

UNITED STATES NUCLEAR REGULATORY COMMISSION REGION II 101 MARIETTA STREET, N.W. ATLANTA, GEORGIA 30303

MAR 0 5 1985

Report No.: 50-302/85-05

Licensee: Florida Power Corporation 3201 34th Street, South St. Petersburg, FL 33733

Docket No.: 50-302

License No.: DPR-72

Facility Name: Crystal River Unit 3

Inspection Conducted: February 4 - 8, 1985

Inspectors: blave & Kno Sn W. B. Gloersen G. B. Kuzo G. B. Kuzo Jate Signed 28 Februar 1985 Date Signed Accompanying Personnel: P. C. McPhail Approved by: M. M. Montgomery, Section Chief D. M. Montgomery, Section Chief Date Signed

D. M. Montgomery, Section Chief Emergency Freparedness and Radiological Protection Branch Division of Radiation Safety and Safeguards

Scope: This routine, unannounced inspection entailed 132 inspector-nours onsite in the areas of: liquid and gaseous radwaste systems; liquid and gaseous effluent sampling, and analysis; reactor coolant chemistry; quality control and confirmatory measurements including comparison of the results of split samples analyzed by the licensee and NRC Region II mobile laboratory; and whole-body counter measurements using a fission product phantom.

SUMMARY

Results: One violation was identified: failure to have approved written procedures for calibration of the whole-body counter.

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REPORT DETAILS

1. Licensee Employees Contacted

- P. McKee, Nuclear Plant Manager
- G. Boldt, Nuclear Plant Operations Manager
- *V. Roppel, Manager, Plant and Engineering Technical Services
- *L. Hill, Manager, Site Nuclear Services
- *R. Fuller, Superintendent, Radiation Support Specialist
- *P. Skramstad, Chem/Rad Superintendent
- *J. Roberts, Nuclear Chemistry Manager
- D. Wildler, Radiochemistry and Environmental Specialist
- *D. McCollough, Nuclear Chemistry Supervisor
- *R. Pinner, Nuclear Chemistry Supervisor
- D. Betts, Supervisor, Quality Audits
- R. Browning, Health Physics Supervisor
- G. Halnon, Nuclear Plant Engineer

Other licensee employees contacted included engineers, technicians and office personnel.

NRC Resident Inspectors

*J. Stetka *J. Tedrow

*Attended exit interview

2. Exit Interview

The inspection scope, findings, and status of the inspector followup items were summarized on February 8, 1985, with those persons indicated in Paragraph 1. The inspectors described the violation concerning the failure to have approved written procedures for radiation protection equipment (Paragraph 5). Four new inspector followup items were opened concerning: gamma spectroscopy analyses dead time limits (Paragraph 6); confirmatory measurements (Paragraph 14); and post-accident sampling system periodic test program and design modification (Paragraph 13). Licensee representatives acknowledged the violation and the inspectors' comments. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters (92702)

(Closed) 50-302/84-07-01, Failure to perform an adequate procedure review of the post-accident sampling system (PASS). Certain valve alignments required by both Emergency Plant Implementing Procedure EM-307 and Operating Procedure OP-301 were contradictory. This contradiction resulted in the PASS being inoperable with regards to returning a sample to containment in accordance with the procedure. The licensee's corrective action was to open all four manual isolation valves in question (RCV-34, -39, -48, and -144) and to revise OP-301 (Rev. 26, 6/20/84) so that the valves would be left in

the open position. The inspector reviewed the licensee's corrective action and Modification Procedure 2 (Rev. 0, 7/31/84), which was developed to ensure that all necessary system documentation is reviewed prior to transferring the responsibility for a system to the operations and maintenance groups. This item is considered closed.

4. Audits (84723, 84724, 84725)

- a. Technical Specification 6.5.2.9 requires audits of facility activities to be performed under the cognizance of the Nuclear General Review Committee (NGRC) encompassing the conformance of facility operation to provisions contained within the Technical Specifications and applicable license conditions at least once per 12 months; the radiological environmental monitoring programs and the results thereof at least once per 12 months; the Offsite Dose Calculation Manual and implementing procedures at least once per 24 months; and the performance of activities required by the Quality Assurance Program for effluent and environmental monitoring at least once per 12 months. The inspectors reviewed selected portions of the following audit reports:
 - QP-259 Audit of Radiation Protection Program Activities, October 1984.
 - (2) QP-261 Audit of Environmental Technical Specification Conformance, January 1985.

The inspectors discussed audit results with cognizant licensee representatives and noted the program areas were audited against the Final Safety Analysis Report, Technical Specifications and procedural requirements. The inspectors noted that these audits did not address the accuracy of the plant radiochemical and chemical measurements. The inspectors discussed the use of Regulatory Guide 4.15 "Quality Assurance for Radiological Monitoring Programs (Normal Operations) Effluent Streams and The Environment" for the QA audit program. The inspectors noted that most of this document's guidance was already followed by the Crystal River Unit 3 radiochemistry department and would be applicable to audits. Significant adverse findings were not identified in the audit reports.

