U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No:	50-440/98004(DRS)
Licensee:	Centerior Service Company
Facility:	Perry Nuclear Power Plant
Location:	P. O. Box 97, A200 Perry, OH 44081
Dates:	January 5 through 9, 1998
Inspectors:	Kara N. Selburg, Radiation Specialist Diana H. Nissen, Radiation Specialist
Approved by:	Gary L. Shear, Chief, Plant Support Branch 2 Division of Reactor Safety

EXECUTIVE SUMMARY

Perry Nuclear Power Plant, Unit 1
NRC Inspection Report 50-440/98004

This inspection included a review of the Radiological, Environmental and Chemistry Section's programs. This included reviews of the chemistry program, the radiological environmental monitoring program, and the post accident sampling system.

- A strong commitment to advanced technologies for source term reduction and reactor component protection was demonstrated through the implementation of the depleted zinc oxide program, and the plans for the chemistry optimization program which was to include hydrogen water chemistry and noble metal chemical addition (Section R1.1).

- Plant water quality continued to be excellent, remaining well beneath industry guidelines (Section R1.1).

- The radiological environmental monitoring program was effectively implemented. The environmental sample data indicated that there had been no discernable radiological impact on the environment from the operation of the facility (Section R1.2).

- The licensee had effectively maintained the material condition of the post accident sampling system. Annual comparisons between post accident sampling system and reactor water samples were generally within agreement, with one exception noted for the results from the first half of 1997. These comparison results were outside of the acceptance criteria and no contingency actions were taken indicating a weakness in the comparison program (Section R2.1).

- Overall, material condition of the chemistry instrumentation was good, maintenance was performed in a timely manner, and calibrations were performed as required. Some problems were observed with personnel not reviewing calibration results in a timely manner, and with personnel not communicating instrumentation problems to other departments relying on those instruments; however, these problems did not adversely impact any required analyses (Section R2.2).

- Overall technician performance was good with strong communication skills, good procedural adherence, and a thorough understanding of the sample process identified (Section R4.1).

- Overall, the quality assurance program was effectively implemented. Laboratory comparison results were satisfactory, with one exception noted in the first half of 1996. The instrumentation quality control program was effective, with the licensee using a comprehensive computer program to track parameters, and to identify trends (Section R7.1).

Report Details

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Water Chemistry Control Program

a. Inspection Scope (IP 84750)

The inspectors reviewed the licensee's water chemistry control program, including a review of trend charts of numerous chemistry parameters from January 1996 through January 1998. The inspectors also interviewed cognizant licensee individuals regarding the hydrogen water chemistry program, zinc addition program, and noble metal chemical addition program.

b. Observations and Findings

The water chemistry program was consistent with the Electric Power Research Institute (EPRI) boiling water reactor guidelines. A review of selected trend records indicated that plant water quality was excellent, and no significant problems were observed. Radiochemistry trend charts for reactor coolant isotopic analysis indicated that there were no problems with fuel integrity.

Adverse chemistry parameter trends were readily identified and addressed by chemistry personnel. The inspectors noted that the chemistry department coordinated well with plant engineering and operations personnel to ensure that system problems effecting water chemistry were appropriately repaired. This type of coordination was noted particularly with the identification of an increase of dissolved oxygen in the condensate (hot well) during the fourth quarter of 1997. After the increase was identified, chemistry and plant engineering personnel worked together to determine the potential in-leakage point. During the inspection period, the inspectors noted that engineering personnel effectively identified the appropriate hot well pump train in which the in-leakage was occurring. Through coordination with operations personnel, this train was isolated, and the dissolved oxygen concentration returned to normal levels. At the end of the inspection period, licensee personnel were working on identifying the exact source of the in-leakage, in order to repair the problem. Additionally, the inspectors noted that chemistry personnel effectively tracked continuing problems with the reactor water clean-up filter/demineralizer system, and coordinated with other licensee departments for routine system repairs. Chemistry department and plant engineering personnel also implemented a new filtration method to improve the overall system performance. The licensee was completing a gradual conversion of the original filter pre-coat material to an all resin product. The new resin product provided a greater ion exchange capacity which yielded longer run times, resulting in a reduction of radioactive waste generated. Eliminating the cellulose fiber from the original pre-coat also eliminated a potential organic source term from the system. The inspectors noted that these efforts contributed to the excellent water chemistry at the facility.

