APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-458/92-07

Operating License No. NPF-47

Licensee: Gulf States Utilities
P.O. Box 220
St. Francisville, Louisiana

Facility Name: River Bend Station (RBS)

Inspection At: RBS Site, St. Francisville, Louisiana

Inspection Conducted: March 2-6, 1992

Inspectors: J. B. Nicholas, Senior Radiation Specialist
L. Wilborn, Radiation Specialist

Approved: Blaine Murray 3/18/92
Blaine Murray, Chief, Facilities Inspection Programs Section — Date

Inspection Summary:

Inspection Conducted March 2-6, 1992 (Report 50-458/92-07):

Areas Inspected: Routine, announced inspection of the licensee's water chemistry and radiochemistry programs including water chemistry and radiochemistry confirmatory measurements.

Results: Within the areas inspected, no violations or deviations were identified. The licensee had adequately addressed all previously identified violations, deviations, unresolved items, and inspection follow-up items in the areas of water chemistry and radiochemistry.

The chemistry department had experienced a relatively high turnover of technician personnel. However, this high personnel turnover did not appear to cause a decline in the effectiveness of the chemistry control program.

An excellent chemistry training program had been established. An appropriate number of well qualified personnel were assisgned to the chemistry department.

An excellent Quality Assurance (QA) surveillances and audits program had been established. The audits were technically comprehensive and provided excellent program evaluation.

The chemistry analytical instrumentation had been upgraded since the previous chemistry inspection. The analytical results from the chemistry laboratory indicated 92 percent agreement with the NRC certified standard values. These analytical results indicated the same good performance as that reported during the previous NRC inspection.

The analytical results from the radiochemistry counting room indicated 99 percent agreement with the NRC's mobile laboratory analytical results. These radiochemistry confirmatory measurement results showed the same excellent performance reported during the previous NRC radiochemistry confirmatory measurements inspection.

DETAILS

1. PERSONS CONTACTED

GSU

*J. C. Deddens, Senior Vice President, River Bend Nuclear Group (RBNG)
*R. J. Backen, Supervisor, QA Systems
*R.L. Biggs, QA Auditor
*J. E. Booker, Manager, Nuclear Industry Relations
*T. D. Burnett, Chemistry Foreman
*E. M. Cargill, Director, Radiological Programs
*T. C. Crouse, Manager, Administration
*S. V. Desai, Principal Engineer
*P. D. Graham, Plant Manager
*K. C. Hodges, Supervisor, Chemistry
*G. R. Kimmel, Director, QA
*D. N. Lorfing, Supervisor, Nuclear Licensing
*I. M. Malik, Supervisor, Operations QA
*W. D. Odell, Manager, Oversight
*J. J. Pruitt, Manager, Business Systems
*M. F. Sankovich, Manager, Engineering
*J. P. Schipport, Assistant Plant Manager, Operations/Chemistry/Radwaste
*W. H. Spell, Senior Health Physicist
*J. E. Spivey, Jr., Senior QA Engineer/Audits Coordinator
*K. E. Suhrke, General Manager, Engineering and Administration
*C. W. Walker, Supervisor, Operations Quality Control (QC)
*S. B. Wilson-Wright, Plant Chemist
*R. J. Vachon, Senior Compliance Analyist/Systems Engineer

*Indicates those present at the exit meeting on March 6, 1992.

2. FOLLOW-UP ON PREVIOUSLY IDENTIFIED INSPECTION FINDINGS (92702)

(Open) Open Item (458/9122-01): ODCM Dose Conversion Factors - This item was identified in NRC Inspection Report 50-458/91-22 and involved differences in the calculated offsite dose results between the licensee and the NRC for the total body and critical organs for all age groups from airborne iodines. The licensee's iodine-131 and iodine-133 dose conversion factor values for the inhalation pathway and ground plane calculations appeared to be erroneous and high by a factor of 2 causing an overestimation of the iodine dose to the public as a result of airborne iodines released to the environment. The licensee reviewed and evaluated their current computer code and was unable to determine the reason for the high (factor of 2) dose conversion factors for iodine-131 and iodine-133. The inspectors reviewed the licensee's actions and determined that the licensee was in the process of procuring a new computer code designed to perform offsite dose calculations. After evaluation and verification of the new software package for correct dose factors and methodology to ensure that all assumptions are in agreement with referenced documents, the licensee will make a revision to the Offsite Dose Calculation

Manual (ODCM). The review of the new software package and the revision to the ODCM are scheduled to be completed during the fourth quarter of 1992. This item remains open pending follow-up review of the new computer code by the inspectors.

3. ORGANIZATION AND MANAGEMENT CONTROLS (84750)

The inspectors reviewed the organization, staffing, and staff functional assignments of the chemistry department to determine agreement with commitments in Chapter 13 of the Updated Safety Analysis Report (USAR) and compliance with the requirements in TS 6.2.

