U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/83-13(DRMSP)

Docket No. 50-331 License No. DPR-49

Licensee: Iowa Electric Light and Power
Company
IE Towers
P. O. Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Duane Arnold Site, Palo, IA

Inspection Conducted: July 18-21, 1983

Inspectors: M. J. Oestmann — 8/12/83 Date

S. Rozak — 8/12/83 Date

Approved By: M. C. Schumacher, Chief — 8/15/83 Date
Independent Measurements and
Environmental Protection Section

Inspection Summary

Inspection on July 18-21, 1983 (Report No. 50-331/83-13(DRMSP))
Areas Inspected: Routine, unannounced inspection of: (1) Confirmatory Measurements Program including discussions of results of beta analysis of a previous spiked liquid sample and analysis onsite of radiological effluent samples utilizing the Region III Mobile Laboratory and discussion of analytical results; (2) Radiological Environmental Monitoring Program (REMP) including management controls, program implementation, and review and audit; and (3) review of item of noncompliance and open items from a previous inspection. The inspection involved 56 hours onsite by two NRC inspectors. Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

a. R. York, Assistant Plant Superintendent, Operations
a.b. K. Young, Radiation Protection Supervisor
a. R. Dye, Assistant Radiation Protection Supervisor
a. H. Giorgio, ALARA Coordinator
a. G. Taylor, Chemistry Coordinator
a. W. Miller, Technical Support Supervisor
a. R. Pohto, Assistant Chemistry Coordinator
a. L. Kriege, Radiological Engineer, Linn Engineering (contractor)
a. A. Feldman, Radiological Engineer, Chemrad (contractor)
a. R. Lewis, Chemistry Foreman
A. Funke, Chemistry Technician
D. Rees, Chemistry Technician
R. Schluerter, Radiation Waste Operator
E. Root, Chairman of the Safety Committee
b.c. W. Holden, Quality Assurance Engineer
c. J. Kerr, Quality Assurance Engineer

a. Denotes those present at exit interview on July 21, 1983.
b. Denotes those present during telephone conversation on July 29, 1983.
c. Denotes those present during telephone conversation on August 8, 1983.

2. Licensee Action on Previous Inspection Findings

a. (Closed) Open Item (50-331/81-14-01): QC of analytical measurements. The inspectors observed that the licensee has made a decided improvement in the QC of analytical measurements in the counting room and laboratory during this inspection. Procedures have been revised, and updated; instruments have been calibrated; and a QC program established on the counting room and laboratory equipment. See Section 4 for further discussion. This item is therefore considered closed.

b. (Closed) Open Item (50-331/82-15-01): Issue a correction for the third quarter 1981 value reported for Kr-87 in the semiannual effluent release report. On September 13, 1982, the licensee submitted a letter with the corrected Kr-87 values for the third quarter of 1981 to the NRC. This item is considered closed.

c. (Closed) Open Item (50-331/82-15-02): A list and schedule for the writing of additional counting room procedures and a schedule for revising existing counting room procedures were to be submitted to Region III by October 1, 1982. In a letter from Mr. Root (DAEC) to Mr. Keppler (NRC) dated October 29, 1982, the licensee stated that the gamma spectrometer calibration procedure would be completed by January 1, 1983 and all counting room calibration procedures would be completed by April 1, 1983. The licensee completed procedure

PCP 9.14 "Calibration of the Ortec Gamma Spectroscopy System" on December 26, 1982. Other procedures governing the use and calibration of counting room instruments were written or revised between December 1982 and April 1983. These procedures now address all the counting room instruments. The revised procedures show a general improvement in technical content over previous versions. This item is therefore considered closed.

d. (Closed) Open Item (50-331/82-15-03): Recalculate EBAR values and Appendix B T/S Section 2.3.1.C.1 for preceeding 12 months to assure T/S compliance. Several significant differences had existed between licensee and NRC values for the average gamma energy per disintegration for several isotopes used to calculate EBAR as required by T/S Section 2.3.1.C.1. The licensee has recalculated the average energy per disintegration using current references and the results tabulated in chemistry Form C-11 agree with NRC values. The licensee had corrected the semiannual report for the first half of 1982 and recalculated the T/S limit back to July 1, 1981 to insure it had not been violated. Licensee action was documented in a draft of a letter dated October 1, 1982 to the NRC in response to Inspection Report No. 50-331/82-15. The inspectors have no further questions about this matter and this item is closed.

