U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-254/90024(DRSS); 50-265/90023(DRSS)

Docket Nos. 50-254; 50-265 License Nos. DPR-29; DPR-30

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place
Downers Grove, IL 60515

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

Inspection At: Quad Cities Site, Cordova, Illinois

Inspection Conducted: December 17-21, 1990 and January 9 and 10, 1991

Inspectors: A. G. Januska — Date 2/6/91

J. E. House — Date 2/6/91

Approved By: M. C. Schumacher, Chief
Radiological Controls and
Chemistry Section — Date 2/6/91

Inspection Summary

Inspection on December 17-21, 1990 and January 9 and 10, 1991 (Report Nos. 50-254/90024(DRSS); 50-265/90023(DRSS))

Areas Inspected: Routine unannounced inspection of (1) the licensee's radiation protection program including organization and management controls (IP 83750), external and internal exposure controls (IP 83750), training and qualifications (IP 83750), radiation occurrence reports (IP 83750), and tours, and (2) the confirmatory measurements program including audits and appraisals (IP 84750), organization and management controls (IP 84750), Radiological Environmental Monitoring Program (IP 84750), the environmental monitoring program quality assurance program (IP 84750), split sample collection and analysis (IP 84750), training and qualifications (IP 84750) and 3) follow up on Open Items.

Results: The licensee's method for reduction of personnel contamination events is a strong point in the radiation protection program as are the results of the radiochemical confirmatory measurements sample split in chemistry. Management support for these programs is also a strong point. Repeated failure of access control to high radiation areas was a weakness noted in this inspection which resulted in a noncited violation.

DETAILS

1. Persons Contacted

[1]T. Barber, Regulatory Assurance
[1]P. Behrens, Chemistry Supervisor
[1]J. Burkhead, Nuclear Quality Programs (NQP)
R. Cadogan, Health Physics
K. DeVault, General Instructor
B. Elkin, Health Physics
K. Engle, General Instructor
[1,2]R. Hebeler, Laboratory Supervisor
[1,2]A. Lewis, Health Physics Services Supervisor
G. Moran, Health Physics
P. Moore, Health Physics
[1]G. Powell, Lead Health Physicist
[1]J. Sirovy, Services Director
[1]C. Smith, NQP Superintendent
R. Tank, Health Physics
[1]R. Taylor, Health Physics
[1]R. Wiebenga, Chemistry
[1]J. Wooldridge, Chemistry
M. Zinnen, Health Physics

[1]T. Taylor, Senior Resident Inspector, NRC.
[1]Present at the Exit Meeting on December 21, 1990.
[2]Telephone conversations on January 9 and 10, 1991.

2. General

This inspection was conducted to review the licensee's radiation protection program and conduct split sampling for the confirmatory measurements program. The inspectors toured licensee facilities to review posting, labeling, and access controls and the conduct of operations in the chemistry laboratories.

3. Licensee Action on Previous Inspection Findings

(Closed) Open Item (50-254/90005-01; 50-265/90004-01): Licensee agreed to examine the Fastscan Whole Body Counter (WBC) Quality Control program and make appropriate changes. The inspectors examined the latest Quality Control Chart (QCC) and noted that the licensee now uses an appropriate scale, and plots room temperature and source activity for each QCC check. The source plots are very stable and appear to be the result of a room air conditioner put into use in September 1990. In addition, the licensee has purchased an anti-surge device to eliminate electrical line fluctuations and plans to institute the use of a problem sheet to track recurring troubles. This sheet is in addition to the instrument history log now maintained.

(Closed) Open Item (50-254/89005-03; 50-265/89005-03): Licensee to estimate air inleakage in Radiological Environmental Monitoring Program (REMP) air samplers and correct the problems. The inspectors reviewed the results of a test by the licensee's environmental contractor of

air inleakage. The contractor concluded that the apparent inleakage most likely occurred around the holding ring and not necessarily in the sampling train. Additionally, testing by a Quad Cities Employee concluded that under normal operating conditions the amount of air that bypasses the filter is negligible. The environmental contractor replaced sampling head gaskets starting in November 1989, developed a leak test procedure requiring the placement of plastic over the air inlet face during leak testing and agreed to routine replacement of the gaskets twice per year. These efforts appear to have resolved the problem.

