APPENDIX

U. S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: STN 50-482/84-40 Construction Permit: CPPR-147

Docket: STN 50-482 Category: A2

Licensee: Kansas Gas and Electric Company (KG&E)
P. O. Box 208
Wichita, Kansas 67201

Facility Name: Wolf Creek Generating Station (WCGS)

Inspection At: WCGS Site, Burlington, Kansas

Inspection Conducted: October 22-25, 1984

Inspectors: Blaine Murray 12/20/84
for J. Blair Nicholas, Radiation Specialist, Date
Facilities Radiological Protection Section (FRPS)

Blaine Murray 12/20/84
for Russell Wise, Radiation Specialist, FRPS Date

Approved: Blaine Murray 12/20/84
Blaine Murray, Chief, FRPS Date

L. E. Martin 1/4/85
L. E. Martin, Chief, Project Section A, Date
Reactor Project Branch 2

Inspection Summary

Inspection Conducted October 22-25, 1984 (Report STN 50-482/84-40)

Areas Inspected: Routine, announced inspection of the licensee's chemistry/radiochemistry program including review of outstanding open items, offsite and onsite organizations, staffing, staff qualifications, training program, primary chemistry program, secondary chemistry program, radwaste sampling system, postaccident sampling system (PASS), chemical inventory program, facilities and equipment, analytical instrumentation, quality assurance (QA) program of chemistry/radiochemistry activities, administrative and departmental procedures, radiochemistry confirmatory measurements, and whole body counting system confirmatory measurements. The inspection involved 68 inspector-hours by 2 NRC inspectors.

Results: Within the 14 areas inspected, no violations or deviations were identified. Five previously identified open items were closed; one new open item is discussed in paragraph 4.

DETAILS

1. Persons Contacted

KG&E

*F. T. Rhodes, Plant Manager
*G. D. Boyer, Superintendent Technical Support
*L. F. Breshears, Health Physics Supervisor
J. A. Harris, Health Physics Technician
*S. A. Henry, Chemistry Supervisor
*C. J. Hoch, QA Technician
*W. M. Lindsay, QA Systems Supervisor
*R. L. Logsdon, Site Chemist
*L. K. Loney, Chemistry Technician
*O. L. Maynard, Licensing Supervisor
*T. S. Morrill, Chemistry Supervisor
*M. M. Nichols, Site Health Physicist
*C. L. Palmer, Chemistry Supervisor
D. K. Parks, Training Specialist
C. G. Patrick, Quality Evaluations Superintendent
W. J. Rudolph II, Manager, QA
R. M. Stambaugh, QA Audit Supervisor
*H. L. Stubby, Chemistry Supervisor
*P. E. Turner, Nuclear Training Manager

Others

*B. Bartlett, NRC Resident Inspector
*B. Murray, Chief, Facilities Radiological Protection Section, NRC Region IV

*Denotes those present during the exit briefing on October 25, 1984.

2. Applicant Action on Previous Inspection Findings

(Closed) Open Item (482/8404-01): Onsite Chemistry/Radiochemistry Organization - This item involved the lack of approved procedures defining responsibilities and functional area assignments, approved position descriptions and personnel qualifications, and complete staffing of the onsite chemistry/radiochemistry section. The NRC inspectors reviewed the approved position descriptions and section procedures governing activities within the assigned areas of responsibility and found them acceptable. The chemistry/radiochemistry section supervisory and technician positions were filled in the organizational structure. This item is considered closed.

(Closed) Open Item (482/8404-02): Chemistry/Radiochemistry Personnel Qualifications - This item involved the lack of selection and qualification criteria and implementing procedures for the determination of qualified personnel and the fact that the Final Safety Analysis Report (FSAR) did not address the current onsite chemistry organization positions and define personnel qualifications for those positions. The NRC inspectors reviewed the licensee's revision to the FSAR, Chapter 13, Table 13.1-1 and confirmed that the table reflected current onsite chemistry section key personnel and minimum qualifications for the site chemist position. The NRC inspectors reviewed the personnel data for each chemistry/radiochemistry staff member and verified that the educational and experience backgrounds of the staff met the academic and experience qualifications as committed to in the FSAR. The licensee had revised the chemistry/radiochemistry section position descriptions to provide a more detailed analysis of job requirements and had incorporated ANSI N18.1-1971 personnel qualifications into the position descriptions. It was noted that 3 of the 4 chemistry supervisors and 6 of the 14 chemistry technicians hired at the time of the inspection met the experience qualification recommendations of ANSI N18.1-1971. The NRC inspectors determined that the licensee would apparently have sufficient qualified technical staff to meet shift staffing requirements in chemistry/radiochemistry at the time of power operation. The licensee had written an approved procedure to provide selection and qualification criteria for the hiring of qualified onsite chemistry/radiochemistry personnel. This item is considered closed.

(Closed) Open Item (482/8404-08): Chemical Inventory Program - This item involved the implementation of a chemical procurement and inventory program for the station laboratories. The NRC inspectors reviewed the present status of the chemical inventory program and found the licensee had implemented a program according to approved procedure and had completed initial procurement of chemicals, reagents, and standards required to support station operation. The NRC inspectors inspected the storage area for chemicals, acids, and flameable solvents in the shop building and respective laboratories and noted that safety storage cabinets were in use. However, it was noted that fire detection equipment was installed but no fire sprinkler system was installed in the shop building chemical storage area. This item is considered closed.