e. (Closed) Open Item (50-331/82-15-04): Investigate algorithms producing different results from the same data. Use both programs for liquid analyses and use the more conservative result. The licensee used two versions of vendor supplied nuclide identification programs in gamma spectral analysis. Because of observed differences between the two programs, the licensee investigated the differences in an effort to determine which was more reliable. A licensee internal memorandum dated August 18, 1982 outlines the results of this investigation. GAMMA 1 and GAMMA 2 usually should give the same results. Under special circumstances, these programs may give differing results. In that case GAMMA 1 is likely to be the more conservative. Since GAMMA 2 provides more data on the spectral characteristics, the licensee decided to use both programs routinely and the jobstreams used for automated analysis have been modified so that both programs are run routinely. The inspectors have no further questions regarding this matter and this item is closed.

f. (Closed) Open Item (50-331/82-15-05): Count split liquid samples for beta analysis. Strontium analyses will require new carriers be made for chemical separation: An addendum to Inspection Report No. 50-331/82-15 was issued on January 20, 1983, showing agreements or possible agreements for gross beta, tritium, and Sr-89 but a disagreement for Sr-90. The licensee was conservative in his Sr-90 results. The licensee has had a continuing problem with the analysis of Sr-90. In an effort to resolve this problem the licensee contracted Nuclear Utilities Services, Inc (NUS) to conduct his strontium analysis. As discussed in Section 5, this contractor analyzed a spiked effluent sample provided by the NRC Reference

Laboratory which resulted in a nonconservative result of several orders of magnitude lower than the known Sr-90 value. The corrective actions the licensee has proposed to take are outlined in Section 5. The correct analysis of Sr-90 remains an open item (50-331/83-13-01).

g. (Closed) Open Item (50-331/82-15-06): Continued use of the three point search criteria for gaseous quantification. During the previous inspection the licensee had a disagreement for Kr-85m using a five point peak search parameter in the vendor supplied software. When the spectrum was reanalyzed using a three point search parameter, the licensee achieved an agreement. In an internal memo dated August 18, 1982, the routine use of the three point criteria for gaseous samples was recommended and the jobstreams have been modified so that this is done routinely. The inspectors have no further questions regarding this matter and this item is closed.

h. (Closed) Open Item (50-331/82-15-07): Examine implementation of corrective action for licensee identified QA finding. During this inspection, the inspectors examined correspondence dated October 4, 1982 from the Nuclear Utilities and Industries, Inc. to the licensee describing the certification of instruments traceable to the National Bureau of Standards used to calibrate the licensee's environmental air samples in compliance with Section 5.3.A requirements of the Environmental Technical Specifications (ETS). This item is therefore considered closed.

i. (Closed) Unresolved Item (50-331/82-15-08): Safety Committee had not performed timely and continuing audits of the environmental monitoring program as required by Section 5.1.2 of the ETS. This finding had been identified in a Corporate Quality Assurance Audit (I-82-16). The Safety Committee responded to this finding on August 20, 1982, within the "reply due" date of August 26, 1982, by adding audits of this program to future schedules of audits performed under Safety Committee cognizance. This item was closed on December 9, 1982 when the new schedules were issued. This is a licensee identified item. Subsequently, the Corporate Quality Assurance Department performed an audit of the licensee's contractor, Hazleton Environmental Sciences Corporation (HES) on March 25, 1983, and identified one finding. A response to the finding from HES was due on May 17, 1983. This item had not been responded to as of the end of the onsite portion of this inspection. The inspector discussed this matter with the Chairman of the Safety Committee and also at the exit interview. Licensee representatives agreed to follow up on the response to the audit. On July 29, 1983, the licensee telephonically informed the inspector that an extension had been provided HES who responded adequately before the extended due date. The inspectors have no further questions regarding this matter.

j. (Closed) Open Item (50-331/82-15-09): Use of two liter Marinelli beaker counted for 2500 seconds to achieve MDA values listed in Appendix B T/S Table 3.3-1. During the previous inspection, the

licensee was unable to achieve a sensitivity of 5 E-7 μCi/ml in liquid effluent samples as required by Appendix B T/S Table 3.3-1. The licensee stated that the geometry and count times used for this measurement had not been those that would have been used for an effluent sample. During this inspection the correct geometry was used for comparison on the liquid sample. Judging from this measurement and a background spectrum obtained using this geometry, the licensee most likely can achieve the required sensitivity. The inspectors have no further questions regarding this matter and this item is considered closed.

