



A center of excellence in earth sciences and engineering®

Geosciences and Engineering Division
6220 Culebra Road • San Antonio, Texas, U.S.A. 78238-5166
(210) 522-5160 • Fax (210) 522-5155

January 13, 2016
NRC-HQ-12-C-02-0089

U.S. Nuclear Regulatory
ATTN: Dr. Anthony Hsia
Office of Nuclear Material Safety and Safeguards
Division of Spent Fuel Management
Mail Stop TWFN-4B34
Washington, DC 20555

SUBJECT: Quality Assurance Audit Report for Geosciences and Engineering
Division Audit 2015 of NRC-Funded Programs Conducted by the Center
for Nuclear Waste Regulatory Analyses

Dear Dr. Hsia:

This letter transmits the subject audit report. Although this document is not a deliverable under the contract for operation of the Center for Nuclear Waste Regulatory Analyses (CNWRA®), it is provided for your information and use in maintaining confidence in the support provided to the U.S. Nuclear Regulatory Commission (NRC) by CNWRA. The report gives an objective assessment of the effectiveness of the quality assurance program and related commitments for all CNWRA support to NRC.

This audit was planned, executed, and reported in accordance with the Geosciences and Engineering Division (GED) Quality Assurance Manual, which is supported by administrative, quality assurance, and technical operating procedures. We appreciate the observation of this audit by the NRC representatives both in San Antonio and from NRC headquarters. This audit confirms that CNWRA is implementing an effective quality assurance program, adequate controls are placed on technical product development, and the integrated quality program continues to address the needs of NRC. We plan to review each of the recommendations made during the audit for continuous improvement opportunities related to the GED Quality Assurance Program.

Also enclosed is a copy of Preventive Action Request (PAR) 2016-PAR-0001, which was developed in response to observations made during the audit of the Independent Cost Estimation project. Because this project is closed and NRC does not desire that the CNWRA report be revised, transmittal of the PAR is being used to document the requested clarifications and corrections.

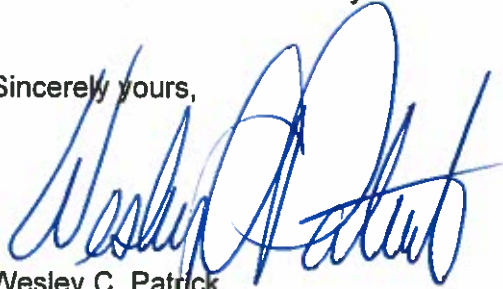


Washington Office
1801 Rockville Pike, Suite 105 • Rockville, Maryland 20852-1633

Dr. Anthony Hsia
January 13, 2016
Page 2

Please contact me at 210.522.5158 or Fred Hawkins at 210.522.5504 if you have any questions concerning this matter.

Sincerely yours,



Wesley C. Patrick
Vice President
Geosciences and Engineering Division
Director
Center for Nuclear Waste Regulatory Analyses

WCP/FH/ar
Enclosure

cc:	<u>NRC</u>	<u>GED (email)</u>
	M. Lombard	GED Managers
	T. Matula	GED Directors
	S. McCubbin	F. Hawkins
	J. Rubenstone	Record Copy B-IQS
	S. Schneider	



SOUTHWEST RESEARCH INSTITUTE

QUALITY ASSURANCE AUDIT REPORT

For

**GEOSCIENCES AND ENGINEERING DIVISION AUDIT 2015-1
OF NRC-FUNDED PROGRAMS CONDUCTED BY THE
CENTER FOR NUCLEAR WASTE
REGULATORY ANALYSES**

