UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

JUN 12 1989

Report Nos.: 50-280/89-11 and 50-281/89-11

Licensee: Virginia Electric and Power Company
Glen Allen, VA 23060

Docket Nos.: 50-280 and 50-281 License Nos.: DPR-32 and DPR-37

Facility Name: Surry 1 and 2

Inspection Conducted: May 15-19, 1989

Inspector: D. M. Collins for P. G. Stoddart 6-9-89
Date Signed

Approved by: D. M. Collins 6-9-89
D. M. Collins, Acting Chief
Radiological Effluents and Chemistry Section
Emergency Preparedness and Radiological Protection Branch
Division of Radiation Safety and Safeguards
Date Signed

SUMMARY

Scope:

This routine, unannounced inspection was in the areas of plant chemistry, radwaste, effluent monitoring, environmental monitoring, and review of Semiannual Annual Radioactive Effluent Release Reports and 1988 Environmental Report.

Results:

Review of the Semiannual Effluent Release Reports for 1988 indicated that the licensee continued to release radioactivity in liquid effluents and radioactive iodines and particulates in gaseous effluents at a rate among the highest of licensees in Region II. There appeared to be signs of progress in the replacement of process and effluent radioactivity monitors which had been either out-of-service or radioactively contaminated for over six years. An oxygen monitor in the waste gas system had been authorized for a design change after being out-of-service for approximately two years. The plant chemistry program was functioning well and chemistry technician training was adequate; the chemistry program and the chemistry technician training program were considered to be licensee strengths. Sludge lancing results from the 1988 shutdowns indicated continuing problems with system piping corrosion, especially in Unit 2.

In the areas inspected, violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

A. Brown, Instructor, Licensed Operator Training
J. Carson, Engineer, Instrumentation and Electronics
*D. Erickson, Superintendent, Health Physics
*B. Garber, Supervisor, Health Physics
*M. Kansler, Site Manager
C. Mehalie, Instructor, Training Center
L. Morris, Engineer Maintenance
*E. Swindell, Supervisor, Chemistry

Other licensee employees contacted during this inspection included engineers, operators, security force members, technicians, and administrative personnel.

NRC Resident Inspector

*W. Holland

*Attended exit interview

2. Status of Inspector Followup Items and Information Notices (84750)

(Closed) Information Notice (IN) 50-280, 281/88-IN-31: Steam generator tube rupture analysis deficiency. The inspector determined that the licensee had received the IN and had initiated remedial action. On the basis of conservative analyses, the licensee determined that the Exclusion Area Boundary (EAB) doses would be within 10 CFR Part 100 dose limits but would exceed the Standard Review Plan (SRP) 15.6.3 criteria. The licensee also determined that, on the basis of conservatisms in the above analyses, the radiological consequences of the postulated event would be less than calculated. The licensee concluded that, while the analysis using conservative assumptions produced radiological results higher than SRP 15.6.3 criteria, the licensee would actively participate in the Westinghouse Owners Group (WOG) program, along with other utilities, to seek a generic resolution of this potential safety concern. When the WOG work is finalized, the licensee intended to reevaluate the plant's steam generator tube rupture accident analysis and would then submit the results of NRR for review. On the basis of the foregoing discussion, this matter was considered closed for tracking purposes.

(Closed) IN 50-280, 281/88-IN-22: Disposal of sludge from onsite sewage treatment facilities. Inspection Report (IR) No. 50-280, 281/88-13, Section 3, page 2, described the method used to dry sludge for packaging for shipment to the Surry County (VA) landfill. Shipments were normally

made about twice a year in volumes of 20 to 30 cubic feet (ft^3) per shipment. During this inspection, the inspector reviewed the licensee's procedure for monitoring of shipments of dried sludge to the Surry County (VA) landfill. The licensee's procedures for preventing the inadvertent shipment of radioactive material to the county landfill were considered to be adequate. On the basis of the foregoing discussion, this matter is considered closed.

