief Information Officer and includes one matrixed SQA subject matter expert (SME) who regularly meets with TA-V SQA representatives and SFO SQA oversight staff to discuss safety software status. The SQA SME appropriately conducts an annual review of the safety software inventory and ensures that any needed corrections are made by software owners. NTESS provides for some employee SQA training and oversight. IT008 effectively identifies recommended training for three sets of roles: software developers and modifiers; safety software developers, modifiers, and end-users; and software assessment leads and team members. All software developers for safety software are required to take the training course entitled, *Software Engineering Excellence for Safety Software SQE200 – For Software Developers*, which presents the flow down of safety software requirements, definitions of safety software and nuclear facility safety software, requirements for users and developers, and provides links to safety software tools and resources. Records for software developers responsible for the reviewed TA-V safety software show that their training is current.

While NTESS had established a generally adequate SQA program, the following weaknesses were identified:

- Contrary to SAND2023-041370, section 5.12, and DOE Order 414.1D, attachment 2, section 4.a, NTESS did not submit IT008, Center 1300 QAP, and TAV-AP-034 to SFO for review, concurrence, or approval. (See **Deficiency D-NTESS-1.**) Not submitting all requirements documents and implementing procedures, which constitute the full SNL QMSD, for review and approval inhibits the SFO's ability to effectively evaluate the complete SQA program.
- NTESS has performed document reviews since May 2019 and has identified issues in SS-R89727, the SSQAP; however, those issues have not been resolved and incorporated into a new update. The SQA SME explained that NTESS maintains a red-line version of SS-R89727 with SFO concurrence but has not formally incorporated the identified changes. SS-R89727, Issue K, only includes minor changes not subject to required SFO approval. Contrary to SAND2023-041370, section 5.12, and DOE Order 414.1D, attachment 2, section 4.a, NTESS has not updated the effective version of SSQAP, SS-R89727, Issue K, dated May 3, 2019, to address issues identified from subsequent reviews. (See **Deficiency D-NTESS-2.**) When known issues in quality management system documentation are not addressed, users are precluded from having the correct information needed to adequately perform their work.
- NTESS uses multiple versions of the NQA-1 consensus standard creating avoidable program complexity that can inhibit effective implementation. The SFO approved SS-R89727 invokes NQA-1-2008 and NQA-1a-2009. In contrast, the SFO approved SAND2023-041370 and *TA-V Management System*, invokes NQA-1-2017. (See **OFI-NTESS-2.**)
- The NTESS corporate QA/SQA SME does not regularly conduct SQA oversight of all SNL safety software. Of the 38 safety software applications (items) owned by NTESS and listed in the safety software inventory, the corporate QA/SQA SME is only involved in overseeing the 13 owned by TA-V and the Weapons Response Code (WRC) software owned by the Surety Engineering and Weapons Quality organization. The remaining 24 safety software applications owned by five other NTESS divisions (including such safety software as MACCS2, a DOE Safety Software Quality Assurance Central Registry code developed by SNL) receive no formal, corporate-level oversight attention. NTESS IE is responsible for NTESS corporate-level SQA oversight and program implementation; however, it is not aware of the effectiveness of its other organizations in managing safety software consistent with organization-specific SQA procedures due to this lack of oversight attention. (See **OFI-NTESS-3.**)

Non-safety Software

SAND2024-006780, *Software Acquisition Process Specification*, describes the software governance process that is used to develop the web-based software acquisition Approved List and Denied List. The practice level is not included on the Approved List for software as all entries are assumed to be the lowest practice level, P0; however, individual software users may raise the practice level for individual use of the approved software. Use of SS-R89727, appendix C, *The Software Risk/Practice Level Determination Template*, is not required. As discussed previously for safety software, SS-R89727 contains implementation guidance, recommended practices, and optional templates and forms. Individual organizations may use other means, and non-safety software owners at the project level may document software grading how they choose. However, the NTESS IE does not maintain documentation of where software applications are being implemented, the responsible software owners, or what software practice levels were increased when implemented at the facility level. (See **OFI-NTESS-4.**) This approach limits the visibility of non-safety software used in higher risk operations and inhibits the ability to determine the need for enhanced oversight of SQA program implementation.

NTESS IE has recently evaluated key software quality processes. NTESS IE requested that the Audits and Advisory Services organization perform independent assessments of the governance process and the SDL (assessments ASMT-776399 and ASMT-821555, respectively). ASMT-776399 determined that 25% of denied software had been installed on the network and that 58% of tested software acquisitions were purchased without receiving the required approval resulting in a finding that the software governance process lacked a method for ensuring compliance. Some of the implemented software that was identified as not included on the Approved List was evaluated as part of this assessment. The contractor has initiated corrective actions to address the issues identified in ASMT-776399 and make other identified improvements. Assessment ASMT-821555 determined that the SDL process steps were not reviewed against requirements and that information technology products, processes, or service offerings were not reviewed to ensure all required projects are following the SDL process. Corrective actions to address these issues and to clarify and communicate who must use the SDL are due by September 30, 2024. NTESS IE relies on program/project management to verify compliance with SDL or organization-specific SQA processes. As such, other than required reviews and approvals for individual use of the SDL process, NTESS IE does not assess program implementation. (See **OFI-NTESS-5**.)

