UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

MAY 0 4 1989

Report Nos.: 50-413/89-10 and 50-414/89-10

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-413 and 50-414 License Nos.: NPF-35 and NPF-52

Facility Name: Catawba 1 and 2

Inspection Conducted: April 3-7, 1989

Inspector: Susan S. Adamovitz 5/2/89
S. S. Adamovitz Date Signed

Approved by: John B. Kahle 5/2/89
J. B. Kahle, Chief Date Signed
Radiological Effluents and Chemistry Section
Emergency Preparedness and Radiological
Protection Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope

This routine, unannounced inspection was in the areas of liquid and gaseous radwaste, plant chemistry, environmental monitoring, confirmatory measurements, and follow-up on previously identified inspector followup items (IFIs).

Results

The licensee maintained an adequate program to control radioactive effluents (Paragraphs 3, 4, and 5). Waste gas releases were minimal and liquid releases were properly controlled.

Design problems with a process monitor EMF-34, the steam generator blowdown monitor (Paragraph 3.c.) were being evaluated. The licensee was currently considering two modifications and expected to implement one during early 1990.

The post-accident liquid sampling (PALS) system routed undiluted sample residues (Paragraph 12.a.) to an open sump, not to containment or a closed system as specified in NUREG 0737. This had been identified as a 1986 IFI and corrective actions had been delayed. Licensee management verbally committed to correct this problem during 1990.

One violation (Paragraph 3) was identified concerning failure to include a description of abnormal releases in the Semiannual Effluent Report. One IFI (Paragraph 7) was identified concerning modification of the post-accident gaseous sampling (PAGS) system vacuum gauges.

Confirmatory measurement results (Paragraph 11) for spiked beta emitters showed agreement for Sr-89, Sr-90 and H-3. The initial disagreement for Fe-55 was attributed to a dilution problem and resolved.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

B. Chundrlik, Scientist, Health Physics
W. Deal, Station Health Physicist
*J. Forbes, Technical Services
M. Geckle, Associate Engineer, Performance
*R. Glover, Compliance Engineer
*V. King, Nuclear Production Engineer
D. Lee, Associate Scientist
*P. LeRoy, Regulatory Compliance
*F. Mack, Jr., Projects
P. McNamera, Scientist
B. McNeill, Scientist
*G. Mode, General Supervisor, Health Physics
*T. Owen, Station Manager
R. Painter, General Supervisor
R. Rayfield, Production Specialist
R. Salmons, Specialist
C. Taylor, Scientist, Chemistry
*C. Tharrian, Supervising Scientist, Chemistry

NRC Resident Inspectors

*M. S. Lesser
*W. T. Orders

*Attended exit interview

2. Audits (84750)

The inspector reviewed the audit NP-88-27 (CN), "Chemistry Activities," conducted August 8-September 7, 1988. The audit's scope included review of procedures, personnel qualifications and training, record management, laboratory quality control and housekeeping, test equipment and surveillance required by technical specifications. Unresolved items and recommendations were assigned tracking numbers for followup and closeout. The inspector noted that corrective actions were taken in a timely manner.

No violations or deviations were identified.

3. Semiannual Radioactive Effluent Release Reports (84750)

a. The inspector reviewed the Semiannual Radioactive Effluent Reports for 1988, and discussed the reports with licensee representatives.

The effluent information presented in Table A was obtained from current and previous effluent reports.

Table A
Effluent Release Summary for Catawba
Units 1 and 2

Activity Released (Curies)	1985	1986	1987	1988
Gaseous Effluents				
Fission and Activation Products	2.77E+2	2.72E+3	4.82E+3	3.12E+3
Iodines and Particulates	6.40E-4	1.47E-2	1.57E-2	9.02E-3
Tritium	1.55E-1	5.70E0	2.98E+1	6.06E-1
Liquid Effluents				
Fission and Activation Products	1.26E0	7.64E-1	1.31E0	1.08E0
Tritium	1.75E+2	2.36E+2	7.28E+2	7.06E+2

Liquid and gaseous releases increased from 1986 to 1987, and the increase was attributed to Unit 2 coming online in May 1986. The 1988 release summaries showed slight decreases, with the exception of gaseous tritium, over 1987 values.