DECEMBER 15 – 17, 2015

CONTENTS

EXECUTIVE SUMMARY	iii
1.0 AUDIT SCOPE	1
2.0 PROGRAMMATIC ELEMENTS AUDITED	1
3.0 AUDIT APPROACH	2
4.0 TECHNICAL ACTIVITIES AUDITED	2
5.0 AUDIT TEAM.....	2
6.0 APPLICABLE REQUIREMENTS DOCUMENTS	3
7.0 U.S. NUCLEAR REGULATORY COMMISSION (NRC) OBSERVERS	3
8.0 AUDITED ACTIVITIES	3
8.1 <i>Technical Assistance for Independent Cost Estimation (ICE) Under Contract No. NRC-HQ-50-14-E-0001, Task Order No. NRC-HQ-20-15-T-0012 – Task Order 37 (19934.01)</i>	3
8.2 <i>Disposal-Related Integrated Spent Nuclear Fuel Regulatory Activities - Identification and Analysis of Key Regulatory and Technical Issues for Disposal of Spent Nuclear Fuel and High-Level Waste, Task Order 9 Under Contract NRC-HQ-12-C-02-0089, Subtask 3 - Waste Package; Experiments on Corrosion of Copper and Carbon Steel Waste Containers – Progress Report (17860.09.013)</i>	4
8.3 <i>Technical Assistance for the Development of an Environmental Impact Statement (EIS) for Termination of NRC Materials License SUB-1435 for the Depleted Uranium Impact Area at Jefferson Proving Ground, Madison, Indiana – Task Order No. 9 (19921.01)</i>	4
8.4 Programmatic QA.....	4
9.0 SUMMARY OF RESULTS	7
9.1 Good Practice.....	7
9.2 Recommendations	7
10.0 QUALITY ASSURANCE PROGRAM EFFECTIVENESS	9
PERSONS CONTACTED	10
APPROVAL SIGNATURES	11

EXECUTIVE SUMMARY

The annual internal quality assurance (QA) audit for the Geosciences and Engineering Division (GED) of NRC-funded programs conducted by the Center for Nuclear Waste Regulatory Analyses (CNWRA[®]) was performed December 15 – 17, 2015. The audit team, comprised of technical specialists and QA auditors, determined that the GED QA program continues to be effectively implemented and provides adequate controls over technical product development and related quality affecting activities. A U.S. Nuclear Regulatory Commission (NRC) representative, QA and program management, observed the audit.

The GED staff continues to operate in accordance with the GED *Quality Assurance Manual* (QAM), operations plans, technical operating procedures (TOPs), QA procedures (QAPs), and applicable administrative procedures (APs). The technical staff was judged to be appropriately qualified through education, experience, and training. The technical work was determined to have been executed in a satisfactory manner.

The results of the audit were discussed with the GED management and staff as well as with the NRC representatives, both present and through teleconference, during the post-audit meeting held on December 17, 2015. There were no nonconformances identified during the audit. One (1) good practice was documented as an example of an exemplary work practice. In addition, six (6) recommendations were identified that may provide opportunities for the improvement of the GED quality program and technical products.

1.0 AUDIT SCOPE

This internal audit evaluated the Geosciences and Engineering Division (GED) quality assurance program to determine whether it meets contractually mandated QA program requirements and is being effectively implemented for Nuclear Regulatory Commission (NRC) sponsored activities of the Center for Nuclear Waste Regulatory Analyses (CNWRA®). This was a full-scope audit in which all QA program elements applicable were evaluated and three (3) technical tasks with associated reports were audited. In addition, the corrective action process was reviewed to determine its effectiveness.

2.0 PROGRAMMATIC ELEMENTS AUDITED

QA Program Criteria	Corresponding QAM* Chapter
Organization	1
Quality Assurance Program	2
Design Control	Not Applicable
Scientific/Engineering Investigation and Analysis Control	3
Procurement Document Control	4
Instructions, Procedures, and Drawings	5
Document Control	6
Procurement Control	7
Identification and Control of Items, Software, and Samples	8
Control of Processes	9
Inspection	10
Test Control	11
Control of Measuring and Test Equipment	12
Handling, Storage, and Shipping	13
Inspection and Test Status	14
Nonconformance Control	15
Corrective Action	16
Records Control	17
Audits	18

*QAM—GED *Quality Assurance Manual*

Design-related activities are not performed by CNWRA®; therefore, design control requirements are not applicable. All other QAM sections were addressed in the audit.