No violations or deviations were identified.

- 5. Changes in Equipment and Procedures (84723, 84724, 84725)
 - a. Technical Specification 6.8.1.a requires that written procedures be established, implemented and maintained covering the applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, November, 1972; Off-site Dose Calculation Manual implementation; and Quality Assurance Program for effluent and environmental monitoring. The inspectors reviewed selected portions of the following procedures:

(1) OP-301 Filling and Venting the RC System, Rev. 26, 6/20/84.

- (2) CH-163 Calibration of the Leeds and Northrup 7866 Thermal Conductivity Gas Analyzer, Rev. 1, 12/12/84.
- (3) CH-200 Guidelines for Radiochemical Analysis, Rev. 4, 3/3/81.
- (4) CH-204 Beckman Model LS 3800 Liquid Scintillation System, Rev. 0, 5/18/84.
- (5) CH-205 Determination of Gross Beta in Liquids (with the Beckman LS 3800), Rev. 0, 10/17/84.
- (6) CH-211 Quality Control Requirements for Nuclear Counting Instrumentation, Rev. 2, 8/29/84.
- (7) CH-213 Quality Control Requirements for Radiochemistry Procedures, Rev. 4, 1/27/84.
- (8) CH-232 Atmospheric Radiation Monitoring System Calibration Procedure, Rev. 9, 1/10/85.
- (9) CH-233 Liquid Radiation Monitoring System Calibration Procedure, Rev. 4, 9/27/84.
- (10) CH-260 Determination of Radionuclides Using Gamma Spectroscopy, Rev. 3, 9/16/82.
- (11) CH-261 Determination of Radiogases in Pressurized Reactor Coolant, Rev. 1, 10/4/83.
- (12) CH-322 Sampling and Analysis of the Reactor Coolant System Utilizing Post Accident Sampling System, Rev. 4, 11/28/84.
- (13) CH-402 Secondary and Primary Cycle In-Line Monitors' Quality Control Surveillance Program, Rev. 4, 1/10/85.
- (14) CH-407 Laboratory Radiochemistry Instrumentation Quality Control Scheduling Program, Rev. 4, 10/17/84.
- (15) EM-305 Post-accident Sampling and Analysis of Effluent Releases from the Plant using the Automated Isotopic Measuring System (A.I.M.S.), Rev. 1, 12/8/84.
- (16) SP-701 Radiation Monitoring System Surveillance Program, Rev. 11, 9/20/84.
- (17) SP-731 Gaseous Radwaste Release Surveillance Program, Rev. 8, 11/8/84.
- (18) RP-208 Bioassay Sampling Procedure, Rev. 4, 12/16/83.
- (19) RP-214 Whole Body Chair Calibration, Rev. 2, 11/28/81.

- (20) CH-105 Determination of Chloride, Mercuric Thiocyanate Method, Rev. 3, 9/11/84.
- (21) CH-142 Determination of Flouride Ion Concentration, Specific Electrode Method, Rev. 1, 6/27/83.
- (22) CH-152 Determination of Sodium in Aqueous Samples by Flameless Atomic Absorption, Rev. 1, 5/26/83.
- (23) RP-101 Radiation Manual, Rev. 20, 6/25/84.

The inspectors noted that RP-214 (Rev. 2, 11/28/81), "Whole Body Chair Calibration" was a calibration procedure for a whole-body counting system that was no longer in use. The licensee calibrates the present whole-body counting system by using a vendor-prepared calibration procedure that had not been reviewed and approved by appropriate plant management. The inspectors noted that Technical Specification 6.8.1 requires the licensee to have applicable written procedures outlined in Appendix A of Regulatory Guide 1.33 which states specifically that written radiation protection procedures for a bioassay program shall be established, implemented, and maintained. Additionally, 10 CFR 20.103(a)(3) states in part that the licensee shall use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals. Also, 10 CFR 20.103(c)(2) requires the licensee to maintain and implement a respiratory protection program that includes surveys and bioassays as appropriate to evaluate actual exposures if allowances are made for the use of respiratory equipment on estimating exposures of individuals to material. From a review of radiation protection procedures, including RP-101 (Rev. 20, 6/25/84) "Radiation Manual" and discussions with cognizant licensee representatives, the inspectors determined that the whole-body counter was utilized in the radiation protection program for bioassay measurements to comply with 10 CFR 20.103(c)(2). The inspectors informed cognizant licensee representatives that the failure to have an approved written procedure for the calibration of the whole-body counting system in use was a violation of Technical Specification 6.8.1. (50-302/85-05-01).

