U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/85019(DRSS)

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: August 5-9, 12-14, and 21, 1985

Inspectors: M. J. Oestmann for M. Schumacher — 8/29/85 — Date

R. B. Holtzman for M. Schumacher — 8/29/85 — Date

Approved By: M. C. Schumacher, Chief — 8/29/85 — Date
Independent Measurements and
Environmental Protection Section

Inspection Summary

Inspection on August 5-9, 12-14, and 21, 1985 (Report No. 50-331/85019(DRSS))
Areas Inspected: Routine, announced inspection of confirmatory measurements. The Region III mobile laboratory was onsite to analyze radioactive samples which were collected and split with the licensee for comparison. The inspectors also reviewed recent personnel changes in the Chemistry Group and licensee action on previously identified findings. The inspection involved 54 inspector-hours onsite by two NRC inspectors.
Results: No violations or deviations were identified.

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DETAILS

1. Persons Contacted

K. Young, Assistant Plant Superintendent, Radiation Protection and Security, Iowa Electric (IE)
[1]W. Miller, Technical Services Superintendent, IE
[1]J. Smith, Acting Technical Support Supervisor, IE
[1] [2]H. Giorgio, Radiation Protection Supervisor, IE
[1]L. Kriege, Acting Chemistry Coordinator, Linn Engineering
[2] [3]P. Schmelzer, Assistant Chemistry Coordinator, IE
[1] [2]R. Lewis, Chemistry Foreman, IE
[1] [2] [3]A. Feldman, Radiological Engineer, Chem Rad Services
J. Ford, Chemistry Technician, IE
[3]C. Sealls, Chemistry Technician IE

[1]Attended plant exit meeting on August 8, 1985.

[2]Present during a telephone conversation on August 2, 1985

[3]Present during telephone conversations on August 12, 1985.

[4]Present during telephone conversation on August 9, 1985.

2. Licensee Action on Previous Inspection Findings

a. (Open) Open Item (50-331/83013-02): Inadequate ventilation in laboratory and sample hoods - a third finding in a licensee internal audit (I-82-28). A Design Change Package has been received at the plant to modify the existing ventilation system. However it has been placed on a low priority since it was discovered that to modify the existing ventilation system, workers would have to cut through asbestos material. Licensee representatives were unable to provide the inspectors any information as to when the work would be started or completed until the problem of the toxicity of the asbestos materials solved. This item remains open pending completion of the necessary modifications to provide adequate ventilation in the laboratory and fume hoods.

b. (Closed) Violation Severity Level 5 (50-331/85009-01): The licensee failed to collect one wildlife sample in 1983 and in 1984 and one soil sample in 1984. The licensee has taken the necessary corrective actions as outlined in their letter dated June 4, 1985 to assure that the required sampling of wildlife and soil samples would be performed in accordance with the Environmental Technical Specification, Appendix B, Table 4.3-1. The licensee has also expanded the monthly log of environmental sampling, maintained by a radiological engineer, to provide management with more data on sample collection. These samples have been collected as required during 1985.

c. (Closed) Open Item (50-331/85009-02): Licensee to check on anomalous Sr-90 result in milk samples from sample location 93. The licensee determined that the milk samples were obtained from goats and that the hay fed the goats was found to be consistently higher in Sr-90

levels than was the other vegetation (corn and soybeans) sampled. The observed variation in Sr-90 activity reflects the uptake fractions of the different vegetation types. It is expected that location 93 will continue to show slightly elevated Sr-90 levels in the goats milk (4 pCi/l). This level is half the 8 pCi/l level of Sr-90 in the EPA Drinking Water Standard.