3.0 AUDIT APPROACH

A performance-based approach to auditing was accomplished to the extent possible by direct evaluation of selected technical activities, assessment of products, discussions with key project staff, and the contributions of these processes to product quality. Interview teams, composed of a programmatic QA auditor and the assigned technical specialist, performed the technical audits of the activities. Technical NRC representatives for each project audited were invited to participate in the sessions through teleconference. The NRC observer was also present during each session.

In preparation for the audit, technical specialists and QA auditors reviewed applicable operation plans and proposals, the *Quality Requirements Application Matrix* (GRAM) for each project, procedures, other quality planning documents, and technical products. Technical checklists were prepared based on these reviews appropriate to each scope of work. A comprehensive QA programmatic checklist was prepared for application during the technical sessions and for the assessment of the programmatic elements.

The technical sessions were conducted through discussions with project management and key technical staff and review of objective evidence, which included document review packages and scientific notebooks (SNs). Technical and programmatic results were compiled for discussion and reporting. Programmatic activities were also conducted through review of objective evidence, evaluation of reports and SNs through the *Electronic Library Facility* (ELF) database and paper records, discussions with project staff, and observation of laboratory activities.

Daily caucuses for the audit team and NRC observer as well as a morning briefing between the audit team leader and CNWRA® management were conducted.

4.0 TECHNICAL ACTIVITIES AUDITED

A risk-informed approach was applied in selecting the technical activities to audit. Technical and programmatic risks and the time since the previous audit of an activity were considered in selecting the areas for this audit, as follows:

- 19934.01, *Technical Assistance for Independent Cost Estimation (ICE) Under Contract No. NRC-HQ-50-14-E-0001, Task Order No. NRC-HQ-20-15-T-0012 – Task Order 37;*
- 17860.09.013, *Disposal-Related Integrated Spent Nuclear Fuel Regulatory Activities - Identification and Analysis of Key Regulatory and Technical Issues for Disposal of Spent Nuclear Fuel and High-Level Waste, Task Order 9 Under Contract NRC-HQ-12-C-02-0089, Subtask 3 - Waste Package; Experiments on Corrosion of Copper and Carbon Steel Waste Containers – Progress Report;*
- 19921.01, *Technical Assistance for the Development of an EIS for Termination of NRC Materials License SUB-1435 for the Depleted Uranium Impact Area at Jefferson Proving Ground, Madison, Indiana – Task Order No. 9.*

5.0 AUDIT TEAM

QA Auditors

Faye Brockwell	Institute Quality Systems (IQS) – Audit Team Leader (ATL)
Thomas Trbovich	IQS – Auditor
Mark Ehnstrom	IQS – Auditor

Technical Specialists

Augusto Garcia Hernandez	Technical Specialist SwRI Group Leader Fluids and Machinery Engineering	Mechanical Engineering (18)
Leonardo Caseres, PhD	Technical Specialist SwRI Sr. Research Engineer Materials Engineering	Mechanical Engineering (18)
Dave Turner, PhD	Technical Specialist Environmental Assessment	St. Mary's University, San Antonio

6.0 APPLICABLE REQUIREMENTS DOCUMENTS

The following criteria formed the basis of the audit conduct and the generation of audit checklists:

- Title 10 CFR Part 50, Appendix B
- Title 10 CFR Part 60, Subpart G
- Title 10 CFR Part 63, Subpart G
- Title 10 CFR Part 71, Subpart H
- Title 10 CFR Part 72, Subpart G
- NQA-1-1986
- GED QA Manual (QAM)
- GED QA Procedures (QAPs)
- GED Administrative Procedures (APs)
- GED Technical Operating Procedures (TOPs)

7.0 U.S. NUCLEAR REGULATORY COMMISSION (NRC) OBSERVERS

Tom Matula	Observer
------------	----------

8.0 AUDITED ACTIVITIES

8.1 *Technical Assistance for Independent Cost Estimation (ICE) Under Contract No. NRC-HQ-50-14-E-0001, Task Order No. NRC-HQ-20-15-T-0012 – Task Order 37 (19934.01)*

Audit Team

Augusto Garcia-Hernandez (*Technical Specialist*)

Mark Ehnstrom (*QA Auditor*)

Task Description

The purpose of this task was to provide an independent cost estimate for the rule making and implementation of new ASME code cases for application in nuclear power plants. The rule making activity dictates which ASME code cases should be adopted while the cost estimation quantifies the implementation of the cases that need to be incorporated.