k. (Closed) Violation - Severity Level V (50-331/82-15-10): Lack of specific calibration procedures and lack of quality control program for the gamma spectrometer. The licensee responded to the item of noncompliance in a letter dated October 29, 1982 from E. Root (IE) to J. G. Keppler (NRC). During this inspection, the implementation of corrective action proposed in this letter was examined. A procedure for the calibration of the gamma spectrometer has been written - PCP 9.14 dated December 26, 1982. Daily QC checks on the spectrometer are being performed and the results are plotted and examined for trends. The inspectors examined these records and no problems were noted. In addition, the licensee now participates in a cross check program with Analytics, Inc. in which this instrument is used to analyze blind spiked samples. QC for the other counting room instruments has also been improved. The overall state of QC in the counting room appears to have improved substantially. The inspectors have no further questions regarding this matter.

3. Radiological Environmental Monitoring Program (REMP)

The licensee's REMP as defined in the ETS was used as the criteria for this portion of the inspection.

a. Management Controls

The inspectors reviewed the administrative controls of the REMP and determined that the Radiation Protection Supervisor is responsible for the conduct and implementation of the REMP. Personnel under his supervision at DAEC collect all environmental samples except aquatic samples, and ship them for analysis to the licensee's contractor, Hazleton Environmental Sciences Corporation (HES). Aquatic samples are collected by Ecological Analysts, Inc. personnel and analyzed by HES.

b. REMP Implementation

The inspector accompanied the DAEC sample collector during the weekly sample collection tour and observed air particulate and charcoal adsorber samples being collected. All of the four air sampling systems observed were operating properly. The collector was very proficient in changing samples, assuring that information on the sample was accurately recorded, and checking that each system

was not leaking. Each air sampler had a current calibration sticker affixed. Thermoluminescent dosimeters(TLDs) were found to be satisfactorily placed.

The inspectors reviewed the REMP results for CY 1982 as presented in the annual report prepared by HES to assure the requirements of Section 4.3 of the ETS were met. The inspectors also reviewed the Data Tabulation Report which includes more detail on sampling and analysis of environmental media. No problems were noted in their reviews. Sample recovery was good and appropriate reasons presented for missing samples. No anomalies or trends of the results were determined except for moderate fallout effects from previous weapons testing. There was no effect on the environment attributable to plant operation.

The inspectors also reviewed the sampling procedures and found them current. The licensee's study plan for REMP was reviewed. No problems were identified.

c. QA Practices and Audit

The inspectors examined the contractor's results of their participation in the EPA interlaboratory cross check and the TLD international exchange programs and found no problems. As discussed in Section 2i, the licensee's contractor had responded to the finding of an audit of the REMP by the Corporate Quality Assurance Department conducted on March 25, 1982.

No items of noncompliance or deviations were identified.

4. Chemistry and Radiochemistry Program

a. Procedures

The inspectors reviewed the chemistry, radiochemistry, and counting room procedures which are incorporated in the Plant Chemistry Procedures (PCP) Manual. Nonradiological procedures reviewed covered analysis for boron, chloride, conductivity, fluoride, pH, dissolved oxygen, spectrometric analysis of various reactor coolant metals, and reagent and sample preparation. Radiological procedures reviewed, primarily in Sections 8 and 9 of the PCP Manual, concern operation and calibration of counting room equipment for use in analysis of reactor plant effluents. The licensee met his commitment to revise and upgrade these procedures taking into account the comments made by NRC inspectors in a previous inspection.[1]

A new procedure was prepared for calibration of the gamma spectrometer (PCP 9.14) in response to an item of noncompliance from the previous inspection.[2] In addition, a new procedure concerning calibration of proportional counters was prepared. All procedures

[1] Inspection Report No. 50-331/82-15
[2] Ibid

revised were an improvement in technical content. All procedures reviewed were current with dates of revision in 1982 and 1983 and found acceptable.

b. Quality Control of Analytical Practices and Measurements

The inspectors observed that there were no problems in the collection of an off gas sample for the confirmatory measurements. However, during the preparation of a liquid sample split with the licensee, the inspectors pointed out to the laboratory technician the necessity of using protective means for handling radioactive samples. The inspectors also observed that a better demarcation in the laboratory was needed for handling different levels of radioactivity. There were no clear designations of the cold or hot sections of the laboratory.