3. Management Controls and Organization

The inspectors reviewed the management controls and organization of the Chemistry Group. The group leader is the Chemistry Coordinator (CC) who reports to the Radiation Protection Supervisor, who in turn reports to the Assistant Plant Superintendent-Radiation Protection and Security. Dr. L. Kriege is now the Acting Chemistry Coordinator. The inspectors determined that the qualifications of the Acting Chemistry Coordinator meet the requirements of Section 4.4.3 of ANSI/ANS 3.1-1978. The former Chemistry Coordinator is presently the Corporate Chemist. The Assistant Chemistry Coordinator is P. Schmelzer who is presently involved in implementing the Appendix I Technical Specification change (which will be implemented by January 1, 1986).

No violations or deviations were identified.

4. Confirmatory Measurements

Samples collected for the confirmatory measurements program were off gas, a charcoal adsorber, reactor coolant liquid, an air particulate filter, and liquid radwaste, and analyzed by both the licensee in his laboratory and by the NRC inspectors using the Region III Mobile Laboratory. The results of the NRC-licensee comparisons are given in Table 1 with comparison criteria presented in Attachment 1. The liquid radwaste sample was filtered through a 0.45 µm membrane filter to remove solids (mainly spent resin fines) from the liquid prior to the split with the licensee. The licensee agreed to analyze the split filtered sample for gross beta, H-3 Sr-89, and Sr-90. The results will be compared with those from the NRC Reference Laboratory, the Radiological Environmental Sciences Laboratory (RESL), and will be included in an addendum to this report (Open Item 50-331/85019-01).

The licensee had 27 agreements out of 30 comparisons. Two additional nuclides (I-131 in the primary reactor coolant and Cs-137 in the liquid waste) were detected, but because of poor counting statistics, no comparisons were made. The comparison of Kr-85m in the off gas sample was in disagreement (67% of the NRC value). The licensee attributed this low value to the use of the 151-kev peak for Kr-85m. This energy is on the knee of the detector efficiency curve where two curves meet, and hence, this region is very sensitive to calibration errors. At the request of the inspectors, the spectrum was reanalyzed using a secondary peak at 305 keV and an agreement was achieved. This peak was not listed in the licensee library normally used for this analysis and thus was not available for the analyst to use for confirmation. Had it been, the discrepancy at 151 keV should have been noted. In a telephone discussion on this matter on August 21, 1985, licensee representatives agreed to examine their calibration in the 151-keV region and to add the 305-keV line to the library (Open Item 50-331/85019-02).

In the primary sample the short-lived (2.59 h) Mn-56 comparison agreed only after the criterion was relaxed to the next higher acceptance range (Attachment 1). This adjustment was made to allow for the additional uncertainty introduced by correcting for the I-134 contribution to the 847 keV peak used to quantify Mn-56. This adjusted value was consistent with the value obtained using a secondary peak at 1810 keV. This correction was not made by the licensee because the interfering 847 keV line for I-134 is not in the licensee's library and the discrepancy with the 1810-keV peak was not noted. In the August 21 telephone discussion of this problem, licensee representatives agreed to review and determine the need for change in their analysis for Mn-56. (Open Item No. 50-331/85019-03). They also agreed to discuss the Kr-85m and Mn-56 problems and the importance of analyst intervention in such cases in a regular Friday training session with the chemistry technicians. (Open Item No. 50-331/85019-04).

The As-76 comparison was in disagreement because this nuclide was not in the licensee's library used in this analysis. (It was in other licensee libraries). The licensee has agreed to include As-76 in his library for reactor coolant. (Open Item No. 50-331/85019-05),

The filtered waste sample gave disagreement for Mn-54 when counted by the licensee in a two-liter Marinelli and again when recounted in a one-liter plastic bottle. Agreement for Co-60 was achieved both times. The cause for disagreement was not discovered; it may owe to differing effects of the settling of suspended particles on the different licensee and NRC counting geometries. The licensee has agreed to analyze a spiked liquid sample from the NRC Reference Laboratory in an attempt to resolve this matter. (Open Item 50-331/85019-06)

No violations or deviations were identified.