The licensee implemented a depleted zinc addition program following the sixth refueling outage in November 1997 in order to reduce source term from cobalt-60 (Co-60) in the reactor coolant. A review of trend charts had not identified a significant decrease in the reactor coolant soluble Co-60 as of January 1, 1998, however, depleted zinc had not been added for a long enough period of time for a decrease to be observed. The licensee planned to add the depleted zinc at various concentrations over the next nine months to determine the optimum concentration in the reactor coolant.

The licensee had initiated an optimization chemistry program in which plans and preliminary modifications were conducted for the implementation of hydrogen water chemistry and a noble metal chemical addition (NMCA). This chemistry program was initiated to aid in reactor protection through reducing the electrochemical corrosion potential on the reactor components, thus reducing intergranular stress corrosion cracking. Hydrogen water chemistry was scheduled to begin at the end of 1998 or the beginning of 1999, and the NMCA was scheduled to be implemented in spring of 1999 during the seventh refueling outage. The NMCA process would involve an addition of noble metal additives to the reactor water during shutdown, during which time the compounds decompose to produce a thin layer of noble metals on wetted surfaces. Using the NMCA in conjunction with hydrogen water chemistry would allow for a lower concentration of hydrogen to be added to the system, which would consequently result in lower general area dose rates.

c. Conclusions

The chemistry program was well implemented. A strong commitment to advanced technologies was demonstrated through the implementation of the depleted zinc oxide program, and the plans for the chemistry optimization program which was to include hydrogen water chemistry and noble metal chemical addition. While no significant impact had yet been observed from the use of the depleted zinc, and the hydrogen water chemistry and NMCA were still being developed, plans to implement and continue with these programs should result in long term benefits. Additionally, plant water quality continued to be excellent, remaining well beneath EPRI guidelines.

R1.2 Radiological Environmental Monitoring Program

a. Inspection Scope (IP 84750)

The inspectors reviewed various aspects of the licensee's radiological environmental monitoring program (REMP), including technician training, material condition of sampling stations, and trending of environmental data. The inspectors also reviewed the 1996 Annual Environmental and Effluent Release Report, the Off-site Dose Calculation Manual (ODCM), Updated Final Safety Analysis Report (UFSAR), and Technical Specifications (TS) and compared these documents against the program implementation.

b. Observations and Findings

The inspectors determined that the 1996 Annual Environmental and Effluent Release Report complied with REMP requirements specified in the ODCM, the UFSAR, and the TS. Environmental samples had been collected and analyzed; missing samples were documented; and the annual land use census had been conducted as required. The environmental sample data indicated that there had been no discernable radiological impact on the environment from the operation of the facility.

Changes to the REMP program in 1996 included removing the precipitation samples from the program. These samples were not required by licensee documents, however, the sampling sites remained available if future samples were desired. In 1997, the licensee determined that one air sampling station would have to be moved due to the development of a housing project in the vicinity of the current sampling station. This station was to be moved in 1998 to a nearby location in the same sector. In 1997, the licensee also changed the Environmental Section's direct report from the Environmental Supervisor to the Chemistry Supervisor. To compensate for this change, the licensee planned to give the REMP technician more responsibilities regarding report preparation and review of environmental data. Additionally, the licensee planned to certify additional chemistry technicians to allow them to obtain REMP samples. While this change had not been fully executed at the time of this inspection, the licensee continued to appropriately implement the program. During this transition period, the licensee had not formally reviewed all available environmental data. While this information had been reviewed from January through April 1997, vendor information provided to the licensee for May through November had not yet been reviewed. While the licensee was not required to submit this data to the NRC until 1998, the failure to review this data in a timely manner did not meet licensee expectations.