(Open) Inpsector Followup Item (IFI) 87-02-03: Resolve the inoperability problem of component cooling service water monitor RM-SW-107. The existing monitor had been out-of-service since approximately 1978, when fouling of pumps and pump intakes precluded reliable automated sampling. As built, the monitor took samples from four separate service-water-to-component-cooling-water heat exchangers by means of four pumps. Debris in the service water (river water) caused plugging of sampling lines and jamming of pumps on a frequent basis and made the monitor essentially useless, at which time the licensee opted for periodic sampling and analysis of the service water. During this inspection, the inspector was informed that this monitor problem had recently been elevated to "Type 3" engineering study status the licensee's most urgent priority. Consideration was being given to installing a detector in a "well" on the manway cover of one of the service water heat exchangers; however, no firm solution or date had been established. Since this matter had not been fully resolved, it remained open for tracking purposes.

3. Chemistry: Primary and Secondary Coolant Chemistry and Radiochemistry (84750)

At the time of this inspection, both units had been shut down for over six months. A number of chemistry-related operations had taken place during the shutdown and in the interval since the chemistry inspection of February 16-19, 1988 (IR No. 50-280, 281/88-06).

Pipe-thinning continued to be a major concern and the licensee was participating actively in industry efforts to minimize the problem. Sludge lancing of Unit 1 steam generators in the Spring of 1988 produced 43 pounds of sludge from A steam generator, 35 pounds from B steam generator and 58 pounds from C steam generator. Lancing of Unit 2 steam generators in Fall of 1988 produced 440 pounds from A steam generator, 170 pounds from B steam generator and 180 pounds from C steam generator. These quantities were consistent with the sludge removed from Units 1 and 2 during the 1986 outages (see IR No. 50-280, 281/88-06, Paragraph 4.a.(2)) and were indicative of continued piping thinning. The licensee's chemistry program had been able to monitor plant chemistry within the owner's group guidelines but this appeared to have had little effect on the amount of corrosion material removed from the steam generators.

The licensee contracted with an outside company to evaluate corrosion product transport in the secondary systems of both units as a result of an increase in secondary coolant pH from 8.8 to 9.16 and to identify, if

possible, differences in plant chemistry which occurred over the history of the Surry units. The change in pH resulted in no apparent improvement in iron transfer, but transport of nickel and copper was found to have increased. A decrease in the concentration of dissolved oxygen in the secondary coolant as the result of increased water purity control was seen as the only apparent change in water chemistry since about 1980.

The inspector reviewed logs and records of completed chemical analyses and reviewed trending graphs for principal plant chemical parameters.

The licensee had installed an on-line monitoring system for principal plant parameters and was in the process of testing and calibrating the system prior to formal acceptance. The system was to provide essentially continuous on-line monitoring and to provide computerized data logging. The system will be backed up by frequent grab sampling and analysis as a quality control measure.

Approximately five percent of condenser tubes were eddy current tested during the last shutdowns. This was up from four percent in previous inspections but did not reach the eight percent level forecasted in IR No. 50-280, 281/88-06. The condenser tubes were hydrolased during the last shutdowns (1988).

The licensee employed a private consultant to review plant chemistry data to determine if any significant changes had taken place in the chemistry of the secondary coolant since 1980. A licensee representative stated that the only apparent change was in a lowered concentration of dissolved oxygen.

Graphic trending was being employed extensively by the chemistry department and by other licensee groups. Employment of trending was anticipating to increase when the on-line chemistry monitoring system became operational.

Licensee chemistry representatives stated that the biggest chemistry problem recently had been sulfate throw from the condenser demineralizers. A system was being installed to separate resins for better regeneration and less fragmenting of resin beads. The licensee estimated that anion resins would be regenerated every second cycle, or one bead every 10 days. Cation resins were expected to be regenerated about once each five days. It was considered that such a program would reduce sodium concentrations in the secondary system to about 1 ppb. The licensee had not seen problems with silica to date. Some calcium was apparently being introduced into the system from makeup but was seen primarily as hideout return during startup and shutdown.

The licensee had experienced very little river water intrusion since titanium condenser tubes were installed.