5. Quality Control/Quality Assurance of Analytical Measurements

The inspectors reviewed the operation of the gamma spectrometry system, which consists of an ORTEC 7010 Analyzer and an ORTEC 1150 Computer System (equivalent to a DEC PDP 11/34) with a VT100 monitor and a Decwriter III printer. Two high purity Ge detectors operate on the system, one in the radiochemistry laboratory and the other in the health physics laboratory. The backup system is a Canberra Series 35 Multichannel Analyzer in the Offsite Radiological Laboratory in the licensee's corporate office in Cedar Rapids. The radiochemistry detector is checked daily with an Eu-152 source on a filter paper. Four parameters are stored in the computer from each test, the ratio of each factor to that obtained from the average of a set of counts (the "standard"): (1) the "recovery factor," the ratio of counts in a set of peaks to those in the standard set; (2) the change in the recovery factor from day-to-day; (3) the mean ratio of the FWHM of the test peaks to those of the standard; and (4) the FWHM-to-FWTM (full width one-tenth maximum) relative to those of the standard set. The last ratio, in particular, provides a sensitive measure of changes in the system. These parameters usually vary by less than 0.5% from measurement to measurement on daily results, based on the inspector's review of selected data from January 6, 1985. Some larger variations, up to about ± 2% were, however, observed and were attributed as stated by a licensee representative,

to a fault in the analyzer, which was subsequently repaired. The increased variability was first noted on the plotted control chart posted near the analyzer. This quality control system appears to be very good and a valuable asset in the maintenance of the system.

One problem noted in the previous report on radio chemistry quality control[1] was that, while the cross check results with the licensee's reference laboratory, Analytics, Inc., were generally in agreement, the licensee's overall levels were lower than Analytics' by about 10-15%. The results of our comparison (Table 1) are consistent with the above in that, except for the charcoal filter, the mean ratio of licensee to NRC values was about 90%.

Other than the charcoal filter, these comparisons suggest a peristent bias. Subsequent comparisions with Analytics, Inc. in the second quarter of 1985 showed a similar, but smaller bias for a liquid sample with licensee/Analytics ratio being 0.94 ± 0.04Cs. No bias was observed in the air filter sample, 0.99 ± 0.10. The licensee agreed to test some of the most frequently used calibrations to further examine possible bias.

The Radiological Engineer in charge of the gamma spectrometry system and the Chemistry Foreman appeared to be knowledgeable about the system and its operation. No problems were observed the in the technician's efforts in collecting and processing of the samples for analysis.

No violations or deviations were identified.

6. Exit Interview

The inspectors met with licensee representatives denoted in Section 1 at the conclusion of the inspection on August 8, 1985, and discussed the scope and findings of the inspection. Followup telephone discussions concerning the confirmatory measurements comparison were held with licensee representatives on August 9, 12-14 and 21, 1985. The importance of analyst intervention in the evaluation of problems seen in the Kr-85m and Mn-56 comparison was emphasized.

The inspectors discussed the likely informational 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 1, Confirmatory Measurements Program, Third Quarter of 1985
2. Attachment, Criteria for Comparing Analytical Measurements

[1] Inspection Report 50-331/85009

TABLE 1

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DUANE ARNOLD
FOR THE 3 QUARTER OF 1985

