U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/86016(DRSS)

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

Licensee: Iowa Electric Light and
Power Company
IE Towers
Post Office Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Duane Arnold Site, Palo, IA

Inspection Conducted: September 15-18, 1986

A. G. Januska

Inspector: A. G. Januska 10/3/86
Date

M. C. Schumacher

Approved By: M. C. Schumacher, Chief 10/3/86
Radiological Effluents and Date
Chemistry Section

Inspection Summary

Inspection on September 15-18, 1986 (Report No. 50-331/86016(DRSS))
Areas Inspected: Routine, unannounced inspection of (1) the Confirmatory Measurements Program including sample split and onsite analysis with the Region III Mobile Laboratory; review of the licensee's counting room quality control program and (2) open items identified during previous inspections.
Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

*R. Salmon, Technical Services Superintendent
*H. Giorgio, Radiation Protection Supervisor
*J. Smith, Technical Support Supervisor
*L. Kriege, Chemistry Coordinator
*R. Lewis, Chemistry Foreman
*P. Schmelzer, Health Physicist
*G. Taylor, Chemistry
G. Ford, Chemistry Technician
G. Skala, Chemistry Technician
W. McVickers, Chemistry Technician

*Denotes those present at the exit interview.

2. Licensee Action on Previous Inspection Findings

a. (Open) Open Item (331/83013-02): Inadequate ventilation in laboratory and sample hoods (finding in radiochemistry audit I-82-28). The licensee is currently engaged in removal of asbestos material in the plant. Tentative plans for the ventilation modification include asbestos removal in the chemistry laboratory starting in late October and the issuance of a DCP in early 1987 followed by the modification. This item will remain open and be examined during a subsequent inspection.

b. (Closed) Open Item (331/85019-02): Licensee to examine gamma calibration in the Kr-85m 151 kev region and add the 305 kev line to his library for gamma spectroscopy. The licensee has added the Kr-85m 305 kev line to his library and made it his quantification peak with the 151 kev line as a confirming peak. This change resulted in an agreement for this nuclide as noted in the sample comparison result in Table 1.

c. (Closed) Open Item (331/85019-03): Licensee to review need for change in his analysis for Mn-56. The licensee has changed his library so that the 1810 kev line is now used for quantification with the 847 kev line as a confirming peak. The changes in Sections 2b and 2c and in Section 3a below should ensure greater accuracy in quantification.

d. (Closed) Open Item (331/85019-04): Discuss the Kr-85m and Mn-56 problems and importance of analyst intervention at training sessions. The licensee presented training on gamma spectroscopy analytical algorithms in addition to training on analyst intervention. The technician assigned to the counting room at this time appeared to be knowledgeable on the operation of the spectroscopy system and the required review of analytical data.

e. (Closed) Open Item (331/85D19-05): Include As-76 in his gamma spectroscopy library. The licensee added As-76 to his library as evidenced by the quantifications in L WASTE and PRIMARY listed in Table 1.

3. Confirmatory Measurements

a. Sample Split

Six samples (air particulate, charcoal, liquid collector tank, gas, reactor coolant and spiked particulate) were analyzed for gamma emitting isotopes by the licensee and in the Region III mobile laboratory onsite. Results of the sample comparisons are listed in Table 1; comparison criteria are given in Attachment 1. The licensee achieved all (45) agreements.

On the air particulate, Ba-139 was the only nuclide present for comparison and therefore a spiked air particulate, belonging to the licensee, was analyzed and compared as if a real sample.

A reactor coolant sample, filtered through a 0.45µm filter, was analyzed two hours after collection according to procedure and yielded disagreements for Co-58, Co-60, I-134 and Sr-92. As settling and plate out, a phenomenon observed on previous occasions, was suspected of being the problem, a second sample was collected, filtered, and counted immediately. Co-58 and I-134 remained disagreements. The criterion for Co-58 was relaxed to allow for the uncertainty of plate out. The I-134 results and the licensee's nuclide library were examined. The licensee quantified I-134 using the 884 kev line which also corresponds to an energy line of Ag-110m. The shared line reduced the activity reported for both nuclides. The licensee removed this line from the Ag-110m portion of the library which resulted in an agreement for I-134.

The inspector stressed the importance of preparing and counting liquid samples as soon after collection as possible to reduce plate out and settling effects which produce nonconservative results. The licensee acknowledged the inspector's comments and stated that appropriate changes will be made.