The inspectors reviewed the organizational structure of the RBS chemistry department and verified it to be as described in the USAR and TS. The RBS staff assignments and management control procedures were reviewed for the assignment of responsibilities for the management and implementation of the water chemistry and radiochemistry programs. The organizational structure and staffing of the chemistry department met the TS requirements. The inspectors verified that the management control responsibilities specified in the RBS procedures were being implemented.

The inspectors reviewed the staffing of the chemistry department and determined that the chemistry department had one plant chemist position vacant since December 1991. The chemistry supervisor was actively recruiting to fill the position with a qualified person. Since the previous NRC chemistry inspection in December 1989, the RBS chemistry department had replaced nine nuclear chemistry technicians. This represented a personnel turnover of approximately 56 percent. This was an increase in chemistry staff turnover compared to previous inspections. However, the two year (1990-1991) trend showed a decrease in chemistry department personnel turnover. Based on a review of the results of chemistry water quality specification analyses and the low number of out-of-specification chemistry conditions and the excellent chemistry department performance demonstrated by the confirmatory measurements results detailed in this report, it appeared that the chemistry department analytical chemical analyses results and the effectiveness of the chemical control program for the plant systems were not decreased by the seemingly high personnel turnover.

The nuclear chemistry technician staff were organized into eight pairs of technicians who were assigned to a four shift rotation schedule. Each pair of nuclear chemistry technicians had a lead technician who was fully qualified in accordance with RBS procedures and the RBS INPO accredited training program and met the qualification requirements specified in ANSI/ANS 3.1-1978. The chemistry department staffing was determined to be in accordance with licensee commitments.

No violations or deviations were identified.

Conclusions

The chemistry department's organizational structure and staffing met the TS requirements. Chemistry department management controls were being implemented

in accordance with plant procedures. During the past 2 years, the chemistry department experienced a relatively high turnover of technician personnel. However, this high personnel turnover did not appear to cause a decline in the effectiveness of the chemistry control program.

4. TRAINING AND QUALIFICATIONS (84750)

The inspectors reviewed the licensee's training and qualification program for chemistry department personnel to determine agreement with commitments in Chapter 13 of the USAR and compliance with the requirements in TS 6.3 and 6.4.

The inspectors reviewed the qualifications of the present chemistry department staff. It was determined that 11 of the 16 nuclear chemistry technicians met the qualification requirements of ANSI/ANS 3.1-1978, and that nine of the 16 nuclear chemistry technicians were fully qualified and trained in accordance with RBS procedures and an INPO accredited training program. It was noted that four of the nine nuclear chemistry technicians hired during 1990 and 1991 met the ANSI/ANS 3.1-1978 requirements prior to being employed at RBS, and that four of the recently hired nuclear chemistry technicians had college science degrees. This brought the total number of chemistry department staff having college science degrees to 13 out of 25. It was determined that the licensee's chemistry department had an adequate qualified staff to meet USAR and TS requirements.

The inspectors reviewed the licensee's training program for chemistry department personnel including a review of nuclear chemistry technician training procedures, selected chemistry training lesson plans, training instructors' qualifications, training facilities, and selected individual technician training records. The licensee's chemistry training program was being implemented and documented in accordance with RBS procedures. The inspectors' review of nuclear chemistry technician training records indicated that the postaccident sampling system (PASS) operator requalification training had been completed semiannually during 1990 and 1991.

The inspectors reviewed the job performance measures training/qualification matrix for the 16 nuclear chemistry technicians. The training/qualification training matrix contained 133 qualification tasks. Training using the job performance measure tasks was being completed as rapidly as time and routine chemistry activities would permit.

No violations or deviations were identified.

Conclusions

The licensee had implemented an INPO accredited chemistry department training program. Nine of the 16 nuclear chemistry technicians were fully qualified to perform independent chemistry sampling and analyses. The chemistry department staff included 13 persons with college science degrees. The chemistry department had an adequate qualified staff.

5. QA PROGRAM (84750)

The inspectors reviewed the licensee's QA surveillance and audit programs regarding water chemistry and radiochemistry activities to determine agreement with commitments in Chapter 13 of the USAR and compliance with the requirements in TS 6.5.3.8.

The inspectors reviewed the QA audit and surveillance schedules for 1990, 1991, and 1992; audit plans and checklists; and the qualifications and training of the QA auditors and technical specialist who performed the audits of the chemistry program. Audit and surveillance reports of QA activities performed during 1990 and 1991 in the area of chemistry were reviewed for scope, thoroughness of program evaluation, and timely follow-up of identified deficiencies. The QA surveillances and audits of the chemistry program were performed in accordance with RBS procedures and schedules and by qualified auditors and assisted by technical specialists who were knowledgeable in chemistry requirements at nuclear power facilities. Sixteen quality assurance finding reports (QAFRs) were issued and 10 auditor concerns identified in the chemistry area during 1990 and 1991. All but two of the QAFRs issued in the 1991 chemistry audit had been closed. The remaining two open chemistry QAFRs were scheduled for closure during March 1992.