Products and Associated Documents Reviewed

- 19934.01.001.200, Task 2: Provide the Final Independent Cost Estimate
- QRAM for 19934.01

8.2 Disposal-Related Integrated Spent Nuclear Fuel Regulatory Activities - Identification and Analysis of Key Regulatory and Technical Issues for Disposal of Spent Nuclear Fuel and High-Level Waste, Task Order 9 Under Contract NRC-HQ-12-C-02-0089, Subtask 3 - Waste Package; Experiments on Corrosion of Copper and Carbon Steel Waste Containers – Progress Report (17860.09.013)

Audit Team

Dr. Leonardo Caseres (*Technical Specialist*)

Mark Ehnstrom (*QA Auditor*)

Task Description

The purpose of this task was to evaluate the use of copper and carbon steel for waste container materials. Corrosion of copper and carbon steel was determined in conditions typical of groundwater and concrete pore water without oxygen. Hydrogen induced cracking of carbon steel was also determined.

Products and Associated Documents Reviewed

- 17860.09.013.500, Experiments on corrosion of Copper and Carbon Steel Waste Containers – Progress Report.
- QRAM for 17860.09

8.3 Technical Assistance for the Development of an Environmental Impact Statement (EIS) for Termination of NRC Materials License SUB-1435 for the Depleted Uranium Impact Area at Jefferson Proving Ground, Madison, Indiana – Task Order No. 9 (19921.01)

Audit Team

Dr. David Turner (*Technical Specialist*)

Thomas Trbovich (*QA Auditor*)

Task Description

The purpose of this task was to prepare an EIS to document the environmental review of the U.S. Army application (August 28, 2013) to terminate license SUB-1435 for a depleted uranium impact area at Jefferson Proving Ground. The annotated outline for the structure of the EIS is in accordance with NUREG 1748.

Products and Associated Documents Reviewed

- AI 19921.01.002.010 – Activity 2A1: Preliminary Description of the Proposed Action and Alternatives.
- AI 19921.01.002.020 – Activity 2A2: Preliminary Annotated EIS Outline for NRC Task Order No. NRC-HQ-55-14-T-0009: Technical Assistance in Support of the Development of an EIS for Termination of U.S. NRC Materials License SUB-1435 for the Depleted Uranium Impact Area at Jefferson Proving Ground in Madison, Indiana.
- QRAM for 19921.01

8.4 Programmatic QA

QA Auditors

Thomas Trbovich, Mark Ehnstrom

Audit Approach

Those elements that were not likely to be covered in the technical sessions or project reviews (topics including nonconformance control, document control, purchasing, QA records control, etc.) were assigned to the QA auditors. Applicable programmatic elements were also evaluated in each technical session, including *Scientific Notebook Control; Review of Documents, Reports, and Papers; Quality Planning; Documentation and Verification of Scientific and Engineering Calculations*; etc. Following are the QA procedures reviewed during the audit and the results that corresponded to that specific programmatic element.

Quality Procedures Reviewed

- **QAP-001, *Scientific Notebook Control***
The entire audit team was involved in reviewing the scientific notebooks in two (2) of the technical sessions and in the evaluation of laboratory activities. Each notebook was evaluated to determine conformance with the requirements of the procedure. No concerns were identified under this programmatic element.
- **QAP-002, *Review of Documents, Reports, and Papers***
The entire audit team was involved in reviewing documents associated with their assigned technical areas. Project reviews performed by all audit team members included verifying conformance with the QAP. One (1) recommendation was identified under this programmatic element.
- **QAP-004, *Surveillance Control***
The surveillance program implemented by GED continues to be a value-added process. No concerns were identified under this programmatic element.
- **QAP-005, *Quality Indoctrination and Training***
Records of training, training notifications and the database were reviewed during the technical sessions for the personnel involved in the activities. One (1) recommendation was identified under this programmatic element.
- **QAP-007, *Professional Personnel Qualification***
Qualification records were being effectively managed; files were complete and readily available. The position descriptions, qualifications, and other information, as required by the QAP were complete and appropriate in the records reviewed. No concerns were identified under this programmatic element.
- **QAP-008, *Document Control***
Evaluation of this programmatic topic included control of documents, issue of controlled and uncontrolled documents, control of documents of external origin, and control of sensitive/proprietary information. No concerns were identified under this programmatic element.
- **QAP-009, *Nonconformance Control***
A sample of NCRs generated since the previous audit were reviewed and found to be thorough, complete, and the corrections were deemed effective. No concerns were identified under this programmatic element.
- **QAP-010, *Corrective Action***
The corrective actions for one (1) CAR that had been generated since the last audit was reviewed (2014-CAR-0493). No concerns were identified under this programmatic element.

