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

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Report Nos.: 50-348/88-01, 50-364/88-01

Licensee: Alabama Power Company
600 North 18th Street
Birmingham, AL 35291

Docket Nos.: 50-348, 50-364 License Nos.: NPF-2, NPF-8

Facility: Farley 1 and 2

Inspection Conducted: January 4-7, 1988

Inspector: P. G. Stoddart 3/30/88
P. G. Stoddart Date Signed

P G Stoddart/for 3/29/88
W. B. Gloersen Date Signed

Approved by: J R Drake for 3/31/88
J. B. Kahle, Section Chief Date Signed
Division of Radiation Safety and Safeguards

SUMMARY

Scope: This was a special, announced inspection conducted to followup on allegations relative to the licensee's facility. Twenty general allegation subject areas were identified to the licensee. Some sixty specific allegations were investigated and are addressed in this report. NRC followup of these allegations consisted of a review of pertinent records, logs, and reports pertaining to plant chemistry, radiochemistry, radioactivity counting room/operation, effluent monitoring and environmental monitoring.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*W. Bayne, Chemistry and Environmental Supervisor
*D. Grissett, Environmental and Emergency Planning Supervisor
*M. Mitchell, Health Physics and Radwaste Supervisor
C. Nesbitt, Technical Superintendent
*J. Walden, Lead Auditor
*J. Woodard, General Manager

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

NRC Resident Inspectors

W. Bradford
*W. Miller

*Attended exit interview

2. Exit Interview (30703)

The inspection scope and findings were summarized on January 7, 1988, with those persons indicated in Paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee. No violations, deviations, or inspector followup items were identified. The licensee identified as proprietary two items of procedural background information concerning (1) analysis of radioiodine in determination of Dose Equivalent Iodine (DEI), and (2) classifying radioactive waste shipments under 10 CFR 61. Supplemental information and documentation was requested from the licensee on two occasions subsequent to the exit; the material was needed to verify or substantiate inspector findings pertinent to the inspectors' post-inspection review of documentation provided to the inspectors during the inspection period. The requested material was received on January 19, 1988, and on February 2, 1988.

4. Allegation Followup: (99014)

An allegation is defined as a declaration, statement, or assertion of impropriety or inadequacy associated with NRC-regulated activities, the validity of which has not been established.

The allegations addressed in this section of the report were received from various sources and covered a broad range of issues. The description of the allegation represents a capsular summary of the concern.

The NRC considers every allegation to be a serious matter. Each allegation discussed in this report was reviewed by several senior members of the NRC staff prior to being evaluated as applicable to the safe operation of the plant or to the health and safety of the public. An explanation of "substantiated" or "not substantiated" is appropriate in this juncture. "Not substantiated" does not necessarily mean that the facts as provided by the alleger were untrue; rather, it means that the inspection process was unable to obtain objective evidence to corroborate the statement of concern through interviews, document reviews, and/or direct observation. As a regulatory agency, objectivity is of utmost importance along with ensuring compliance with regulatory requirements. Objectivity ensures that decisions and conclusions are based on fact and that any action based on those facts can be legally enforced. In addition, there are occasions when the alleger provides information which is factually correct, but that information does not constitute a violation of regulatory requirements. This is often the case when there is not a clear understanding of regulatory requirements or the technical issues involved. This lack of understanding can cause concern and lead to the expression of that concern.

a. Allegations: Dose Equivalent Iodine (DEI)

Description

Dose equivalent iodine above limits (2850058009).

Dose equivalent iodine was too high (1 uCi/ml) and the plant did not shut down or ask the NRC for an extension (2850058109).

DEI sample preparation procedure was radically changed in 1982 and this modification was not indicated in the written procedure. Valve lineup was also changed (2850058158).

Discussion

"Dose Equivalent Iodine" or "DEI" is a Technical Specification (TS) item involving isotopic determinations of radioiodine in the reactor coolant of a PWR. Typically, five isotopes of the element iodine are detected and measured in samples of PWR reactor coolant. At the present time, these five isotopes of iodine (I-131, I-132, I-133, I-134, and I-135) are considered by NRC to be the most important nuclides in calculation of radiation doses from potential releases of radioactivity from a nuclear power plant in the event of an accident. Iodine is also a known precursor or indicator of existing or potential fuel damage in the reactor core.