(Closed) Open Item (482/8404-10): Chemistry/Radiochemistry Analytical Instrumentation - This item involved procurement of laboratory instrumentation; placement of instruments in their final operating locations; the lack of operating, calibration, and calibration check procedures; completion of calibration of all analytical instruments; and the implementation of an instrument calibration check program. The NRC inspectors reviewed the licensee's inventory of analytical equipment and supplies to be used in the laboratories and counting room and verified that equipment originally identified by the licensee as required had been

purchased, received, and placed in the laboratories. Instrument operating, calibration, and calibration check procedures had been written and approved. All analytical instrumentation had been tested and calibrated and a calibration check program had been implemented and was being maintained on instrumentation in routine use. The NRC inspectors reviewed calibration data and calibration check data for selected laboratory and counting room analytical instrumentation and found the records according to procedure. The licensee's analytical instrumentation calibration and calibration check program appeared to be adequate. This item is considered closed.

(Closed) Open Item (482/8404-12): Procedures - This item involved the lack of necessary completed and approved procedures to implement and conduct a satisfactory chemistry/radiochemistry program. The NRC inspectors reviewed selected procedures contained in the "Administrative Procedures Manual" and "Chemistry Procedures Manual" and found that they appeared to be satisfactory to effectively implement a chemistry/radiochemistry program. This item is considered closed.

3. Open Items Identified During This Inspection

Open items are matters that require further review and evaluation by the inspectors or the licensee. Open items are used to document, track, and ensure adequate followup on matters of concern to the inspector.

Open Item	Description	Reference Paragraph
(482/8440-01)	Corporate Chemistry/Radiochemistry Personnel Qualifications	4

4. Corporate Chemistry/Radiochemistry Personnel Qualifications

The NRC inspectors reviewed the qualifications of the corporate chemistry/radiochemistry personnel to determine agreement with commitments in the FSAR. The NRC inspectors determined that the supervisor of radiological projects and the corporate nuclear chemist were not addressed in the FSAR in the area of management and corporate organization. The FSAR had not been updated to reflect the current organizational structure and the industry standard qualification requirements for these technical support positions. The current position descriptions for the manager of radiological environmental assessment (REA), supervisor of radiological projects, and the corporate nuclear chemist did not include minimum qualifications for these positions which were consistent with industry standards and did not indicate any requirements for having any prior

operating nuclear power plant experience. The NRC inspectors reviewed the experience resumes of the corporate chemistry technical support personnel and found that the REA section staff had only limited operating nuclear power plant chemistry experience. Since the previous NRC chemistry inspection, the REA's manager position has been vacated and a replacement had not been named. The licensee had not established procedures providing definitive guidance on evaluation of personnel training and experience for determination of qualification to at least Regulatory Guide 1.8, ANSI N18.1-1971, and NUREG-0731 recommendations for corporate technical support staff.

This item is considered open (482/8440-01) pending:

- Update of the FSAR to include the current corporate chemistry organization and staff position personnel qualifications.

- Incorporation of at least minimum ANSI N18.1-1971 personnel qualifications for all corporate chemistry staff positions into the respective position descriptions.

- Development and approval of selection and qualification criteria implementing procedures for the determination of qualified personnel for corporate chemistry technical support personnel.

No violations or deviations were identified.

5. Chemistry/Radiochemistry Training Program

The NRC inspectors reviewed the licensee's chemistry/radiochemistry training program to determine compliance with FSAR commitments, 10 CFR Part 19.12 requirements, and the recommendations of ANSI N18.1-1971 and Regulatory Guide 1.8.

The NRC inspectors discussed the training program for chemistry/radiochemistry personnel with the nuclear training manager and training specialist who provides instruction in basic mathematics and science to the technical staff. The nuclear training department did not have on its staff a instructor with expertise in nuclear power plant chemistry/radiochemistry. The NRC inspectors determined that the licensee's program for qualification and training of WCGS chemistry staff was described in Procedure ADM-04-004, "Chemistry Group Training Program," Revision 3, June 30, 1984. At the time of the inspection the nuclear training department was operating in accordance with a series of administrative procedures and was in the process of writing a training manual.

The NRC inspector determined that the chemistry section was training its own personnel on analytical procedures and instrument operation. The nuclear training department was functioning as a service organization and offering specialized training as requested. The nuclear training department had placed the training responsibilities for various section personnel with the various section's management. The nuclear training department had requested that each section provide its own qualified training coordinator/instructor.

The nuclear training department had developed a health physics/chemistry technician course with local universities. The course lecture outline and study materials were reviewed for content and applicability. The NRC inspector found the course adequate to prepare the chemistry/radiochemistry staff for their technical duties. All chemistry technicians onsite prior to January 1, 1984, had completed the course presented by the licensee's contractor. Chemistry technicians hired after January 1, 1984, will be scheduled to complete the contractor's course when it is scheduled again in the spring of 1985.

The NRC inspectors reviewed the chemistry/radiochemistry section individual staff training records and found that most of the staff had completed about 70 percent of the required training. This completed training included different levels of instrument qualification and analytical procedures training as required by job assignments to support startup operations. The licensee indicated that staff qualification training was continuing and that shift qualification training would be completed before power operation for all chemistry/radiochemistry technicians onsite prior to May 1, 1984.

Open Item (482/8404-03): Chemistry/Radiochemistry Training Program - will remain open pending:

- Development and implementation of a formal training program for chemistry/radiochemistry personnel with oversight by the training department.