- **QAP-011, Audits**
The results of GED annual audit 2014-1 were reviewed prior to this audit under the follow-up surveillance, 2015-SR-0454, and any remaining items were addressed during this audit. No concerns were identified under this programmatic element.
- **QAP-012, Quality Assurance Records Control**
Examination of archived quality records verified conformance to this procedure. No concerns were identified under this programmatic element.
- **QAP-013, Quality Planning**
Quality planning was considered by each member of the audit team during the review of the technical documentation as well as through the project reviews. The Quality Requirements Application Matrix (QRAM) for each technical topic was used to verify implementation and conformance to this procedure. One (1) recommendation was identified under this programmatic element.
- **QAP-014, Documentation and Verification of Scientific and Engineering Calculations**
The entire audit team was involved in reviewing scientific and engineering calculations associated with each SN generated for the technical areas audited and the project reviews. No concerns were identified under this programmatic element.
- **QAP-016, Procurement**
Purchase requisitions initiated in the previous twelve months for quality-affecting material were reviewed. No concerns were identified under this programmatic element.
- **QAP-017, Drawing Control**
A drawing control process is established and no concerns were identified under this programmatic element.
- **QAP-018, Procedure for Confirmatory Analysis**
The applicability of this procedure was reviewed during each technical session. No concerns were identified under this programmatic element.
- **QAP-019, Control of Measuring and Test Equipment**
Measuring and test equipment was evaluated in the laboratories of Building 57. Calibration of equipment in use was verified to be current or evidence of calibration verification was documented in the scientific notebooks. No concerns were identified under this programmatic element.
- **AP-001, Source Selection and Evaluation**
The entire audit team was involved in reviewing the applicability of this procedure in each technical session to determine if this process is being followed. No concerns were identified under this programmatic element.
- **TOP-012, Identification and Control of Samples and Chemical Reagents and Standards**
Laboratory controls implemented in Building 57 were reviewed. No concerns were identified under this programmatic element.
- **TOP-018, Control, Development and Modification of Scientific and Engineering Software**
A sampling of controlled software was evaluated. These requirements were also evaluated during the technical sessions. No concerns were identified under this programmatic element.

9.0 SUMMARY OF RESULTS

Each technical activity was audited by a team of at least one technical specialist knowledgeable in the field of study and a programmatic QA auditor. Based on review of deliverables produced in the period since the last audit in August 2014, checklists were created specific to each technical task in addition to a general programmatic checklist addressing the QA requirements. Detailed checklists were used containing a total of one-hundred fifty one (151) items which resulted in one-hundred thirty three (133) satisfactory items and eighteen (18) judged to be not applicable (NA) or that could not be evaluated (NE) due to lack of use or execution of the particular item. As the technical specialist evaluated the technical qualifications of involved personnel, rigor of the science or engineering involved, and thoroughness of supporting documentation, the programmatic auditor confirmed the presence of required documentation supporting the processes involved and their conformance to QA procedural requirements. This programmatic review included review and approval of quality documents, SN controls, training and qualification of the personnel involved in the activity. The following is a detailed description of the audit results including the technical task or programmatic topic from which the results were noted. One (1) good practice and six (6) recommendations are described below.

