



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA ST., N.W., SUITE 3100  
ATLANTA, GEORGIA 30303

Report No. 50-281/79-29

Licensee: Virginia Electric and Power Company  
P. O. Box 26666  
Richmond, Virginia 23261

Facility Name: Surry, Unit 2

License No. DPR-37

Inspection at Surry site/near Williamsburg, Virginia

Inspector: C. M. Hosey 8/2/79  
C. M. Hosey Date Signed

Approved by: G. R. Jenkins 8/2/79  
G. R. Jenkins, Acting Section Chief, Date Signed  
FFMS Branch

SUMMARY

Inspection on April 15-19, 1979

Areas Inspected

This special, unannounced inspection involved 35 inspector-hours on-site in the area of review of events surrounding the overexposure of a shift supervisor.

Results

Five apparent items of noncompliance were found in the area inspected [Violation-Exceeded quarterly whole body radiation exposure limit (50-281/79-29-01), paragraph 7.a; Violation-Failure to follow plant procedures (50-281/79-29-02), paragraph 6.g; Violation-Failure to perform a survey (50-281/79-29-05), paragraph 6.i; Infraction-Failure to provide radiation monitoring device (50-281/79-29-03), paragraph 6.h; Deficiency-Failure to provide written notification within 24 hours (50-281/79-29-04), paragraph 8].

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## DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*W. L. Stewart, Station Manager
- \*J. L. Wilson, Superintendent - Operations
- \*T. A. Peebles, Superintendent - Technical Services
- \*R. M. Smith, Health Physics Supervisor
- O. Vogtsburger, Nuclear Training Coordinator
- S. Sarver, Corporate Health Physicist
- M. Beckham, Assistant Health Physics Supervisor
- J. S. Dodson, Assistant Health Physics Supervisor
- D. Densmore, Assistant Health Physics Supervisor
- G. Kane, Operating Supervisor
- \*E. P. Dewandel, Staff Assistant

Other licensee employees contacted included two shift supervisors, one operator trainee, and five technicians.

#### NRC Resident Inspector

- \*D. Burke

\*Attended exit interview.

### 2. Exit Interview

The inspection scope and findings were summarized on April 19, 1979 with those persons indicated in Paragraph 1 above. The Station Manager stated that he issued a memorandum to all superintendents and supervisors on April 18, 1979, directing that all personnel issued keys to any locked barricade for high radiation areas greater than 1 R/hr must contact the assistant health physics supervisor on duty prior to entering the area. In addition, he stated that the keys to the in-core instrument rooms would be placed under the administrative control of the Health Physics Supervisor. The Station Manager acknowledged the items of noncompliance; however, he stated that the station should not be penalized when an individual violated the administrative controls that had been established to prevent an over-exposure. On May 2, 1979, the NRC Resident Inspector informed the Station Manager that the name of the licensed Reactor Operator directly involved in the matter identified in this report would be transmitted to the Operator Licensing Branch of the Office of Nuclear Reactor Regulation and to IE:HQ for their information. On May 7, 1979, an NRC inspector discussed the noncompliance item regarding failure to survey prior to entry with the Station Manager.

3. Licensee Action on Previous Inspection Findings

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Overexposure Incident - General

- a. On April 14, 1979, at approximately 11:10 p.m., the shift supervisor on duty entered the reactor cavity (incore instrument room) of Unit 2 to locate the source of water leaking into the room. Water had been observed running out of the room earlier in the shift. At the time of the entry, the reactor was defueled and the incore instrument thimbles were in the withdrawn position.
- b. The shift supervisor and an operator trainee entered containment under a standing radiation work permit (RWP) Number 79-SWP-1 which permitted general entries, operational walkdowns, sampling and back seating of valves. The shift supervisor and trainee passed through a radiological control barrier in going from the -3'6" elevation to the access hatch of the incore instrument room on the -13' elevation. The barrier was posted with a warning sign which read, "CAUTION-High Radiation Area-Prior Health Physics Notifications Required for Entry". The "buddy" system was used for the entry into the incore instrument room. The trainee remained at the access to the room and remained in voice contact with the shift supervisor. Entry into the area was made without a prior survey sufficient to ensure that the dose limits of 10 CFR 20.101(b) were not exceeded without prior notification of Health Physics, and without a dose rate indicating instrument.
- c. The shift supervisor unlocked the access to the incore instrument room and entered. The shift supervisor was in the area approximately 15 minutes. Upon exiting, the shift supervisor's 0-200 mr pocket dosimeter was observed to be off-scale. The shift supervisor and trainee exited containment. The off-scale dosimeter reading was immediately reported to Health Physics. The shift supervisor's thermoluminescent dosimeter (TLD) was read by Health Physics. The primary whole body area of the TLD ribbon read 10.093 rem. A radiation survey of the areas of the incore instrument room that had been occupied by the worker was performed by Health Physics and indicated radiation levels in excess of 45 R/hr. An estimated dose based on radiation levels in the room and time spent in the area supported the dose recorded on the TLD.
- d. The shift supervisor was removed from all work assignments involving radiation exposure and/or radioactive contamination for the remainder of 1979.