b. The report identified two abnormal releases but did not provide descriptions of the events. The inspector reviewed the station's problem investigation reports and licensee event reports concerning these releases. An abnormal liquid release occurred February 11, 1988, and totalled 0.35 curies. A waste monitor tank was partially released with the effluent radiation monitor incorrectly isolated from the release flow. The isolation of the effluent monitor, 1-EMF-49, was due to improper verification of the monitor's operability and attributed to personnel error. The tank had been sampled prior to discharge and radioactive concentrations were determined to be within administrative limits. However, technical specifications required collection and analysis of a second sample if the EMF-49 was inoperable. The release was terminated as soon as the incorrect monitor isolation was discovered, and additional sampling was initiated. Analytical results showed that administrative effluent release limits had not been exceeded. A second abnormal release identified in the report occurred on February 8, 1988, and released activity was estimated to be 7.46 curies of noble gases. The release was attributed to a leaking vent plug on the waste gas compressor moisture separator which allowed release of the in-service waste gas decay tank (WGDT). The leak was not discovered until the

WGDT was empty since the released gaseous activity was insufficient to trip the Auxiliary Building ventilation or the Unit Vent radiation monitors. The licensee initiated procedural and program changes to require leak checks and to provide an alarm upon decreasing WGDT pressure.

Since these abnormal releases were not described in the Semiannual Effluent Release Report, the inspector informed licensee representatives that failure to include the description was considered a potential violation of Technical Specification (TS) 6.9.1.7.

Violation 50-413, 414/89-10-01: Failure to include a description of unplanned releases in the Semiannual Effluent Release Report as required by TS 6.9.1.7.

c. The Units 1 and 2 steam generator blowdown monitor, EMF-34's, were identified in the report as being inoperable since October 19, 1988, and November 2, 1988, respectively. The EMF-34 monitor for each unit was located on a sampling line off the steam generator blowdown common header. The licensee had determined that the system maintained problems with plugged lines and flow control to the monitor. Kerotest isolation valves used in the system were susceptible to plugging by blowdown scale and magnetite and were not designed for throttling to accommodate differences in steam generator pressure. The common header did not have the ability for flow control from the four steam generators and, as a result, composite flow from the generator blowdown could not be guaranteed to the EMF-34 monitor. Since steam generators' individual pressures varied somewhat, the steam generator with the greatest pressure would provide the majority of flow to the EMF-34 and could possibly isolate flow from the other generators if the pressure differential was large enough. At the time of the inspection, the licensee was evaluating two system modifications to correct the flow problems. The first modification would isolate the common header and eliminate kerotest obstructions. The current EMF-34 monitor would be used and a scanning valve would be installed which could sample in series from one generator to another. This scanning valve could provide flow to the EMF-34 monitor from either a composite of the four steam generators or from a single steam generator. The second modification being considered would also isolate the common header and eliminate kerotest obstructions. Four new EMF monitors would be installed (one for each steam generator) to monitor individual generator blowdown. The licensee tentatively scheduled the modification to be implemented by the first quarter 1990. The resident inspectors had tracked the clogging of the sample lines as an unresolved item 50-413, 414/88-15-02.

One violation was identified.

4. Monitoring of Liquid and Gaseous Effluents (84750)

The inspector, accompanied by a licensee representative, examined selected effluent monitoring locations to verify operability. The inspector also reviewed 1989 monitor calibration packages for the following monitors:

EMF-36, Unit vent gas monitor
EMF-38, Containment air particulate monitor
EMF-39, Containment gas monitor
EMF-49, Waste liquid discharge monitor
EMF-50, Waste gas discharge monitor

The examined records appeared complete and calibrations were performed within the required time period.

No violations or deviations were identified.

5. Liquid and Gaseous Radwaste Systems (84750)

a. Radioactive liquid wastes from various sources in the Auxiliary Building were collected in the Floor Drain Tank. The liquid waste was then routed via filters and demineralizers to one of four 5,000 gallon Waste Monitor Tanks (WMT) for discharge. Discharges from the WMTs were monitored by EMF-49, which would automatically terminated the release on high alarm. If the EMF-49 was nonfunctional, the liquid release was still permitted but required additional sampling. The inspector observed the valve lineup, sampling and analyses of a WMT for a liquid release permit. The inspector noted that approved sampling procedures were used and that the technicians appeared knowledgeable of the valve line-up and sampling process. The inspector reviewed the procedure OP/O/B/6500/15, "Radwaste Chemistry Procedure for Discharging a Monitor Tank to the Environment," Revision 8. The procedure contained numerous cross checks and independent verifications of procedural steps by a second individual to prevent valve misalignment or improper releases. The inspector examined a series of liquid waste release permits from August 1988 to March 1989, and verified that the packages were complete and that duplicate samples were pulled whenever the EMF-49 monitor was not operational.