9.1 Good Practice

Disposal-Related Integrated Spent Nuclear Fuel Regulatory Activities - Identification and Analysis of Key Regulatory and Technical Issues for Disposal of Spent Nuclear Fuel and High-Level Waste, Task Order 9 Under Contract NRC-HQ-12-C-02-0089, Subtask 3 - Waste Package; Experiments on Corrosion of Copper and Carbon Steel Waste Containers – Progress Report (17860.09.013)

1. Known concentration (blind) samples are sent to the analytical laboratories to confirm the accuracy of the testing performed.

9.2 Recommendations

During the course of the audit activities, six (6) recommendations were made, which if acted upon, may prevent future nonconformances or will support continuous improvement of the GED quality program. These recommendations include the following:

Technical Assistance for Independent Cost Estimation (ICE) Under Contract No. NRC-HQ-50-14-E-0001, Task Order No. NRC-HQ-20-15-T-0012

1. The organization should identify a method to capture the following items that were identified in the final report.
 - The Short Term Replacement power calculation presented in page 2-9 of the final report should be reviewed and clarified.
 - A clarification should be provided to address the difference between the cost presented in Table 3-4 and Table 3-6 for the One-Time cost per reactor for the reactors that are currently in operation (previously identified and discussed with NRC).
 - For document consistency the recurring cost amount or time for the expected recurring cost in Table 3-10, SI No 4, Page 3-10 should be incorporated.
 - The correct equation should be provided in Table 3-11, Page 3-12 as used in the calculation of the average number of alternatives (179).
(Reference 2016-PAR-0001)

Disposal-Related Integrated Spent Nuclear Fuel Regulatory Activities - Identification and Analysis of Key Regulatory and Technical Issues for Disposal of Spent Nuclear Fuel and High-Level Waste, Task Order 9 Under Contract NRC-HQ-12-C-02-0089, Subtask 3 - Waste Package; Experiments on Corrosion of Copper and Carbon Steel Waste Containers – Progress Report (17860.09.013)

2. The following items should be considered for any future work in the area of corrosion analysis.
 - The deionized water used for the source solutions should be checked to ensure there is no contamination.
 - Potassium and sodium ions should be included in the concrete pore solution since these ions could promote hydrogen induced cracking of carbon steel.
 - The test setup for the corrosion of carbon steel should be improved in order to mitigate conspicuous crevice corrosion in undesirable areas.
 - Ensure the hydrogen concentration in metals is measured shortly after the test is completed to avoid any hydrogen loss.
 - Document all periodic verification and maintenance of the oxygen probe.(Reference 2016-PAR-0002)

Technical Assistance for the Development of an Environmental Impact Statement (EIS) for Termination of NRC Materials License SUB-1435 for the Depleted Uranium Impact Area at Jefferson Proving Ground, Madison, Indiana – Task Order No. 9

3. Section 4.4 of the Draft EIS states “NRC conducted independent review of the models and supporting data developed by the Army to evaluate their validity and developed its own assessment of potential impacts to water resources”. This wording may imply that staff have performed independent confirmatory calculations; therefore, wording should be clarified that no independent calculation verifications have been performed at this time as part of the confirmatory analysis. It should be appropriately addressed in future submissions. (Reference 2016-PAR-0003)

QAP-005, Quality Indoctrination and Training

4. The procedure should be revised to remove the use of Form QAP-2, *Document Transmittal, Training and Acknowledgement Records*, since this form is no longer used. It was noted that training is documented through email notification. (Reference 2016-PAR-0004)

QAP-013, Quality Planning

5. All sections of the QRAM should be completed to show a review and evaluation of each area/question has been performed. It was observed that several were not marked for project 19934.01. In addition, questions on the QRAM (Form QAP-17, Quality Requirements Application Matrix) should be reviewed and reworded where necessary to allow for a Yes/No response and to capture all required information. (Reference 2016-PAR-0005)

QAP-002, Review of Documents, Reports, and Papers

6. The technical review requirements for an EIS report should be evaluated to ensure Form QAP-012, *Instructions to Technical Reviewers*, identifies the following “Technical Correctness” review criteria, when appropriate;
 - *Critical information obtained from cited sources is accurately described and correctly interpreted.*
 - *Data are appropriate and are properly referenced.*

- *Conclusions are properly supported by correctly interpreted data.*
 - *Calculations require verification.*
- (Reference 2016-PAR-0006)


10.0 QUALITY ASSURANCE PROGRAM EFFECTIVENESS

As determined by this annual audit, the QA program applied by the GED continues to be adequate and effectively implemented. The recommendations identified provide opportunities for improvements and, if implemented, may reduce the potential to adversely affect products in the future.