During a tour of the chemistry laboratory, the majority of laboratory instruments appeared to be functional, operable, and calibrated with current calibration stickers. Three instruments, however, were out of calibration; each tagged appropriately. Licensee representatives stated that they would be calibrated within the next few days. Reagent bottles were observed to be labeled with dates of preparation and and expiration. No other problems were noted in the chemistry laboratory.

The licensee has obtained blind samples of nonradiological chemicals to test the analytical capabilities of his technicians. The test results are reviewed by the Chemistry Coordinator. The licensee is also checking on his radioanalytical capability by analyzing spiked samples from Analytics, Inc. in order to improve his QC practices. The inspectors reviewed some preliminary results and found them to be acceptable.

The inspectors reviewed the results of a Corporate QA audit (I-82-28) performed on January 31, 1983, regarding the radiochemistry program. The audit was comprehensive and thorough and resulted in three findings and three observations. Responses to these findings were submitted on March 3, 1983, but implementation of the findings were in progress during this inspection. The close out of these findings will be reviewed in a subsequent inspection. (Open Item 50-331/83-13-02)

c. Training

The licensee has initiated an eight step training program for chemistry technicians which covers such topics as fundamentals of chemistry, safety practices, theory, administrative and analytical procedures, systems. All new technicians are required to demonstrate proficiency in laboratory analyses before being allowed to perform these analyses. This program was implemented June 1, 1983 and all technicians are participating.

5. Sample Comparisions in the Confirmatory Measurements Program

a. Results of Spiked Sample - First Quarter 1983

On March 1, 1983, the licensee was provided with a spiked sample containing beta emitters supplied by the NRC Reference Laboratory. This was done in order to resolve a continuing problem of quantifying Sr-90. The results of comparisons of this sample are given in Table I and the comparison criteria in Attachment 1. The licensee again has a disagreement for Sr-90. This disagreement is grossly nonconservative whereas previous disagreements were conservative. For the previous comparisons, the licensee had performed the strontium analyses onsite. Since then, the licensee has contracted the services of Nuclear Utilities Services, Inc. (NUS) for strontium analyses. Recently, NUS performed an analysis for Sr-90 on a spiked sample provided by Analytics, Inc. For this comparison, NUS results were a factor of 26 higher than the known value. The licensee has contacted NUS concerning these disagreements and in an effort to resolve this problem NUS will analyze the previously supplied spiked samples and analyze at least one more spiked sample provided by the licensee. The licensee has agreed to send the results of these comparisons to Region III. (Open Item 50-331/83-13-01)

NUS has performed strontium analyses on composited air particulate samples for the first two quarters of 1983 as required by Appendix B T/S Table 3.3-2. The sample for the first quarter of 1983 is no longer available for reanalysis; however, the licensee has agreed to reserve a portion of the sample from the second quarter for reanalysis when this problem is resolved. (Open Item 50-331/83-13-04)

b. Results of Sample Comparisons - Third Quarter 1983

Liquid, gas, air particulate filter and charcoal adsorber samples were analyzed by the licensee and by the NRC inspectors using the Region III Mobile Laboratory. In addition, the licensee was provided with an NBS traceable spiked air particulate sample. Results for these comparisons are tabulated in Table II with the comparison criteria given in Attachment 1. In addition, a liquid sample has been sent to the Radiological Environmental Sciences Laboratory, the NRC's Reference Laboratory. The licensee agreed to perform analyses for H-3, gross beta, Sr-89, and Sr-90 (gross beta to be counted August 3, 1983) and to report the results to Region III. Results for these comparisons will be included in an addendum to this report. (Open Item 50-331/83-15-03)

The licensee had 37 agreements or possible agreements out of 40 comparisons. The three disagreements in the liquid sample from a waste storage tank were for isotopes not in the licensee's library. Y-92 and As-76 due to their short half lives are not normally seen in effluent samples. The licensee infers the level of Mo-99 in

a sample by measuring the activity of the daughter Tc-99m after equilibrium is achieved. The licensee agreed to add these isotopes to the library. Additional initial disagreements for Zn-65 and Np-239 were resolved by making minor changes to the licensee's library. Most of these problems were aggravated by the fact that the sample analyzed was not typical of an effluent sample but contained many isotopes not normally seen in effluent samples causing problems in identification and interferences between closely spaced gamma ray peaks.