The inspector and a licensee representative toured the Monitor Tank Building, the licensee's new liquid radwaste facility. The building contained three waste monitor tanks of 20,000 gallons each and a 30,000 gallon spent resin tank. The licensee planned for the facility to be operational by the end of the year and was currently field testing various filter/demineralizer combinations for isotopic reduction. Once operational, the licensee planned that the Monitor Tank Building would handle the bulk (approximately 75 percent) of nonrecyclable radioactive wastes from the Floor Drain Tank.

b. The licensee's gaseous radwaste system utilized six WGDTs for normal use and two tanks for plant shutdown and startup. During 1987-1988, the licensee modified the system to allow gaseous releases from only one WGDT. The modification had been initiated to correct sampling problems. The inspector reviewed a summary of gaseous releases from 1986-1988. Releases from the gaseous radwaste system totalled seven for 1988, including one abnormal release. Typically, curie quantities for normal releases were one curie or less of noble gases.

No violations or deviations were identified.

6. Leak Testing of High Efficiency Particulate Air (HEPA) Filters and Charcoal Absorbers in Engineered Safety Feature (ESF) Ventilation Treatment System (84750)

The inspector reviewed methyl iodide laboratory tests of charcoal samples from August 1988 to February 1989, and noted that results were within TS requirements. The inspector also reviewed the test packages and results of in-place leak tests for the following systems:

Control Room, February 1989
Unit 1 Containment Purge, December 1988
Technical Support Center, October 1988
Annulus, September 1988

The results of all system tests appeared to be adequate.

No violations or deviations were identified.

7. Post-Accident Liquid Sampling (PALS) and Gaseous Sampling (PAGS) Systems (84750)

The inspector discussed system operability, testing, and training for the licensee's PAS systems. The facility utilized two separate systems for collecting liquid and gaseous samples under accident conditions. Operation and maintenance of the PALS system was the responsibility of the Chemistry Department. The PALS system had the capability to take a sample from the reactor coolant hot leg A or C or the residual heat removal system. The liquid was then routed to the PALS system where it was degassed, pH determined, and a small volume (approximately 5 milliliters) trapped for dilution. The licensee had the option of diluting the sample to different volumes based upon the activity of the liquid. Undiluted samples were collected from the normal sampling point in the NM (Nuclear Sampling System) laboratory for comparison purposes. The inspector reviewed the results of a series of operability tests for 1988 and 1989, and noted that any disagreements between PALS system analytical results and daily sampling data were resolved in a timely manner. The licensee currently had nine people qualified to operate the panel. Initial qualification included classroom lecture and demonstration of proficiency in operating the PALS system. Requalification required a performance test of operating the system every six months.

The licensee's PAGS system was maintained and operated by the Health Physics (HP) department. The system sampled from containment and drew 1.4 milliliters of containment air through a thiosulfate solution in order to strip out radioactive iodines. The air sample was then diluted with nitrogen to approximately 11,200 milliliters. Previous problems with using plant system bulk nitrogen (Paragraph 12) had been corrected by utilizing bottled nitrogen. At the time of the inspection, the licensee was modifying the PAGS system's vacuum gauges. The originally installed gauges were not of sufficient range and were dissimilar from Unit 1 to Unit 2. The inspector informed licensee representatives that the vacuum gauge modification and subsequent PAGS system performance testing would be considered an IFI. The system was performance tested semiannually and annual training was required for all shift personnel. Currently, the HP department had twenty people qualified to operate the system.

IFI 50-413, 414/89-10-02: Track PAGS system vacuum gauge modification and performance testing.

No violations or deviations were identified.

8. Organization (84750)

The Chemistry Department was staffed by a total of 77 people, including 15 supervisors. The department had undergone a major reorganization of shift and day personnel during February 1988. In the areas of plant chemistry and radioactive effluents, chemistry was responsible for collecting and preparing liquid samples, valve line-up for liquid releases, nonradiological chemical analyses, and operation of the PALS system.