PERSONS CONTACTED

	Pre-Audit Meeting	Contacted During Audit	Post-Audit Meeting
GED Staff and Consultants			
Patrick, W.	X	X	X
Wittmeyer, G.	X		
Pearcy, E.	X	X	X
Prikryl, J.	X	X	X
Pickett, D.	X	X	X
Mohanty, S.	X	X	
Howard, L.	X	X	X
Poerner, M.		X	
He, X.		X	
Pensado, O		X	
Juckett, M.		X	
Neill, L.		X	
NRC Observers			
Matula, T.	X		X
Schneider, S.		X (via teleconference)	X (via teleconference)
Ahn, T.		X (via teleconference)	X (via teleconference)
Lemont, S		X (via teleconference)	X (via teleconference)
McCubbin, S.			X (via teleconference)
Gwo, J.			X (via teleconference)
Hsia, A			X (via teleconference)
Rubenstein, J.			X (via teleconference)
Schofer, F.			X (via teleconference)
Audit Team and Others			
Hawkins, F.	X	X	X
Brockwell, F.	X		X
Trbovich, T.	X		X
Ehnstrom, M.	X		X
Garcia-Hernandez, A	X		X
Caseres, L	X		X
Turner, D	X		X
Lewis, M.	X		X


APPROVAL SIGNATURES


Faye Brockwell
Audit Team Leader (ATL)

January 6, 2016.
Date


Thomas Trbovich
QA Auditor


1/2/16
Date


Mark Einstrom
QA Auditor


1/7/16
Date


Augusto Garcia-Hernandez
Technical Specialist

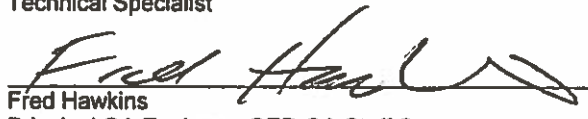
1/8/16
Date


Dr. Leonardo Caseres
Technical Specialist

1/8/16
Date

for 
Dr. David Turner
Technical Specialist

1.8.16.
Date


Fred Hawkins
Principal QA Engineer, GED QA Staff Support

1/8/16
Date

U:\CC3018_DOCS\AUDITS\2015 AUDITS\GED AUDIT 2015-1 OF NRC FUNDED ACTIVITIES\GED 2015-1 AUDIT REPORT\GED 2015-1 AUDIT REPORT.DOC