The licensee agreed to analyze a portion of a collector tank sample for gross beta, H-3, Sr-89 and 90 and report the results to RIII (Open Item 331/86016-01). The results will be compared to those of the NRC and reported to the licensee as an addendum to this report.

Although the licensee achieved all agreements, both the two liter marinelli (L WASTE) and the 10 ml vial (PRIMARY) results suggest a nonconservative bias. In contrast, the particulate and charcoal results are slightly conservatively biased. The inspector discussed possible causes for the biases with the licensee.

b. QA/QC of Analytical Measurements

The licensee conducts a QC program for the count room equipment in accordance with the DAEC Chemistry Quality Control Manual and appropriate Plant Chemistry Procedures. The chemistry technician assigned to the count room performs "Equipment Performance Checks" daily, logs results in a Personal Laboratory Logbook and also onto control charts in the count room. The current count room technician's logbook was examined and found to be complete and well maintained. The control charts were up-to-date.

Both the technician who collected liquid samples and processed them for analysis, and the count room technician who collected samples in addition to analyzing them for the sample split appeared to be well trained and knowledgeable in their job requirements. The Chemistry Foreman demonstrated knowledge of the gamma spectroscopy system in addition to the overall Chemistry/Radiochemistry/Counting room operation.

The inspector examined calibration records of the gamma spectroscopy system mainly for the liquid and particulate geometries because of biases observed (Section 3a). The data generated and the resultant calibration curves appear technically correct.

The licensee participates in a quarterly cross check program with a vendor. Results from the first and second quarter of 1986 were examined and found to be in good agreement.

No violations or deviations were identified.

4. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee or both. An open item disclosed during the inspection is discussed in Section 3a.

5. Exit Interview

The inspector reviewed the scope and findings of the inspection with the licensee representatives listed in Section 1. The apparent biases noted were discussed in detail. The licensee acknowledged the inspectors comments.

During the exit interview, the inspector discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. Licensee representatives did not identify any such documents or processes as proprietary.

Attachments:
1. Table 1, Confirmatory Measurements Program Results, 3rd Quarter 1986
2. Attachment 1, Criteria for Comparing Analytical Measurements

TABLE 1

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DAEC
FOR THE 3 QUARTER OF 1986

		------NRC------		----LICENSEE----		---LICENSEE:NRC----		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
L WASTE	NA-24	8.5E-06	3.5E-07	7.5E-06	0.0E-01	8.8E-01	2.4E 01	A
	CR-51	7.1E-06	1.6E-06	7.4E-06	0.0E-01	1.0E 00	4.5E 00	A
	MN-54	2.0E-06	2.2E-07	1.6E-06	0.0E-01	8.3E-01	8.8E 00	A
	CO-58	5.8E-06	2.7E-07	5.3E-06	0.0E-01	9.1E-01	2.1E 01	A
	CO-60	1.3E-05	3.8E-07	1.2E-05	0.0E-01	9.5E-01	3.4E 01	A
	ZN-65	2.5E-06	5.3E-07	1.9E-06	0.0E-01	7.5E-01	4.8E 00	A
	AS-76	1.3E-06	3.2E-07	1.2E-06	0.0E-01	9.2E-01	4.0E 00	A
	I-132	8.6E-07	1.3E-07	5.5E-07	0.0E-01	6.4E-01	6.4E 00	A
	I-133	1.6E-06	2.1E-07	1.2E-06	0.0E-01	7.1E-01	7.9E 00	A
	Y-91M	4.8E-07	1.5E-07	4.1E-07	0.0E-01	8.5E-01	3.2E 00	A
	TC-99M	2.9E-06	1.4E-07	2.8E-06	0.0E-01	9.7E-01	2.0E 01	A
OFF GAS	KR-85M	1.5E-04	4.2E-06	1.7E-04	0.0E-01	1.2E 00	3.5E 01	A
	KR-87	6.8E-04	2.2E-05	8.4E-04	0.0E-01	1.2E 00	3.1E 01	A
	KR-88	4.5E-04	1.9E-05	4.1E-04	0.0E-01	9.2E-01	2.3E 01	A
	XE-133	4.2E-05	6.4E-06	3.9E-05	0.0E-01	9.4E-01	6.5E 00	A
	XE-135	6.3E-04	7.4E-06	6.2E-04	0.0E-01	1.0E 00	8.4E 01	A
	XE-135M	3.1E-03	3.2E-04	2.5E-03	0.0E-01	8.1E-01	9.7E 00	A
	XE-138	1.3E-02	1.1E-03	1.3E-02	0.0E-01	9.6E-01	1.2E 01	A
	AR-41	8.1E-05	1.2E-05	7.6E-05	0.0E-01	9.5E-01	6.4E 00	A
PRIMARY	NA-24	2.7E-04	1.2E-05	2.7E-04	1.5E-05	9.8E-01	2.2E 01	A
	CR-51	2.9E-03	1.7E-04	2.7E-03	1.8E-04	9.3E-01	1.7E 01	A
	CO-58	1.8E-04	1.1E-05	1.3E-04	1.2E-05	7.4E-01	1.7E 01	A*
	CO-60	2.1E-04	9.6E-06	1.7E-04	9.2E-06	8.0E-01	2.2E 01	A
	ZN-65	6.3E-05	1.4E-05	3.9E-05	0.0E-01	6.2E-01	4.5E 00	A
	AS-76	1.2E-03	3.0E-05	1.2E-03	3.5E-05	1.0E 00	3.8E 01	A
	I-132	3.2E-04	1.7E-05	2.7E-04	1.6E-05	8.3E-01	1.9E 01	A
	I-133	1.5E-04	1.2E-05	1.0E-04	1.0E-05	7.0E-01	1.2E 01	A
	I-134	9.3E-04	2.4E-05	8.3E-04	3.7E-05	9.0E-01	3.9E 01	A
	I-135	2.4E-04	3.9E-05	2.2E-04	3.4E-05	9.3E-01	6.2E 00	A
	SR-92	2.6E-04	1.3E-05	2.2E-04	1.7E-05	8.5E-01	2.0E 01	A