The licensee used a contractor laboratory to perform TS required radiochemistry analyses on several radioactive effluent composite samples. The licensee performed vendor audits triennially with annual evaluations to retain current status on the RBS qualified suppliers' list. The inspectors reviewed the latest QA audit performed during November 6-8, 1991, for the licensee by a contract auditor using one of the licensee's chemistry foreman as a technical specialist on the audit team. The audit appeared to be adequate to evaluate the contractor laboratory's ability to perform TS required analyses.

No violations or deviations were identified.

Conclusion

QA surveillances and audits had been performed of the chemistry program as required, and they were technically comprehensive and provided excellent program evaluation.

6. LIGHT WATER REACTOR CHEMISTRY CONTROL, CHEMICAL ANALYSIS, AND CONFIRMATORY MEASUREMENTS (84750)

The inspectors reviewed the licensee's water chemistry analysis program including analytical procedures, facilities and equipment, implementation of a water chemistry control program, implementation of a QC program for chemical measurements, and water chemistry confirmatory measurements to determine agreement with the commitments in Chapters 5 and 9 of the USAR and compliance with the requirements in TS 3/4.4.4 and 6.8.1.

The inspectors' review of the water chemistry program found that the licensee had revised and approved administrative procedures, surveillance procedures, chemistry control procedures, instrument calibration and QC procedures, and

analytical procedures. A review of selected procedures revised since the previous NRC chemistry inspection conducted in December 1989 indicated that the chemistry section had developed and implemented excellent programmatic procedures to meet the commitments in the USAR and the TS requirements.

The inspectors inspected the facilities and instrumentation used by the chemistry department staff. The laboratories were equipped with the necessary chemicals, reagents, and state-of-the-art analytical instrumentation to perform the required analyses. The inspectors noted several changes and improvements in the laboratorys' analytical instrumentation. The physical facilities inspected had not been changed since the previous NRC inspection of this area.

The inspectors reviewed selected chemistry department analytical procedures and procedures for the operation, calibration, and QC of the analytical instrumentation used for the analysis of the NRC water chemistry standards. The laboratory's analytical instruments had been calibrated in accordance with approved procedures and an instrument QC program had been implemented.

The inspectors reviewed condensate water, feedwater, and reactor water chemistry data to determine compliance with TS requirements. It was verified that TS required water chemistry sampling and analyses had been performed and documented according to procedures. The review included the records of out-of-specification chemical parameters and the licensee's corrective actions taken when chemical parameters did not meet established chemical control limits. The licensee's chemical control limits were established according to the Electric Power Research Institute owner's group guidelines for boiling water reactor auxiliary water systems and reactor coolant chemistry and the General Electric chemistry specifications. The licensee had established action levels and corrective actions for out-of-specification chemistry conditions. The action levels and corrective actions were strictly enforced.

The inspectors reviewed the chemistry department monthly activity reports for the period January 1990 through December 1991. The monthly reports provided details concerning significant chemistry events during the month, synopsis of major chemistry plant support activities, status of special chemistry projects, and a listing of potential chemistry concerns and items being tracked and requiring action by the chemistry department in support of plant operation. The reports included analyses trends of chemical parameters in the various plant water systems. The graphs and narrative descriptions in the reports indicated where specific problem areas may be developing, when out-of-specification conditions existed, and corrective actions which were taken to reestablish normal chemical parameters. The monthly reports provided a thorough and helpful description of plant chemistry performance.

During the inspection, the inspectors provided prepared standard chemical solutions to the licensee for confirmatory measurement analyses. The standards were analyzed by the licensee in the chemistry laboratory using routine analytical methods and equipment. The analyses of the chemical standards were used to verify the licensee's capability to monitor chemical parameters in various plant water systems with respect to TS requirements and other industry standards. In addition, the analyses of standards were used to evaluate the licensee's analytical procedures with respect to accuracy and precision. The

results of the water chemistry confirmatory measurement comparisons are listed in Attachment 1 for the analyses performed in the chemistry laboratory. Attachment 2 contains the criteria used to evaluate the analytical results.

The licensee's analytical results from the analyses performed in the chemistry laboratory indicated minor problems with the analyses for nickel and chromium. The water chemistry analytical results indicated that 19 results were in agreement and 3 results were in qualified agreement of the 24 results compared.

(1) The licensee's mid-range concentration and high concentration nickel analytical results were in qualified agreement and disagreement respectively and biased low. A review of the licensee's nickel QC results obtained simultaneously with the nickel analytical results indicated a low instrument bias of approximately 13 ppb at the 250 ppb nickel concentration range and approximately 29 ppb at the 400 ppb nickel concentration range. If these instrument QC biases were mathematically applied as bias corrections to the nickel analytical results, all the nickel analytical results of the NRC standard solutions would meet the agreement criteria.