Based on the above, the licensee's chemistry program was a licensee strength.

No violations or deviations were identified.

4. Chemistry: Training and Staffing (84750)

The chemistry staffing level, as of the time of this inspection, was 22, including the Chemistry Supervisor. The Chemistry Supervisor reported to the Superintendent of Technical Services, who reported to the Assistant Station Manager for Operations and Maintenance, who, in turn, reported to the Station Manager. The inspector was informed that, as a result of increased attention to plant chemistry, authorization had recently been given to add three new positions to the chemistry staffing level.

Training of chemistry personnel was coordinated through the licensee's onsite training center. The inspector inspected the chemistry training facilities, discussed chemistry training with members of the training center staff, and reviewed selected portions of chemistry lesson plans, self-study materials, training aids and visuals, and reviewed typical examinations and examination results. The two chemistry instructors were former plant chemists and appeared to have a good background in the various phases of chemistry applicable to nuclear power plants.

Special chemistry training facilities included a full equipped chemistry laboratory and an operating mockup of the licensee's High Range Sampling System (HRSS) or Post-Accident Sampling System (PASS).

Formal training requirements were divided into eight modules or "steps," with chemists-in-training expected to complete each "step" within a nominal six-month period. The licensee had been generally successful in hiring new chemistry staff members with a minimum of a Bachelor's degree in chemistry or a related field such as biology. In each step, an individual would be assigned to one week in training status in each six-week segment, with each week of training devoted to 40 hours formal classroom training, "on-the-job" training or a combination of both. The fully qualified chemists subsequently received a minimum of 96 hours of continued training annually.

A low turnover of chemistry personnel was demonstrated by the training status, with only five out of 22 not having completed the full four-year training program. A licensee representative stated that no contractor chemistry personnel were employed at the site.

The low turnover rates and the resultant continuity of staff, backed up by a commendable training program and adequate management support, were licensee strengths.

No violations or deviations were identified.

5. Post Accident Sampling System (PASS) (84750)

The licensee's PASS was designated by the licensee as the HRSS and will be referred to in this inspection report as HRSS. The inspector discussed

the HRSS with licensee representatives of the Chemistry Department and of the Training Department. The Chemistry Department had principal responsibility for operation of the HRSS, while the Training Department had responsibility for training and periodic training of Chemistry technicians in HRSS operation.

Licensee's administrative procedure ADM 9.7 required a monthly status report on the operational availability of the HRSS. The ADM 9.7 status report of May 16, 1989, showed the PASS at an overall availability rating of 75 percent (%). For reactor coolant analyses, the boron analyzer had been inoperable since May 16, 1989, because of a failed memory board; however, the licensee retained the alternative of procuring a diluted grab sample for local analysis. The status report incorrectly showed the availability of the containment air sampling module of the HRSS as 100%; however, the report details showed TV-HC-208B, as inoperable since February 9, 1989, which prohibited sampling from the Unit 2 containment and availability should have been 55%, not 100% as stated. The Unit 1 containment sump sampling was reported to have been out-of-service since May of 1987; repairs were to have been made during the current outage of Unit 1, but licensee representatives indicated that the needed repairs had not been completed as of the time of this inspection.

The inspector discussed HRSS training of Chemistry technicians with licensee representatives and reviewed training plans and self-study material. Training plans and self-study material appeared to be adequate. It was noted by the inspector that revision of this material had been undertaken and was in a near-final draft form.

No violations or deviations were identified.

6. Semiannual Effluent Release Reports (84750)

The inspector reviewed the licensee's Semiannual Radioactive Effluent Release Reports for January-June 1988 and July-December 1988. The reports appeared to be complete and were submitted on a timely basis. The contents of the reports were discussed with licensee representatives.

In a comparison of site radioactive effluents with other Region II sites, on a "per unit" release basis, with 22 other operating pressurized water reactor (PWR) units, it was observed that releases of noble fission product gases and gaseous and liquid tritium were below Region II averages for 1988 unit releases. However, releases of radioiodines and particulates in gaseous (airborne) releases were a factor of 8.4 greater than Region II unit averages and were the highest in Region II. The inspector and licensee representatives discussed these releases and concluded that most of the activity was probably the result of fuel defects. The licensee shut one unit down after a short run because of fuel leaks, and took action to remove the defective fuel. The unit had not been restarted as of the end date of this inspection.