- Completion of shift qualification training of the nine technicians who were onsite prior to May 1, 1984.

No violations or deviations were identified.

6. Primary Chemistry Program

The NRC inspectors reviewed the licensee's primary chemistry program to determine compliance with FSAR commitments and proposed Technical Specifications.

The NRC inspector's review of the primary chemistry program found the licensee had completed and approved all planned primary system procedures. Radiochemistry analytical procedures and nuclear instrument operating and calibration procedures were completed and approved. The licensee had written and approved procedures to provide surveillance of Technical Specification requirements in the primary chemistry area. Analytical procedures for the determination of the various chemistry parameters were written and approved to cover all of the required analyses. The licensee had completed calibration of laboratory analytical instrumentation which were to be used to support the primary chemistry program. Primary chemistry analytical procedures had been tested and verified using known standards.

The NRC inspector visited and inspected the primary chemistry sampling area. The primary sample panel was installed but not operational. The sample lines had been traced and measured as a basis for calculating sample line flush times. The licensee had written and approved sampling procedures to operate the primary sample panel and obtain primary system grab samples. The licensee had not completed determining recirculation times of the primary chemistry and radwaste tanks to produce representative samples.

Open Item (482/8404-04): Primary Chemistry Program - will remain open pending:

- Complete testing of the primary sample panel and verification of all sample points.

- Verification of primary chemistry and radwaste tank recirculation times (where applicable) to produce representative samples.

No violations or deviations were identified.

7. Secondary Chemistry Program

The NRC inspectors reviewed the licensee's secondary chemistry program to determine compliance with FSAR commitments and proposed Technical Specifications.

The NRC inspector's review of the secondary chemistry program found the licensee had completed and approved all planned secondary system procedures. The licensee had written and approved analytical procedures for the determination of the secondary chemistry parameters to support station startup and operating requirements. Procedures for the operation,

calibration, and calibration check of analytical and process instrumentation were written and approved. The licensee had completed calibration of laboratory analytical instrumentation and implemented a calibration check program for those instruments in routine use. Secondary chemistry analytical procedures had been tested and verified using known standards.

The NRC inspectors visited and inspected the secondary chemistry sampling area. The secondary sample panel was installed and operational. Sample points had been verified and sample lines traced and measured as a basis for calculating sample line flush times to produce a representative sample. The licensee had written and approved sampling procedures to operate the secondary chemistry sample panel and obtain secondary system grab samples. The licensee had not completed calibration of the process analyzers associated with the sample panel.

Open Item (482/8404-05): Secondary Chemistry Program - will remain open pending completion of the various process analyzer calibrations and implementation of a quality control program for the process analyzers.

No violations or deviations were identified.

8. Radwaste Sampling System

The NRC inspectors reviewed the licensee's liquid effluent radwaste sampling system to determine compliance with FSAR commitments and the recommendations of Regulatory Guide 1.21.

The NRC inspectors inspected the liquid radwaste sampling area located adjacent to the radwaste laboratory on the 2000-foot level of the radwaste building. The liquid radwaste sample panel was installed, but preoperational testing had not been performed. The sample panel lines were not connected or verified. The licensee had not verified tank volumes, tank recirculation times, and sample line flush times to ensure the collection of representative samples from the various sample points. The licensee had written and approved a sampling procedure to operate the radwaste sample panel and obtain specific representative grab samples. Construction was near completion in the radwaste laboratory but analytical equipment had not been installed and the laboratory was not being used.

Open Item (482/8404-06): Radwaste Sampling System - will remain open pending:

- Complete checkout of the radwaste sampling panel and verification of all sample points.
- Determination of tank recirculation times and sample line flush times for each sample point to produce a representative sample.

- Complete construction, instrument installation, and occupancy of the radwaste laboratory.

No violations or deviations were identified.

9. Postaccident Sampling System

The NRC inspectors reviewed the licensee's PASS to determine compliance with FSAR commitments and the requirements of NUREG-0737.

The NRC inspectors toured the area in the plant where the PASS hardware was installed. The PASS sampling equipment, manual local control panel, remote computer operated control panel, and remote operated multichannel analyzer system were installed in their respective plant locations. The high purity germanium detector for the multichannel analyzer system was not placed in the system due to construction still being performed in the area. The PASS manufacturer had not turned over the system to the licensee and the site acceptance testing had not been performed. Procedures to test and operate the system were written. The PASS system is expected to be tested and operational prior to fuel loading. The technicians were receiving training on the PASS at the Callaway Nuclear Power Station during their 3 week training at that operating site.

Open Item (482/8404-07): Postaccident Sampling System - will remain open pending:

- Completion of operating procedures, installation and site acceptance of proposed system, and calibration of inline instrumentation.

- Verification of system operation by collecting samples of reactor coolant and containment atmosphere under simulated accident conditions and performing required comparative analyses prior to exceeding 5 percent power.

- Training of chemistry/radiochemistry technicians on the PASS for shift qualification.

No violations or deviations were identified.

10. Facilities, Equipment, and Supplies

The NRC inspectors toured and inspected the facilities to be used by the chemistry/radiochemistry staff in performing their various chemistry support responsibilities. The following facilities were inspected: water treatment laboratory, secondary chemistry laboratory and sampling area, primary chemistry laboratory and sampling area, radiochemistry counting room, postaccident sampling area, and radwaste laboratory and sampling area. It was noted that the licensee had not completed construction of all the facilities.