(2) The licensee's low concentration and mid-range concentration chromium analytical results were in qualified agreement, the high concentration nickel analytical result was in disagreement, and all chromium analytical results were biased low. A review of the licensee's chromium QC results obtained simultaneously with the chromium analytical results indicated a low instrument bias of approximately 6 ppb at the 150 ppb chromium concentration range, approximately 15 ppb at the 250 ppb chromium concentration range, and approximately 36 ppb at the 400 ppb chromium concentration range. If these instrument QC biases were mathematically applied as bias corrections to the chromium analytical results, all the chromium analytical results of the NRC standard solutions would meet the agreement criteria.

The licensee's analytical results from the analyses performed in the chemistry laboratory indicated that 92 percent of the compared results were in agreement or qualified agreement with the NRC's results. The licensee's analytical results indicated the same good performance in the chemistry laboratory as reported in the previous NRC inspection of this area conducted in December 1989. The two disagreements were not considered to indicate any significant programmatic problems.

No violations or deviations were identified.

Conclusions

The water chemistry program had been implemented in accordance with NRC requirements. The chemistry laboratory and analytical instrumentation were being maintained satisfactorily. The chemistry analytical instrumentation had been upgraded since the previous chemistry inspection. The licensee's analytical results from the chemistry laboratory indicated 92 percent agreement

with the NRC certified standard values. These analytical results indicated the same good performance as that reported during the previous NRC inspection conducted in December 1989.

7. RADIOLOGICAL CHEMISTRY CONTROL, RADIOCHEMICAL ANALYSIS, AND CONFIRMATORY MEASUREMENTS (84750)

The inspectors reviewed the licensee's radiochemical analysis program including analytical procedures, facilities and equipment, implementation of a QC program for radiochemistry measurements, and radiochemistry confirmatory measurements to determine agreement with the commitments in Chapters 5 and 9 of the USAR and compliance with the requirements in TS 3/4.4.5, 3/4.11, and 6.8.

The inspectors reviewed selected radiochemistry procedures revised and approved since the previous NRC chemistry inspection conducted in December 1989 and determined that the licensee had implemented sufficient radioanalytical procedures to meet the commitments in the USAR and the TS requirements.

The inspectors reviewed the licensee's records for the period January 1990 through December 1991 involving radioanalytical instrument calibration and QC. It was verified that the radiochemistry counting room instruments had been calibrated, and an instrument QC program had been implemented in accordance with RBS procedures. It was noted that the licensee had implemented the use of instrument QC charts to monitor and trend radioanalytical instrument QC data.

The inspectors verified that the licensee had established and implemented a routine surveillance and preventative maintenance program for the PASS. The inspectors reviewed monthly surveillance reports and found the licensee had performed their surveillance requirements. The inspectors also reviewed the results of the licensee's performance test of the PASS conducted on February 21, 1992. Actual reactor coolant samples were obtained from the PASS sample point associated with an instrument line on one of the reactor coolant system jet pumps. Chemical and gamma isotopic analyses were performed on both the large volume and diluted PASS reactor coolant samples and the analytical results were compared against the analytical results from the normal reactor coolant recirculation sample to verify that both PASS samples were representative and accurate. The gamma isotopic and chemical analyses results from both PASS samples were within the acceptance tolerance for PASS analytical results. The test results indicated that the PASS functioned as designed and could be relied upon to provide representative reactor coolant samples in the event of an accident.

During the inspection, radiochemistry confirmatory measurements were performed on the following split samples by the licensee and the inspectors in the Region IV mobile laboratory on site.

(1) Air Particulate Filter Sample
(2) TEDA Charcoal Cartridge Sample
(3) Off Gas Sample
(4) Waste Liquid Sample

(5) Reactor Coolant System Liquid Sample
(6) RESL Liquid Sample

The radiological confirmatory measurement tests consisted of comparing the analyses results of the licensee and the NRC Region IV mobile laboratory. The NRC's mobile laboratory measurements were referenced to the National Institute of Standards and Technology by laboratory intercomparisons. Confirmatory measurements were made only for those nuclides identified by the NRC as being present in concentrations greater than 10 percent of the respective isotopic values for liquid and gas concentrations as stated in 10 CFR Part 20, Appendix B, Table II.