(Closed) Open Item (50-254/89005-01; 50-265/89005-01): Inspector to follow progress in installation of verification monitor of HWC system in RCS. The licensee initiated HWC on October 19, 1990, and is studying the change in radiation levels at selected areas (Section 5). The monitoring system, consisting of Electrochemical Potential monitors, Crack Arrest Verification System (CAVS) and Constant Extension Rate Test Specimen (CERTS) system, is at the site. The licensee is preparing to install suction and discharge piping necessary for the autoclave which will house these systems. Completion of these revisions is expected to take some time. This open item is being closed but will be reviewed during subsequent inspections.

4. Organization and Management Controls (IP 83750, 84750)

The inspectors reviewed the licensee's organization and management controls for the radiation protection (RP) and the chemistry groups. The radiation protection group increased by two since the last inspection and consists of 22 total management and 34 Rad Techs (RTs). The chemistry group increased by one and consists of 10 total management and 11 Chem Techs (CTs). Both groups are divided into first line supervision of the techs, and professionals for operational and technical aspects. The techs are either "A" (fully CECo qualified) or "B" (in training). The current A techs (24 RP and 10 CT) are ANSI N18.1-1971 qualified. All current techs (primarily RTs) are expected to be fully CECo qualified by February 1992. Review of other facets of these groups indicate that there is strong management support for the programs.

No violations or deviations were identified.

5. Training and Qualification (IP 83750)

The inspectors reviewed the licensee's program for training and retraining of "A" RTs and training of contract RTs including course content and applicability, quality of test questions, test results, retesting policy and special task testing.

The inspectors verified through review of records that all of the "A" RTs had received required annual training and had passed a test with a required grade of 80%. The inspectors noted that the course material and tests were challenging.

In addition to the annual training, RTs and RP staff receive supplemental training each quarter. This consists of receiving a folder that contains applicable procedures that have been revised within the previous quarter

and documented operational experiences (OPEX) of interest from other facilities, not limited to CECo. The recipients are required to sign an acknowledgment of completion of the material, complete and return a test on the material, and the folder to the instructor. The tests are corrected and returned to the individual for review and completion if mistakes are found. The quarterly supplements to the annual retraining program are considered a strength by the inspector.

Contractor RTs employed at the station must pass a theory and procedure test on material in a packet made available to each contractor RT. Special tasks (e.g. front desk duties, Fastscan whole body counting and quantitative mask fitting) are treated on a case by case basis with structured training.

The two instructors responsible for these programs have had varied plant experience including nonlicensed operator, RCT, and CT and appear to be very well qualified to conduct the above training and qualification.

No violations or deviations were identified.

6. External Exposure Control and Personal Dosimetry (IP 84750)

The inspectors reviewed the licensee's external exposure control and personal dosimetry programs. The licensee has a National Voluntary Laboratory Accreditation Program (NAVLAP) certificate for Thermoluminescent Dosimeter (TLD) categories I - VIII which is current and applicable for all six CECo nuclear plants. Accreditation is based on the results of a different station each year which qualifies all the stations. Quarterly results for the Quad Cities Station have never exceeded the NAVLAP criteria and are typically within the CECo allowable bias which are considerably more restrictive. No problems were identified in the TLD program.

On October 4, 1990, the station instituted a new Radiation Work Permit (RWP) program to govern access to Radiologically Controlled Areas (RCA). At the same time, electronic dosimeters (ED) replaced self reading dosimeters (SRD) as primary backup to the TLD. The inspector observed on several occasions during the inspection that personnel entering and leaving the RCA were wearing the required dosimetry.