The NRC inspectors noted that there was no office space provided for the chemistry supervisors in close proximity to the laboratories they were supervising. Adequate space was available, but had not been planned for a laboratory technician study area to handle data, prepare reports, and study technical materials. This type of work space should be planned and provided for the laboratory technicians in their assigned laboratory areas.

Open Item (482/8404-09): Facilities, Equipment, and Supplies - will remain open pending:

- Complete testing of the primary sample panel, verification of all sample points, and placing the primary sample panel in routine use.
- Radiochemistry counting room instrumentation placed in final arrangement and construction work completed.
- Postaccident sampling area construction completed and system instrumentation operational.
- Complete construction, instrument installation, and routine occupancy of the radwaste laboratory.
- Provision for chemistry technician work/study areas in or near their assigned laboratory areas.

No violations or deviations were identified.

11. Quality Assurance Program

The NRC inspectors reviewed the licensee's internal audit program regarding chemistry/radiochemistry activities to determine compliance with FSAR commitments, the requirements of 10 CFR Part 50, Appendix B, and the recommendations of ANSI N18.7-1976 and Regulatory Guides 1.33, 1.144, 1.146, and 4.15.

The NRC inspectors were specifically interested in the existence of an audit/review program and the scope of that program as it relates to the chemistry/radiochemistry department and what progress had been made in the development and implementation of such a program since the previous inspection.

The NRC inspectors reviewed the WCGS QA organizational structure as applicable to the chemistry/radiochemistry program and found it weak in nuclear power plant chemistry/radiochemistry experience.

The NRC inspectors reviewed the WCGS QA audit program and found the licensee had written and approved procedures in the Quality Program Manual which would establish a satisfactory audit program. The licensee had completed a list of essential elements and attributes to be used in preparing and conducting audits in chemical/radiochemical control. It appeared to include most of the areas of NRC concern which should be inspected in an audit of the chemistry/radiochemistry program.

The licensee had conducted an audit of Hydro/Flush Water Quality in January 1984. The NRC inspectors reviewed the audit plan and report for adequate scope and depth to ensure thoroughness of program evaluation and timely followup of deficiencies. The NRC inspectors found that the audit procedure and checklist questions appeared to be adequate and comprehensive for the areas audited and the status of the plant startup at the time of the audit. The NRC inspectors determined that the responses and corrective actions to the audit findings were satisfactory and performed in a timely manner. It was noted that the audit team included members with an educational background in chemical engineering but not trained and knowledgeable in chemistry/radiochemistry activities at a nuclear power facility.

A review of the 1984 WCGS QA audit schedule indicated a chemical-radiochemical control audit was scheduled for the second quarter of 1984. The licensee stated that this audit had not been performed due to the lack of qualified auditors to perform the audit at that time. The audit had not been rescheduled.

Open Item (482/8404-11): Quality Assurance Program - will remain open pending:

- Implementation of a comprehensive audit and surveillance program for chemistry/radiochemistry activities covering at least all the areas of concern listed in the open item.

- Scheduling and performing audits of chemical-radiochemical control in accordance with established essential elements and attributes prior to plant operation.

No violations or deviations were identified.

12. Analytical Measurements

a. Confirmatory Measurements

Confirmatory measurements were performed on the following standards and samples in the NRC Region IV mobile laboratory at WCGS during the inspection:

(1) NRC Face Loaded Charcoal Cartridge Standard (SRS-15176-109)

(2) NRC Particulate Filter Standard (SRS-15177A-109)

(3) NRC One Liter Liquid Marinelli Beaker Standard (SRS-15174-109)

(4) NRC 20ml Liquid Scintillation Vial Standard (SRS-15171-109)

(5) NRC 30cc Gas Bulb (SRS-15087-109)

(6) WCGS One Liter Gas Marinelli Beaker (HPH-303-1)

(7) Waste Liquid Test Sample

(8) NRC Tritium Sample

The confirmatory measurements test consisted of comparing measurements made by the licensee and NRC's mobile laboratory. The NRC's mobile laboratory measurements are referenced to the National Bureau of Standard (NBS) by laboratory intercomparisons.

Attachment 1 contains the criteria used to compare the results.

b. Results

The sample analyses and comparison of analytical results of the confirmatory measurements are tabulated in Attachment 2.

The licensee maintains three high purity intrinsic germanium (HPG) detectors connected to a Nuclear Data gama spectrometer system. All three detectors will be used for routine isotopic analysis of radioactive samples to demonstrate compliance with Technical Specifications and regulatory requirements. All three detectors were cross-checked on selected counting geometries during this inspection.

The NRC inspectors provided the licensee with a face loaded charcoal cartridge standard, particulate filter standard, one liter liquid Marinelli beaker standard, liquid scintillation vial standard, 30cc gas bulb standard, and a tritium sample. In addition, the applicant provided a one liter gas Marinelli beaker sample and a waste liquid test sample.

The licensee analyzed eight of eight nuclides correctly on the face loaded charcoal cartridge, particulate filter, and in the one liter liquid Marienlli beaker, six of eight nuclides correctly in the liquid scintillation vial, six of six nuclides correctly in the waste liquid test sample, both nuclides correctly in the 30 cc gas bulb, and quantified the activity in the tritium sample within the

acceptance criteria for agreement. The licensee only analyzed one of three nuclides in the agreement category in the one liter gas Marinelli beaker geometry. The licensee committed to evaluate their calibration of this counting geometry. The licensee's results from those listed in Attachment 2 showed an overall 87 percent agreement with the NRC analysis results based on 88 agreement results out of 101 total results compared. The licensee's results cross-checked with 100 percent agreement between each of the three HPG detectors for all counting geometries compared.