The samples were analyzed by the licensee using routine methods and equipment. The radiological confirmatory measurements involved analyses performed in the radiochemistry counting room. At the time of the inspection, the licensee was utilizing four intrinsic high purity germanium detectors in the radiochemistry counting room. These detectors were used routinely for isotopic analysis of radioactive samples to demonstrate compliance with TS and regulatory requirements. The analytical results from these four detectors were compared with the NRC's analytical results. The individual sample analyses and comparison of analytical results of the radiological confirmatory measurements are tabulated in Attachment 3. Attachment 4 describes the criteria used to compare the analytical results

The licensee's chemistry department gamma isotopic results from the samples listed in Attachment 3 showed 99 percent agreement with the NRC's analytical results based on 148 agreement results out of 149 total results compared. The licensee's performance in the area of radiological confirmatory measurements was consistent with the excellent high quality performance achieved during the previous NRC inspection of this area in December 1989.

Confirmatory measurements were performed by the licensee on liquid samples prepared by the NRC's reference laboratory, Department of Energy, Radiological and Environmental Sciences Laboratory (RESL), in Idaho Falls, Idaho. The licensee's analytical results were compared to the certified sample activities and the results of the comparisons are presented in Attachment 3, sample 6. The gamma isotopic analysis results, tritium result, strontium-90 result, and iron-55 result were in agreement. The licensee's strontium-89 analysis result was in disagreement. The licensee consulted with their contractor laboratory who performed the strontium and iron analytical analyses concerning the strontium-89 disagreement. The contractor laboratory defended their original analytical result. The licensee decided to submit an additional sample supplied by RESL in an attempt to resolve the problem with the strontium-89 analysis. The analyses results from this additional sample will be reported and compared with the NRC certified values in a future inspection report.

No violations or deviations were identified.

Conclusions

The radiochemistry program had been implemented in accordance with NRC requirements. The radiochemistry counting room instrumentation was being

calibrated and maintained satisfactorily. The licensee's analytical results from the radiochemistry counting room indicated 99 percent agreement with the NRC's mobile laboratory analytical results. These radiochemistry confirmatory measurement results showed the same excellent performance reported during the previous NRC radiochemistry confirmatory measurements inspection conducted in December 1989.

8. EXIT MEETING (30703)

The lead inspector met with the licensee representatives identified in paragraph 1 of this report at the conclusion of the inspection on March 6, 1992. The lead inspector summarized the scope and findings of the inspection and discussed the results of the water chemistry and radiochemistry confirmatory measurements as presented in the report. The licensee did not identify as proprietary any of the materials provided to, or reviewed by, the inspectors during the inspection.

ATTACHMENT 1

Water Chemistry Confirmatory Measurements Results

River Bend Nuclear Station

NRC Inspection Report: 50-458/92-07

1. Chloride Analysis (5-40 ppb) Ion Chromatograph

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92A	11.2	9.6	Agreement
92B	18.6	17.6	Agreement
92C	36.3	34.7	Agreement

2. Fluoride Analysis (5-40 ppb) Ion Chromatograph

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92A	10.1	10.0	Agreement
92B	20.8	19.3	Agreement
92C	38.2	39.6	Agreement

3. Sulfate Analysis (5-40 ppb) Ion Chromatograph

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92A	10.7	9.5	Agreement
92B	20.7	19.0	Agreement
92C	39.5	39.9	Agreement

4. Boron Analysis (100-500 ppm) Plazma Emission Spectroscopy

Sample	RBS Results (ppm)	NRC Results (ppm)	Comparison Decision
92D	103.1	103.1	Agreement
92E	298.1	303.7	Agreement
92F	511.3	502.0	Agreement

5. Iron Analysis (100-500 ppb) Plasma Emission Spectroscopy

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92G	133.1	133.3	Agreement
92H	198.9	205.0	Agreement
92I	393.3	413.5	Agreement

6. Copper Analysis (100-500 ppb) Plasma Emission Spectroscopy

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92G	131.5	131.3	Agreement
92H	196.1	201.5	Agreement
92I	396.2	410.5	Agreement

7. Nickel Analysis (100-500 ppb) Plasma Emission Spectroscopy

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92G	12C [illegible]	130.0	Agreement
92H	177.3	196.5	Qual. Agree.
92I	351.2	393.5	Disagreement

8. Chromium Analysis (100-500 ppb) Plasma Emission Spectroscopy

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92G	114.2	128.6	Qual. Agree.
92H	176.6	199.5	Qual. Agree.
92I	353.1	406.0	Disagreement

9. Sodium Analysis (5-40 ppb) Ion Chromatograph

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
92J	5.0	5.1	Agreement
92K	9.6	9.6	Agreement
92L	30.5	29.2	Agreement

10. Silica Analysis (5-500 ppb) Spectroscopy

Sample	RBS Results (ppb)	NRC Results (ppb)	Comparison Decision
8FS	26.8	27.2	Agreement
86T	54.7	54.5	Agreement

ATTACHMENT 2

CRITERIA FOR COMPARING WATER CHEMISTRY ANALYTICAL MEASUREMENTS

The following are the criteria used in comparing the results of the capability tests and verification measurements. The criteria for the judgement limits are based on the data from Table 2.1 of NUREG/CR-5244, "Evaluation of Non-Radiological Water Chemistry at Power Reactors." Licensee values within the plus or minus two stadnard deviations range of the NRC known values are considered to be in agreement. Licensee values outside the plus or minus two standard deviations range but within the plus or minus three standard deviations range of the NRC known values are considered to be in qualified agreement. Retest results which are in qualified agreement will receive additional attention. Licensee values greater than the plus or minus three standard deviations range of the NRC known values are in disagreement. The standard deviations were computed using the average percent standard deviation values of each analyte in Table 2.1.