The inspector discussed the new RWP program instituted on October 4, 1990 with ALARA personnel and selectively examined RWPs and associated radiation survey records. The RWPs were complete and the inspector observed personnel reviewing the information before signing on the RWP. Exposure information obtained from EDs is the basis for the generation of a daily report of the previous day's and cumulative exposures which is reviewed by cognizant Health Physicists. When certain preset dose levels are reached the results are flagged and prescribed procedural actions taken. The licensee implements adequate administrative controls to keep personnel exposure below a company administrative limit of 3500 mrem per year.

The inspectors discussed the current site person rem exposure to date versus the projection and last years recorded exposure.

The 1989 actual exposure which included one 80 day outage was 900 rem versus the estimated exposure of 845 rem. The current exposure through December 17, 1990 is 970 rem with a projected final total of 1050, below the 1100 rem estimated for 1990 which included two outages of 142 days.

Hydrogen Water Chemistry (HWC) records were examined to determine the change in personnel exposure. During startup testing performed in June 1990, dose rates in general plant areas increased by a factor of three to five. Precautions were taken prior to the test to identify and secure those areas which had the potential of becoming high radiation areas.

Routine HWC use began in October along with a TLD (quarterly) and continuous ED study in 15 selected areas to quantify radiation levels. These results are to be evaluated by April 30, 1991 to determine the need for additional actions. For the period October 19, 1990, when hydrogen addition was started on both units, through November 21, 1990, the readings (including background) ranged from 6.0 mrem (old training bldg.) to 42.1 mrem (north end of crib house) while fence readings ranged from 14.0 mrem (east fence) to 26.9 mrem (north fence). During October and November Units one and two had HWC addition of 29.6% and 25.6% of the time respectively. From November 21, 1990 through December 21, 1990 the fish house increased from 25.2 to 47.1 mrem. This matter will be reviwed in subsequent inspections.

No violations or deviations were identified.

7. Control of Radioactive Materials and Contamination, Surveys, and Monitoring (IP 84750)

The inspectors discussed the licensee's efforts and examined reports related to the reduction of personnel contamination events, releases of contaminated plant areas and plant occurrences.

Personnel contamination events (PCEs) defined as 1000 dpm measured at 2 cm. with a 15 cm^2 probe on skin or personal clothing have been on the decline since 1987 when 528 were recorded. In 1988 there were 472 with 76 outage days, in 1989, 326 with 90 outage days and in 1990 through December 21 there were 266 with 142 outage days. The licensee documents each PCE on a procedure form which has input and follow-up by the individual, an assigned RT, the Health Physics Services Supervisor, and the individual's supervisor. The individual must then meet with a review board chaired by the Plant Manager and consisting of assistant Superintendents and above to discuss the event. This management involvement and support appears to be effective in the reduction of PCEs.

The percent of plant (turbine, reactor, and rad waste buildings excluding the drywell, fuel pool, floor grating and stairwells) contamination was approximately 42% prior to the current Q1R11 outage when it rose to 51% in December. A survey of the extent of plant contamination is made monthly and the results reported to Department Heads and above. The inspectors examined a draft action plan for decontamination of plant areas in response to a Performance Enhancement

Program requirement. It delegates responsibilities for tracking total areas, addresses identification and initiation of work requests for material condition problems, provides for a quarterly review by the ALARA Committee to determine progress, and scheduling. The station goal is to reduce the total contaminated areas to below 20 percent by the end of 1991 and below 10 percent by the end of 1992. This effort will be followed during subsequent inspections.

The inspectors reviewed the calibrations and QC checks performed on the licensee's PM-7 and IPM-8/8a personnel monitors. They were done at the required interval; however the inspector noted that the source used for the QC checks only proved operability and did not verify an appropriate alarm setting. The licensee acknowledged the inspectors comments and stated that a source is on order which will allow for routine verification of the alarm setting.