To complete the confirmatory measurements inspection and provide strontium nuclide analyses at activity levels which can be easily detected and compared, the NRC inspectors have requested the NRC's reference laboratory, Radiological and Environmental Sciences Laboratory (RESL) in Idaho Falls, Idaho, to send the licensee an unknown sample prepared by RESL using known nuclide concentrations for analysis of ^{89}Sr, ^{90}Sr, tritium, and several gamma emitting nuclides. The licensee is to analyse the sample and report the results as requested. The analytical results will be compared to the known sample activities and the results of the comparisons will be reported in the next NRC confirmatory measurements report.

No violations or deviations were identified.

13. Whole Body Counting System

The NRC inspectors reviewed the licensee's whole body counting system to determine compliance with 10 CFR Part 20.103.

The NRC inspectors reviewed the health physics procedures which provide guidance in the operation, calibration, and quality control of the whole body counting system. The procedures provide for a semiannual full range calibration of the whole body counter and quality control checks to be performed quarterly and prior to use on the instrument's energy calibration and system operability. The licensee had established a calibration program using sources of common nuclides found in nuclear power facilities which represented various percentages of maximum permissible organ burdens. The licensee's sources were traceable to the NBS and were used in a polyethylene phantom supplied by the vendor of the whole body counting system. The licensee's calibration program and QA program for the whole body counting system were reviewed and appeared to meet industry standards. The licensee participates in a cross-check program on a quarterly basis with a commercial vendor who supplies unknown activities in the phantom configuration used by the licensee. The NRC inspectors reviewed the licensee's calibration and QA check data for 1984 and found no deficiencies.

The NRC inspectors supplied the licensee with a whole body counting phantom designed to conform to the "reference man" of the International Commission on Radiological Protection - 23 to perform confirmatory measurements in their chair style whole body counting system. The phantom contained various configurations of radioactive sources traceable to the NBS. The phantom and nuclides duplicated the organs and body burdens that the licensee might encounter during normal operation. The confirmatory measurements test consisted of comparing measurements made by the licensee with the certified activities of the NRC standards positioned in the whole body phantom. The tests included a body positioning verification test, lung scan, thyroid scan, and combination of lung and thyroid implant and scan. The tests required identification and quantitative analysis of nuclide activities in the various body organs resulting in the determination of percentage of maximum permissible body/organ burdens. The results of the body positioning test and the comparison of the analytical results of the confirmatory measurements against the standard activities are tabulated in Attachment 3.

The licensee analyzed the nuclide activities positioned in the NRC phantom to simulate inhilation as "mock iodine" in the thyroid and ^{137}Cs and ^{60}Co in the lungs. The NRC inspectors checked the licensee's accuracy of body positioning in the whole body counting system chair and found the reproducibility of measurements satisfactory. The results of the body burden activity measurements taken revealed several weaknesses in the licensee's whole body counting system. These weaknesses included the following:

a. The licensee's results for 5 percent through two body burdens of ^{60}Co in the right lung were approximately 50% lower than the certified activity of the NRC standards.

b. The licensee's results for 5 percent through two body burdens of ^{133}Ba as "mock iodine" in the tyroid were approximately 45% lower than the certified activity of the NRC standards.

c. The licensee was unable to obtain analytical results from a two body burden thyroid and lung loading due to activity saturation of the system.

The licensee was informed of the analytical results and the NRC's concerns as a result of the confirmatory measurements. The licensee acknowledged the indicated whole body counting system weaknesses and committed to evaluating the areas of NRC concern and taking corrective action where needed. The licensee's evaluation and corrective actions will be reviewed during future inspections.

No violations or deviations were identified.

14. Emergency Facilities for the NRC Mobile Laboratory

The NRC inspectors discussed with the licensee the installation of emergency facilities at the Emergency Operations Facility (EOF) at the WCGS Education Center. The EOF's capability to support the Region IV mobile laboratory requirements for electrical and telephone connections during a response to a radiological incident was reviewed. The NRC inspectors outlined the mobile laboratory's emergency support requirements as follows:

a. The parking location should be on a level concrete slab in an area away from overhead electrical transmission lines.

b. Electrical power should be provided to the vehicle through three independent (nonground faulted) 115 volt, 30 ampere circuits equipped with twist-lock receptacles located within 50 feet of the parked vehicle.

c. Telephone line and modular connection should be provided at the vehicle parking site.

The licensee committed to investigate how these support requirements could be met at the EOF and to initiate proper installation.

15. Status of the Chemistry/Radiochemistry Department

During this inspection the NRC inspectors reviewed the licensee's status in the areas of organization, staffing, qualifications, training, primary and secondary chemistry programs, radwaste sampling, PASS, facilities and equipment, analytical instrument calibration and quality control, QA program, and confirmatory measurements and found the applicant's chemistry/radiochemistry section to be approximately 80 percent complete in resolving NRC concerns. Of the 12 open items originally identified during the initial preoperational chemistry/radiochemistry inspection conducted in February 1984, 5 are presently closed leaving 7 to be resolved and closed. All of the open items must be resolved prior to exceeding 5 percent power. Based on the inspection, it appears that the licensee's chemistry/radiochemistry section should be ready to support plant operations satisfactorily at the time of projected low power testing.