Finding: Violation - Failure to have approved written calibration procedures for the whole-body counting system.

b. The Crystal River Nuclear Station adopted the Standard Radiological Effluent Technical Specifications (RETS) effective July 1, 1984. The licensee submitted the Offsite Dose Calculation Manual (ODCM), including NRC changes and editorial revisions by Florida Power Corporation, with the Effluent and Waste Disposal Semiannual Report dated 8/24/84. The inspectors briefly reviewed the latest revision to the ODCM (Rev. 3, 10/31/84). The inspectors reviewed the setpoint calculations with various licensee representatives and determined that the licensee uses (1) the raw water discharge volume as the dilution factor for dose calculations in the ODCM and (2) the nuclear services water discharge volume for maximum permissable concentration (MPC) calculations (i.e., instantaneous releases) in the ODCM. The Process Control Program (PCP) was under revision. Changes to the PCP will be submitted with the Effluent and Waste Disposal Report for second half 1984.

- c. Since the last inspection, the licensee has installed a Nuclear Data 6685 computer and associated software which became operational in July 1984. The licensee's new computer programs are associated directly with the new RETS. The licensee validated the software computations by performing hand calculations. Currently, the licensee is searching for a contractor to write a procedure for verifying revisions to the effluent release software and master radionuclide library program so that an in-house validation program can be established.
- 6. Records (84723, 84724, 84725)
 - a. The inspector reviewed selected portions of the following records:
 - (1) Gaseous Radwaste Release Reports, January 1984 February 1985
 - (2) Liquid Radwaste Release Reports (Batch Mode) January 1984 -February 1985
 - (3) Annual (1984) Gamma Spectroscopy Detector System Nos. 1, 2, and 3 Efficiency Calibration Records for the following geometries: liter bottle; 20 cc scintillation vial; 34 cc gas bulb; 35 mm filter paper; charcoal cartridge; and liter gas marinelli beaker.
 - (4) Gamma Spectroscopy Detector System Nos. 1, 2, and 3 Quality Control Logs for January - February 1985 including:
 - i. Daily Centroid Check
 - ii. Background Check
 - iii. Efficiency Check
 - iv. Resolution Check
 - v. Daily QC Trend Data
 - (5) RD-13 Alpha, RD-13 Beta, LSC Packard Beta & Tritium Daily Quality Control Logs including:
 - i. Source Count
 - ii. QC Accuracy
 - iii. Background Accuracy
 - iv. QC Precision Check
 - (6) RD-13 Alpha & Beta High Voltage Curves and Standard Efficiency Calculations - January 1984 - February 1985
 - (7) Packard LSC and LS 3800 Quality Control Logs for January 1984 -February 1985 including:

- i. Efficiency Determination, Tritium & Gross Beta
- ii. Background Determination
- iii. Quench Curve Determination
- (8) Chemrad Reports Determination of Tritium Concentrations at RM-A12, September 1984 - February 1985
- (9) Radiochemistry Crosscheck Results, January December 1984
- (10) Wet Chemistry Crosscheck Results, January December 1984
- (11) Analytical QC Data Spike and Duplicate Samples for November 1984 -February 1985
- (12) Quality Control Analytical Checks for the following analyses and/or instrumentation:
 - i. pH Meters
 - ii. Fluoride Electrode
 - iii. Turbidity
 - iv. UV Spectrophotometer
- (13) Gamma Spectroscopy Dead-time Test Results
- (14) Calibration records (1983-1984) for the following gaseous and liquid effluent monitors:
 - i. RM-A1 Reactor Building Purge Exhaust Monitor
 - ii. RM-A2 Auxiliary Building and Fuel Handling Exhaust Monitor
 - iii. RM-L2 Plant Liquid Discharge Line Monitor
 - iv. RM-L7 Turbine Building Basement Discharge Line Monitor

Results of the record review were discussed with cognizant licensee representatives as noted in Paragraph 6.b.

- b. The inspectors discussed disagreements noted for selected wet chemistry analyses with cognizant licensee representatives. Licensee representatives stated that the standard 10% limit utilized for acceptance was too restrictive for analytical chemistry comparisons conducted in the parts per billion range. Licensee representatives are presently attempting to develop a flexible acceptance criteria dependent on the crosscheck laboratory's variability in reporting selected data. The inspectors noted that previous disagreements in phosphate analyses resulted from differences in chemical species. All results for this analysis were in agreement.
- c. The inspectors reviewed results of the licensee's gamma spectroscopy dead time evaluation. The inspectors noted the minimum error, at 5% dead time, was approximately 7-8%. The inspectors noted that significant errors were expected with increasing dead time and noted from a review of procedures (Paragraph 5.a) and gas calibration records (Paragraph 6.a) that selected gamma spectroscopy calibrations were conducted with analyzer dead times exceeding 10%. The inspectors noted

that the high dead time noted for the 34 cc gas bulb calibration could have contributed to the differences noted between the NRC and licensee gas confirmatory measurements (Paragraph 14.a). Licensee representatives agreed to further evaluate this area. Licensee actions in this area will be reviewed during a subsequent inspection (50-302/85-05-02).