6. Sequence of Events

- a. The following sequence of events was determined from licensee records, and from interviews with involved individuals, including the shift supervisor who made the entry, the operator trainee who accompanied the shift supervisor, health physics technicians at dose control, the assistant health physics supervisor on duty at the time of the incident, the station Health Physics Supervisor and the health physics technician on duty in containment when the incident occurred.
- b. On April 14, 1979 the operators in the control room had observed that the Unit 2 containment sump pump was running frequently. During the later part of the 4-12 shift on April 14, 1979, the shift supervisor sent an operator trainee into Unit 2 containment to determine the source of water entering the sump. The trainee discovered water running from around a steel plate covering the plug which provided access to the area under the reactor vessel in the vicinity of the accumulators. The shift supervisor telephoned the senior reactor operator (SRO) on-call and discussed the possible source of the water. They also discussed going under the reactor vessel to locate the source. The SRO on-call told the shift supervisor that going in the Unit 2 reactor cavity would not be a problem since a recent radiation survey performed in the area to collect information for North Anna Power Station indicated the radiation levels were low. (This information was in error since the survey had actually been performed in the Unit 1 reactor cavity.) During an interview, the shift supervisor stated that this information supported his personal experience. Previously, when he had gone in the reactor cavity for valve line-ups and visual inspections, his radiation exposure was not significant. He also stated that at the time the entry was made, the fact that the thimbles had been withdrawn into the reactor cavity prior to defueling the reactor did not register.
- c. Between 10:45 and 11:00 p.m., the shift supervisor and the trainee dressed in anti-contamination clothing and the shift supervisor checked out the normal dosimetry (low range pocket dosimeter) from dose control for a preliminary walkdown of containment. The trainee had a low range pocket dosimeter from previous entries. The shift supervisor also obtained a permit to draw a self-contained breathing apparatus (SCBA) because he had some concern about the quality of air in the reactor cavity. When the SCBA was requested, the shift supervisor indicated that he would be working on radiation work permit 79-SWP-1 for general entries into containment and operational walkdowns. In discussions with the health physics technician at dose control and the health physics supervisor who interviewed the involved parties immediately following the incident, the inspector determined that the shift supervisor did not notify health physics that he was going into the reactor cavity. The Station Manager stated that his interviews with the individuals involved support the conclusion that notification was not given to health physics prior to entry.

- d. At approximately 11:05 p.m., the shift supervisor and trainee entered Unit 2 containment and went to the ladder on the -3'6" elevation leading to the Residual Heat Removal (RHR) platform and access to the incore instrument room. The shift supervisor and trainee descended a vertical ladder and proceeded to the access hatch for the incore instrument room. When they discovered the access hatch was locked, the trainee left the area and, using the intercom, called the control room for the key to be brought into containment. While the trainee was gone, a health physics technician in containment noticed the shift supervisor standing on the RHR platform and asked him what he was doing. The shift supervisor's reply was "no problem, just looking around". The technician left to cover a job in the basement of containment; when he returned, 20 to 30 minutes later, the shift supervisor was gone.
- e. The trainee brought the key and the lock was opened. The shift supervisor stated that he had looked at his watch while the trainee was gone and it was approximately 11:10 p.m. The shift supervisor entered the hatch and climbed down a 10 foot ladder. He observed water was approximately one foot above the walkway. The shift supervisor stated he had some concern about electrical shock since the sump pump was completely submerged in water, but proceeded anyway.
- f. The shift supervisor worked his way down the horizontal hand rails searching for leaks and looked under the reactor vessel. He stated he went to within 10 feet of the reactor vessel and observed water running over the lip of the vessel. He exited the incore instrument room and read his pocket dosimeter. The pocket dosimeter was off-scale. He stated he again looked at his watch and it was approximately 11:25 p.m. The shift supervisor relocked the access hatch and, along with the trainee, exited containment and went to the health physics office.
- g. Facility Technical Specifications 6.4.B and 6.4.D require that radiation control procedures be provided, made available to all station personnel and followed. The licensee's Health Physics Manual, Section 1.3, Paragraph F.4 states, in part, that "Any area, tools, components, etc. posted with a radiation warning placard, roped-off, or otherwise barricaded, signifies the existence of a potential hazard. The placarded instructions must not be violated and no unauthorized entrance past the ropes or barricades is allowed". The shift supervisor and trainee passed through a barrier at the top of the ladder leading down to the RHR flat that was posted "Caution-High Radiation Area-Prior Health Physics Notification Required for Entry". The access hatch to the incore instrument room was posted with an identical sign. The shift supervisor stated that, based on prior knowledge and his conversation with the SRO on-call, he did not believe the area in the incore instrument room was a high radiation area and thought that failure to remove the signs had been an oversight. A radiation survey of the incore instrument room performed immediately after the incident indicated the radiation levels in the area occupied by the shift supervisor ranged from 0.115 R/hr to in

excess of 45 R/hr. Also, the Health Physics Manual, Section 1.3, Paragraph F.5 requires, in part, that a special RWP be initiated by the responsible supervisor for non-routine jobs or to cover unusual circumstances on a routine job. The shift supervisor did not initiate an RWP for his entry to the incore instrument room. Failure to comply with procedures and posted instructions was cited as noncompliance with Technical Specification 6.4.D (281/79-29-02).