Liquid radioactive releases of fission and activation products for 1988 were lower than licensee's releases in any year since 1980. This was considered to be partially attributable to improvements in radioactive waste processing and partially to extended plant shutdowns during 1988.

The licensee had previously recognized that there was room for improvement in the areas of radwaste processing and radwaste management and at the time of this inspection was in the process of contracting an extensive radwaste building designed to provide improvements in several areas of radwaste processing, including a "super compactor" for dry wastes, a solidification system for resins and high activity liquids, and improved capacity for demineralizer treatment of liquid wastes. The licensee tentatively projected a December 1990 completion date for that facility. Other compensatory measures already in place to minimize or reduce liquid effluents included a plant-wide leak reduction program, administrative control measures to eliminate introduction of organics into the radioactive drains system, and the installation of larger capacity demineralizers in the liquid radwaste treatment system. While the liquid radwaste treatment system normally operated with one filter vessel and two demineralizers in series, the system had the capability of adding two more demineralizers in series.

Gaseous effluent releases occurred from two principal paths; the gaseous radwaste treatment system and the ventilation effluent high efficiency particulate air (HEPA) filter and charcoal absorber systems. The gaseous radwaste treatment system processed offgases from the plant primary coolant system by holdup to allow for radioactive decay of short-lived fission product noble gases and gaseous neutron activation products. The ventilation exhaust treatment system used HEPA filtration to remove radioactive particulate material from ventilation exhaust treatment systems and absorption of gaseous radioiodine on activated charcoal beds.

The licensee also reported that there were no unplanned releases of radioactive materials for the period January through December 1988.

Operability of radioactive liquid and gaseous process and effluent monitoring instrumentation was also reported by the licensee. The Component Cooling Service Water Monitor (RM-SW-107) continued to be out-of-service. The inspector noted and discussed with the licensee that this monitor had been out-of-service essentially continuously since approximately 1978. In the interim, the licensee had performed alterative surveillance of this potential release pathway through regular sampling and analysis, as provided by the Technical Specifications. Licensee representatives were reminded that the purpose of the alternative surveillance provisions of the Technical Specifications (TSs) was to provide the licensee with a reasonable but unspecified period of time in which to repair or replace the monitor. The licensee was informed that it was not the intent of the TSs to permit the licensee, in effect, to permanently change the design basis of the monitor and circumvent the basic function of the monitor indefinitely. The licensee was also reminded that two related monitors (RM-SW-105/106) were, for practical

purposes, out-of-service as the result of high radiation background readings for approximately the same time period as the result of radioactive contamination of the Component Cooling Water Circulatory System; these were not TS monitors and were not required to be reported. The inspector was notified that a high priority level Design Change had been initiated for installation of redesigned monitors to replace all three monitors (RM-SW-105/106/107). No specific date was defined for placing the redesigned monitors in service. Since an existing IFI (50-280, 281/87-02-03) was already in place for tracking resolution of the inoperability of RM-SW-107, the licensee was notified that IFI 50-280, 281/87-02-03 would remain as an open item for tracking purposes.

The licensee also reported that the Waste Gas Holdup System oxygen monitor, which has the function of assuring that an explosive mixture of hydrogen and oxygen gases does not develop in the Waste Gas Holdup System by verifying that the percentage of oxygen in the system does not exceed four percent, continued to be out-of-service. The inspector was notified that the replacement of the oxygen monitor had been assigned a high priority for design change, but no completion date was committed to by the licensee.

No violations or deviations were identified.

7. Audits (84750)

The inspector reviewed licensee audit files for audits concerning matters within the scope of this inspection and conducted or issued since the previous inspection (IR No. 50-280, 281/88-13, issued May 26, 1988).