16. Exit Briefing

The NRC inspectors met with the licensee representatives identified in paragraph 1 of this report at the conclusion of the inspection on October 25, 1984. The NRC inspectors summarized the scope of the inspection, discussed the closing of five open items, and presented the requirements for closing the remaining seven previously identified open items as discussed in this report. The NRC inspectors discussed the results of the confirmatory measurements performed on various intercomparison samples and the whole body counting system. The NRC inspectors stated that all outstanding open items are considered by Region IV NRC office as requirements for an effective operation and must be resolved prior to the plant exceeding 5 percent power.

ATTACHMENT 1

Criteria for Comparing Analytical Measurements

The following are the criteria used in comparing the results of capability tests and verification measurements. The criteria are based on an empirical relationship established through prior experience and this program's analytical requirements.

In these criteria, the judgement limits vary in relation to the comparison of the resolution.

$$\text{Resolution} = \frac{\text{NRC VALUE}}{\text{NRC UNCERTAINTY}}$$

$$\text{Ratio} = \frac{\text{LICENSEE VALUE}}{\text{NRC VALUE}}$$

Comparisons are made by first determining the resolution and then reading across the same line to the corresponding ratio. The following table shows the acceptance values.

RESOLUTION	AGREEMENT RATIO
<4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

The above criteria are applied to the following analyses:

(1) Gamma Spectrometry.

(2) Tritium analyses of liquid samples.

(3) Iodine on adsorbers.

(4) ^{89}Sr and ^{90}Sr determinations.

(5) Gross Beta where samples are counted on the same date using the same reference nuclide.

ATTACHMENT 2

Confirmatory Measurements Results

1. NRC Face Loaded Charcoal Cartridge (SRS-15176-109)
(Standardized 11:00 CST, April 16, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{57}Co	(1)	3.13±0.03E-02	2.88±0.01E-02	1.09	Agreement
	(2)	3.05±0.02E-02		1.06	Agreement
	(3)	2.27±0.02E-02		0.79	Disagreement
^{60}Co	(1)	5.06±0.06E-02	4.70±0.03E-02	1.08	Agreement
	(2)	5.07±0.05E-02		1.08	Agreement
	(3)	5.10±0.05E-02		1.09	Agreement
^{88}Y	(1)	1.38±0.02E-01	1.22±0.01E-01	1.13	Agreement
	(2)	1.41±0.02E-01		1.16	Agreement
	(3)	1.43±0.02E-01		1.18	Agreement
^{109}Cd	(1)	1.25±0.01E+00	1.15±0.01E+00	1.09	Agreement
	(2)	1.24±0.01E+00		1.07	Agreement
	(3)	8.76±0.05E-01		0.76	Disagreement
^{113}Sn	(1)	7.13±0.10E-02	6.38±0.04E-02	1.12	Agreement
	(2)	7.05±0.08E-02		1.11	Agreement
	(3)	No Result [1]/			No Comparison
^{137}Cs	(1)	4.43±0.04E-02	4.12±0.02E-02	1.08	Agreement
	(2)	4.43±0.04E-02		1.08	Agreement
	(3)	4.15±0.03E-02		1.01	Agreement
^{139}Ce	(1)	3.50±0.04E-02	3.13±0.02E-02	1.12	Agreement
	(2)	3.61±0.03E-02		1.15	Agreement
	(3)	2.73±0.03E-02		0.87	Agreement
^{203}Hg	(1)	1.52±0.03E-01	1.38±0.01E-01	1.11	Agreement
	(2)	1.48±0.02E-01		1.08	Agreement
	(3)	1.24±0.02E-01		0.90	Agreement

[1]/ Nuclide was not reported by the licensee because it was not included in the isotope library used by the health physics department.

2. NRC Particulate Filter Standard (SRS-15177A-109)
(Standardized 11:00 CST, April 16, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{57}Co	(1)	2.28±0.01E-02	2.56±0.01E-02	0.89	Agreement
	(2)	2.30±0.02E-02		0.90	Agreement
	(3)	2.30±0.02E-02		0.90	Agreement
^{60}Co	(1)	4.19±0.04E-02	4.17±0.02E-02	1.01	Agreement
	(2)	4.19±0.05E-02		1.01	Agreement
	(3)	3.99±0.10E-02		0.96	Agreement
^{88}Y	(1)	1.19±0.01E-01	1.07±0.01E-01	1.11	Agreement
	(2)	1.15±0.02E-01		1.07	Agreement
	(3)	1.14±0.03E-01		1.06	Agreement
^{109}Cd	(1)	8.76±0.05E-01	1.03±0.002E+0	0.85	Agreement
	(2)	8.61±0.06E-01		0.84	Disagreement
	(3)	8.51±0.01E-01		0.83	Disagreement
^{113}Sn	(1)	5.48±0.06E-02	5.82±0.03E-02	0.94	Agreement
	(2)	5.58±0.08E-02		0.96	Agreement
	(3)	No Result [1]/			No Comparison
^{137}Cs	(1)	3.54±0.03E-02	3.75±0.02E-02	0.95	Agreement
	(2)	3.64±0.04E-02		0.97	Agreement
	(3)	3.73±0.07E-02		0.99	Agreement
^{139}Ce	(1)	2.70±0.02E-02	2.80±0.01E-02	0.97	Agreement
	(2)	2.68±0.02E-02		0.96	Agreement
	(3)	2.75±0.06E-02		0.99	Agreement
^{203}Hg	(1)	1.18±0.02E-01	1.23±0.01E-01	0.96	Agreement
	(2)	1.16±0.02E-01		0.94	Agreement
	(3)	1.24±0.04E-01		1.01	Agreement

[1]/ Nuclide was not reported by the licensee because it was not included in the isotope library used by the health physics department.