T TEST RESULTS:
REEMENT
SAGREEMENT
*=CRITERIA RELAXED
N=NO COMPARISON

TABLE 1

U S NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

CONFIRMATORY MEASUREMENTS PROGRAM
FACILITY: DAEC
FOR THE 3 QUARTER OF 1986

		NRC		LICENSEE		LICENSEE:NRC		
SAMPLE	ISOTOPE	RESULT	ERROR	RESULT	ERROR	RATIO	RES	T
PRIMARY	TC-99M	2.2E-03	1.8E-05	2.3E-03	1.7E-05	1.0E 00	1.2E 02	A
	RU-106	7.3E-04	9.8E-05	5.2E-04	9.2E-05	7.2E-01	7.5E 00	A
	BA-139	3.3E-04	6.5E-05	2.4E-04	7.5E-05	7.3E-01	5.1E 00	A
	MO-99	3.2E-04	7.4E-05	1.9E-04	5.8E-05	5.9E-01	4.3E 00	A
P FILTER	BA-139	8.4E-04	7.9E-05	6.9E-04	1.5E-04	8.2E-01	1.1E 01	A
C FILTER	I-131	4.5E-04	5.1E-05	5.2E-04	6.0E-05	1.1E 00	8.7E 00	A
	I-133	4.8E-04	7.2E-05	5.7E-04	7.1E-05	1.2E 00	6.7E 00	A
SPIKED	CR-51	9.5E-02	1.4E-03	1.1E-01	2.0E-03	1.2E 00	6.6E 01	A
	MN-54	2.3E-02	3.5E-04	2.5E-02	4.8E-04	1.1E 00	6.5E 01	A
	FE-59	1.7E-02	4.9E-04	1.9E-02	5.2E-04	1.1E 00	3.5E 01	A
	CO-58	1.0E-02	2.9E-04	1.1E-02	3.5E-04	1.1E 00	3.6E 01	A
	CO-60	2.7E-02	3.9E-04	2.9E-02	4.1E-04	1.1E 00	6.9E 01	A
	CS-137	1.4E-02	3.0E-04	1.6E-02	3.9E-04	1.1E 00	4.8E 01	A
	CE-141	1.2E-02	1.7E-04	1.4E-02	2.3E-04	1.1E 00	6.8E 01	A
	CE-144	4.2E-02	7.0E-04	4.9E-02	9.2E-04	1.2E 00	6.0E 01	A

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 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
<4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 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.