U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/85021(DRSS); 50-265/85024(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: July 9-12, 1985

Inspector: L. J. Hueter for M. Schumacher 7/30/85
Date

Approved By: M. C. Schumacher, Chief 7/30/85
Independent Measurements and Date
Environmental Protection Section

Inspection Summary

Inspection on July 9-12, 1985 (Reports No. 50-254/85021(DRSS); 50-265/85024(DRSS))
Areas Inspected: Routine, unannounced inspection of gaseous and liquid radioactive program including: effluent releases; records and reports of effluents; effluent control instrumentation; procedures for controlling releases; reactor coolant chemistry and activity; gaseous effluent filtration; and audits. The inspection involved 35 inspector-hours onsite by one NRC inspector.
Results: One violation was identified (failure to collect and analyze service water grab samples at required frequency for both reactor units when the service water monitors were inoperable - Section 5).

DETAILS

1. Persons Contacted

*R. Bax, Production Superintendent
*P. Behrens, Lead Chemist
H. Lihou, Technical Staff Supervisor
E. Mendenhall, Thermal Engineer
*C. Norton, Quality Assurance Engineer
R. Petri, Radwaste Engineer
*J. Sirovy, Rad/Chem Supervisor
R. Soenksen, Scheduler/Work Analyst, Instrument Maintenance Department
*G. Spedl, Assistant Supervisor, Technical Services
B. Strub, Compliance Coordinator
*T. Tamlyn, Services Superintendent

*A. Madison, NRC Senior Resident Inspector
A. Morrongiello, NRC Resident Inspector

*Denotes those present at the exit meeting.

2. General

This inspection, which began at 8:00 a.m. on July 9, 1985, was conducted to examine the licensee's gaseous and liquid radwaste management program and related activities for safety and compliance with regulatory requirements.

3. Gaseous Radioactive Waste

The inspector reviewed the licensee's gaseous radwaste management program, including: determination whether gaseous radioactive waste effluents were in accordance with regulatory requirements; adequacy of required records, reports, and notifications; and experience concerning identification and correction of programmatic weaknesses.

The program was reviewed for calendar year 1984 and first quarter of 1985. The inspector reviewed semiannual effluent reports for 1984 and selectively reviewed effluent records for the same period.

Gaseous effluents are exhausted from the plant via two pathways, the reactor building ventilation duct (a ground level release, common to both units which is sampled and monitored before the two unit effluents combine) which may include drywell and torus venting, and the plant chimney (an elevated release comprised of sources such as turbine building exhaust, standby gas treatment system (SGTS) exhaust, gland steam exhaust and off gas, the latter, following processing by the hydrogen recombiner, delay line and charcoal beds).

Under normal plant conditions, gaseous releases are quantified for noble gas based on weekly grab samples from the reactor building vent duct and daily grab samples from the plant chimney. Particulates and iodine releases are quantified based on weekly particulate filters and charcoal samples from both pathways. Under abnormal conditions, sampling may be more frequent to meet technical specification requirements.

In addition to the grab samples described above for quantifying noble gas releases, the chart recorders on the noble gas monitors for these pathways are routinely observed for spikes or peaks that could represent short term releases over and above that quantified from the grab samples. Such releases are quantified by procedure using "area under the peak" and an efficiency factor obtained during monitor calibration using a sample of plant generated gas mixture. Tritium samples are collected monthly from both the reactor building vent duct and the plant chimney by a freeze trap using glycol and dry ice. (Before December 19, 1984, the frequency of the noble gas, particulate, iodine, and tritium samples was different than described above in order to meet technical specifications in effect at that time.)

Particulate filters for the various pathways are accumulated monthly and a gamma isotopic analysis is performed inhouse following which the filters are sent to a contractor for analysis of alpha activity and strontium-89 and strontium-90 activity.

Prior to drywell venting the atmosphere is sampled and analyzed for particulate and iodine activity to evaluate whether the effluent may be released from the reactor building vent duct or whether it should be diverted through SGTS and released via the plant chimney.