The HP department maintained a total staff of 96, including 26 supervisors and 70 technicians. The department had recently lost two technician positions to the 5 percent company-wide cutback, but staffing for the past year had been relatively stable. The department was responsible for the in-plant count room, operation of the PAGS system, generation of the controlling paperwork for liquid and gaseous releases, collection and preparation of gaseous samples, and control of solid radioactive waste.

No violations or deviations were identified.

9. Environmental Monitoring (84750)

The inspector reviewed the licensee's Environmental Report for 1987 and discussed the report with licensee personnel. The report identified increasing trends for H-3 in surface water and Mn-54 and Co-60 in bottom sediment. These sampling points were located at the facility's discharge canal. Average tritium concentrations in surface water had increased from 2,340 pCi/liter in 1986 to 4,170 pCi/liter in 1987. Average Mn-54 concentrations in sediment increased from 360 pCi/dry kilogram in 1986 to 723 pCi/dry kilogram in 1987. Average Co-60 concentrations also increased from 964 pCi/dry kilogram to 2,460 pCi/dry kilogram. All other levels or

radioactivity in environmental samples attributable to the operation of the plant remained constant or decreased.

No violations or deviations were identified.

10. Plant Chemistry and Steam Generator Integrity (84750)

The inspector reviewed the selected records of primary coolant chemical and radiochemical parameters for the past 12 months, which included Units 1 and 2 dissolved oxygen chlorides, fluorides, and dose equivalent iodines (DEI). Typical DEI values for both units were in the range of E-3 uCi/ml. The TS requirements for analysis of primary coolant appeared to have been met.

The inspector also reviewed the licensee's Fuel Performance Reports for Unit 1 Cycle 3 and Unit 2 Cycle 2. Both Units had experienced good fuel performance during the past cycles. Unit 1 I-131 levels averaged E-3 uCi/ml during Cycle 3 which indicated one or two leakers with open defects. Cesium ratio analyses and constant activity levels at steady-state power indicated that the defects were carried from the previous cycle and not generated in Cycle 3. Unit 2 I-131 levels ranged from E-3 to E-4 uCi/ml in Cycle 2 which indicated one or two leakers with small defects. Again, cesium ratio analyses confirmed that the defects were a carryover from Cycle 1 and not generated in Cycle 2.

The inspector also discussed steam generator integrity with licensee representatives. The licensee had had few problems with primary to secondary leaks for both units. During July 1988, Unit 1 developed a leak which peaked at 100 gallons per day in August. The unit was brought down from power and the leaking tubes plugged. Current leak rates for both units were less than one gallon per day.

No violations or deviations were identified.

11. Confirmatory Measurements (84750)

As part of the NRC Confirmatory Measurements Program, spiked liquid samples were sent on January 9, 1989, to the plant for selected radiochemical analyses. The NRC received the analytical results from Duke Power Company in a letter dated March 27, 1989. The comparison of licensee results to the known values are presented in Attachment 1. The acceptance criteria for the comparison are listed in Attachment 2. On April 19, 1989, the inspector contacted the licensee via telephone to discuss the results. Fe-55 results were noted as being in disagreement. Sr-89, Se-90, and H-3 results were in agreement. The licensee determined the cause of the Fe-55 discrepancy and contacted the inspector the same day. The Fe-55 analysis was performed by the Duke Power Applied Science Center. Catawba plant personnel received the spiked sample and, prior to sending it to the Applied Science Center, had diluted the spike by a factor of ten. The plant's transmittal documents to the laboratory did not indicate that the spike had been diluted so that the laboratory did

not correct for the dilution. The licensee agreed to record sample preparation in the transmittal documents to the laboratory.

No violations or deviations were identified.