No violations or deviations were identified.

7. Radioactive Liquid Wastes and Liquid Effluent Treatment System (84723)

Technical Specification 3.11.1.1 establishes limits for concentrations of radioactive materials in liquid effluents released to unrestricted areas. Technical Specification 3.11.1.2 establishes limits for dose commitments to individuals offsite as the consequence of the release of radioactive materials in liquid effluents to unrestricted areas. Technical Specification 3.7.13.2 requires the liquid radwaste treatment system to be operable and requires use of the system to reduce radioactive materials in liquid wastes prior to their discharge.

The inspectors reviewed selected liquid waste discharge permits and records for the release of radioactive liquid effluents for the period January -December 1984. Based on the review of selected liquid effluent release permits, the inspectors determined that the required sampling and analysis frequencies were followed and the records required by Technical Specification 6.10 were maintained. The licensee uses a demineralizer filter system for treatment of liquid radwastes. In discussions with licensee representatives, the inspector noted that the plant treats approximately 3350 gallons of liquid radwaste per day at approximately 11¢ per gallon during normal plant operations.

No violations or deviations were identified.

8. Reactor Coolant and Secondary Chemistry (84723)

Technical Specification 3.4.7 establishes the maximum reactor coolant concentration limits for dissolved oxygen, chloride, and flouride when the reactor coolant temperature is above 250°F. Sampling frequencies are specified in Technical Specification Table 4.4-3. Technical Specification 3.4.8 specifies primary coolant sampling and analysis frequencies for gross radioactivity, dose equivalent I-131, and radiochemical E determination.

The inspectors reviewed selected records covering the period of January 1984 to January 1985 and verified that the required tests were performed at the specified frequencies. The inspectors discussed trend charts with the licensee and reviewed the licensee's trending of the above parameters and in addition: reactor coolant tritium, stripped gases (Xe-133, Xe-135, Kr-85), cobalt, and cesium; and secondary coolant-gross beta and tritium. The inspectors did not note any marked trends and the above parameters appeared to meet specifications. Presently, the trend charts are drawn by hand, however the licensee is developing an automated system to trend the various reactor coolant and secondary chemistry parameters.

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No violations or deviations were identified.

9. Radioactive Gaseous Wastes and Gaseous Effluent Treatment System (84724)

Technical Specifications 3/4.11.2.1(a) and (b) establish dose rate limits at or beyond site boundary due to radioactive materials released in gaseous effluents for radioactive noble gases, iodine, tritium and radioactive particulates. Technical Specifications 3/4.11.2.3(a) and (b) establish dose rate limits to individuals offsite due to I-131, tritium and radioactive particulates. Technical Specification 3.7.13.3 requires the gaseous radwaste treatment system to be operable and requires use of the system to reduce radioactive materials in gaseous wastes prior to discharge.

The inspectors reviewed selected radioactive gaseous waste release permits for the period January 1984 to January 1985. Based on the review of selected gaseous effluent release permits, the inspector determined that the required sampling and analysis frequencies were followed and the records required by Technical Specification 6.10 were maintained. In all cases, the licensee met the lower limit of detection (LLD) requirements by analyzing the gaseous samples within ten minutes after sample collection as required by CH-269.

No violations or deviations were identified.

10. Air Cleaning Systems (84724)

Technical Specifications 3/4.7.7.1 and 3/4.7.8.1 describe the testing and surveillance requirements for the control room emergency ventilation system and auxiliary building ventilation exhaust system, respectively.

The inspectors examined records of charcoal absorber sample efficiency tests and HEPA and charcoal absorber in-place leak tests from second half 1983 to second half 1984. The inspectors noted that the auxiliary building ventilation exhaust system in-place leak test failed on 7/8/83. The licensee took appropriate corrective actions and performed a successful in-place leak test on 7/12/83 which satisfied the requirements of Technical Specification 3.7.8.1 Limiting Condition for Operation.

No violations or deviations were identified.

11. Reports (84723, 84724)

Technical Specification 6.9.15.d specifies the reporting requirements for radiological effluent releases. The inspectors reviewed the Crystal River Unit 3 Effluent and Waste Disposal Semiannual Report for the second half of 1983 (dated 2/28/84) and first half of 1984 (dated 8/24/84). The semiannual report for the second half of 1984 was in preparation. Based on the reported releases, the licensee met the ALARA criteria of 10 CFR 50, Appendix I.

No violations or deviations were identified.

12. Instrumentation (84723, 84724)

Technical Specifications 4.3.3.8 and 4.3.3.9 provide criteria for the testing and calibration of radioactive liquid and gaseous effluent monitors, respectively.