3. NRC One Liter Liquid Marinelli Beaker Standard (SRS-15174-109)
(Standardized 11:00 CST, April 16, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/ml)	NRC Results (uCi/ml)	WCGS/NRC Ratio	Decision
^{57}Co	(1)	2.73±0.02E-02	2.83±0.03E-02	0.96	Agreement
	(2)	2.69±0.03E-02		0.95	Agreement
^{60}Co	(1)	4.67±0.05E-02	4.65±0.05E-02	1.00	Agreement
	(2)	4.65±0.05E-02		1.00	Agreement
^{88}Y	(1)	1.26±0.02E-01	1.26±0.01E-01	1.00	Agreement
	(2)	1.25±0.01E-01		1.00	Agreement
^{109}Cd	(1)	1.09±0.01E±00	1.10±0.01E+00	0.99	Agreement
	(2)	1.09±0.01E+00		0.99	Agreement
^{113}Sn	(1)	6.49±0.08E-02	6.59±0.08E-02	0.98	Agreement
	(2)	6.21±0.08E-02		0.94	Agreement
^{137}Cs	(1)	4.14±0.04E-02	4.06±0.04E-02	1.02	Agreement
	(2)	3.98±0.04E-02		0.98	Agreement
^{139}Ce	(1)	3.11±0.03E-02	3.07±0.04E-02	1.01	Agreement
	(2)	3.09±0.04E-02		1.00	Agreement
^{203}Hg	(1)	1.26±0.02E-01	1.46±0.03E-01	0.86	Agreement
	(2)	1.26±0.02E-01		0.86	Agreement

4. NRC 20ml Liquid Scintillation Vial Standard (SRS-15171-109)
(Standardized 11:00 CST, April 16, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{57}Co	(1)	2.37±0.02E-02	3.05±0.02E-02	0.78	Disagreement
	(2)	2.34±0.02E-02		0.77	Disagreement
^{60}Co	(1)	4.36±0.05E-02	5.01±0.04E-02	0.87	Agreement
	(2)	4.35±0.04E-02		0.87	Agreement
^{88}Y	(1)	1.21±0.02E-01	1.27±0.01E-01	0.95	Agreement
	(2)	1.15±0.02E-01		0.90	Agreement
^{109}Cd	(1)	9.45±0.05E-01	1.22±0.004E+0	0.78	Disagreement
	(2)	9.65±0.07E-01		0.79	Disagreement
^{113}Sn	(1)	5.63±0.07E-02	6.94±0.06E-02	0.81	Agreement
	(2)	5.83±0.08E-02		0.84	Agreement
^{137}Cs	(1)	3.59±0.03E-02	4.48±0.03E-02	0.80	Agreement
	(2)	3.69±0.04E-02		0.82	Agreement
^{139}Ce	(1)	2.72±0.03E-02	3.31±0.02E-02	0.82	Agreement
	(2)	2.72±0.04E-02		0.82	Agreement
^{203}Hg	(1)	1.13±0.02E-01	1.39±0.02E-01	0.81	Agreement
	(2)	1.13±0.02E-01		0.81	Agreement

5. NRC 30cc Gas Bulb (SRS-15087-109)
(Sampled 09:00 CST, October 23, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{85}Kr	(1)	6.70±0.03E+01	8.44±0.02E+01	0.79	Disagreement
	(2)	7.17±0.04E+01		0.85	Agreement
^{127}Xe	(1)	4.50±0.06E-02	4.67±0.03E-02	0.97	Agreement
	(2)	4.78±0.07E-02		1.02	Agreement

6. WCGS One Liter Gas Marinelli Beaker (HPH-303-1)
(Sampled 13:50 CST, October 23, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{85}Kr	(1)	1.86±0.03E+00	2.72±0.04E+00	0.68	Disagreement
	(2)	1.87±0.03E+00		0.68	Disagreement
^{127}Xe	(1)	2.99±0.02E-02	3.50±0.02E-02	0.85	Agreement
	(2)	2.98±0.02E-02		0.85	Agreement
^{133}Xe	(1)	4.50±0.13E-03	7.03±0.22E-03	0.64	Disagreement
	(2)	5.02±0.18E-03		0.71	Disagreement

7. Waste Liquid Test Sample
(Sampled 12:00 CST, October 24, 1984)

Nuclide	WCGS Det.	WCGS Results (uCi/Sample)	NRC Results (uCi/Sample)	WCGS/NRC Ratio	Decision
^{57}Co	(1)	1.41±0.03E-05	1.40±0.04E-05	1.01	Agreement
	(2)	1.33±0.03E-05		0.95	Agreement
^{60}Co	(1)	3.68±0.02E-04	3.84±0.04E-04	0.96	Agreement
	(2)	3.59±0.02E-04		0.94	Agreement
^{109}Cd	(1)	7.96±0.11E-04	7.86±0.15E-04	1.01	Agreement
	(2)	7.68±0.11E-04		0.98	Agreement
^{113}Sn	(1)	5.11±0.61E-06	3.71±0.93E-06	1.38	Agreement
	(2)	5.10±0.50E-06		1.38	Agreement
^{137}Cs	(1)	3.91±0.02E-04	4.09±0.03E-04	0.95	Agreement
	(2)	3.79±0.02E-04		0.93	Agreement
^{139}Ce	(1)	2.89±0.29E-06	3.24±0.40E-06	0.89	Agreement
	(2)	2.95±0.25E-06		0.91	Agreement