- h. Technical Specification 6.4.B.1.e states, in part, that any individual or group of individuals permitted to enter a high radiation area shall be provided with a radiation monitoring device which continuously indicates the radiation dose rate in the area. The shift supervisor stated he did not feel that a dose rate measuring instrument was necessary due to the reported low dose rates in the reactor cavity. The inspector stated that failure to take a radiation monitoring device which continuously indicates radiation dose rates into the posted high radiation area was in noncompliance (281/79-29-03) with Technical Specification 6.4.B.1.e.
- i. 10 CFR 20.201(b) states that each licensee shall make or cause to be made such surveys as may be necessary for him to comply with the regulations in this part. The licensee stated that no radiation surveys had been performed in the reactor cavity (incore instrument room) prior to the entry of the shift supervisor. An inspector stated that failure to perform a radiation survey, prior to the entry of the shift supervisor into the incore instrument room, to assure that the dose limits of 10 CFR 20.101 would not be exceeded was in noncompliance (281/79-29-05) with 10 CFR 10.201(b).

## 7. Dosimetry

- a. At approximately 11:50 p.m., the shift supervisor's TLD was read by health physics personnel. The readout of the primary and the backup whole body regions of the Teledyne TLD ribbon were 10.093 and 9.663 rem, respectively. To confirm the dose a radiation survey was performed in the incore instrument room at approximately 12:00 midnight. The radiation levels in the part of the room entered by the shift supervisor ranged from 0.115 R/hr at the access hatch to approximately 45 R/hr near the reactor cavity. Radiation levels are thought to increase rapidly as the area under the reactor vessel is approached. Although the part of the area closest to the reactor vessel was not surveyed, the radiation levels were likely in excess of 1000 R/hr based on surveys at similar facilities. Considering the time the shift supervisor remained in the incore instrument room and the radiation levels in the room, the dose recorded on the TLD appears to be valid. The inspector questioned the health physics technician who performed the radiation survey in the incore instrument room concerning the uniformity of the radiation dose levels in the areas where the shift supervisor had gone. The technician indicated that in the whole body region (head to lower limbs) the radiation levels were uniform.

10 CFR 20.101(b)(1) requires the dose to the whole body of any individual in a restricted area shall not exceed 3 rems per calendar quarter. The inspector stated that the exposure of the shift supervisor to 10.093 rems, as indicated by TLD, was in noncompliance with 10 CFR 20.101(b)(1) (281/79-29-01).

- b. The inspector reviewed the operation and calibration of the TLD reader used to evaluate the shift supervisor's TLD. A calibration check of the instrument was last performed on April 11, 1979. A group of specially selected TLD's were exposed to 1.050 R using a Cs-137 source. Each TLD read within plus or minus 10 percent of the batch average (1.054 rem). To determine the response of the TLD to exposure rates of 45 R/hr and a total dose of 10 rem the inspector asked the licensee to expose a group of TLD's using a Cs-137 standard. The dose recorded on each TLD was within plus or minus 10 percent of the known dose. During the readout of the TLD's the inspector observed that the technicians did not record the heater block temperatures on the TLD Reader Daily Check Form (HP-3.1-18-2) as required by procedure HP-3.1-18. A check of the Daily Check records for 1979, revealed that the heater block temperatures had not been recorded between March 29, 1979 and April 16, 1979. The TLD reader computer control evaluates the heater block temperatures and internal light standard and if the temperatures are not within plus or minus 5 degrees Celsius or readout of the internal light standard is not within plus or minus 5 units prior to the beginning of a readout cycle, the system automatically shuts down. Due to the automatic evaluation of system parameters prior to start of the readout cycle, the inspector considered the recording of the parameters a redundancy. A licensee representative stated that he would review the need to continue to record the heater block temperatures.

8. Notification of NRC

10 CFR 20.403(b) states, in part, that each licensee shall within 24 hours notify by telephone and telegraph, mailgram, or facsimile, the Director of the appropriate NRC Regional Office of any incident involving licensed material possessed by him and which may have caused or threatens to cause exposure of the whole body of any individual to 5 rem or more of radiation. The licensee notified the NRC resident inspector assigned to the facility by telephone at approximately 3:00 a.m., on April 15, 1979. However, notification by facsimile was not sent to the NRC until the morning of April 17, 1979. A licensee representative stated that they prepared the written notification using the guidelines in the Technical Specification which requires a report within one working day following a reportable occurrence. The inspector stated that failure to make notification by telegraph, mailgram, or facsimile within 24 hours was in noncompliance (281/79-29-04) with 10 CFR 20.403(b).