The inspectors reviewed calibration records covering the period from 1983 to 1984 for the following gaseous and liquid effluent monitors: RM-A1 (reactor building purge exhaust monitor), RM-A2 (auxiliary building and fuel handling exhaust monitor), RM-L2 (plant liquid discharge line monitor), and RM-L7 (turbine building basement discharge line monitor). The licensee calibrated the liquid effluent monitors by using three different concentrations of a Cs-137 solution which was assayed on a calibrated GeLi detector. The liquid effluent monitors' gas channels, particulate channels, and iodine channels were calibrated in the following manner: (1) the gas channel was calibrated by using a gas sample taken from the waste gas decay tank which was assayed on a calibrated GeLi detector; (2) the particulate channel was calibrated by using a spiked Cs-137 filter; and (3) the iodine channel was calibrated by using a charcoal cartridge spiked with Ba-133 in order to set the I-131 "window".

The inspectors, accompanied by a licensee representative, examined the gaseous and liquid effluent monitoring stations RM-A1, RM-A2, RM-L2, and RM-L7 and observed the operation of the gaseous effluent monitors.

No violations or deviations were identified.

13. Post-Accident Sampling System (PASS) (84723, 84724)

The inspectors reviewed procedures for the operation, maintenance, and testing of the licensee's post-accident sampling system. In addition, the inspectors, accompanied by a licensee representative, examined the PASS facility including the containment air and reactor coolant sampling stations. The inspectors discussed system operation, performance testing, analytical capabilities, and the ability of the PASS system to obtain representative samples of dissolved hydrogen from the liquid phase of the reactor coolant sample. The licensee is in the process of making a comparison of the hydrogen content in a normal "grab" reactor coolant sample with that obtained from the PASS.

As discussed in Paragraph 17, IFI 50-302/84-07-03 identified the need for the licensee to establish a recalibration and periodic test program for the PASS. This item was closed since the licensee completed most of the PASS recalibration and periodic test program, however the licensee did not complete the development of surveillance procedures for the containment hydrogen analyzer and for the RM-A1 and RM-A2 noble gas monitors. In addition, instrument data sheets for the remaining non-essential instrumentation were not assembled. The inspectors informed licensee representatives that this item will be reviewed during a future inspection (50-302/85-05-03). In addition, IFI 50-302/84-07-05 identified numerous design problems associated with the PASS. The licensee addressed and made the necessary modification to all but one of the design problems. The problem in question was the need for heat tracing containment air sample lines to ensure representative sampling when moisture content is high. A licensee contractor is performing an evaluation on the need for heat tracing and the licensee will determine whether or not to modify or heat trace the containment air sample lines. The inspectors informed licensee representatives that this item will be reviewed during a future inspection (50-302/85-05-04).

- 14. Confirmatory Measurements (84725)
 - During the inspection, reactor coolant and selected liquid and gaseous a. plant effluent process streams were sampled and the resultant sample matrices analyzed for radionuclide concentrations using licensee and NRC Region II Laboratory gamma ray spectroscopy systems. The purpose of these comparative measurements was to verify the licensee's capability to measure radionuclides accurately in various plant systems. Analyses were conducted utilizing as many of the licensee's gamma spectroscopy systems as practicable. Samples included the following: a reactor coolant (RCS) sample, liquid waste sample, plant vent charcoal cartridge, and a 30 cc waste gas sample. A spiked particulate filter sample type was provided for analyses in lieu of the licensee sample which did not have sufficient levels of activity for analysis. Comparison of licensee and NRC results are listed in Table 1 with the acceptance criteria listed in Attachment 1. Excluding the 35 cc gas bulb geometry, results were in agreement between the licensee and the NRC. For Xe-133 in the 35 cc gas bulb geometry, results were in disagreement using Ge(Li) detector system No. 1 and agreement using Ge(Li) detector system No. 2. Reanalyses conducted using the 35 cc geometry resulted in licensee ke-133 measured concentrations exceeding NRC results by approximately 15-20 percent. The observed differences were not resolved prior to the inspectors leaving the site. Licensee representatives stated that they would review calibration procedures and records. The inspectors informed licensee representatives that their evaluation would be reviewed during a subsequent inspection (50-302/85-05-05).
 - b. The inspectors reviewed licensee results for H-3, Sr-89, and Sr-90 analyses of a spiked sample prepared by the NRC contract laboratory. Comparison of licensee results are listed in Table 2 with the acceptance criteria outlined in Attachment 1. The licensee conducted all analyses in triplicate for the spiked sample. Tritium and Sr-90 results were in agreement for all analyses. Strontium-89 results were in disagreement for one of the three analyses conducted. The inspectors noted that the licensee has strontium analyses procedures using both ingrowth or yttrium separation methodology, however, the ingrowth method is utilized for all regulatory reporting requirements.