Radiation Occurrence Reports for 1990 were examined. The inspector noted that they were investigated, and that appropriate corrective actions were apparently taken to preclude recurrence. However, of 23 RORs through December 7, eight dealt with failure to control access to high radiation areas where R doors/locks/gates were left unlocked and/or open. These events are violations of Technical Specification 6.2.B which requires that radiation control procedures be adhered to and that a radiation protection program meet the requirements of 10 CFR 20. These were identified by the licensee, were not committed by the same individual, were not in the same location and do not appear to be willful. Therefore, pursuant to Section V.G.1, of Appendix C 10 CFR 2, a violation will not be issued (NCV 50-254/90024-01; 50-265/90023-01).

The licensee has initiated the use of a Radiation Protection Deficiency Report program to establish a data base of minor problems which can be corrected before they become major performance weaknesses. The goal of the program is to improve radiation protection performance using open, less formal communication.

One violation was identified.

8. Radiological Confirmatory Measurements (IP 84750)

a. Sample Split

Five samples (air particulate, charcoal, gas, liquid waste and primary coolant) were analyzed for gamma emitting nuclides by the licensee and by the NRC on site in the Region III Mobile Laboratory. Comparisons were made using the licensee's three high purity germanium detectors and one GeLi detector, each sample being counted on two of the four detectors. In 46 comparisons the licensee achieved 45 agreements and two disagreements. The data is listed in Table 1 and the comparison criteria are given in Attachment 1.

The licensee achieved all agreements except for the comparison of the most recent air particulate filter which resulted in disagreements for I-131 on detectors 25-P844 and 13-1040. The licensee did not detect I-131 whereas the inspectors found 9.00 E-14 microcuries per milliliter (uci/ml). As this is below the Technical Specification LLD of E-11 uci/ml for I-131 on a particulate filter no corrective action is required of the licensee.

The licensee is installing a new software analysis package which should improve overall operation of the gamma spectroscopy system. A comparison of reactor coolant spectra with the NRC system indicated that the new software is operating adequately; however, as this software was not officially certified for use by the licensee at the time of the inspection, this data was not retained by the inspectors and is not included in this report.

A portion of a liquid waste sample will be analyzed for gross beta, H-3, Sr-89, Sr-90 and Fe-55 by the licensee and the results reported to Region III for comparison with an analysis by the NRC Reference Laboratory on a split of the sample (Open Item 50-254/90024-02; 50-265/90023-02).

b. Quality Assurance

The inspectors reviewed the radiological laboratory quality assurance program including physical facilities and laboratory operations. Housekeeping was generally good; laboratory and counting room work space was adequate. Chemistry technicians were observed and evaluated on sample acquisition, preparation, analysis and general laboratory practices. They appeared to be knowledgeable and followed proper laboratory procedures; however, the inspectors noted to licensee representatives that technicians did not wear laboratory coats when handling radioactive plant samples which appears to be a poor practice.

The licensee participates in an intercomparison cross-check program with an outside vendor. The inspectors examined selected results from 1989 and 1990. In 65 comparisons there were 63 agreements and 2 disagreements.

Detector calibration and calibration source certificates appeared to be adequate. Implementation of the instrument quality control program was reviewed. Source checks were run daily as required and the results plotted on trend charts.

No violations or deviations were identified.

9. Audits and Appraisals (IP 83750, 84750)

The inspectors reviewed the QA audit report numbers QAA-04-90-1, 04-90-14, 04-90-17 and surveillances QAS-04-90-56, 04-90-67 and 04-90-79 for chemistry, radiation protection and environmental monitoring performed in 1990. The licensee's QA audit/surveillance program appears adequate to assess technical performance, compliance

with requirements, implementation of appropriate Quality Assurance and Quality Control programs and program activities in the three areas examined. Responses to findings and observations appear to be timely and appropriate; however as noted in Section 10, cleanliness at an environmental monitoring station examined during the inspection appears to have declined since the problem was noted during surveillance QAS-04-90-56. The audits appear to be performance oriented and the auditors very knowledgeable.