The CECo computer program for dose updates and projections is run monthly to meet technical specification requirements. By inputting releases of each nuclide for the month into the computer program, the gamma air dose, beta air dose, total body dose, skin dose and most restrictive organ dose is provided for the current month, the current calendar quarter to date, the three previous calendar quarters and the calendar year to date.

Since July 1, 1984, reactor Unit 1 has been in operational status except for the first seven weeks of the period and several one to three day outages since that time. Since July 1, 1984, Unit 2 has been in operational status except for a few short outages lasting one to nine days and one larger outage lasting over 11 weeks, ending on June 5, 1985. The licensee has had no evidence of fuel cladding problems for the past several years with either unit. Radioactive effluent release rates and offsite dose rates have remained low. In 1984, 6,000 curies of noble gas and 4.52E-02 curies of iodine-131 were released in gaseous effluents from both units combined. Inserting into the CECo computer code the annual values of curies of each nuclide released in gaseous effluents in 1984, the calculated maximum whole body dose and maximum thyroid dose (most restrictive organ dose) to any individual beyond the site boundary were 4.85E-02 mrem and 6.49E-02 mrem respectively for Unit 1 and 4.77E-02 mrem and 7.59E-02 mrem respectively for Unit 2.

In review of gaseous effluent records it was observed that the iodine activity in gaseous effluents for one month during the third quarter of 1984 was not included in the semiannual effluent report for the last half of 1984. The iodine activity had been included in the monthly reports (prepared for the State of Illinois) which are used to prepare the quarterly data. The iodine releases for the month in question were lower than normal and if included would have added only about 9% to the quarterly total of iodine releases. During a previous inspection, Inspection Report Nos. 50-254/84-13 and 50-264/84-11, errors were identified in 1983 effluent reports for which the licensee submitted errata sheets to correct the data. The inspector observed that although the errata sheets corrected the previous erroneous data some typographical errors involving signs of exponential numbers for dilution water volume were included on one errata sheet involving previously correct data. These matters were discussed at the exit.

No violations were identified.

4. Liquids and Liquid Radioactive Wastes

The inspector reviewed the licensee's reactor liquids and liquid radwaste management programs, including: determination whether reactor liquids meet chemical and radiochemical requirements, determination whether liquid radioactive waste effluents were in accordance with regulatory requirements, adequacy of required records, reports, and notifications, and experience concerning identification and correction of programmatic weaknesses.

The program was reviewed for calendar year 1984 and the first quarter of 1985. The inspector reviewed semiannual effluent reports for 1984 and selectively reviewed effluent records for the same period. No significant problems were identified during this review.

Liquid effluents are released on a batch basis from a single tank (following sampling and analysis) to a single release path which is a monitored (with alarm and isolation function) radwaste line. This line directs effluent to the south diffuser line of two diffuser lines to provide adequate dilution with station circulating water to assure that the effluent reaching the river is below MPC for the mixture of all nuclides released. This has been the only release path since May 1984 when use of the stations circulating water system has been operated directly to the river rather than the spray and recycle mode. This change resulted from alteration of a previous commitment made to a public environmental organization. It increases the dilution flow when radioactive liquids are batch released from the discharge tank to the circulating water system. Most plant liquids, including chemical waste liquids, are processed and reclaimed by use of filters and resin beds (no radwaste evaporators). Resins which are basically "spent" are further used for initial processing of chemical wastes. As a result, batch releases consist mainly of laundry water (filtered prior to release) or an occasional batch of water which has been processed but either does not meet criteria (such as high organic content) for reuse or is released during the early stages of an outage due to lack of storage space.

Analyses of batch liquid releases includes two grab samples of the recirculated water with verification that gross beta counts of both samples are within 10 percent of each other. Following this, either both samples or the sample having the greater gross beta count is counted using a GeLi system to identify and determine the concentration of gamma emitting nuclides. For pure beta emitters, including strontium-89 and 90, iron-55 and tritium, concentrations are determined by analysis of monthly composite proportional samples with all beta analyses but tritium being performed by a contractor.