No items of noncompliance or deviations were identified.

6. Exit Interview

The inspectors met with licensee representatives denoted in Section 1 at the conclusion of the inspection on July 21, 1983. The inspectors summarized the purpose, scope and findings of the inspection. The licensee acknowledged the inspectors' comments and agreed to the following:

a. Continue to resolve the problem of strontium analysis and provide results of analysis of various strontium samples (Open Item 50-331/83-13-01)

b. Closeout of findings to QA/QC audit of chemistry laboratory. (Open Item 50-331/83-13-02)

c. Analyze the split liquid sample for gross beta, H-3, Sr-89, and Sr-90 according to agreed upon dates and report the results to Region III. (Open Item 50-331/83-13-03)

d. Reserve a portion of air particulate composite sample for the second quarter of 1983 for reanalysis of Sr-90. (Open Item 50-331/83-13-04)

The licensee also informed the inspectors by telephone on July 29, 1983 that an adequate response from the licensee's REMP contractor had been received before the due date of extension for one finding in a corporate QA audit.

Attachments:

1. Attachment 1, Comparison Criteria
2. Table I, Comparisons, First Quarter, 1983
3. Table II, Comparisons, Third Quarter, 1983

TABLE I

U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DUANE ARNOLD
FOR THE 1 QUARTER OF 1983

		-------NRC--------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
L WASTE	H-3	4.2E-04	8.0E-06	4.0E-04	5.2E-06	9.5E-01	5.3E 01	A
	SR-89	2.0E-04	5.0E-06	1.2E-04	2.0E-05	6.0E-01	4.0E 01	P
	SR-90	2.3E-04	9.0E-06	8.3E-07	1.0E-07	3.6E-03	2.6E 01	D

T TEST RESULTS:
A=AGREEMENT
D=DISAGREEMENT
P=POSSIBLE AGREEMENT
N=NO COMPARISON

TABLE 1

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DUANE ARNOLD
FOR THE 3 QUARTER OF 1983

		------NRC------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
C FILTER	I-131	4.3E-03	6.6E-05	3.9E-03	7.4E-05	9.0E-01	6.6E 01	A
	I-133	5.2E-03	1.6E-04	5.3E-03	1.1E-04	1.0E 00	3.2E 01	A
P FILTER	BA-140	1.5E-03	6.8E-05	1.7E-03	1.2E-04	1.2E 00	2.2E 01	A
OFF GAS	AR-41	1.2E-03	2.3E-05	1.1E-03	3.7E-05	8.8E-01	5.3E 01	A
	KR 85M	6.5E-04	8.2E-06	4.6E-04	9.6E-06	7.0E-01	7.9E 01	P
	KR-87	3.8E-03	4.8E-05	3.8E-03	4.5E-05	9.9E-01	7.8E 01	A
	KR-88	2.3E-03	3.1E-05	2.1E-03	3.9E-05	9.0E-01	7.6E 01	A
	XE-133	2.2E-04	1.3E-05	1.9E-04	1.5E-05	8.6E-01	1.8E 01	A
	XE-135	3.1E-03	1.7E-05	2.8E-03	1.7E-05	9.2E-01	1.9E 02	A
	XE-135M	1.8E-02	6.7E-04	1.3E-02	2.1E-04	7.3E-01	2.6E 01	P
	XE-138	6.8E-02	1.9E-03	5.7E-02	5.7E-04	8.3E-01	3.7E 01	A
F SPIKED	CD-109	3.7E-01	1.8E-02	3.4E-01	1.4E-03	9.2E-01	2.1E 01	A
	CO-57	8.8E-03	4.7E-04	7.8E-03	4.7E-05	8.9E-01	1.9E 01	A
	CE-139	1.1E-02	4.8E-04	9.7E-03	9.2E-05	8.9E-01	2.3E 01	A
	SN-113	2.7E-02	1.1E-03	2.5E-02	3.0E-04	9.0E-01	2.5E 01	A
	CS-137	2.0E-02	8.9E-04	1.8E-02	1.1E-04	9.1E-01	2.2E 01	A
	CO-60	2.3E-02	9.8E-04	2.1E-02	1.0E-04	9.0E-01	2.4E 01	A
	Y-88	5.6E-02	2.7E-03	5.1E-02	6.7E-04	9.2E-01	2.0E 01	A
L WASTE	XE-135	5.8E-06	2.4E-07	5.5E-06	0.0E-01	9.4E-01	2.4E 01	A
	NA-24	4.1E-05	5.9E-07	3.7E-05	0.0E-01	8.9E-01	7.0E 01	A
	MN-54	1.2E-05	3.3E-07	8.2E-06	0.0E-01	6.9E-01	3.6E 01	P
	MN-56	1.0E-05	5.4E-07	1.0E-05	0.0E-01	9.9E-01	1.9E 01	A
	I-131	1.7E-06	2.2E-07	1.5E-06	0.0E-01	8.8E-01	7.6E 00	A
	I-132	1.8E-05	6.2E-07	1.6E-05	0.0E-01	8.8E-01	2.9E 01	A
	I-133	1.5E-05	3.0E-07	1.6E-05	0.0E-01	1.0E 00	5.2E 01	A
	I-134	2.5E-05	3.4E-06	1.4E-05	0.0E-01	5.6E-01	7.3E 00	A
	I-135	3.2E-05	1.4E-06	2.7E-05	0.0E-01	8.3E-01	2.3E 01	A
	SR-92	3.4E-06	4.1E-07	3.4E-06	0.0E-01	1.0E 00	8.4E 00	A

