U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/85006(DRSS); 50-265/85006(DRSS)

Docket Nos. 50-254; 50-265 Licenses No. DPR-29; DPR-30

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Quad Cities Site, Cordova, Illinois

Inspection Conducted: February 25 through March 1, 1985

M. J. Oestmann

Inspectors: M. J. Oestmann 3/29/85 Date

S. Rozak

S. Rozak 3/29/85 Date

R. B. Holtzman

R. B. Holtzman 3/29/85 Date

M. Schumacher

Approved By: M. C. Schumacher, Chief
Independent Measurements and
Environmental Protection Section 3/29/85 Date

Inspection Summary

Inspection on February 28 through March 1, 1985 (Reports No. 50-254/85006(DRSS); 50-265/85006(DRSS))

Areas Inspected: Routine, unannounced inspection of: (1) plant chemistry and radiochemistry, including management controls and chemistry staffing, chemistry control, sampling and analysis of water quality, facilities and equipment, quality assurance/control of analytical measurements, chemical processes and practices for controlling chemical impurities; (2) implementation of 10 CFR Part 61 and 10 CFR Part 20.311 requirements for disposal of low-level radioactive wastes, quality control, tour of the facility, and implementation of waste form and waste classification requirements; (3) licensee internal audits; and (4) review of previous inspection findings. The inspection involved 114 inspector-hours onsite by three NRC inspectors.

Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

*N. Kalivianakis, Station Superintendent, QCNPS
*L. Gerner, Assistant Superintendent, Administrative and Support Services, QCNPS
*T. Kovack, Rad-Chemistry Supervisor, QCNPS
*J. Sirovy, Lead Chemist, QCNPS
*R. Carson, Lead Health Physicist, QCNPS
*N. Griser, Senior Quality Assurance Inspector, QCNPS
*R. Robey, Senior Operating Engineer, QCNPS
G. Powell, Health Physicist, QCNPS
P. Behrens, Chemist, QCNPS
R. Hebeler, Laboratory Foreman, QCNPS
G. Rankin, Rad-Chemisty Technician, QCNPS
J. Neal, Training Supervisor, QCNPS
M. Deutscher, Training Instructor, QCNPS
C. Richardson, Foreman, Instrument and Measurements, QCNPS
L. Geerts, Rad-Chemistry Technician
A. Lewis, Health Physicist, QCNPS
K. Hall, Health Physics Coordinator, QCNPS
W. Bielasco, Special Projects Health Physicist, QCNPS
J. Forest, Staff Assistant, Radwaste, QCNPS
R. Petri, Staff Assistant, Radwaste, QCNPS
*A. Madison, NRC Senior Resident Inspector
A. Morrongiello, NRC Resident Inspector

The inspectors also contacted other Health Physics, Chemistry, and Radwaste personnel during this inspection.

*Present at the exit meeting on March 1, 1985.

2. Licensee Actions on Previous Inspection Findings

a. (Closed) Open Item (50-254/84-10-01; 50-265/84-09-01): Weekly collection sheets for radiological environmental monitoring program (REMP) should be signed off by licensee management after management review. The inspectors examined selective REMP weekly collection sheets for the latter half of 1984 and 1985 to date and found that all had been stamped, reviewed by licensee management, and signed off. No problems were noted.

b. (Closed) Open Item (50-254/84-10-02; 50-265/84-08-02): Licensee to analyze liquid sample for beta emitters and report the results to NRC Region III for comparison purposes. Comparisons of the licensee's analytical results to those of the NRC Reference Laboratory are presented in Table I and the comparison criteria in Attachment 1. The analyses for ^{3}H, ^{89}Sr and ^{90}Sr were performed by a contractor laboratory Science Applications, Inc. (SAI) for the licensee. The licensee also had performed the analysis for ^{3}H onsite. The licensee's result for ^3H performed onsite (not presented in the Table) was in agreement with the NRC result whereas the result obtained by the contractor disagreed by approximately a factor of two. In addition the contractor did not obtain any positive results for the radio-strontium analyses, but reported values as less than lower limits of detection (LLDs). The inspectors discussed with licensee representatives the fact that these LLDs are not sufficiently low to satisfy the requirement of 5×10^{-8} μCi/cc required by the licensee's current Technical Specifications for liquid effluents. This is a new requirement which went into effect in late 1984. The licensee is aware of this potential problem and stated that the contractor is instructed to meet the required detection limit on samples currently being sent for analysis.