No violations or deviations were identified.

10. Radiological Environmental Monitoring Program (REMP) (IP 84750)

The inspectors reviewed the REMP, including the 1989 Annual Environmental Report, and toured selected air sampling stations. The Annual Environmental Report appeared to comply with the REMP requirements. All of the required samples were collected and analyzed. The results do not indicate a significant contribution to the environment due to plant operation.

The inspectors toured nine air sampling stations around the plant, observed calibration dates on equipment, the general condition of sampling stations and tested the filter trains for air inleakage and vacuum pump operation. The inspector noted the following observations to licensee representatives; at sampling station Q-05, the pump developed very little vacuum when the filter train was blocked at the filter housing and at the disconnect fitting with the filter housing removed. Air flow did not decrease significantly in either case indicating air inleakge. The vacuum gauge at station Q-09 was covered with oil and had to be cleaned before a reading could be made. The inside of the sampler housing was generally dirty and equipment was partially covered with an oily residue. Licensee representatives are investigating the causes of the conditions of these sampling stations.

Maintenance and filter changeout services are supplied by a vendor. The licensee agreed to review and improve oversight of this program. Calibration information was properly documented and the remaining samplers were observed to be operating adequately with respect to vacuum and flow. Overall, the REMP appeared to be operating satisfactorily.

No violations or deviations were identified.

11. Exit Interview

The scope and findings of the inspection were discussed with licensee representatives (Section 1) at the conclusion of the onsite inspection on December 21, 1990. The inspectors discussed the apparent recurring problem on the REMP air sampling stations in detail. 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 or processes as proprietary. Additional telephone

discussions were held with licensee representative on January 9, 10, and February 6, 1991, concerning the noncited violation regarding failure to control access to high radiation areas.

Attachments:
1. Table 1, Confirmatory Measurements Program Results, Fourth Quarter 1990
2. Attachment 1, Criteria for Comparing Analytical Measurements

TABLE 1

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

FACILITY: QUAD CITIES

FOR THE 4TH QUARTER OF 1990

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
CHARCOAL	I-131	2.68E-13	4.54E-14	2.70E-13	5.90E-14	1.01	5.9	A
CART.	I-133	9.57E-13	2.57E-13	1.10E-12	2.50E-13	1.15	3.7	N
Detector 13-1040								
AIR PART.	I-131	9.00E-14	1.84E-14	0.00E+00	0.00E+00		4.9	D
Detector	I-133	7.29E-13	1.30E-13	5.40E-13	1.35E-13	0.74	5.6	A
25P844	BA-139	2.39E-10	4.94E-11	1.50E-10	1.90E-11	0.63	4.8	A
	LA-140	6.93E-13	1.41E-13	4.00E-13	1.20E-13	0.58	4.9	A
CHARCOAL	I-131	2.68E-13	4.54E-14	2.30E-13	5.10E-14	0.86	5.9	A
CART.	I-133	9.57E-13	2.57E-13	0.00E+00	0.00E+00		3.7	N
Detector 25-60RA								
AIR PART.	I-131	9.00E-14	1.84E-14	0.00E+00	0.00E+00		4.9	D
Detector	LA-140	6.93E-13	1.41E-13	7.10E-13	1.59E-13	1.02	4.9	A
13-1040	LA-140	6.93E-13	1.41E-13	7.10E-13	1.59E-13	1.02	4.9	A
LIQ.RAD.	MN-54	1.52E-06	6.07E-08	1.60E-06	1.40E-07	1.05	25.0	A
WASTE	CO-60	8.06E-06	1.28E-07	7.50E-06	4.50E-07	0.93	63.0	A
DETECTOR	CS-137	9.53E-07	6.44E-08	9.50E-07	9.20E-08	1.00	14.8	A
25-P844								
LIQ.RAD.	MN-54	1.52E-06	6.07E-08	1.50E-06	1.50E-07	0.99	25.0	A
WASTE	CO-60	8.06E-06	1.28E-07	7.40E-06	4.70E-07	0.92	63.0	A
DETECTOR	CS-137	9.53E-07	6.44E-08	8.40E-07	1.30E-07	0.88	14.8	A
13-1040								
RCS 1	NA-24	7.13E-03	6.95E-05	6.00E-03	5.00E-04	0.84	102.6	A
DETECTOR	CR-51	2.39E-02	1.22E-04	2.00E-02	0.00E+00	0.84	195.9	A
25-P844	MN-54	5.91E-05	6.43E-06	4.70E-05	4.80E-06	0.80	9.2	A
	CO-58	9.34E-05	7.72E-06	7.80E-05	7.00E-06	0.84	12.1	A
	CO-60	2.99E-04	9.85E-06	2.60E-04	1.60E-05	0.87	30.4	A