The ranges for the data in Attachment 1 are as follows:

Ampule	Analyte	Agreement Range	Qualified Areement Range
92A	Cl	8 - 12	7 - 13
	F	8 - 12	7 - 13
	SO_4	9 - 11	8 - 12
92B	Cl	14 - 20	13 - 21
	F	16 - 22	15 - 23
	SO_4	17 - 21	16 - 22
92C	Cl	36 - 38	28 - 40
	F	35 - 44	33 - 46
	SO_4	37 - 43	36 - 44
92D	B	100.8 - 105.2	99.7 - 106.3
92E	B	292.6 - 305.4	289.4 - 308.6
92F	B	499.1 - 520.9	493.7 - 526.3
92G	Fe	119 - 145	113 - 151
	Cu	120 - 145	114 - 151
	Ni	120 - 137	116 - 141
	Cr	121 - 146	114 - 153
92H	Fe	177 - 215	168 - 224
	Cu	183 - 222	174 - 232
	Ni	184 - 209	179 - 215
	Cr	182 - 222	173 - 232

Ampule	Analyte	Agreement Range	Qualified Agreement Range
92I	Fe	385 - 445	370 - 450
	Cu	380 - 440	370 - 450
	Ni	376 - 414	367 - 424
	Cr	375 - 435	360 - 450
92J	Na	4.4 - 5.8	4.0 - 6.2
92K	Na	8.4 - 11.2	7.7 - 11.9
92L	Na	25.0 - 33.4	22.8 - 35.6
86S	SiO_2	24.7 - 29.3	23.6 - 30.5
86T	SiO_2	50.0 - 60.0	47.3 - 62.5

ATTACHMENT 3

Radiological Confirmatory Measurement Results

River Bend Nuclear Station

NRC Inspection Report: 50-458/92-07

1. Air Particulate Filter Sample (RB039A)
(Sampled: 10:00, CST, March 3, 1992)

The sample was analyzed by the licensee using detectors (1), (2), (3), and (4) in the radiochemistry counting room. The results are reported for each detector in that order in the table.

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
Sr-91	3.184±0.338E-3	3.317±0.256E-3	0.96	Agreement
	3.441±0.342E-3		1.04	Agreement
	3.568±0.346E-3		1.08	Agreement
	2.731±0.302E-3		0.82	Agreement
Sr-92	1.368±0.299E-3	9.271±1.775E-4	1.47	Agreement
	1.221±0.258E-3		1.32	Agreement
	1.357±0.251E-3		1.46	Agreement
	1.207±0.297E-3		1.30	Agreement
I-131	5.326±0.742E-4	3.869±0.329E-4	1.38	Agreement
	5.290±0.733E-4		1.37	Agreement
	5.509±0.787E-4		1.42	Agreement
	4.926±0.692E-4		1.27	Agreement
I-132	2.923±0.254E-3	2.748±0.296E-3	1.06	Agreement
	3.323±0.247E-3		1.21	Agreement
	3.309±0.228E-3		1.20	Agreement
	2.480±0.249E-3		0.90	Agreement
I-133	4.906±0.393E-3	3.991±0.077E-3	1.23	Agreement
	4.861±0.395E-3		1.22	Agreement
	4.909±0.396E-3		1.23	Agreement
	4.006±0.333E-3		1.00	Agreement

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
I-135	6.895±0.538E-3	6.589±0.370E-3	1.05	Agreement
	7.365±0.546E-3		1.12	Agreement
	7.644±0.546E-3		1.16	Agreement
	5.629±0.483E-3		0.85	Agreement
Ba-140	3.851±1.870E-4	4.890±1.419E-4	0.79	Agreement
	3.664±1.853E-4		0.74	Agreement
	2.512±1.471E-4		0.51	Agreement

2. TEDA Charcoal Cartridge Sample (RB038A)
(Sampled: 10:00, CST, March 3, 1992)

The sample was analyzed by the licensee using detectors (1), (2), (3), and (4) in the radiochemistry counting room. The results are reported for each detector in that order in the table.