During this inspection, the inspectors collected and split another sample from a lake discharge tank for analysis of gross beta, ^3H, ^{89}Sr, ^{90}Sr, and ^{55}Fe. Comparisons on this sample will be used to test the capability of the contractor laboratory in meeting the licensee's analytical requirements for accuracy and sensitivity (Open Item 50-254/85-06-01; 50-265/85-06-01).

c. (Open) Open Item (50-254/84-10-03; 50-265/84-09-03): Licensee agreed to recalibrate gas geometry for effluent samples. The licensee recalibrated the 4.7 liter gas Marinelli geometry in September 1984 with a vendor supplied gas standard. This item will remain open until confirmatory measurements comparisons can be performed using this geometry.

3. Management Controls, Organization, Training, and Qualifications

Management responsibility in the shipping of radwaste and complying with applicable regulations is shared by three groups. The initial request and coordination with the burial ground, the actual packaging, sampling, and labeling are done under the supervision of the Staff Assistants of the Radwaste group who report to the Operating Engineer. The Staff Assistants use the functional titles of Radwaste Planner and Radwaste Engineer.

The analysis of radwaste samples and the development of correlation factors to be used for waste classification are done under the supervision of the Lead Chemist. Manifest preparation, waste classification, compiling of paperwork package, radiation surveys, and shipment tracking are done under the supervision of the Lead Health Physicist. Both the Lead Chemist and Health Physicist are in the Radiation Chemistry Department. The Lead Chemist, who reports to the Radiation-Chemistry Supervisor, meets the qualifications of the position description required by ANSI/ANS 3.1-1982 and appears to have management support to effectively meet plant chemistry requirements. Five chemists/chemical engineers with B.S. degrees are supervised by the Lead Chemist. Another chemical engineer will be added to his staff in the near future.

The Radiation-Chemistry Supervisor supervises the Laboratory Foreman, who in turn supervises the six to eight of a total of 31 Radiation-Chemistry Technicians (RCTs) working in the chemistry laboratory. The Foreman directs on-the-job training and job assignments of the RCTs. He also provides QC samples to the RCTs to test their laboratory proficiency. The inspectors observed that the Laboratory Foreman plays a key role in developing techniques for the operation of new laboratory instruments. During 1985, an assistant foreman will be added to the staff to provide training for the RCTs and to direct the QC program in the laboratory. The inspectors discussed with licensee representatives the desirability of extending the assignment of the RCTs to the Chemistry Group beyond the usual 7-8 day period. Because the RCTs rotate between the Health Physics and Chemistry Groups, they normally do not return to the Chemistry Group for a period of 8-10 weeks. This absence from the laboratory results in a loss of laboratory proficiency. A licensee representative agreed with this assessment but could not promise any change in the existing program because of corporate policy.

The training program for RCTs was also reviewed and includes formal lectures, on-the-job experience, and supervisory observation in accordance with QCP 1400-6 "On-The-Job Training for Radiation Chemistry Technicians," approved by the Quad Cities Onsite Review Board (QCOSR) on July 30, 1982. Six RCTs hired in the fall of 1984 have just completed a 14 week radiation-chemistry course involving both lectures and laboratory exercises at the licensee's Production Training Center in Braidwood, Illinois. Lesson plans and examinations were discussed with Training Department representatives. No problems were noted with the formal training program.

In addition, the licensee recently developed an OJT Training Manual that requires each RCT to demonstrate his ability to perform an extensive list of tasks and analyses. During 1985, the licensee plans to increase the annual one week RCT retraining course to two weeks.

No problems were noted during the review of the training program for the chemistry staff.

Development of a comprehensive training program involving BWR water chemistry control is being recommended by the licensee in order to implement a corporate policy on this subject. (See Section 4.) This program is to be administered by the Production Training Department and will involve training corporate and plant management and technical staff on this subject. Training of licensee personnel in water chemistry control will be reviewed in a subsequent inspection. (Open Item 50-254/85-06-02; 50-265/85-06-02).

No violations or deviations were identified.

4. Water Chemistry Control Program

The inspectors reviewed the licensee's BWR Water Chemistry Control Program, (Nuclear Stations Division Directive NSDD-S17) issued on October 5, 1984. The program, established for all the licensee's BWRs, addresses management policies, assignment of authority and responsibilities to implement the program, and provides guidance to the plants on operational chemistry limits designed to minimize intergranular stress corrosion cracking (IGSCC). An analytical measurements program, performance monitoring of the program, and training, as discussed in Section 3, are also included. The licensee has set June 1, 1985 as the date when each BWR station is required to incorporate these corporate requirements into the station's procedures.