No violations or deviations were identified.

15. Laboratory Quality Control Program (84725)

The inspectors reviewed selected portions of the Quality Assurance program with cognizant licensee representatives and determined that organizational structure and program management had not changed since the previous confirmatory measurements inspection (IE 50-302/83-25). The inspector discussed the laboratory QA program with cognizant licensee representatives and noted that the in-plant radiochemistry QC program incorporated detailed crosscheck programs for radiological and chemical measurements. Review of crosscheck results and followup actions are conducted by cognizant plant personnel. The inspectors discussed the 1984 crosscheck results (Paragraph 6) and the proposed changes to chemical measurements acceptance criteria. Licensee representatives stated that acceptance criteria based on the analytical sensitivity of the contract laboratory used in comparisons rather than the 10% limit now utilized was being considered for the wet chemistry crosscheck program. The inspectors noted that followup actions on previously identified crosscheck differences were adequate (Paragraph 17).

No violations or deviations were identified.

 Use of Fission Product Phantom for Checking Whole-body Counter Measurements (92706)

During this inspection, the inspectors verified the licensee's capability to perform radiological bioassays using a whole-body counting system. A commercially available fission product phantom containing radioactive sources traceable to the National Bureau of Standards was provided to the licensee for analysis. The phantom duplicated the nuclides and organ burdens that the licensee might encounter during normal operation. The phantom was analyzed using the licensee's normal methods and equipment.

Currently, the licensee has one whole-body counting system in service which is located offsite at the licensee's Emergency Operations Facility. The licensee uses a chair system with three NaI detectors and Nuclear Data electronics. The results of the intercomparisons are presented in Table 3. The results are based on an average of three measurements, except as noted in the footnote of Table 3. The results showed good agreement with the known concentrations.

The inspectors reviewed the licensee's whole-body counting operating procedure (RP-208, Rev. 4, 12/16/83) and calibration procedure (RP-214, Rev. 2, 11/28/81). The inspectors noted that the whole-body counting system with current software has been in service for approximately two years, however RP-214 referred to a previous system. The licensee calibrates the whole-body counting system by using a vendor-prepared calibration procedure and a set of polybottles containing either Cs-137, Co-60, or Eu-152. The polybottles are uniquely designed for calibrating either the thyroid detector, lung detector, or lower torso detector. The inspectors informed the licensee that the failure to have a written and approved procedure for the calibration of the whole-body counting system as required by Technical Specification 6.8.1 was a violation (See Paragraph 5.a., Procedures).

17. Inspector Followup Items (92701)

(Open) 50-302/83-05-01, Corrective actions required to preclude recurrent NCOR's addressing meteorological instrumentation and data recovery system failures. The licensee has installed a new onsite meteorological measurements facility, however, the licensee was still in the process of upgrading the meteorological data recovery system. This item will remain open and will be examined during a future inspection.

(Closed) 50-302/83-25-01 Evaluation of Dead-time Effect of Gamma Spectroscopy Analyses. From a review of procedures and a licensee evaluation of gamma spectroscopy system dead time effects, the inspectors requested additional evaluation of this area. This evaluation of dead time effects on the gamma spectroscopy systems will be followed as a new inspector followup item (Paragraph 6.c).

(Closed) 50-302/83-25-02 Review of Gross Alpha Crosscheck results. The inspectors reviewed the 1984 interlaboratory comparison results for gross alpha analyses and noted analyses were in agreement for the samples analyzed.

(Closed) 50-302/83-25-03 Review of the Wet Chemistry Phosphate Crosscheck Results. The inspectors reviewed the 1984 interlaboratory comparison results for phosphate analyses. All results were in agreement between the licensee and the crosscheck laboratory.

(Open) 50-302/83-08-01, Calibration of RM-A1 and RM-A2 air sampler flowmeters. The inspectors determined that the flowmeters associated with the RM-A1 and RM-A2 gaseous effluent monitors were calibrated by reviewing the calibration records for calendar year 1984. The licensee performed the calibration by using a temporary instruction which has expired. The licensee is in the process of revising SP-168, "Radiation Monitoring Flow Rate Instrumentation Calibration" to include procedures to calibrate RM-A1 and RM-A2 flowmeters. The inspector informed licensee representatives that this item would remain open until final completion and approval of SP-168 is accomplished.

(Closed) 50-302/84-07-02, Adequate system of controls for certain manually operated valves associated with the post-accident sampling system must be developed and implemented. The inspectors interviewed cognizant licensee representatives and determined that all manual valves outside of containment are verified monthly in accordance with CH-383, "Automated Isotopic and Chemical Measurement System Standby Operation." Similarly, manual valves inside of containment are verified in accordance with OP-301, "Filling and Venting the RC System" and OP-403, "Chemical Addition System." This item is considered closed.