12. Licensee Action on Previous Followup Items (92701)

a. (Open) IFI 50-413, 414/86-01-01: Review modification to PALS system routing undiluted sample residues to containment sump. Original installation of the PALS system routed PALS system panel sump discharge from the PALS system sump to the Waste Evaporator Feed Tank (WEFT) sump. The WEFT sump was not a closed system and NUREG-0737 specified that "residues of sample collection should be returned to containment or to a closed system." During an inspection conducted January 6-10, 1986, the inspector concluded that the Catawba Plant PALS system for both Units 1 and 2 would fulfill the design criteria of NUREG-0737, Section II.B.3 with the modifications to return the undiluted sample residues to containment. The licensee originally scheduled the modification to be implemented for Unit 1 during a 1986 refueling outage but this modification was cut due to higher priority items. The Unit 2 modification was not scheduled at the time since the unit did not go critical until May 1986. The licensee rescheduled the modification for implementation during Unit 1 end-of-cycle 3 (November 1988-January 1989), and Unit 2 end-of-cycle 2 (March 1989-May 1989). However, an ALARA review of the modification calculated an integrated dose of approximately 11 person-rem per unit. Based upon this calculated high dose, the licensee chose to investigate possible alternatives, and the scheduled modifications were not implemented. Discussions with licensee representatives indicated that the Waste Drain Tank (WDT), a closed system, was considered as a possible alternative to routing PALSS sample residues to the containment sump. Proposed advantages for the WDT modification included that this modification did not require containment penetration or outage conditions and doses were thought to be lower. However, integrated dose projections for this modification were calculated to be as high as the dose from the original containment sump modification. Since the WDT modification would not reduce the worker radiation exposure and partial work had been completed on the initial modification to containment, the licensee was again considering the original plan of routing the residues to the containment sump. Currently, this was scheduled for implementation during the next refueling outages in 1990. During the exit meeting conducted April 7, 1989, the inspector requested that a firm date be established for the PALS system modifications. The plant manager requested additional time to determine the status of the modifications and a conference call was set for April 13, 1989. On April 13, 1989, the inspector contacted the plant manager who committed to completing the PALS system modifications during 1990. The licensee was also considering the possibility of routing PALS system residues to the Volume Control Tank (VCT) instead of the containment sump or the WDT. The licensee's design engineers had not

completed an evaluation of this VCT modification but doses to implement the modification were estimated to be much lower than the containment or WDT modification. If the VCT modification was not feasible, the licensee indicated that the containment modification would be completed. In either case, the plant manager committed to a completion date of 1990. Any piping changes or penetrations that required outage conditions would be performed during the next refueling outages in early 1990. This item remains open pending licensee action.

b. (Closed) IFI 50-413, 414/87-27-01: Evaluate PAGS system following correction of water-contaminated nitrogen supply. The licensee had experienced problems with water contaminating the GN system, the station's bulk nitrogen system. Additionally, the PAGS system panel was located on the 543' elevation which was the low point for the GN system, where moisture would accumulate. Moisture carryover to the PAGS system affected the accuracy of hydrogen, containment atmosphere particulate, and iodine aerosol sampling and essentially rendered the PAGS system inoperable. The licensee had corrected this problem by permanent use of a bottled nitrogen supply. The modification had been made to the PAGSS in order to accommodate this alternate nitrogen supply. Additionally, during the current inspection, the procedures PT/O/B/4600/17, "Post-Accident Containment Air Sampling System Periodic Test," dated April 6, 1989, and HP/O/B/1009/17, "Post-Accident Containment Air Sampling System," dated April 6, 1989, had been revised to include the bottled nitrogen supply. This item is considered closed.

c. (Closed) IFI 50-413, 4141/87-27-02: Review licensee action to correct pressure swing problem associated with valve WG159 in gaseous radwaste treatment system monitor EMF50. The WG159 was a pressure regulating valve which had the function of holding pressure constant in the detector operating chamber. The response of the detector, a beta-sensitive plastic scintillator inside the gas sample chamber, was dependent upon chamber pressure and gas density, and pressure swings would alter the detector's response. The licensee corrected this problem by replacing the WG159 valve with a Fisher 952 pressure reducing regulator which maintained constant pressure in the sample chamber. The inspector reviewed the nuclear station modification (NSM) request, NSM #CN-50334, which described this valve replacement in addition to other modifications for the waste gas system. The valve modification was functionally verified and closed by September 1988. This item is considered closed.

d. (Closed) IFI 50-413, 414/88-26-01: Review licensee's action regarding level of hood window when collecting reactor coolant samples. Subsequent to the August 1988 inspection, the licensee had performed preventive maintenance on hoods A and B in the NM (nuclear sampling system) laboratory. Air flow through hood A was found to be restricted by kimwipes that had been caught in the duct. The obstructions were removed and air flow through the hood with the

window fully open was measured to be 100 linear feet per minute. No obstructions were found for hood B and fully opened air flow was determined to be 100 linear feet per minute. This item is considered closed.

e. (Open) IFI 50-413, 414/88-28-01: Evaluate contractor report of tests to determine sampling losses of iodine species in sampling lines for plant vent iodine sampler/monitor. As of the date of this inspection, the licensee had received the draft of the contractor's report and was preparing comments upon it. Since the final report had not been issued, this item remains open.

f. (Open) IFI 50-413, 414/88-28-02: Evaluate licensee report of tests to quantify sampling line losses of iodine species in sampling lines for containment atmosphere iodine sampler and monitor. The licensee had not completed testing at the time of this inspection. This item remains open.