8. NRC Tritium Sample
(Samples 09:00 CST, October 19, 1984)

Nuclide	WCGS Result (uCi/Sample)	NRC Result (uCi/Sample)	WCGS/NRC Ratio	Decision
^{3}H	1.78±0.03E-03	1.94±0.05E-03	0.92	Agreement

ATTACHMENT 3

Whole Body Counting System Confirmatory Measurements Results

1. Positioning Verification Test

NRC Whole Body Phanton with 5 Percent Body Burden Standard 114-1 in the Right Mid Lung (Standardized August 27, 1984)
Tests (1), (2), and (3)

Nuclide	WCGS Result Test (1)	WCGS Result Test (2)	WCGS Result Test (3)	Average	Standard Deviation
^{60}Co	0.310	0.321	0.293	0.308	0.014

2. Analytical Measurements

a. Lung Test

Test (4) - NRC Whole Body Phantom with 5 Percent Body Burden Standard 114-1 (Standardized August 27, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{60}Co	Rt. Mid Lung	0.308	0.500	0.62

Test (5) - NRC Whole Body Phantom with 10 Percent Body Burden Standard 114-2 (Standardized August 27, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{60}Co	Rt. Mid Lung	0.553	1.000	0.55

Test (6) - NRC Whole Body Phantom with 50 Percent Body Burden Standard 114-3 (Standardized August 27, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{60}Co	Rt. Mid Lung	2.541	5.000	0.51

Test (7) - NRC Whole Body Phantom with One Body Burden
Standard 114-4 (Standardized August 27, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{60}Co	Rt. Mid Lung	4.58	10.00	0.46

Test (8) - NRC Whole Body Phantom with Two Body Burden
Standard 114-5 (Standardized August 27, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{60}Co	Rt. Mid Lung	8.707	20.00	0.44

b. Thyroid Test

Test (9) - NRC Whole Body Phantom with 5 Percent Body Burden
Standard 104-1 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{133}Ba (mock iodine)	Lt. Thyroid Lobe	0.0165	0.032	0.52

Test 10 - NRC Whole Body Phantom with 10 Percent Body Burden
Standard 104-2 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{133}Ba (mock iodine)	Lt. Thyroid Lobe	0.0282	0.064	0.44

Test (11) - NRC Whole Body Phantom with 50 Percent Body Burden
Standard 104-3 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{133}Ba (mock iodine)	Lt. Thyroid Lobe	0.1415	0.32	0.44

Test (12) - NRC Whole Body Phantom with One Body Burden
Standard 104-4 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{133}Ba (mock iodine)	Lt. Thyroid Lobe	0.2872	0.64	0.45

Test (13) - NRC Whole Body Phantom with Two Body Burden
Standard 104-5 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{133}Ba (mock iodine)	Lt. Thyroid Lobe	0.5233	1.27	0.41

c. Lung Test (mixed isotopic standards)

Test (14) - NRC Whole Body Phantom with 5 Percent Body Burden
Standard 103-1 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	0.8638	1.57	0.55
^{60}Co	Rt. Mid Lung	0.2719	0.502	0.54

Test (15) - NRC Whole Body Phantom with 10 Percent Body Burden
Standard 103-3 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	1.955	3.13	0.62
^{60}Co	Rt. Mid Lung	0.5056	1.00	0.51

Test (16) - NRC Whole Body Phantom with 50 Percent Body Burden Standard 103-5 Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	8.233	15.70	0.52
^{60}Co	Rt. Mid Lung	2.331	5.02	0.46

Test (17) - NRC Whole Body Phantom with One Body Burden Standard 103-7 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	17.18	31.3	0.55
^{60}Co	Rt. Mid Lung	4.345	10.0	0.43

Test (18) - NRC Whole Body Phantom with Two Body Burden Standard 103-9 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	No result	62.6	-----
^{60}Co	Rt. Mid Lung	No result	20.1	-----

d. Lung and Thyroid Scan

Test (19) - NRC Whole Body Phantom with 5 Percent Body Burden Standards 104-1 and 103-1 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value [1]/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	0.8823	1.57	0.56
^{60}Co	Rt. Mid Lung	0.2453	0.502	0.49
^{133}Ba	Lt. Thyroid	0.011	0.032	0.34

Test (20) - NRC Whole Body Phantom with One Body Burden
Standards 104-4 and 103-7 (Standardized January 5, 1984)

Nuclide	Organ	WCGS Result (uCi)	NRC Value 1/ (uCi)	WCGS/NRC Ratio
^{137}Cs	Rt. Mid Lung	17.54	31.30	0.56
^{60}Co	Rt. Mid Lung	4.87	10.00	0.49
^{133}Ba	Lt. Thyroid	0.1713	0.64	0.24

1/ NRC values were taken from the standard certificates supplied with the standards as prepared by a commercial vendor.