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
RCS 1	AS-76	1.39E-04	1.57E-05	1.20E-04	1.30E-05	0.86	8.9	A
DETECTOR	I-131	1.22E-05	3.60E-06	1.30E-05	2.10E-06	1.07	3.4	N
25-P844	I-133	1.88E-04	1.33E-05	1.50E-04	0.00E+00	0.80	14.1	A
RCS 2	NA-24	7.09E-03	7.47E-05	6.20E-03	5.30E-04	0.87	94.9	A
DETECTOR	CR-51	2.41E-02	1.22E-04	2.10E-02	0.00E+00	0.87	197.5	A
28-TP20	MN-54	5.35E-05	7.78E-06	4.70E-05	5.00E-06	0.88	6.9	A
	CO-58	9.21E-05	6.91E-06	8.20E-05	7.70E-06	0.89	13.3	A
	CO-60	3.20E-04	1.15E-05	2.70E-04	1.70E-05	0.84	27.8	A
	ZN-65	3.87E-05	1.36E-05	2.90E-05	6.40E-06	0.75	2.8	N
	AS-76	1.49E-04	1.64E-05	1.20E-04	1.30E-05	0.81	9.1	A
	I-131	1.60E-05	4.26E-06	8.90E-06	2.10E-06	0.56	3.8	N
	I-133	1.95E-04	1.57E-05	1.60E-04	1.70E-05	0.82	12.4	A
	MO-99	2.02E-04	5.13E-05	1.83E-03	0.00E+00	9.06	3.9	N
	ND-147	7.00E-05	2.00E-05	0.00E+00	0.00E+00		3.5	N
OFF GAS	AR-41	1.35E-04	4.37E-05	0.00E+00	0.00E+00		3.1	N
30 MIN	KR-85M	5.25E-04	1.49E-05	5.80E-04	5.60E-05	1.10	35.2	A
DECAY	KR-87	3.49E-03	8.70E-05	3.90E-03	4.00E-04	1.12	40.1	A
	KR-88	1.86E-03	5.60E-05	1.90E-03	2.20E-04	1.02	33.2	A
	XE-135	3.01E-03	3.02E-05	3.00E-03	2.60E-04	1.00	99.7	A
	XE-135M	1.52E-02	6.00E-04	1.70E-02	2.80E-03	1.12	25.3	A
	XE-138	6.62E-02	1.82E-03	7.40E-02	9.10E-03	1.12	36.4	A
OFF GAS	AR-41	1.61E-04	3.44E-05	1.60E-04	2.80E-05	0.99	4.7	A
3 HOUR	KR-85M	5.68E-04	9.76E-06	5.60E-04	4.10E-05	0.99	58.2	A
DECAY	KR-87	3.38E-03	8.51E-05	3.50E-03	3.00E-04	1.04	39.7	A
DETECTOR	KR-88	2.00E-03	4.22E-05	2.00E-03	1.40E-04	1.00	47.4	A
28-TP20	XE-133	2.53E-04	1.56E-05	2.70E-04	3.10E-05	1.07	16.2	A
	XE-135	3.03E-03	1.65E-05	3.20E-03	2.20E-04	1.06	183.6	A
OFF GAS	AR-41	1.61E-04	3.44E-05	1.90E-04	3.60E-05	1.18	4.7	A
3 HOUR	KR-85M	5.68E-04	9.76E-06	5.70E-04	4.10E-05	1.00	58.2	A
DECAY	KR-87	3.38E-03	8.51E-05	3.40E-03	3.20E-04	1.01	39.7	A
DETECTOR	KR-88	2.00E-03	4.22E-05	1.90E-03	1.40E-04	0.95	47.4	A
25-P844	XE-133	2.53E-04	1.56E-05	2.00E-04	2.30E-05	0.79	16.2	A
	XE-135	3.03E-03	1.65E-05	3.10E-03	2.10E-04	1.02	183.6	A