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
I-131	1.476±0.137E-3	1.460±0.061E-3	1.01	Agreement
	1.601±0.138E-3		1.10	Agreement
	1.521±0.138E-3		1.04	Agreement
	1.478±0.131E-3		1.01	Agreement
I-133	1.034±0.075E-2	8.717±0.120E-3	1.19	Agreement
	1.020±0.074E-2		1.17	Agreement
	9.801±0.714E-3		1.12	Agreement
	1.024±0.073E-2		1.18	Agreement
I-135	1.096±0.073E-2	1.003±0.047E-2	1.09	Agreement
	1.150±0.070E-2		1.15	Agreement
	1.099±0.070E-2		1.10	Agreement
	1.126±0.070E-2		1.12	Agreement

3. Off Gas Sample - 15 cc Gas Vial (RB040A)
(Sampled: 09:43, CST, March 4, 1992)

The sample was analyzed by the licensee using detectors (1), (2), (3), and (4) in the radiochemistry counting room. The results are reported for each detector in that order in the table.

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
Kr-85m	1.385±0.091E-1	1.376±0.001E-1	1.01	Agreement
	1.445±0.093E-1		1.05	Agreement
	1.519±0.097E-1		1.10	Agreement
	1.287±0.090E-1		0.94	Agreement
Kr-87	9.122±0.617E-1	8.521±0.038E-1	1.07	Agreement
	9.351±0.616E-1		1.10	Agreement
	9.552±0.656E-1		1.12	Agreement
	9.172±0.595E-1		1.08	Agreement
Kr-88	4.983±0.264E-1	4.956±0.021E-1	1.01	Agreement
	5.239±0.271E-1		1.06	Agreement
	5.336±0.280E-1		1.08	Agreement
	4.737±0.304E-1		0.96	Agreement
Xe-133	5.809±0.836E-2	6.282±0.099E-2	0.92	Agreement
	6.166±0.869E-2		0.98	Agreement
	6.949±0.938E-2		1.11	Agreement
	5.295±0.969E-2		0.84	Agreement
Xe-135m	3.629±0.432E+0	3.373±0.386E+0	1.08	Agreement
	3.905±0.305E+0		1.16	Agreement
	4.224±0.735E+0		1.25	Agreement
	3.890±0.235E+0		1.15	Agreement
Xe-135	7.293±0.473E-1	7.631±0.001E-1	0.96	Agreement
	7.346±0.488E-1		1.00	Agreement
	7.839±0.494E-1		1.03	Agreement
	7.051±0.474E-1		0.92	Agreement
Xe-138	1.603±0.137E+1	1.806±0.346E+1	0.89	Agreement
	1.567±0.089E+1		0.88	Agreement
	1.564±0.067E+1		0.87	Agreement

4. Waste Liquid Sample - 1.0 L Marinelli Beaker (RB03YA)
(Sampled: 08:00, CST, March 3, 1992)

The sample was analyzed by the licensee using detectors (1), (2), (3), and (4) in the radiochemistry counting room. The results are reported for each detector in that order in the table.

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
Cr-51	5.876±0.623E-3	7.642±0.394E-3	0.77	Agreement
	6.243±0.649E-3		0.82	Agreement
	6.378±0.657E-3		0.83	Agreement
	5.608±0.611E-3		0.73	Agreement
Mn-54	0.943±0.099E-3	1.092±0.056E-3	0.86	Agreement
	1.025±0.109E-3		0.94	Agreement
	0.997±0.105E-3		0.91	Agreement
	0.922±0.098E-3		0.84	Agreement
Co-60	2.897±0.163E-3	2.916±0.093E-3	0.99	Agreement
	3.026±0.172E-3		1.04	Agreement
	3.073±0.171E-3		1.05	Agreement
	2.720±0.157E-3		0.94	Agreement
Zn-65	1.118±0.787E-4	2.158±0.786E-4	0.52	Agreement
	1.385±0.874E-4		0.64	Agreement
	1.395±0.833E-4		0.35	Agreement
Mo-99	5.285±2.553E-4	6.443±3.021E-4	0.82	Agreement
	7.634±0.802E-4		1.18	Agreement
	7.889±0.833E-4		1.22	Agreement
	7.779±0.840E-4		1.21	Agreement
I-131	1.501±0.365E-4	1.630±0.335E-4	0.92	Agreement
	1.152±0.346E-4		0.71	Agreement
	1.338±0.352E-4		0.82	Agreement
	1.217±0.340E-4		0.75	Agreement
I-133	1.455±0.423E-4	1.455±0.366E-4	1.00	Agreement
	1.413±0.444E-4		0.97	Agreement
	1.621±0.452E-4		1.11	Agreement
	1.495±0.434E-4		1.03	Agreement

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
La-140	1.855±0.189E-3	1.326±0.083E-3	1.02	Agreement
	1.647±0.184E-3		0.90	Agreement
	1.316±0.192E-3		0.99	Agreement
	1.703±0.182E-3		0.93	Agreement

5. RCS Liquid Sample - 1.0 L Marinelli Beaker (RBOLLA)
(Sampled: 08:00, CST, March 3, 1992)

The sample was analyzed by the licensee using detectors (1), (2), (3), and (4) in the radiochemistry counting room. The results are reported for each detector in that order in the table.