Quality Assurance Program Conclusions

NTESS has established a generally adequate QAP for safety and non-safety software associated with TA-V and for the WRC safety software. However, weaknesses were observed regarding appropriate SQA program document maintenance, review, and approvals. In addition, as-implemented practice levels for non-safety software are not documented in a way that facilitates oversight by responsible organizations, and the NTESS IE oversight program is not comprehensive. NTESS self-identified additional compliance issues with the software governance and SDL processes.

3.2 Software Quality Assurance Program Implementation

This portion of the assessment evaluated NTESS implementation of, and adherence to, SQA program procedures for safety software and non-safety software.

Safety Software

EA reviewed SQA program implementation for the following six safety software applications:

- MicroShield 11.24
- Ansys 2022
- MELCOR Accident Consequence Code System (MACCS2), MACCS 4.2
- Monte Carlo N-Particle Transport Code (MCNP) 6.2
- SCALE/KENO, 4.4/4.4a, 5.0, 5.1, 6.0, 6.1/6.1.1, 6.1.3/6.1.x, 6.2.3, 6.2.4
- WRC 2.3.0.

NTESS personnel adequately adhered to applicable SQA program requirements and applied the established graded approach to appropriately identify, use, and manage the six reviewed safety applications in accordance with DOE Order 414.1D, attachments 2 and 4. The software management plans were appropriately approved and distributed and include a roles and responsibilities matrix that clearly defines project assignments. The requirements specifications adequately address the software function and performance methodology. The software documentation adequately describes the overall architecture and workflow based on an approved process model. Software data collection was appropriately gathered, measured, and analyzed per SQA program requirements to research problems, answer questions, evaluate outcomes, and forecast trends and probabilities. The risk analyses documented by NTESS for the reviewed safety software demonstrate effective mitigation of potential loss

of data or functionality. Reviewed documentation showed that testing was performed during each stage of the development workflow and appropriately included peer reviews and audits. The reviewed software application training documentation demonstrated appropriate training of users aligned with their skill levels. Procurement documentation demonstrated that safety software was procured with adequate processes to ensure specified quality.

Records demonstrate that the software developers for the reviewed TA-V safety software are current in the *Software Engineering Excellence for Safety Software SQE200 – For Software Developers* training, which presents the flow down of safety software requirements, definitions of safety software and nuclear facility safety software, requirements for users and developers, and provides links to safety software tools and resources.

Non-safety Software

EA reviewed SQA program implementation for the following seven non-safety software applications:

- CONFLUENCE
- MAXIMO
- ARAS/QuIN
- WebREMS
- SNL-NM fire alarm systems software
- Badge reader security software
- Microsoft Office 365.

In general, NTESS personnel adequately adhere to applicable SQA program requirements and apply the established graded approach to appropriately identify, use, and manage six of the seven reviewed non-safety software applications in accordance with DOE Order 414.1D, attachment 2. For six of the reviewed non-safety software applications, NTESS has implemented all required criteria or maintained application-specific software management plans. The reviewed risk analysis process for these six software applications demonstrated effective mitigation of potential loss of data or functionality. In addition, the reviewed training records generally demonstrated appropriate training and qualification of personnel acquiring, maintaining, using, and assessing these software applications. Most of the documentation provided for the non-safety software applications was observed to be thorough. However, contrary to DOE Order 414.1D, attachment 2, NTESS was unable to provide the information to demonstrate SQA program implementation for the badge reader security software during the assessment period. (See **Deficiency D-NTESS-3.**) Without documentation of SQA program implementation for given software items, reasonable assurance cannot be provided to demonstrate that the implemented software meets quality requirements.

The reviewed risk analysis process for sampled non-safety software applications demonstrated effective mitigation of potential loss of data or functionality with the exception of the badge reader security software. In addition, the reviewed training records demonstrated appropriate training and qualification of personnel acquiring, maintaining, using, and assessing non-safety software applications.