Audit S88-19, dated August 22, 1988, was concerned with Health Physics and Radiological Environmental Monitoring. Four findings, three concerns and two comments were identified and the auditor noted that the discrepancies indicated an overall weakness in the effectiveness of the Radiation Protection Program. The licensee's responses to the audit findings appeared to be timely and were considered to be adequate to meet the specified concerns.

Audit S89-17, dated March 28, 1989, "Quality Assurance Chemistry Audit," and Audit S89-11, "Process Control Program Audit," dated April 18, 1989, were also reviewed by the inspector. Audit S89-11 had three findings relating to purchasing, procurement, and onsite storage of shipping containers for radioactive resins and the use of forms in radwaste processing. Two findings had been evaluated and corrected at the time of the inspection, while resolution of the third matter was due after the end date of this inspection. No adverse findings were reported in Audit S89-17, but two "observations" were dismissed. Licensee's responsiveness and timeliness of responses were considered adequate.

No violations or deviations were identified.

8. Liquid and Gaseous Radwaste Processing (84750)

In Paragraph 6 of this report pertaining to the Semiannual Radwaste Effluent Release Reports, it was noted that certain effluents were in excess of annual averages for operating PWRs in RII. A summary of past years' experience at Surry is illustrative.

Effluent Releases, Curies Per Year (for 2 Units)

Year	Liquids - Fission and Activation Products	Gases Noble Gases
1988	2.41E+00	3.66E+02
1987	5.10E+00	3.08E+02
1986	8.77E+00	1.99E+03
1985	8.50E+00	2.07E+03
1984	9.73E+00	6.96E+03
1983	1.45E+01	5.49E+03
1982	6.70E+00	2.10E+04
1981	6.11E+00	1.40E+04

It should be noted that releases for 1987 and 1988 were lower than in previous years; however, this could be largely due to the ongoing extended plant shutdowns.

The licensee had earlier recognized that lower releases were practicable and had developed a long-term plan for reducing the curie content of both liquid and gaseous effluents. One major feature of that plan was the new consolidated radwaste processing facility, which was in an early construction stage at the time of this inspection.

The present liquid radwaste processing system was based on five stainless steel demineralizer vessels, each having a capacity of 30 ft^3 of resin and a nominal flow rate of 50 gpm. A typical operating configuration was three vessels in series, the first containing a combination of activated charcoal, cation resin and a mechanical filter, the second containing cation resin, and the third containing mixed anion and cation resins. Processing was normally on a once-through basis to a sampling or monitoring task where the processed water was sampled and analyzed prior to discharge under a radwaste release permit system. Discharge from the sampling or monitoring task was to the plant circulating water system which in turn discharged to the James River. Final control of discharge in the event of error was provided by the waste release monitor, RM-LW-108, an in-line scintillation monitoring system which in the event of alarm would signal for the automatic termination of flow through closure of the discharge control valve.

Post operational experiences with demineralizer resins as the method of choice for plant-generated liquid radwaste had shown the present system to be capable of operating within the permissible discharge limits of the plant TSs and of other applicable State and Federal regulations and

guidelines. While the demineralizer system was technically capable of reducing discharges by as much as a factor of 10 below the actual discharges, the in-plant control of resin-depleting wastes such as oils, solvents, and detergents had been inadequate to prevent premature depletion of the demineralizer resins, thus reducing the effective decontamination factor of the radwaste processing system. To alleviate this situation, the licensee implemented an action plan to eliminate or minimize the introduction of resin-fouling materials. Drains were specially labelled, sinks were posted with signs restricting use, and plant-wide indoctrination programs were held. Parallel programs for minimizing leaks plant-wide were also initiated.

The new radwaste facility, under construction at the time of this inspection, was to have added capacity for holdup and reprocessing, and for additional flexibility in processing methods.

Leak reduction programs were also established for waste gas systems. Reduction of leaks would permit use of longer decay times for gas holdup tanks, thus reducing the concentration of short-lived noble gases in decay tank releases and could also reduce the fraction of short-lived noble gases being discharged via the system and to maintain the subatmospheric containment pressure used for the licensee's reactor units.