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
Na-24	6.571±0.449E-3	6.952±0.194E-3	0.95	Agreement
	6.776±0.474E-3		0.97	Agreement
	6.627±0.463E-3		0.95	Agreement
	6.793±0.461E-3		0.98	Agreement
Cr-51	1.814±0.163E-2	1.844±0.087E-2	0.98	Agreement
	1.796±0.164E-2		0.97	Agreement
	1.784±0.159E-2		0.97	Agreement
	1.633±0.158E-2		0.89	Agreement
Co-60	4.648±0.795E-4	3.429±0.790E-4	1.36	Agreement
	4.007±0.781E-4		1.16	Agreement
	4.195±0.768E-4		1.22	Agreement
	4.243±0.823E-4		1.24	Agreement
Sr-91	5.284±0.448E-3	5.262±0.522E-3	1.00	Agreement
	5.557±0.479E-3		1.06	Agreement
	5.335±0.469E-3		1.01	Agreement
	5.273±0.441E-3		1.00	Agreement
Sr-92	3.769±0.334E-3	3.561±0.309E-3	1.06	Agreement
	3.844±0.388E-3		1.08	Agreement
	3.616±0.398E-3		1.02	Agreement
	3.660±0.316E-3		1.03	Agreement
Mo-99	1.601±0.104E-2	1.586±0.089E-2	0.95	Agreement
	1.665±0.109E-2		0.99	Agreement
	1.626±0.105E-2		0.96	Agreement
	1.655±0.108E-2		0.98	Agreement

Nuclide	RBS Results (uCi/sample)	NRC Results (uCi/sample)	RBS/NRC Ratio	Comparison Decision
Ru-105	3.660±0.300E-3	4.203±0.304E-3	0.87	Agreement
	3.878±0.337E-3		0.92	Agreement
	3.769±0.340E-3		0.90	Agreement
	3.843±0.297E-3		0.91	Agreement
Cd-113m	4.637±0.877E+0	6.937±1.474E+0	0.67	Agreement
	4.811±0.895E+0		0.69	Agreement
	4.297±0.799E+0		0.62	Agreement
	5.528±0.927E+0		0.80	Agreement
I-131	4.784±0.341E-3	5.225±0.143E-3	0.92	Agreement
	4.835±0.350E-3		0.93	Agreement
	4.923±0.348E-3		0.94	Agreement
	4.770±0.344E-3		0.91	Agreement
I-132	1.683±0.059E-2	1.666±0.048E-2	1.01	Agreement
	1.708±0.064E-2		1.03	Agreement
	1.759±0.067E-2		1.06	Agreement
	1.713±0.057E-2		1.03	Agreement
I-133	5.573±0.308E-2	5.407±0.029E-2	1.03	Agreement
	5.668±0.319E-2		1.05	Agreement
	5.545±0.313E-2		1.03	Agreement
	5.539±0.307E-2		1.02	Agreement
I-135	7.800±0.251E-2	7.967±0.109E-2	0.98	Agreement
	7.701±0.255E-2		0.97	Agreement
	7.332±0.226E-2		0.92	Agreement
	7.776±0.249E-2		0.98	Agreement
Np-239	2.890±0.270E-3	2.775±0.556E-3	1.04	Agreement
	3.051±0.275E-3		1.10	Agreement
	3.019±0.253E-3		1.09	Agreement
	2.975±0.300E-3		1.07	Agreement

6. REGL Liquid Sample
(Standardized: 11:00, CST, October 10, 1991)

Nuclide	RBS Results (uCi/ml)	NRC Results(1) (uCi/ml)	RBS/NRC Ratio	Comparison Decision
H-3	1.26± E-4	9.99±0.30E-5	1.26	Agreement
Sr-89	8.97± E-6	1.08±0.03E-4	0.08	Disagreement
Sr-90	1.71± E-5	1.78±0.05E-5	0.96	Agreement
Fe-55	7.45± E-6	9.51±0.28E-6	0.78	Agreement
Mn-54	9.75± E-6	8.83±0.24E-6	1.10	Agreement
Co-60	7.78± E-6	7.38±0.26E-6	1.05	Agreement
Cs-137	1.22± E-5	1.15±0.40E-5	1.06	Agreement

(1) NRC results were taken from the standards certification supplied to the NRC Region IV office as prepared by REGL and traceable to the National Institute of Standards and Technology.

ATTACHMENT 4

CRITERIA FOR COMPARING RADIOCHEMISTRY 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	0.40 - 2.50
4 - 7	0.50 - 2.00
8 - 15	0.60 - 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 in 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.