The inspectors accompanied a licensee technician on the weekly air sampling rounds to change air particulate filters and iodine cartridges. The technician was knowledgeable of the procedures and process to change the filters and cartridges and properly checked the operating condition of the sampling equipment. Observed air sampling equipment was within calibration and in good working order, and sampling locations were in agreement with the procedures and the ODCM. The licensee had replaced all air samplers with a newer model which improved the reliability of the samplers, improved the readability of the sample flow and run times, and allowed for a simplified calibration process. The inspectors also reviewed the licensee's computer program used to obtain and assemble environmental data. The program was loaded onto a laptop computer which was used during sampling rounds. The technician used the program to identify the sampling stations, and input field data immediately after obtaining the samples. This data was reviewed after returning to the laboratory, and sent to the vendor with the samples. The vendor then returned the laboratory results in both digital and paper form, allowing the licensee to download the information. This program was anticipated to improve data collection, and ease the production of the annual environmental report. The inspectors verified that the program was consistent with licensee procedures, and that the technician was knowledgeable of the program intricacies.

c. Conclusions

The inspectors concluded that the REMP program was effectively implemented. The environmental sample data indicated that there had been no discernable radiological impact on the environment from the operation of the facility.

R2 Status of RP&C Facilities and Equipment

R2.1 Post Accident Sampling System

a. Inspection Scope (IP 84750)

The inspectors reviewed the licensee's post accident sampling system (PASS) capabilities. This included an inspection of the sampling station, discussions with cognizant chemistry personnel, a review of the work requests pending for the system, and a comparison of PASS samples with the reactor coolant samples.

b. Observations and Findings

The material condition of the PASS system was satisfactory and improved from previous inspections. There were very few work requests on the system, and technicians indicated to the inspectors that the new procedures and system repairs eased the acquisition of samples. A review of PASS comparison data from 1996 through 1997 indicated good agreement with the exception of the first half of 1997. The licensee compared the isotopic total activity in the PASS sample to the total activity in the routine reactor water isotopic results. The comparison performed for the first half of 1997 was not within the acceptance criteria of a factor of two. The comparison was performed a second time but was still not within the acceptances criteria, however, no contingency actions were taken. Additionally, the procedure did not provide directions for the expected actions in these circumstances. While this comparison was not procedurally required to be conducted semiannually, and therefore, no violations of NRC requirements occurred, the failure to ensure that the PASS sample was in fact representative after discovering the discrepancy indicated a weakness in the comparison program. While no compensatory or corrective actions were taken the inspectors noted that the licensee's comparison results for the second half of 1997 were acceptable which verified that PASS was capable of conducting its intended function.

c. Conclusions

The inspectors noted that the licensee had effectively maintained the material condition of the PASS system, and that annual comparisons between PASS and reactor water samples showed a good agreement, with the exception of the results for the first half of 1997. These comparison results were outside of the acceptance criteria and no contingency actions were taken indicating a weakness in the comparison program.

R2.2 Chemistry Instrumentation

a. Inspection Scope (IP 84750)

The inspectors reviewed the maintenance and calibration of the various chemistry instrumentation, including the germanium detectors, proportional counters, gas chromatograph, total organic carbon monitor, and the inductively coupled plasma spectrophotometer.

b. Observations and Findings

The inspectors verified that calibrations and maintenance of chemistry equipment were satisfactory and the material condition of the instruments was good. The inspectors noted that the chemistry technicians performed the majority of the maintenance required for laboratory instrumentation. Calibrations for the germanium detectors were not required to be conducted on any routine basis; however, the chemistry staff performed calibrations every two years. A calibration was conducted in August 1996, however, these results were not reviewed until February 1997. Additionally, this information had not been input into the plant computer system at the time of the inspection, so no credit was taken for the calibration. Although the calibration was not procedurally required, the failure to complete all aspects of the calibration, including the subsequent paperwork, was an example of inattention to detail in the calibration program.