Management responsibilities include providing adequate resources of staff, equipment, funds and organization to implement the program effectively to avoid IGSCC. Each station is directed to develop site specific water chemistry control procedures which include definition of key water chemistry control parameters and necessary corrective actions to maintain the associated operating limits on chloride, conductivity, pH, etc., in reactor water, condensate, feed water, and control rod drive cooling water. The progress in revising existing procedures and developing new ones to incorporate the licensee's requirements on this subject will be examined in a subsequent inspection. (Open Item 50-254/85-06-03; 50-265/85-06-03).

The Rad-Chem Department at Quad Cities Nuclear Plant developed a series of goals and schedules for 1985 for improving its functional performance, including corrosion monitoring and treatment of auxiliary water systems, modifying the Makeup Demineralizer System (see Section 5), and controlling the types and amounts of chemicals used in the plants. The licensee issued a directive (NSDD-S07) on June 11, 1984 establishing a chemical control program for consumable products in the plants to limit the use and types and amounts of chemicals. The full implementation of the licensee's water chemistry control program will be examined in a subsequent inspection. (Open Item 50-254/85-06-04; 50-265/85-06-04).

No violations or deviations were identified.

5. Chemical Processes and Practices to Control Chemical Impurities

The licensee utilizes the reactor water cleanup system (RWCU) and the condensate-filter demineralizer system to maintain specified reactor water quality. In the RWCU system, a portion of the recirculated reactor water is removed and purified through two parallel filter-demineralizer units. These demineralizers are of the pressure precoat type using finely ground nonregenerable mixed cation and anion exchange resins. Backwashing of resins with condensate occurs and the backwash water flows to a phase separator and then to a sludge receiving tank. A slurry of resin and water is pumped from the tank to radwaste for disposal. (See Section 8 for further discussion.) Continuous sampling stations are located in the influent header and in each effluent line of the two units. The influent sample station is the source of reactor water grab samples. The inspectors observed the in-line instrumentation for flow, pressure, temperature and conductivity of reactor coolant in the main control room during a tour of the plant.

The condensate feedwater system, consisting of condensate pumps, condensate booster pumps, a demineralizer system, feedwater heaters and feed pumps, provides feedwater of the required purity to the reactor. The system which removes corrosion products originating from the turbine, condenser, and feedwater heaters, protects the reactor against impurities from condenser tube leaks, and removes condensate impurities that might otherwise enter the system in the makeup water. The condensate demineralizer system is composed of seven Powdex filter/demineralizer units, including one spare, and the required tanks, piping and valving for recharging of the demineralizers. Samples are taken of the condensate pump discharge, of effluents from each of the condensate demineralizers and from the demineralizer header, and of reactor feedwater. The monitor for dissolved oxygen on the feedwater line was also observed during a tour of the plant.

The makeup water system (MUD) is designed to provide reactor quality water of the desired quantity for normal operation of the plant Well water is used for makeup. It is processed through a filter and a demineralizer system consisting of anion, cation, and mixed bed units. The system provides makeup water for the condensate storage tank, laboratories, closed cooling water system and other systems requiring demineralized water. A licensee representative reported that the limits of the MUD effluent have been lowered to a conductivity of 0.2 micromhos /cm and 20 ppb silica to improve overall water quality of demineralized water. The licensee plans to develop a long term program to improve performance of the MUD system and to provide increased attention to repair of equipment and calibration of in-line instrumentation. The inspectors observed the MUD system during a tour of the plant and noted the improvements made.

No violations or deviations were identified.

6. <u>Quality Assurance/Quality Control (QA/QC) Program for Chemical Measurements</u>

The inspectors reviewed the QA/QC program and procedures for laboratory equipment and analysis which includes the following:

QCP 1400-11, Revision 1, April 1983, "Verification of Analytical Performance"
QCP 1400-12, Revision 3, February 1984, "Quality Control Program for Chemistry Instrumentation"
QCP 1400-S9, Revision 1, April 1983, "Laboratory Quality Sample Checklist"
QCP 1400-S10, Revision 1, April 1983, "Split Samples Program Checklist"
QCP 1400-S11, Revision 1, April 1983, "Precision Measuring Equipment Quality Checklist"
QCP 1400-S7, Revision 2, August 1983, "Daily Laboratory Fume Hood Exhaust Checklist"
QCP 1400-S6, Revision 1, July 1982, "Radiation-Chemistry Technician On-The-Job Training Chemistry Checklist"

These procedures, approved by QCOSR, were patterned after guidance in INPO procedures CY-701 and CY-702, and are currently being implemented.