The concentration of each gamma emitting nuclide and the available dilution water flow rate are used in calculating the sum of MPC fractions for the gamma emitters, the allowable radwaste discharge flow rate and the setpoint of the monitor (when operable) on the discharge line. Although the beta emitters are not considered in this determination to demonstrate that diluted release concentrations meet 10 CFR 20 criteria, a safety factor of 10 built into the equation, which only takes credit for 10 percent of the actual dilution water, appears to more than adequately compensate for the pure beta emitters. A review by the inspector of data for the last six batches of liquid radwaste releases for which beta emitter data was available showed that the sum of MPC fractions increased a maximum of 30 percent when the beta emitters were accounted for. An additional variable safety factor involves dilution flow. The circulating water returns to the river via either the north or south diffuser line. The volume of water in these lines depends on how many of the six circulating water pumps (157,000 gpm capacity each) and how many of the five service water pumps (13,800 gpm capacity each) are operating. The south diffuser line into which the radwaste effluent (70 gpm maximum) is diluted is run at full capacity while the north diffuser line is throttled to adjust for total flow. In the dilution equation only half of total flow is considered as going through the south diffuser pipe. Therefore an additional safety factor approaching two is involved when the flow rate in the north diffuser pipe is minimal. Selective review of release records identified no problem with determination of release rates and setpoint determination and settings when monitors were operable. For details regarding inoperable radwaste effluent and service water monitors and required alternate actions, refer to Section 5.

To meet surveillance requirements of Technical Specification 4.8.B.2.a, the activity of each nuclide is entered into a CECo computer program on a monthly basis which determines the cumulative dose contributions (in accordance with the ODCM) for the total body and any organ for the month, for the calendar quarter to date and for the calendar year to date.

In 1984, about 73 millicuries of gross beta-gamma activity (excluding tritium) and about 5.4 curies of tritium was released in liquid effluents from both units combined. There were a total of 25 batch releases from July 1, 1984 through June 30, 1985. Since mid-September 1984, the concentration of all batch releases before dilution has been about twice MPC. From these effluent releases, the calculated maximum whole body dose and maximum liver dose (most restrictive organ dose) to any

individual beyond the site boundary were 3.28E-03 mrem and 4.8E-03 mrem respectively for Unit 1 and 3.28E-03 mrem and 4.8E-03 mrem respectively for Unit 2.

Reactor coolant sampling and analysis records were reviewed for compliance with chemical and radiochemical criteria contained in Technical Specifications 3/4.C.1-5. Test results reviewed for the first six months of 1985 included conductivity, chloride, dose equivalent iodine-131 activity, and monthly isotopic analysis of reactor coolant samples.

No problems were identified during the review in frequency of performing monthly isotopic analysis of reactor coolant samples for either unit. Also, dose equivalent iodine-131 activity remained well within the five microcurie per gram of water limit during the period for both units with a maximum concentration of 0.01 uCi/ml for Unit 1 and a maximum concentration of 0.023 uCi/ml for Unit 2 during the review period.

No problems were identified during the review in either frequency of testing or compliance with concentrations of either chloride or conductivity for either reactor unit. Although remaining well within the limit (10 umho/cm), the conductivity of Unit 1 coolant started showing a gradual increase beginning in January indicative of a condenser tube leak. The conductivity had increased to about 1.2 umho/cm during reactor operation when on May 8th, the licensee went into a two day outage, located and repaired the leak. Following the repair, the conductivity returned to the range of about 0.1 umho/cm during reactor operating conditions. The chloride concentration remained at or below the detection level of 0.02 ppm during the condenser tube leak. The licensee has recently obtained instrumentation for measuring chloride concentration which has greater sensitivity by about a factor of 10.

No violations were identified.

5. Calibrations and Surveillances of Gaseous and Liquid Process and Effluent Monitors

The inspector reviewed records for one monitor on the liquid system (the common radwaste discharge monitor) and six monitors on the gaseous system (two monitors each, for the reactor building Unit 1 vents and Unit 2, and the chimney). Technical Specification Table 4.2-4 (effective with amendment No. 89 on December 19, 1984) requires calibration of the monitors described above at 18 month intervals and functional tests at quarterly intervals. Before December 19, 1984, calibrations were required at quarterly intervals and functional tests at monthly intervals for the monitors described above. The inspector reviewed calibration records and selected functional tests for the liquid and gaseous effluent monitors described above for the period July 1, 1984, to June 30, 1985. The review showed proper calibrations and functional tests on a timely basis for operable monitors.