(Closed) 50-302/84-07-03, Recalibration and periodic test program for PASS. The inspectors determined that the licensee has partially completed the PASS recalibration and periodic test program by approving the following procedures:

- CH-163, "Calibration of the Leeds and Northrup 7866 Thermal Conductivity Gas Analyzer
- CH-194, "Chemical Analysis with Dionex Ion Chromatograph"
- CH-234, "Daily Energy Calibration and Yearly Efficiency Calibration of the Post Accident Sampling System High Purity Germanium Detectors"

The following surveillance procedures were in the developmental stage:

Containment Hydrogen Analyzer Surveillance Procedure RM-A1 and RM-A2 Noble Gas Upgrade Surveillance Procedure

In addition, instrument data sheets for the remaining non-essential instrumentation were not assembled. Although this item is considered closed, the completion of the surveillance procedures and assembly of the instrument data sheets will be tracked as a new open item (See Paragraph 13).

(Open) 50-302/84-07-04, Containment hydrogen samples could not be collected since the containment isolation valves could not be opened during plant power operations. The licensee was working on a design change so that containment hydrogen samples could be collected during plant power operations. In addition, the licensee was developing a containment hydrogen analyzer surveillance procedure. This item will be re-examined during a future inspection.

(Closed) 50-302/84-07-05, The following PASS design problems were noted and required modification:

- (1) The stripped gas from the reactor coolant hydrogen analysis was routed to the waste gas system. The return should go to containment.
- (2) A drain tank in the PASS system needs to be shielded in the event that the tank would be filled with reactor coolant.
- (3) The containment air sample lines were not heat traced so that moisture in the system could affect the results of the sample.
- (4) A purge system should be installed in sample line to prevent blockage and excessive plateout.
- (5) The ventilation exhaust from the sample station should be filtered at some point through charcoal absorbers and HEPA filters.

The inspectors determined that all of the above items have been addressed except for item (3). Item (1) involved modification of the hydrogen analyzer. The drain tank referred to in item (2) was removed during the hydrogen analyzer modification since it was not required. A contractor is performing an evaluation on requirements for heat tracing and the licensee will determine whether or not to modify or heat trace the containment air sample lines (See item (3)). Modifications to satisfy items (4) and (5)

have been made. Although this item is considered closed, item (3) will be tracked as a new open item (See Paragraph 13).

TABLE 1

CONCENTRATION (uCi/Unit) RATIO SAMPLE ISOTOPE LICENSEE LICENSEE/NRC NRC RESOLUTION COMPARISON (1) Reactor Coolant Co-58 2.13 E-3 1.10±0.17 E-3 6 1.94 Agreement Liquid 1-131 1.64 E-2 1.58±0.04 E-2 40 1.04 Agreement 1-133 4.66 E-2 4,93±0,07 E-2 70 0.94 Agreement 1-135 2.64 E-2 2.44±0.14 E-2 17 1.10 Agreement (2) Reactor Coolant Co-58 1.75 E-3 1.10±0.17 E-3 6 1.59 Agreement Liquid 1-131 1.34 E-2 1.58±0.04 E-2 40 0.85 Agreement 1-133 3.89 E-2 4.93±0.07 E-2 70 0.79 Agreement 1-135 2.14 E-2 2.44±0.14 E-2 17 0.88 Agreement (3) Reactor Coolant Co-58 1.78 E-3 1.10±0.17 E-3 6 1.62 Agreement Liquid 1-131 1.56 E-2 1.58±0.04 E-2 40 0.99 Agreement 1-133 4.47 E-2 4.93±0.07 E-2 70 0.91 Agreement 1-135 2.49 E-2 2.44±0.14 E-2 17 1.02 Agreement (1) Liquid Waste-Spent Co-58 8.23 E-6 7.77±0.39 E-6 20 1.06 Agreement Fuel Pool 3.42 E-6 Co-60 2.53±0.26 E-6 10 1.35 Agreement Cs-134 9.40 E-6 8.52±0.41 E-6 21 Agreement 1.10 Cs-137 3.08 E-5 3.14±0.07 E-5 45 0.98 Agreement (2) Liquid Waste-Spent Co-58 7.59 E-6 7.77±0.39 E-6 20 0.98 Agreement Fuel Pool Co-60 2.56 E-6 2.53±0.26 E-6 10 1.01 Agreement Cs-134 8.48 E-6 8.52±0.41 E-6 21 0.99 Agreement Cs-137 2.78 E-5 3.14±0.07 E-5 45 0.88 Agreement (3) Liquid Waste-Spent Co-58 7.79 E-6 7.77±0.39 E-6 20 1.00 Agreement 2.53±0.26 E-6 Fuel Pool Sample Co-60 2.91 E-6 10 1.15 Agreement Cs-134 9.56 E-6 8.52±0.41 E-6 21 1.12 Agreement Cs-134 2.97 E-5 3.14±0.07 E-5 45 0.94 Agreement (1) Particulate Filter Co-60 1.46 E-2 1.34±0.03 E-2 45 1.09 Agreement NRC Spiked Sample Cd-109 4.91 E-3 5.27±0.68 E-3 8 0.93 Agreement Cs-137 1.72 E-2 1.63±0.03 E-2 54 1.06 Agreement (2) Particulate Filter Co-60 1.22 E-2 1.34±0.03 E-2 45 1.01 Agreement NRC Spiked Sample Cd-109 3.83 E-3 5.27±0.68 E-3 8 0.73 Agreement Cs-137 1.55 E-2 1.63±0.03 E-2 54 0.95 Agreement (1) Charcoal Cartridge 1-131 1.54 E-2 1.81±0.03 E-2 60 0.85 Agreement Plant Vent 1-133 2.81 E-3 3.34±0.18 E-3 18 0.84 Agreement