Selected chemistry procedures (QCPs) for various analyses and surveillances were being implemented and found current. No technical problems were noted during a review of the procedures and log sheets used in documenting the results. All of the analytical results were also being entered into a computer.

A tour of the cold and hot laboratories revealed no technical problems. Ventilation of the fume hoods is determined daily and the results are recorded on logsheet QCP 1400-S7. Laboratory instruments were found operational and properly calibrated. There is sufficient laboratory equipment to perform adequate chemical analyses. All chemical reagents had proper labels. None with expired labels were found. All counting equipment was also found operational, and adequate to perform the necessary radiological analyses.

The inspectors observed that QC control values for each counting instrument are tabulated daily but only the monthly mean values are plotted on control charts. Control limits are set at ±5% of the mean. Counters are recalibrated only when the mean check source data deviate by this amount. Control charts should have daily results to determine trends on the reliability of the counters over shorter periods of time. This item will be examined in a subsequent inspection. (Open Item 50-254/85-06-05; 50-265/85-06-05).

The inspectors observed a RCT collecting water samples in the Reactor Building and measuring the conductivity of samples. Another RCT was observed in the laboratory doing a low-level chloride determination with specific ion electrodes. Each appeared to understand his job and to follow appropriate procedures. The ability of a RCT to perform a particular analyses is documented on logsheet QCP 1400-S6. Selected logsheets were found in good order. However, the log sheet needs to be updated to reflect use of a new Perkin-Elmer Model 5000 atomic absorption spectrophotometer.

The inspectors reviewed the licensee's QC program of providing the RCTs with blind samples obtained from a vendor, Environmental Resources Associates, involving among others, analysis of chloride, conductivity, pH and total dissolved and suspended solids. Results for 1984 to date showed that for 22 RCTs, about 50 out of 270 analyses (18%) had to be redone before the results were found to be within an acceptable range as defined by the vendor. However, certain analyses may be more susceptible than others to nonreproducible results and thus the conclusions reached depend somewhat on the types of samples analyzed and on the groupings of results.

The inspectors discussed the importance of a good QA/QC program with licensee representatives, particularly in regard to the increasing importance being attached to tight chemical controls needed for maintaining high water quality. The licensee agreed to continue to improve their QC program.

No violations or deviations were identified.

7. Water Sampling and Analysis

The inspectors observed the sample panels in the Reactor Building and Turbine Building Sample Hoods and the in-line monitors for conductivity, pH, chloride and dissolved oxygen at these hoods. The Control Room monitors, also observed, operate on the same signals as the plant monitors. However, the plant monitors, such as that at the inlet of the Reactor Water Cleanup Filter demineralizer had calibration stickers dated 1979. Licensee representatives reported that calibrations are performed only when the monitor is repaired. However electronic checks are performed weekly on the high and low scale of the monitors. Most calibrations were done before 1984. The inspectors discussed with licensee representatives at the exit interview the need to keep calibrations current.

The inspectors noted that the RCT who collected grab samples of reactor water made conductivity measurements with a flow cell using a Solu-meter and compared the results with the in-line conductivity monitor readings. The information was documented on Form QCP 1200-S1.

The inspectors reviewed data on this form from December 1984 through February 1985 and noted that there was good agreement (within ± 5%) between the grab sample conductivity measurements and the Control Room monitor readings for the RWCU Inlet and Outlet and Fuel Pool Inlet and Outlet. However, the correlation between the reactor water conductivity measurements and the Control Room measurements was highly variable. This variability was attributed to the reactor water monitors having high range scales, e.g., a range of 0-10 μmho/cm, compared to actual conductivities on the lower end of the scale, i.e., less than 0.6 μmho/cm. Similar results were obtained in the Turbine Building condensate.

While the low range monitors (scale of 0-1 μmho/cm) appear to be well calibrated, there is little evidence of this effect for the high range monitors (0-10 μmho/cm). The use of high range monitors is related to T/S 3.6.C.4 which allows conductivity up to 10 μmho/cm. Apparently there is no formal analysis performed to track the correlations between the grab sample results and the in-plant and control room monitor readings. A licensee representative reported that the daily reactor coolant conductivity measurements of grab samples are considered more reliable than the in-line readings.