Software Documentation

Most of the reviewed documentation provided for the sampled safety and non-safety software applications was thorough. Annual SQA self-assessments were adequately performed by software owners, which helps to ensure that documentation of SQA program implementation is maintained and available for review. However, the format of the documentation was not generally consistent and, in many cases, was unclear as to its applicability. For example, some software management plans, such as

TAV-AP-034, covered multiple software applications without identifying them by name. In addition, in most cases, NTESS software owners were unable to provide key safety and non-safety software documentation in a timely manner to demonstrate SQA program implementation and compliance. For example, procurement documentation for non-safety software application WebREMS and safety software application SCALE/KENO was provided weeks after completion of the assessment and, in the case of the SCALE/KENO information, months after it was requested. NTESS software owners have not maintained all requested safety and non-safety software quality records such that documentation was readily available for review and use in assessing the SQA program. (See **OFI-NTESS-6**.) Not maintaining records in a manner that facilitates their use inhibits timely retrieval, program assurance, oversight activities, and limits program effectiveness.

Personnel Knowledge

Multiple stakeholders who have SQA program implementation responsibilities for both safety and non-safety software could not effectively identify all processes used and parties responsible for ensuring software quality. For example, non-safety software owners were not known by those implementing the SQA program and using the software at the TA-V area/facility level. Contrary to DOE Order 414.1D, attachment 2, section 1.a, NTESS personnel responsible for SQA program implementation were not thoroughly knowledgeable of all SQA responsibilities, levels of authority, and interfaces, and were not always able to retrieve SQA program implementing documents efficiently. (See **Deficiency D-NTESS-4**.) A lack of understanding of SQA program organizational structure, functional responsibilities, and program interfaces can result in incomplete program implementation and ineffectiveness.

Software Quality Assurance Program Implementation Conclusions

NTESS's adherence to its SQA procedures is generally adequate, and its management of the reviewed safety and non-safety software applications is generally effective. However, SQA program implementation was not demonstrated for one of the seven sampled non-safety software applications. Further, software quality documents and records are not well maintained, and SQA program responsibilities and interfaces are not well understood.

3.3 Software Security

This portion of the assessment evaluated the NTESS processes used to ensure the security of safety and non-safety software managed under the NTESS SQA program.

The NTESS SQA program is adequately established and effective in ensuring the security of safety and non-safety software, in accordance with applicable NQA-1 security requirements. The NTESS SQA program adequately ensures that hardware, software, and electronic data is protected from cybersecurity and phishing attacks by using access credentials and anti-phishing controls. The procedures and documentation are comprehensive and adequately conveyed. The SSQMP included the approval documentation for penetration and functionality testing. The reviewed application-specific quality assurance plans ensure that risk analysis is effectively implemented, mitigating the risk of a total loss of data. Software security processes also ensure adherence to contingency planning and the identification of a risk response strategy.

Software Security Conclusions

NTESS adequately ensures the security of safety and non-safety software managed under the SQA program. To accomplish this, the SQA program adequately implements comprehensive procedures that

flow down applicable security requirements. The software security procedures and documentation are comprehensive and adequately conveyed.

3.4 Federal Oversight

This portion of the assessment evaluated SFO oversight of the NTESS SQA program.

SFO reviews and approves the NTESS SQA program implementing documents in a generally adequate manner. SFO reviews and approves the QMSD, which is applicable to nuclear and non-nuclear facilities. Although SFO approved the safety software consensus standard, grading levels, and grading methodology through approval of SS-R89727, Issue J, on October 26, 2017, the SSQAP is a guidance document to be used with IT008, making the use of both appear to be optional when they are not. (See **OFI-SFO-1**.) SFO did not approve IT008 or request its submittal from NTESS despite SFO approval being required in accordance with QMSD, section 5.12. (See **OFI-SFO-2**.)

Further, the current SFO QMSD approval letter directs the NTESS Enterprise Excellence organization to review and concur on sub-tier QAP plans and implementing documents to ensure that they do not conflict with the SFO-approved QMSD. The SFO QMSD approval letter also requires Enterprise Excellence to provide the SFO contracting officer with any substantial changes to sub-tier documents for review and concurrence. Accordingly, NTESS provided, and SFO reviewed and concurred upon, the sub-tier *TA-V Management System* document; SFO approval is noted on the cover page. However, contrary to DOE Order 414.1D, sections 4.b.(2) and 5.c.(3), SFO did not review or approve TAV-AP-034 and Center 1300 QAP, which are identified in the *TA-V Management System* document as sub-tier implementing documents and part of the SNL-NM QAP for TA-V. (See **Deficiency D-SFO-1**.) By not reviewing implementing documents, SFO could be inhibited from fully understanding and approving the complete SNL-NM QAP. These implementing documents, as cited in the *TA-V Management System* document, supplement IT008 requirements for TA-V.