		------NRC-------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
OFF GAS	AR-41	7.7E-05	1.3E-05	8.1E-05	0.0E-01	1.0E 00	5.9E 00	A
	KR-85M	3.2E-04	6.5E-06	2.1E-04	0.0E-01	6.6E-01	4.9E 01	D
	KR-87	1.6E-03	2.7E-05	1.5E-03	0.0E-01	9.4E-01	5.9E 01	A
	KR-88	1.0E-03	2.2E-05	8.6E-04	0.0E-01	8.6E-01	4.5E 01	A
	XE-133	7.6E-05	5.9E-06	5.4E-05	0.0E-01	7.1E-01	1.3E 01	A
	XE-135	1.2E-03	1.0E-05	1.1E-03	0.0E-01	9.2E-01	1.2E 02	A
	CS-138	1.8E-02	3.0E-04	1.6E-02	0.0E-01	8.9E-01	6.0E 01	A
P FILTER	I-131	6.7E-04	2.0E-05	6.8E-04	0.0E-01	1.0E 00	3.4E 01	A
	I-133	7.7E-04	3.0E-05	8.1E-04	0.0E-01	1.0E 00	2.6E 01	A
C TER	I-131	6.7E-04	2.0E-05	6.8E-04	0.0E-01	1.0E 00	3.4E 01	A
	I-133	7.7E-04	3.0E-05	8.1E-04	0.0E-01	1.0E 00	2.6E 01	A
P FILTER	CR-51	6.5E-04	9.4E-05	5.7E-04	0.0E-01	8.8E-01	6.9E 00	A
	MN-54	3.2E-04	3.5E-05	2.5E-04	0.0E-01	7.8E-01	9.1E 00	A
	CO-58	1.3E-04	2.4E-05	1.3E-04	0.0E-01	1.0E 00	5.4E 00	A
	CO-60	2.5E-03	8.2E-05	2.6E-03	0.0E-01	1.0E 00	3.0E 01	A
PRIMARY	NA-24	6.5E-04	1.9E-05	6.3E-04	2.1E-05	9.7E-01	3.4E 01	A
	CR-51	5.3E-03	1.2E-04	5.3E-03	1.0E-04	1.0E 00	4.4E 01	A
	MN-56	3.5E-04	1.3E-05	5.3E-04	2.5E-05	1.5E 00	2.7E 01	A*
	CO-58	8.3E-05	9.8E-06	6.1E-05	8.5E-06	7.4E-01	8.5E 00	A
	CO-60	1.5E-04	1.1E-05	1.1E-04	7.2E-06	7.1E-01	1.4E 01	A
	AS-76	6.1E-04	1.9E-05	0.0E-01	0.0E-01	0.0E-01	3.2E 01	D
	I-131	2.0E-05	7.6E-06	1.6E-05	0.0E-01	8.0E-01	2.6E 00	N
	I-132	3.5E-04	1.6E-05	3.2E-04	2.1E-05	9.1E-01	2.2E 01	A
	I-133	1.2E-04	1.0E-05	1.0E-04	8.4E-06	8.3E-01	1.2E 01	A
	I-134	1.3E-03	1.1E-04	1.0E-03	1.4E-04	7.7E-01	1.2E 01	A
	I-135	3.7E-04	3.9E-05	3.2E-04	4.0E-05	8.7E-01	9.5E 00	A
	SR-92	2.7E-04	1.8E-05	2.6E-04	2.1E-05	9.6E-01	1.5E 01	A
	TC-99M	2.2E-03	1.5E-05	2.5E-03	1.7E-05	1.1E 00	1.5E 02	A

T ST RESULTS:
A REEMENT
D=DISAGREEMENT
*=CRITERIA RELAXED
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 1985

		------NRC-------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
PRIMARY	MO-99	2.1E-04	5.2E-05	1.2E-04	4.9E-05	5.7E-01	4.0E 00	A
	BA-139	4.8E-04	5.7E-05	3.5E-04	8.5E-05	7.3E-01	8.4E 00	A
	SR-91	5.9E-05	9.8E-06	6.8E-05	3.0E-05	1.1E 00	6.0E 00	A
L WASTE	MN-54	3.8E-07	7.3E-08	1.1E-07	0.0E-01	2.9E-01	5.2E 00	D
	CO-60	1.2E-06	1.4E-07	7.5E-07	0.0E-01	6.2E-01	8.6E 00	A
	CS-137	3.0E-07	1.1E-07	2.6E-07	0.0E-01	8.7E-01	2.7E 00	N

T TEST RESULTS:
A [redacted]EEMENT
D=[redacted]AGREEMENT
*=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.