T TEST RESULTS:
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P=POSSIBLE AGREEMENT
N=NO COMPARISON

TABLE 11

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DUANE ARNOLD
FOR THE 3 QUARTER OF 1983

		------NRC--------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
L WASTE	RU-105	1.2E-05	7.9E-07	8.0E-06	0.0E-01	6.9E-01	1.5E 01	A
	CR-51	2.0E-04	2.3E-06	1.6E-04	0.0E-01	8.0E-01	8.8E 01	P
	CO-58	7.2E-06	2.9E-07	6.0E-06	0.0E-01	8.3E-01	2.5E 01	A
	ZN-65	4.7E-06	5.5E-07	3.5E-06	0.0E-01	7.5E-01	8.5E 00	A
	W-187	3.5E-06	8.1E-07	3.1E-06	0.0E-01	8.8E-01	4.4E 00	A
	NP-239	7.2E-06	4.5E-07	6.4E-06	0.0E-01	8.9E-01	1.6E 01	A
	LA-140	1.1E-06	1.8E-07	6.7E-07	0.0E-01	6.2E-01	6.1E 00	A
	TC-99M	2.3E-05	2.3E-07	2.5E-05	0.0E-01	1.1E 00	1.0E 02	A
	SR-91	4.6E-06	9.2E-07	3.5E-06	0.0E-01	7.6E-01	5.0E 00	A
	Y-92	2.2E-05	3.1E-06	0.0E-01	0.0E-01	0.0E-01	7.2E 00	D
	AS-76	2.3E-05	6.5E-07	0.0E-01	0.0E-01	0.0E-01	3.5E 01	D
	MO-99	8.4E-06	1.4E-06	0.0E-01	0.0E-01	0.0E-01	6.2E 00	D

T TEST RESULTS:
A=AGREEMENT
D=DISAGREEMENT
P=POSSIBLE AGREEMENT
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 Reference Laboratory'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. The acceptance category reported will be the narrowest into which the ratio fits for the resolution being used.

RESOLUTION	RATIO = LICENSEE VALUE/NRC REFERENCE VALUE		
	Agreement	Possible Agreement "A"	Possible Agreeable "B"
<3	No Comparison	No Comparison	No Comparison
≥3 and <4	0.4 - 2.5	0.3 - 3.0	No Comparison
≥4 and <8	0.5 - 2.0	0.4 - 2.5	0.3 - 3.0
≥8 and <16	0.6 - 1.67	0.5 - 2.0	0.4 - 2.5
≥16 and <51	0.75 - 1.33	0.6 - 1.67	0.5 - 2.0
≥51 and <200	0.80 - 1.25	0.75 - 1.33	0.6 - 1.67
≥200	0.85 - 1.18	0.80 - 1.25	0.75 - 1.33

"A" criteria are applied to the following analyses:

Gamma spectrometry, where principal gamma energy used for identification is greater than 250 keV.

Tritium analyses of liquid samples.

"B" criteria are applied to the following analyses:

Gamma spectrometry, where principal gamma energy used for identification is less than 250 keV.

Sr-89 and Sr-90 determinations.

Gross beta, where samples are counted on the same date using the same reference nuclide.