The licensee's BWR Water Chemistry Control Program discussed in Section 4 includes licensee's plans to upgrade the process instrumentation at each BWR plant including maintaining them in reliable working order to meet the chemistry analysis requirements and to perform comparisons of laboratory and plant instrumentation for consistency of values. This item will be examined in a subsequent inspection. (Open Item 50-254/85-06-06; 50-265/85-06-06)

The inspectors reviewed log sheets and forms on results for conductivity, chloride, pH, turbidity, and silica for reactor water and found them to be reasonably constant and substantially below T/S limits and licensee limits.

The Laboratory Foreman reviews the forms and enters the data into the computer. The relative constancy of these results for different analyses indicates overall good quality of the analyses. The Lead Chemist also reviews the chemistry data each day, and promptly notifies the Shift Supervisor of any out-of-specification results.

No violations or deviations were identified.

8. Waste Classification and Form

The inspectors reviewed the status of the licensee's implementation of the requirements of 10 CFR 20 and 10 CFR 61 applicable to low-level radwaste classification, waste form, and stabilization. The licensee has been shipping radwaste under the new regulations since December 28, 1983, largely to Barnwell, South Carolina with occasional shipments to Hanford, Washington. The inspectors examined records of 112 shipments made between December 28, 1983 and January 23, 1985. This represents approximately forty percent of the shipments made during this period.

The types of waste the licensee has shipped consist of: DAW (Dry Active Waste) in steel bins, DAW in 55 gallon drums, resin solidified in 55 gallon drums, absorbed oil solidified in 55 gallon drums, resin solidified in cask liners, and spent control rod blades shipped in fuel casks.

On two occasions the licensee has sent Class C waste for burial. Resin used to filter Unit 1 decon solution was shipped in April 1984 to Barnwell. Chem-Nuclear Systems, Inc. was hired to solidify this resin in a cask liner. For this process, Chem-Nuclear (CNSI) has submitted a topical report to NRC Headquarters to demonstrate compliance with stability requirements of 10 CFR 61.56. Spent control rods, classified as Class C, were shipped to Barnwell on eight occasions between November 30, 1984 and January 23, 1985. Torrey Pines Technology was hired to run the tests necessary to classify these shipments properly. These control rod blades were classified as Class C based on dose rate measurements and neutron activation analysis of each individual control rod blade. These blades were shipped in fuel casks and buried in slit trenches at Barnwell. The State of South Carolina has determined that they consider these blades as activated metal components and as such they are inherent stable products that comply with 10 CFR 61.56. For these eight shipments the inspectors found that the licensees had made no entry on the manifests for I-129 content. This was because the contractor had not provided values for I-129 content of the blades, although they had evaluated this content on waste classification. In response to inspector comments, the licensee has corrected these manifests and forwarded the results to Barnwell.

Currently, the licensee is solidifying all Class B shipments in cask liners using a Chem-Nuclear System, Inc. system. A topical report covering this system has been submitted to NRC headquarters to demonstrate compliance with the stability requirements of 10 CFR 61.56. The licensee started using this system in September, 1984. Prior to this, the licensee had made occasional shipments of Class B waste solidified in 55 gallon drums using an older General Electric cement system. No stability testing of this system had been performed. The licensee had been calling this product "stable" based on guidance from their corporate office. Licensee representatives at the corporate office after discussion with various representatives in the cement and nuclear industries concluded that cement was an inherently stable product. In a letter to Leo Higgonbotham, NMSS, dated October 28, 1983, the licensee stated and explained their disagreement with the Branch Technical Position relating to stability testing of cement solidification systems used for low-level radwaste. Also in a letter to Harold Denton, NRR, dated December 23, 1983, the licensee stated that they would ensure a satisfactory waste form to comply with requirements of 10 CFR 61.56 by ensuring that the waste form contains no more than 0.5% liquid. Having received no negative comment the licensee assumed this was acceptable. At Quad Cities station each drum was inspected to assure that there was no standing water. Because of the extra personnel exposure that this practice entails and for other considerations the licensee later switched to the Chem-Nuclear System to ensure waste stabilization.

The licensee uses correlation factors to determine the concentrations of the difficult-to-measure isotopes in 10 CFR 61.55 that are used for waste classification. These correlation factors are derived from analyses of samples sent to Science Applications, Inc. (SAI). The licensee has sent samples for analysis to SAI since October 1983. The inspectors examined the correlation factors used with four types of waste - cleanup resin, DAW, condensate sludge/spent resin, and reactor coolant loaded items - and no problems were identified.