No violations or deviations were identified.

9. Radiological Environmental Report (84750)

The inspector reviewed the licensee's Radiological Environmental Report for 1988 and discussed the report with licensee representatives. The report appeared to be complete and to contain the necessary information.

Analyses of river water samples taken near the plant discharge at downstream locations failed to show any gamma-emitting fission products in excess of the Lower Limit of Detection (LLD); however, tritium, above anticipated background levels of approximately 300 pCi/l, was measured in 16 of 24 quarterly composite samples, with an average of 411 pCi/l and a range of 150 to 820 pCi/l. The 820 pCi/l sample, taken at the Surry Station water intake, was confirmed by reanalysis. The average tritium activity of the Surry Station liquid effluent was 450 pCi/l, with a range of 420 to 490 pCi/l. For control stations, the average concentration was 280 pCi/l, with a range of 140 to 440 pCi/l. All of the samples were analyzed at sensitivity levels well below the required LLD of 2E+03 pCi/l.

Analyses of shoreline sediments indicated the presence of one man-made nuclide Cs-137 in one sample. The activity of the sample was 16.3 pCi/kg (dry weight). All other samples showed only anticipated levels of the naturally-occurring nuclides.

Analyses of milk from local dairies did not indicate the presence of I-131 in any of 60 samples. Naturally-occurring K-40 was detected in all samples. Cs-137 was identified in two out of 60 samples, with an average

activity of 7.5 pCi/l and a range of 6.3 to 8.8 pCi/l; required LLD was 18 pCi/l. The CS-137 was considered to be a remnant of past atmospheric global weapons testing.

Twelve milk samples were collected in participation with the State split sampling program and analyzed for Sr-89 and Sr-90. Sr-89 was not detected in any samples. Sr-90 was detected in 10 of 12 samples at an average level of 2.45 pCi/l and a range of 0.71 to 4.5 pCi/l. It was noted that during the preoperational radiological monitoring program for the licensee's site, Sr-90 was routinely detected in milk samples at levels of 5.2 to 13 pCi/l.

Direct radiation in the plant environs was monitored by a thermoluminscent dosimetry (TLD) array placed in two concentric rings around the plant site, one ring at the site boundary and the other at approximately five miles distance in each of 16 sectors. Supplemental TLDs were also placed in special interest locations such as population areas and nearby residences and at distant locations for control purposes. Dose measurements for the sited environs averaged 6.3 mR/standard month; with a range of 4.2 to 9.2 mR/standard month. Control station doses were reported at an average 5.7 mR/standard month, with a range of 5.1 to 6.6 mR/standard month. Natural radiation background at seal level has been reported at 80 to 100 mR/year or approximately 6.7 to 8.3 mR/standard month.

The licensee's plant TS 6.6.B.2 requires that a Land Use Census be conducted annually within a five-miles radius of the plant. The 1988 Land Use Census reported that no changes had occurred which would require changes to the Monitoring Program or to the dose calculational model.

Based on the inspector's review of the licensee's Environmental Report for 1988, it appeared that no significant environmental input had occurred as a result of 1988 plant operations, that the report contained sufficient information to meet regulatory guidelines for reporting, and that the report was considered to be adequate.

No violations or deviations were identified.

10. Exit Interview

The inspection scope and results were summarized on May 19, 1989, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed above. Although proprietary information was reviewed during this inspection, none is contained in this report. Dissenting comments were not received from the licensee.

The Semiannual Radioactive Effluent Release Reports and the Radiological Environmental Report for calendar year 1988 were reviewed and discussed. The reports were determined to be adequate. Releases of mixed fission and activation products in liquid effluents and iodine 131 and particulates in

gaseous effluents were higher than average releases from all PWRs in Region II for 1988. The plant chemistry program appeared to be functioning well and chemistry technician training was adequate; the chemistry program and the chemistry technician training program were considered to be licensee strengths. Sludge lancing results from 1988 shutdowns indicated continuing problems with system corrosion, especially with respect to Unit 2.

In the areas inspected, violations or deviations were not identified.