The radwaste monitor has been declared inoperable since the RETS technical specifications became effective (December 19, 1984) owing to its not meeting the change in required sensitivity. The service water monitors were not covered by technical specifications before the RETS technical specification became effective. These monitors were also declared inoperable at that time due to inability to demonstrate that the sensitivity requirements can be met. New side stream monitors with increased sensitivity for both liquid radwaste and service water effluents were initially intended to be installed and operational on December 19, 1984, when the RETS technical specifications became effective. The new monitors were intended to share certain electronics with other monitors previously provided by the same vendor. However, delays for engineering design modifications ensued when it was learned that the new monitors were not readily compatible electronically with the older monitors. At the time of this inspection the new monitors were partially installed but not operable. Licensee personnel stated that the current goal for operability of these monitors was late August 1985.

Technical Specification 3.2.G.2 requires that actions shown in Table 3.2-5 be taken when one or more radioactive liquid effluent monitoring instruments is inoperable. Action B, for the liquid radwaste effluent monitor in Table 3.2-5, permits effluent releases to continue with the monitor inoperable provided that prior to initiating a release, at least two independent samples are analyzed and at least 2 members of the staff independently verify release calculations and discharge valving. These criteria appear to have been met for all liquid radwaste batch releases.

Action A, for the service water gross activity monitors, in Table 3.2-5, permits releases to continue with the monitor inoperable provided that at least once per 12 hours grab samples are collected and analyzed for beta or gamma activity. The 12 hour grab samples from both Unit 1 and Unit 2 service water, required about 8:00 p.m. on June 13, 1985, were not collected or analyzed. This omission was not identified by the normal supervisory review process even though provision had been made for recording sample collection times on the Miscellaneous Samples Log as a result of an observation during an inhouse Quality Assurance Surveillance as described in Section 9. Failure to collect and analyze the 12 hour grab samples from the service water of both Unit 1 and Unit 2 at about 8:00 p.m. on June 13, 1985, while the service water monitors for both units were inoperable is considered to be a violation of Technical Specification 3.2.G.2 which requires the sampling and analysis pursuant to Table 3.2-5. (Violation 254/85021-01; 265/85024-01)

One violation was identified.

6. Procedures for Controlling Releases

The inspector selectively reviewed revisions to the licensee's liquid and gaseous radwaste procedures. No significant problems were identified during the following procedures review.

QCP 100-S9, Revision 3, Liquid Waste Work Sheet
QCP 100-S13, Revision 3, Calculation of Particulate and Halogen Activities
QCP 100-S14, Revision 2, Tritium Gaseous Release Monthly Calculation
QCP 100-S15, Revision 2, Discharge Record Liquid Radioactive Waste Surveillance Sheet
QCP 100-S16, Revision 2, Percent of Limit, Main Chimney
QCP 100-S21, Revision 1, Radwaste Curie Release
QCP 100-S22, Revision 1, Percent Limit Radwaste Curie Release
QCP 100-S30, Revision 1, Noble Gas Releases
QCP 100-S31, Revision 1, Main Chimney Monitor Spikes
QCP 100-S32, Revision 1, Reactor Building CAM Spikes
QCP 400-S1, Revision 2, Main Chimney Particulate Isotopic
QCP 400-S2, Revision 2, Reactor Vent Particulate Isotopic
QCP 400-S4, Revision 1, Strontium-89 and Strontium-90
QCP 400-S5, Revision 1, Percent Limit by Isotopic Calculation Sheet for Iodines and Particulates
QCP 400-S6, Revision 1, Gaseous Iodine
QCP 400-S7, Revision 1, Monthly Particulate and Iodine Release Rates
QOP 2000-S2, Revision 8, Liquid Radioactive Waste Discharge

No violations were identified.