The licensee is using inhouse generated computer programs to perform most of the mathematical calculations needed to classify waste. The inspectors verified by hand calculation of data from various shipments and by examination of test data the licensee has used to verify the programs that the calculations are being performed properly. No procedure exists governing the use of these computer programs. In general, although the licensee's current practices appear to satisfy applicable regulations, many of these practices are not now reflected in current procedures. Licensee representatives stated that a significant change in the way shipments are processed will soon be instituted when a new computer program, designed to prompt the user on all aspects of shipments, is brought into routine use. At the exit meeting the licensee agreed to revise applicable procedures to reflect whatever practices will be in effect following this modification as well as the requirements of 10 CFR 61 and 10 CFR 20.311. (Open Item 50-254/85-06-07; 50-265/85-06-07)

The inspectors toured the licensee's radwaste facilities and identified no problems.

No violations or deviations were identified.

9. Licensee Internal Audits

Three onsite and one offsite QA audits regarding chemistry and radiochemistry control were performed by the licensee during 1984 and 1985. The audits had adequate checklists and were comprehensive. No findings were identified. Also, no findings were identified regarding an audit involving boron concentration determinations in the Standby Liquid Control System.

One audit (QAO 4-84-21) regarding radwaste was conducted in May 1984 covering among other things 10 CFR 61 and 10 CFR 20.311 requirements. No findings related to these requirements were identified. The audit appeared to be fairly comprehensive and a fair attempt to audit the technical aspects of the above regulations. One audit question that was asked, however, was not applicable to QCNPS and this suggests that the auditors may need more training in the new regulations.

No violations or deviations were identified.

10. Exit Interview

The inspectors met with licensee representatives denoted in Section 1 on March 1, 1985, at the conclusion of the inspection. The scope and findings of the inspection were discussed. A licensee representative acknowledged the need to implement the water chemistry control program its management has recommended and to improve its quality control of laboratory practices. In response to inspector comments the licensee also agreed to the following actions:

a. Analyze the water sample for gross beta, ^{3}H, ^{89}Sr, ^{90}Sr, and ^{55}Fe and to report the results to Region III (Open Item 50-254/85-06-01; 50-265/85-06-01) (Section 2.b);

b. To modify radwaste shipping procedures to incorporate current practices and 10 CFR 61 and 10 CFR 20.311 requirements (Open Item 50-254/85-06-06; 50-265/85-06-06) (Section 8).

During this inspection, the inspectors discussed the likely information content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. Licensee representatives did not identify any such documents/processes as proprietary.

Attachments:

1. Table I, Confirmatory Measurements Program Results, 2nd Quarter 1984
2. Attachment 1, Criteria for Comparing Analytical Measurements

TABLE I

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: QUAD CITIES
FOR THE 2 QUARTER OF 1984

		------NRC--------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
L WASTE	BETA	1.4E-05	5.0E-07	1.1E-05	0.0E-01	7.7E-01	2.8E 01	A
	H-3	1.1E-03	1.0E-05	5.2E-04	0.0E-01	4.6E-01	1.1E 02	D
	SR-89	4.9E-08	1.2E-08	<1.0E-06	0.0E-01	2.0E 01	4.1E 00	N
	SR-90	9.7E-08	8.0E-09	<1.7E-07	0.0E-01	1.8E 00	1.2E 01	N

T TEST RESULTS:
A=AGREEMENT
D=DISAGREEMENT
*=CRITERIA RELAXED
N=NO COMPARISON

ATTACHMENT 1

CRITERIA FOR COMPARING ANALYTICAL MEASUREMENTS

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgment limits are variable in relation to the comparison of the NRC's value to its associated one sigma uncertainty. As that ratio, referred to in this program as "Resolution", increases, the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement should be considered acceptable as the resolution decreases. The values in the ratio criteria may be rounded to fewer significant figures to maintain statistical consistency with the number of significant figures reported by the NRC Reference Laboratory, unless such rounding will result in a narrowed category of acceptance.

RESOLUTION	RATIO = LICENSEE VALUE/NRC REFERENCE VALUE
	Agreement
<3	No Comparison
≥ 3 and <4	0.4 - 2.5
≥ 4 and <8	0.5 - 2.0
≥ 8 and <16	0.6 - 1.67
≥ 16 and <51	0.75 - 1.33
≥ 51 and <200	0.80 - 1.25
≥ 200	0.85 - 1.18

Some discrepancies may result from the use of different equipment, techniques, and for some specific nuclides. These may be factored into the acceptance criteria and identified on the data sheet.