In September of 1997, a problem associated with the gamma spectroscopy power supply was identified through a failure of the daily source check. Chemistry personnel investigated the problem, and determined that vendor assistance was necessary to rectify the problem. The inspectors verified that the vendor resolved the problem in a timely manner. Prior to the failed source check, the detector was used for both chemistry analyses and health physics (HP) radioactive (hot) particle analyses. The inspectors questioned the validity of the data obtained between the failed source check and the previous acceptable source check. Chemistry personnel did not review the questionable data since the chemistry quality control program did not identify any discrepancies. The HP department had not been informed of the instrumentation problem, and therefore, was unable to perform additional verifications of the hot particle data. However, HP routinely compared isotopic results to initial hand held radiation detector (frisker) results. This comparison was conducted to verify the hot particle isotopic results used for skin dose calculations. Through discussions with HP personnel, the inspectors determined that the gross comparison analysis used by HP was satisfactory in determining that the data was accurate.

c. Conclusions

Overall, material condition of the chemistry instrumentation was good, maintenance was performed in a timely manner, and calibrations were performed as required. However, the inspectors noted that while chemistry personnel had performed calibrations on the germanium detectors, the results had not been reviewed and the computer had not been updated in a timely manner. Additionally, there were problems noted in the

communications between chemistry and health physics personnel when the germanium detectors used by both departments were experiencing intermittent problems.

R4 Staff Knowledge and Performance in RP&C

R4.1 Staff Performance During Sample Acquisitions (IP 84750)

The inspectors observed chemistry personnel obtain a PASS sample and a reactor water sample. The inspectors reviewed the procedures governing these actions, and also observed the radiation worker practices employed by the technicians. One concern was identified with contamination control practices in which a technician swiped several potentially contaminated components, and returned them to a clean storage area prior to performing a radiological survey of the smears. Survey results indicated that the components were not radiologically contaminated. Additionally, during the acquisition of a PASS sample, the technicians incorrectly skipped several procedure steps and would have proceeded if the inspector had not questioned their actions. However, overall technician performance was good with strong communication skills, good procedural adherence, and a thorough understanding of the process identified.

R7 Quality Assurance in RP&C Activities

R7.1 Laboratory and Instrument Quality Control Program

a. Inspection Scope (IP 84750)

The inspectors reviewed the laboratory quality assurance program. The inspectors reviewed the results of the semiannual inter- and intra-laboratory comparison programs for 1996 and 1997. Additionally, the inspectors reviewed the instrumentation quality control program.

b. Observations and Findings

The chemistry department received various unknown chemical and radiochemical samples from a vendor laboratory on a semiannual basis for the laboratory quality control program. These samples were analyzed by chemistry technicians, and an average of the technician results was sent to the vendor where a comparison of the licensee results versus the actual unknown concentrations was conducted. The vendor analyzed, and informed the licensee of the comparison results. The inspectors noted that the final intra-laboratory (technician comparison) results were within the prescribed relative standard deviation. Additionally, when initial comparison results were not as expected, the outlying technician analyses were re-performed until the results were within the relative standard deviation. The inspectors noted that this was in accordance with the licensee's procedures.

Additionally, the licensee's inter-lab[illegible] comparison (licensee results versus a vendor unknown) program results for 1996 a[illegible]7 were in agreement with the vendors samples, with the exception of the chlo[illegible]e analysis for the first half of 19[illegible]6. Two

separate chloride samples were ordered and analyzed by chemistry technicians. The analysis of both samples resulted in disagreements. However, when the instrument specialist ran the unknown samples, excellent results were obtained. The licensee performed an investigation of this disagreement, and determined that chemistry technicians were inconsistently using the eppendorf pipet. Chemistry supervision, with assistance from the technicians, determined a single consistent method of use of the eppendorf pipets and communicated this method through additional training. Consequently, the results for the second half of 1996 chloride analysis were satisfactory.