13. Exit Interview

The inspection scope and results were summarized on April 7, 1989, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

The licensee maintained an adequate program to control radioactive effluents (Paragraphs 3, 4, and 5). Waste gas releases were minimal and liquid releases were properly controlled.

Design problems with a process monitor EMF-34, the steam generator blowdown monitor (Paragraph 3.c.), were being evaluated. The licensee was currently considering two modifications and expected to implement one during early 1990.

The PALS system routed undiluted sample residues (Paragraph 12.a.) to an open sump, not to containment or a closed system as specified in NUREG-0737. This had been identified as a 1986 IFI and corrective actions had been delayed. Licensee management verbally committed on April 13, 1989, to correct this problem during 1990.

One violation (Paragraph 3) was identified concerning failure to include a description of abnormal releases in the Semiannual Effluent Report. One IFI (Paragraph 7) was identified concerning modification of the PAGS system vacuum gauges.

Three IFIs (Paragraph 12) were closed concerning water-contaminated nitrogen supply to the PAGS, correction of pressure swing problems for EMF50 and hood flow in the NM laboratory. Three IFIs remained open awaiting licensee final action.

ATTACHMENT 1

CONFIRMATORY MEASUREMENT COMARISONS OF H-3, Fe-55, Sr-89 AND Sr-90 ANALYSES
FOR CATAWBA NUCLEAR PLANT ON MARCH 27, 1989

Isotope	Licensee (uCi/ml)	NRC (uCi/ml)	Resolution	Ratio (Licensee/NRC)	Comparison
H-3	1.54E-5	1.81 ± 0.05E-5	36	0.85	Agreement
Fe-55	[1]1.74E-6	1.96 ± 0.06E-5	33	0.09	Disagreement
	[2]1.74E-5	1.96 ± 0.06E-5	33	0.89	Agreement
Sr-89	7.3E-5	7.75 ± 0.23E-5	34	0.94	Agreement
Sr-90	4.5E-6	4.20 ± 0.17E-6	25	1.07	Agreement

Notes:
1. Results not corrected for dilution
2. Results corrected for 10:1 dilution

ATTACHMENT 2

CRITERIA FOR COMPARISONS OF ANALYTICAL MEASUREMENTS

This attachment provides the NRC's criteria for the comparison of results of analytical radioactivity measurements. These criteria are based on empirical relationships which combines prior experience in comparing radioactivity analyses, the measurement of the statistically random process of radioactive emission, and levels of agreement in radioactivity measurements acceptable to the NRC.

In these criteria, the "Comparison Ratio Limits"[1] denoting agreement or disagreement between licensee and NRC results are variable. This variability is a function of the ratio of the NRC's analytical value relative to its associated statistical and analytical uncertainty, referred to in this program as "Resolution"[2]. As the numerical value of "Resolution" increases, the range of acceptable variations or differences between the NRC and licensee analytical becomes smaller or more restrictive. Conversely, as the value of "Resolution" decreases, a wider and less restrictive variation or difference between the NRC and licensee analytical values is considered acceptable.

For comparison purposes, a ratio between the licensee's analytical value and the NRC's analytical value is computed for each radionuclide present in a given sample. The computed ratios are then evaluated for agreement or disagreement based on "Resolution." The corresponding values for "Resolution" and the "Comparison Ration Limits" are listed in the Table below. Ratio values which are either above or below the "Comparison Ratio Limits" are considered to be in disagreement, while ratio values within or encompassed by the "Comparison Ratio Limits" are considered to be in agreement.

TABLE

NRC Confirmatory Measurements Acceptance Criteria
Resolution vs. Comparison Ratio Limits

Resolution	Comparison Ratio Limits for Agreement
<4	0.4 - 2.5
4 - 7	0.5 - 0.2
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

[1]Comparison Ratio = $\frac{\text{Licensee Value}}{\text{NRC Reference Value}}$

[2]Resolution = $\frac{\text{NRC Reference Value}}{\text{Associated Uncertainty}}$