7. Changes to Equipment and Procedures

In discussions/reviews of changes made to gaseous or liquid radwaste systems during the past year, two facility changes were identified which are both in progress and both involve the liquid radwaste system. One modification involves the replacement of the liquid effluent monitor with a side stream monitor having additional shielding and provision for decontamination or removal of a spool piece in front of the detector. In addition, the monitor is being relocated to a lower radiation background area, all in the interest of meeting the sensitivity requirements for the monitor specified in the new RETS technical specifications which became effective December 19, 1984. The other modification involves a similar replacement (and for similar purposes) of the service water effluent monitors for both reactor units. The inspector verified that a 10 CFR 50.59 review/evaluation was performed by the licensee for both of these facility changes.

No violations were identified.

8. HEPA Filter and Charcoal Adsorber Systems

One ventilation system has HEPA filters and charcoal adsorbers subject to technical specification surveillance requirements. This system consists of the two trains (common to both reactor units) of the standby gas treatment system. Inplace testing of HEPA filters and charcoal adsorbers were performed inhouse on a timely basis in December 1984. Records show the DOP penetration and the halogenated hydrocarbon penetration to be less than the one percent criteria for HEPA filters and charcoal adsorbers respectively. In addition, a laboratory analysis of a representative carbon sample (also removed in December 1984) from each train for methyl

iodide removal has been performed by a contractor with records showing the removal efficiency to be greater than the 95 percent criterion specified in Technical Specification 3.7.B.2. The latter test was performed at the specified test conditions of 130°C and 95 percent relative humidity.

No violations were identified.

9. Audits

The inspector reviewed one Quality Assurance audit conducted by an offsite group and two Quality Assurance surveillances conducted by inhouse QA personnel during the past year involving, in part, the gaseous and liquid radwaste processing and effluent programs. Offsite Audit 04-84-2, a technical audit of radiation chemistry, conducted September 11-14, 1984, reviewed collection/analysis of reactor water samples for required frequency and proper analysis of monthly proportional composite samples of each batch of liquid effluent. No problems were identified in these areas.

Quality Assurance Surveillance No. QAO 4-85-20, or radioactive waste records and activities, conducted May 13-17, 1985, identified no findings in the gaseous or liquid radwaste areas.

Quality Assurance Surveillance No. QAO 4-85-40, of chemistry analyses, conducted April 29, 1985, noted an observation. During a review to ensure that the service water effluent is sampled once every twelve hours as required by Technical Specification Table 3.2-5 Action A when the monitor is inoperable, it was noted that the Miscellaneous Samples Log (QCP 1400-S34) did not have a provision for recording sample times on the log. Although sample times had in most cases been recorded next to the dates, for a period of several days, the sample times had not been recorded such that it could be demonstrated by this log alone that the samples had been taken on a timely basis (a separate service water boildown sample "checklist" did provide the times of sample collection on the dates in question). In response to the observation, a temporary procedure with a special column to record sample time on the log was promptly implemented and a permanent procedure change was initiated.

No violations were identified.

10. Exit Meeting

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on July 12, 1985. The inspector discussed the likely information content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify such documents/processes as proprietary. The inspector summarized the scope and findings of the inspection. In response to certain items discussed by the inspector, the licensee:

a. Acknowledged the inspectors suggestion for the need of a more thorough review prior to publication of the data provided in semiannual effluent reports owing to identification by the inspector of several errors (relatively minor) in recent reports. (Section 3)

b. Acknowledged the inspectors favorable comments regarding the licensee's shutdown of Unit 1 in early May, 1985, for repair of a condenser tube leak before the conductivity of the primary coolant approached technical specification levels. (Section 4)

c. Acknowledged the violation for failure to collect and analyze service water grab samples at the required frequency for both reactor units when the service water monitors were inoperable and failure to identify the omission even though provision had recently been made for recording sample collection times on the sample log. The licensee commented that the samples for both units had been missed only once in the past several months and stated that as an additional check to assure that the samples would be taken and analyzed as required, these sample requirements would be added to Chemistry Section's Technical Specification surveillance sheet. The inspector noted the long delay in installing and declaring operational the new liquid radwaste and service water monitors. (Sections 5 and 9)