SFO employs a QA/SQA SME who is in the process of obtaining the DOE-STD-1172, *Safety Software Quality Assurance Functional Area Qualification Standard*, qualification and has completed *ASME NQA-1 Lead Auditor Training* and an NQA-1 overview course. The SFO Management System Description describes SQA oversight activities; however, SQA oversight was limited to an annual review of the safety software inventory and to oversight related to TA-V readiness reviews. Contrary to DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, section 4.b.(1), and DOE Order 414.1D, section 5.c.(7), SFO does not conduct oversight of SQA program implementation for safety software implemented outside TA-V or for non-safety software across SNL-NM. (See **Deficiency D-SFO-2**.) Limiting federal oversight of SQA program implementation to only safety software used at TA-V precludes the discovery of potentially significant issues related to safety software and higher risk non-safety software owned by other divisions across SNL-NM. Further, a lack of comprehensive SFO oversight hinders the identification of needed improvements in managing and implementing the NTESS SQA program. The SFO cybersecurity authorizing official maintains a thorough understanding of NTESS information technology requirements and implementation strategies, which expands SFO knowledge of the NTESS SQA program and helps to mitigate field element oversight deficiencies.

SFO performed a self-assessment in 2018 in preparation for the 2019 Chief of Defense Nuclear Safety (CDNS) biennial review, which included a review of the oversight and quality assurance subject areas. In 2020, SFO requested an independent effectiveness review be performed by NNSA headquarters to evaluate the corrective actions. The review determined all oversight and quality assurance corrective actions to have been effective.

Federal Oversight Conclusions

SFO oversight of the NTESS SQA program is generally adequate. SFO appropriately reviewed and approved the QMSD, SSQAP, and *TA-V Management System* document. However, SFO did not review and approve IT008 and two documents describing additional safety software requirements for TA-V. Further, SQA oversight does not evaluate implementation across all SNL-NM organizations, nor does it cover all types of software.

4.0 BEST PRACTICES

No best practices were identified during this assessment.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 DEFICIENCIES

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

National Technology and Engineering Solutions of Sandia, LLC

Deficiency D-NTESS-1: NTESS did not submit IT008 or the organization-specific TA-V software quality documents for SFO approval. (QMSD, sec. 5.12, and DOE Order 414.1D, att. 2, sec. 4.a)

Deficiency D-NTESS-2: NTESS did not revise the SSQAP to incorporate needed changes identified in reviews over the past five years. (QMSD, sec. 5.12, and DOE Order 414.1D, att. 2, sec. 4.a)

Deficiency D-NTESS-3: NTESS did not provide information to demonstrate compliance with all quality assurance criteria for all non-safety software. (DOE Order 414.1D, att. 2)

Deficiency D-NTESS-4: NTESS has not implemented its SQA program such that functional responsibilities, levels of authority, and interfaces for maintaining the quality of software are consistently understood by all stakeholders. (DOE Order 414.1D, att. 2, sec. 1.a)

Sandia Field Office

Deficiency D-SFO-1: SFO does not review and approve all documents that constitute and describe the QAP for TA-V. (DOE Order 414.1D, secs. 4.b.(2), 5.c.(3), and SFO QMSD Approval Letter)

Deficiency D-SFO-2: SFO SQA oversight does not evaluate NTESS quality management system implementation across all SNL organizations and for all types and grades of software. (DOE Order 226.1B, sec. 4.b.(1), and DOE Order 414.1D, sec. 5.c.(7))

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFIs shown below to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

National Technology and Engineering Solutions of Sandia, LLC

OFI-NTESS-1: Consider identifying the date of DOE concurrence/approval for all reviewed quality documents, as is done on the cover of the *TA-V Management System* document.

OFI-NTESS-2: Consider updating all SQA program documents to invoke NQA-1-2017 for all operations to simplify requirements flow-down and tracking.

OFI-NTESS-3: Consider assessing the extent to which any safety software used outside of TA-V is managed through organization-specific means other than the SSQAP and SDL, and then evaluate the need for additional oversight.

OFI-NTESS-4: Consider creating an inventory of all non-safety software to include where it is implemented, who owns it, and the practice level that was ultimately assigned; and then use this information to facilitate a systematic approach for oversight of NTESS SQA program implementation.

OFI-NTESS-5: Consider conducting NTESS IE oversight of the implementation of software governance, SDL, and organization-specific software management processes to identify noncompliance and areas for improvement.

OFI-NTESS-6: Consider reviewing quality document and records management processes to enhance the timeliness of records retrievability.

Sandia Field Office

OFI-SFO-1: Consider working with NTESS to ensure that consensus standards, grading methodologies, and safety software grading levels requiring SFO approval are contained in requirements documents instead of guidance documents.

OFI-SFO-2: Consider developing a mechanism for tracking NTESS documents requiring SFO review and approval to ensure submittal at required periodicities.

Appendix A Supplemental Information

Dates of Assessment

December 18, 2023 to May 16, 2024

Office of Enterprise Assessments (EA) Management

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