Southwest Research Institute®
Preventive Action Request



IDENTIFICATION		
Submitted By: Rodriguez, Patrick R	Date: 04-JAN-16	Report Number: 2016-PAR-0001
Division: 20 - GEOSCIENCES & ENGINEERING	Project Number: 19934.01	
Quality Program: GED (20) QAM		
Associated Report: N/A		
Potential Problem: The following recommendation was made for the identified project during GED audit 2015-1 of NRC-funded programs. Project: Technical Assistance for Independent Cost Estimation (ICE) Under Contract No. NRC-HQ-50-14-E-0001, Task Order No. NRC-HQ-20-15-T-0012. Recommendation: The organization should identify a method to capture the following items that were identified in the final report. (a) The Short Term Replacement power calculation presented in page 2-9 of the final report should be reviewed and clarified. (b) A clarification should be provided to address the difference between the cost presented in Table 3-4 and Table 3-6 for the one-time cost per reactor for the reactors that are currently in operation (previously identified and discussed with NRC). (c) For document consistency the recurring cost amount or time for the expected recurring cost in Table 3-10, SI No. 4, Page 3-10 should be incorporated. (d) The correct equation should be provided in Table 3-11, Page 3-12 as used in the calculation of the average number of alternatives (179).		
Audit Finding: Internal		
Auditing Organization Comments:		
Issued To: Sitakanta Mohanty	Response Due Date: 15-JAN-16	
SwRI cc: Mohanty, Sitakanta (20), Howard, Lane D (20)		
RESPONSE(S)		
Evaluation Results: (a) The Short Term Replacement power calculation presented in page 2-9 of the final report needs to be reviewed and clarified. i. The short term replacement power cost is correct in the report. It was calculated as shown below. Note that the capacity factor was not included in the description in the report which lead to confusion of the calculated replacement power cost. Cost of replacement power in 2015 dollars from reference: \$36/MW-hr Average size of power plant: 1,011 MWe Average operating capacity factor: 91.6% (percent of time that reactor operates each year) Calculation: Replacement Cost = \$36/MW-hr * 1,011 MWe * 0.916 = \$33,339/hr ii. The last paragraph in the "Short Term Replacement Power" section can be revised for clarification. Old Text: Finally, the electric power production level of the plant must be estimated to determine the replacement cost. The average electrical power output for all operating nuclear reactors is 1,011 MWe and the final average replacement power cost is \$33,339/hr, with a 95 percent confidence range of \$32,829 - \$33,848/hr. New Text: Finally, the electric power production level of the plant must be estimated to determine the replacement cost. The average electrical power output for all operating nuclear reactors is 1,011 MWe, average operating capacity factor is 91.6%, and the final average replacement power cost is \$33,339/hr, with a 95 percent confidence range of \$32,829 - \$33,848/hr. (b) The calculations were checked and the following outlines the recommended changes. i. Table 3-4, One-Time Costs. All values are correct and include costs to both industry and NRC. Change title to "Summary of Estimated Costs to Industry and NRC Under the Proposed Rule by Site Type (2015 Dollars)" ii. Table 3-6. All values are correct.		

(c) It is recommended for document consistency to incorporate the recurring cost amount or time for the expected recurring cost in Table 3-10, SI No. 4, Page 3-10.

i. Revised content for Section 4 of Table 3-10 is shown below.

SI No. 4

Code Case No. N-799

Cost Element Description:

Applies only to AP-1000 reactors

Onetime costs

- Update procedures and work packages - 45 hours labor for plant personnel

Recurring costs

- Weld inspections (every 10 years)
 - 8 welds to be inspected each time
 - Inspections occur every 10 years
 - First inspection occurs in year 1
 - 5 hours for each inspection x 2 plant personnel for each inspection = 10 hours per weld inspection
- Radiation exposure during inspections (every 10 years)
 - 2 worker for inspections (every 10 years)
 - 0.25 person-rem/worker/inspection

(d) The equation presented in Table 3-11, Page 3-12, item "d" needs to be corrected or removed; however, the calculation of the average number of alternatives (179) is correct.

Action: Change "(d)" in the equation to "1-(d)".

Proposed Action:

Actions are indicated in the Evaluation Results section above. Because the ICE report will not be revised, this PAR response in the Quality Reporting System serves as the only document that reflects the proposed actions.

Response By: Mohanty, Sitakanta

Date: 04-JAN-16

Target Action Date: 11-MAR-16

APPROVALS

Management Approval: Patrick, Wesley C.

Date: 04-JAN-16

Comments:

The response is appropriate. These detailed responses are being made in the PAR response because the NRC client does not want the report to be changed but does want to document the response to the PAR recommendations. Finally, note that the "1-d" given in the last item replaces the variable "(d)" in the equation with "1 minus (d)".

QA Approval: Rodriguez, Patrick R

Date: 05-JAN-16

Comments:

Concur with proposed action.

VERIFICATION

Verification of Action Taken:

The response addresses all parts of the recommendation. No further action is required.

Verified By: Hawkins, Frederick W

Date: 12-JAN-16

Target Date for Verification of Effectiveness: 10-JUL-16

Verification of Corrective Action Effectiveness:

Because this Preventive Action Request pertains to a single, stand-alone report, additional follow-up is not required. Accordingly verification of corrective action effectiveness is not applicable.

Verified By: Hawkins, Frederick W

Date: 12-JAN-16