RESULTS OF GAMMA SPECTROSCOPY CONFIRMATORY MEASUREMENTS AT CRYSTAL RIVER FEBRUARY 4-8, 1985

TABLE 1 Con't

SAMPLE	ISOTOPE	CONCENTRATION LICENSEE	(uCi/Unit) NRC	RESOLUTION	LICENSEE/NRC	COMPARISON
(2) Charcoal Cartridge Plant Vent	1-131 1-133	1.63 E-2 2.94 E-3	1.81±0.03 E-2 3.34±0.18 E-3	60 18	0.90 0.88	Agreement Agreement
(3) Charcoal Cartridge Plant Vent	1 - 1 3 1 1 - 1 3 3	1.72 E-2 3.15 E-3	1.81±0.03 E-2 3.34±0.18 E-3	60 18	0.95 0.94	Agreement Agreement
(1) Gas Bulb-35cc	Xe-133	3.60 E-2	2.74±0.01 E-2	274	1.31	Disagreemen
(2) Gas Bulb-35cc	Xe-133	2.85 E-2	2.74±0.01 E-2	274	1.04	Agreement

Analyzed Using Ge(Li) Detector System No. 1
 Analyzed Using Ge(Li) Detector System No. 2
 Analyzed Using Ge(Li) Detector System No. 3

TABLE 2

SAMPLE	1	SOTOPE	CONCENT	CENSE	IN I	(uCi/Unit) NRC		RESOLUTION	LICENSEE/NRC	COMPARISON
NRC Contract Lab Spiked Liquid Sample April 1984		H-3 H-3 H-3	3. 3. 3.	68 E- 71 E- 59 E-	5.5.5	3.54 ± 0.10 3.54 ± 0.10 3.54 ± 0.10 3.54 ± 0.10	E-5 E-5 E-5	35 35 35	1.04 1.05 1.01	Agreement Agreement Agreement
	(1)	Sr-89 SR-89 Sr-89	9. 7. 7.	62 E- 24 E- 96 E-	555	9.76±0.20 9.76±0.20 9.76±0.20	E-5 E-5 E-5	49 49 49	0.98 0.74 0.82	Agreement Disagreemen Agreement
	(1)	Sr-90 Sr-90 Sr-90	1. 1. 1.	47 E- 68 E- 53 E-	5 5 5	1.60±0.04 1.60±0.04 1.60±0.04	E-5 E-5 E-5	40 40 40	0.92 1.05 0.095	Agræement Agreement Agreement

RESULTS OF H-3, Sr-89 AND Sr-90 ANALYSES CONDUCTED AT CRYSTAL RIVER NUCLEAR PLANT FEBRUARY 4-8, 1985

(1) Ingrowth Method

TABLE 3

RESULTS OF WHOLE-BODY COUNTER MEASUREMENTS USING A FISSION PRODUCT PHANTOM AT CRYSTAL RIVER NUCLEAR PLANT FEBRUARY 4-8, 1985

Nuclide	Organ	Licensee (1) (nCi)	<u>NRC</u> (nCi)	Ratio Licensee/NRC
Mn-54	Lungs	54.3	42.4	1.28
Co-57	Lungs	73.1	80.0	0.91 (2)
Co-60	Lungs	248.1	194.5	1.28
Cs-137	Lungs	115.8	90.1	1.29
I-131	Thyroid	23.5	39.8	0.59
I-131	Thyroid	37.6	39.8	0.94 (3)

Licensee value represents the arithmetic mean of three measurements, each measurement was Junted for 600 seconds.

I sensee's software program could not identify Co-57. The licensee estimated the value by a hand calculation method.
(a) Licensee value represents one measurement with the thyroid placed as close as possible to the detector.

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 judgement limits are variable in relation to the comparison of the NRC's value to its associated 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 must be considered acceptable as the resolution decreases.

> RATIO = <u>LICENSEE VALUE</u> NRC REFERENCE VALUE

Resolution	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	