The chemistry staff utilized a computer program for tracking and trending the chemistry data. This program was effective in tracking and trending instrumentation data, and water quality parameters. The program used a series of warnings (flags) to identify to the user when a trend was occurring without allowing the statistical data to become too restrictive. The procedure for chemistry quality control specified how to interpret these flags, so that the trend could be identified and corrected. The inspectors noted that chemistry personnel also used the notepad function associated with the program to identify and track any system or instrumentation problems. The use of the computer program to track and trend chemistry data was considered a strength in the quality control program.

c. Conclusions

Overall, the QA program was effectively implemented. Laboratory comparison results were satisfactory, with one exception noted in the first half of 1996. The instrumentation quality control program was effective, with the licensee using a comprehensive computer program to track parameters, and to identify trends.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on January 9, 1998. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

H. Bergendahl, PNSD Director
N. Bonner, PNMD Director
M. Doty, Chemistry Supervisor
C. Elberfeld, Compliance Engineer
H. Hegrat, RAS Manager
T. Henderson, Compliance Supervisor
W. Kanda, Plant Manager
S. Moffit, PES Manager
L. Meyers, Vice President Nuclear
B. Luthenan, Chemistry Specialist
J. Sears, Radiation Protection Manager
R. Shrauder, PNED Director
J. Sipp, RECS Manager
R. States, Chemistry Supervisor
L. Zerr, Compliance Engineer

NRC

J. Clark, Resident Inspector
D. Kosloff, Senior Resident Inspector

INSPECTION PROCEDURES USED

IP 84750 Radioactive Waste Treatment, and Effluent and Environmental Monitoring.

ITEMS OPENED, CLOSED, AND DISCUSSED

No items were opened closed or discussed during this inspection period.

LIST OF ACRONYMS USED

BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
Co-60	Cobalt-60
DZO	Depleted Zinc Oxide
ECP	Electrochemical Corrosion Potential
EPRI	Electric Power Research Institute
HP	Health Physics
HWC	Hydrogen Water Chemistry
ICP	Inductively Coupled Plasma Spectrophotometer
IGSCC	Intergranular Stress Corrosion Cracking
IP	Inspection Procedure
IR	Inspection Report
NMCA	Noble Metal Chemical Addition
NRC	Nuclear Regulatory Commission
ODCM	Off-site Dose Calculation Manual
PASS	Post Accident Sampling System
PDR	Public Document Room
REMP	Radiological Environmental Monitoring Program
RP&C	Radiation Protection and Chemistry
TOC	Total Organic Carbon
TS	Technical Specifications

PARTIAL LIST OF DOCUMENTS REVIEWED

Calibration data for germanium detectors for August 1996.

Chemistry trend charts for 1997 including the following: reactor power; reactor water (dose equivalent iodine, isotopic, cobalt-58, cobalt-60, cesium-137, cesium-138, zinc-65, chloride, conductivity, silica, sulfate, zinc); hot well or condensate (conductivity, dissolved oxygen); feed water (conductivity, total copper, dissolved oxygen, total iron).

Memorandum to File from G. Forbelm, dated 01/07/08, "Semi annual QA/QC's for the Second Half of 1996."

Memorandum to Chemistry Personnel from W.D. Mills, dated 09/25/97, "Standing Order 96-006 Update."

Perry Nuclear Power Plant 1996 Annual Environmental and Effluent Release Report.

Perry Nuclear Power Plant 1996 Annual Meteorological Report.

Procedures: CHI-0008; CHI-0009; CHI-0013; CHI-0014; RPI-1202; RPI-1313; PAP-1118; SOI-P87.

Quality Control Data Sheets for 1996 and 1997.