TEST RESULTS:

A=AGREEMENT
D=DISAGREEMENT
*=CRITERIA RELAXED
N=NO COMPARISON

TABLE 1

U.S. NUCLEAR REGULATORY COMMISSION

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FACILITY: QUAD CITIES

FOR THE 4TH QUARTER OF 1990

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
CHARCOAL	I-131	2.68E-13	4.54E-14	2.70E-13	5.90E-14	1.01	5.9	A
CART.	I-133	9.57E-13	2.57E-13	1.10E-12	2.50E-13	1.15	3.7	N
Detector 13-1040								
AIR PART.	I-131	9.00E-14	1.84E-14	0.00E+00	0.00E+00		4.9	D
Detector	I-133	7.29E-13	1.30E-13	5.40E-13	1.35E-13	0.74	5.6	A
25P844	BA-139	2.39E-10	4.94E-11	1.50E-10	1.90E-11	0.63	4.8	A
	LA-140	6.93E-13	1.41E-13	4.00E-13	1.20E-13	0.58	4.9	A
CHARCOAL	I-131	2.68E-13	4.54E-14	2.30E-13	5.10E-14	0.86	5.9	A
CART.	I-133	9.57E-13	2.57E-13	0.00E+00	0.00E+00		3.7	N
Detector 25-60RA								
AIR PART.	I-131	9.00E-14	1.84E-14	0.00E+00	0.00E+00		4.9	D
Detector	LA-140	6.93E-13	1.41E-13	7.10E-13	1.59E-13	1.02	4.9	A
13-1040								
LIQ.RAD.	MN-54	1.52E-06	6.07E-08	1.60E-06	1.40E-07	1.05	25.0	A
WASTE	CO-60	8.06E-06	1.28E-07	7.50E-06	4.50E-07	0.93	63.0	A
DETECTOR	CS-137	9.53E-07	6.44E-08	9.50E-07	9.20E-08	1.00	14.8	A
25-P844								
LIQ.RAD.	MN-54	1.52E-06	6.07E-08	1.50E-06	1.50E-07	0.99	25.0	A
WASTE	CO-60	8.06E-06	1.28E-07	7.40E-06	4.70E-07	0.92	63.0	A
DETECTOR	CS-137	9.53E-07	6.44E-08	8.40E-07	1.30E-07	0.88	14.8	A
13-1040								
RCS 1	NA-24	7.13E-03	6.95E-05	6.00E-03	5.00E-04	0.84	102.6	A
DETECTOR	CR-51	2.39E-02	1.22E-04	2.00E-02	0.00E+00	0.84	195.9	A
25-P844	MN-54	5.91E-05	6.43E-06	4.70E-05	4.80E-06	0.80	9.2	A
	CO-58	9.34E-05	7.72E-06	7.80E-05	7.00E-06	0.84	12.1	A
	CO-60	2.99E-04	9.85E-06	2.60E-04	1.60E-05	0.87	30.4	A

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
RCS 1	AS-76	1.39E-04	1.57E-05	1.20E-04	1.30E-05	0.86	8.9	A
DETECTOR	I-131	1.22E-05	3.60E-06	1.30E-05	2.10E-06	1.07	3.4	N
25-P844	I-133	1.88E-04	1.33E-05	1.50E-04	0.00E+00	0.80	14.1	A
RCS 2	NA-24	7.09E-03	7.47E-05	6.20E-03	5.30E-04	0.87	94.9	A
DETECTOR	CR-51	2.41E-02	1.22E-04	2.10E-02	0.00E+00	0.87	197.5	A
28-TP20	MN-54	5.35E-05	7.78E-06	4.70E-05	5.00E-06	0.88	6.9	A
	CO-58	9.21E-05	6.91E-06	8.20E-05	7.70E-06	0.89	13.3	A
	CO-60	3.20E-04	1.15E-05	2.70E-04	1.70E-05	0.84	27.8	A
	ZN-65	3.87E-05	1.36E-05	2.90E-05	6.40E-06	0.75	2.8	N
	AS-76	1.49E-04	1.64E-05	1.20E-04	1.30E-05	0.81	9.1	A
	I-131	1.60E-05	4.26E-06	8.90E-06	2.10E-06	0.56	3.8	N
	I-133	1.95E-04	1.57E-05	1.60E-04	1.70E-05	0.82	12.4	A
	MO-99	1.98E-03	1.11E-05	1.80E-03	0.00E+00	0.91	178.4	A
	ND-147	7.00E-05	2.00E-05	0.00E+00	0.00E+00		3.5	N
OFF GAS	AR-41	1.35E-04	4.37E-05	0.00E+00	0.00E+00		3.1	N
30 MIN	KR-85M	5.25E-04	1.49E-05	5.80E-04	5.60E-05	1.10	35.2	A
DECAY	KR-87	3.49E-03	8.70E-05	3.90E-03	4.00E-04	1.12	40.1	A
	KR-88	1.86E-03	5.60E-05	1.90E-03	2.20E-04	1.02	33.2	A
	XE-135	3.01E-03	3.02E-05	3.00E-03	2.60E-04	1.00	99.7	A
	XE-135M	1.52E-02	6.00E-04	1.70E-02	2.80E-03	1.12	25.3	A
	XE-138	6.62E-02	1.82E-03	7.40E-02	9.10E-03	1.12	36.4	A
OFF GAS	AR-41	1.61E-04	3.44E-05	1.60E-04	2.80E-05	0.99	4.7	A
3 HOUR	KR-85M	5.68E-04	9.76E-06	5.60E-04	4.10E-05	0.99	58.2	A
DECAY	KR-87	3.38E-03	8.51E-05	3.50E-03	3.00E-04	1.04	39.7	A
DETECTOR	KR-88	2.00E-03	4.22E-05	2.00E-03	1.40E-04	1.00	47.4	A
28-TP20	XE-133	2.53E-04	1.56E-05	2.70E-04	3.10E-05	1.07	16.2	A
	XE-135	3.03E-03	1.65E-05	3.20E-03	2.20E-04	1.06	183.6	A
OFF GAS	AR-41	1.61E-04	3.44E-05	1.90E-04	3.60E-05	1.18	4.7	A
3 HOUR	KR-85M	5.68E-04	9.76E-06	5.70E-04	4.10E-05	1.00	58.2	A
DECAY	KR-87	3.38E-03	8.51E-05	3.40E-03	3.20E-04	1.01	39.7	A
DETECTOR	KR-88	2.00E-03	4.22E-05	1.90E-03	1.40E-04	0.95	47.4	A
25-P844	XE-133	2.53E-04	1.56E-05	2.00E-04	2.30E-05	0.79	16.2	A
	XE-135	3.03E-03	1.65E-05	3.10E-03	2.10E-04	1.02	183.6	A

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	NO COMPARISON
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.