Each of the five isotopes of iodine has different characteristic half-lives and radiation energies, and each is capable of affecting potential doses from releases to a different extent. Since iodine-131 is the isotope of greatest importance in dose calculations, it is

convenient to convert the concentrations of the other four isotopes to values which correlate, with respect to dose calculations, to the equivalent in iodine-131. Thus, the term "dose equivalent iodine."

Based on operating experience over many years of operation at a number of nuclear power plants, the NRC determined that if a DEI of less than 1 µCi/g could be maintained over long periods of time, an accident involving release of primary coolant containing less than 1 µCi/g of DEI would not present a significant iodine dose problem, either onsite or offsite.

When a reactor shuts down, it is characteristic that a transient condition known as "iodine spiking" may occur, with DEI levels sometimes exceeding 1 µCi/g for short periods. This can also occur during reactor startup (power ascension) when core conditions are changing. Technical Specifications which have been issued to PWRs since the early 1970's recognize the iodine spiking phenomenon as a temporary and short-lived transient condition. Accordingly, such Technical Specifications, including those applicable to the Farley Nuclear Plant (FNP), provide that if DEI exceeds 1 µCi/g for a period longer than 48 hours, or if certain other criteria are exceeded, the reactor should be shutdown as a precautionary measure.

The exceeding of the 1 µCi/g DEI value for periods of less than 48 hours is not considered by NRC to be an event of any special or unusual safety significance and the NRC does not require that a reactor plant be immediately shutdown if the DEI exceeds 1 µCi/g.

The inspectors reviewed counting room logs of DEI results for the period of September 24, 1981, through July 28, 1983. The inspectors identified two instances, August 11-12, 1982, and January 15, 1983, when DEI exceeded 1 µCi/g. The logbook for January 15, 1983, showed the following:

Date	Time	DEI µCi/g	Unit 1 Reactor Power
1-15-83	1341	0.308	0% (shutdown)
	1714	1.61	0%
	1918	0.392	0%

Subsequent DEI results through July 28, 1983, were less than 1 µCi/g.

The logbook for August 11-12, 1982, showed the following:

Date	Time	DEI µCi/g	Unit 1 Reactor Power
8-11-82	1731	0.448	0.5% Startup
	1944	1.35	16%
	2034	1.73	15%
	2131	1.11	15%
	2340	0.851	15%
8-12-82	0121	0.76	15%
	0315	0.574	16%
	0510	0.539	20%
	0737	0.415	26%
	0937	0.364	33%
	1335	0.201	40%
	1537	0.269	45%

Subsequent DEI samples through January 14, 1983, were less than 1 µCi/g.

TS Limiting Condition for Operation (LCO) 3.4.9 states: "The specific activity of the primary coolant shall be limited to: a. Less than or equal to 1.0 microcurie per gram DOSE EQUIVALENT I-131."

The corresponding Action Statement reads: "a. With the specific activity of the primary coolant greater than 1.0 microcurie per gram DOSE EQUIVALENT I-131 for more than 48 hours during one continuous time interval or exceeding the limit line shown on Figure 3.4-1, be in at least HOT STANDBY with T_{avg} less than 500°F within 6 hours."

FNP TS Figure 3.4-1 (not included in this report) provides values for DEI which would require immediate shutdown. These vary from 260 µCi/g at 30% power down to 80µCi/g at 80 to 100% power. As far as could be determined, such values have never been approached at FNP.

To summarize, the inspectors identified two occasions on which DEI exceeded 1 µCi/g for periods of time substantially less than the 48 hours specified in TS 3.4.9, Action Statement a. These instances did not put DEI above limits established by the NRC.

Findings

The inspectors found no evidence that DEI had exceeded the TS limits at any time. It appeared that the allegers did not fully understand that the TS Action Statement required DEI to exceed 1 µCi/g for a continuous period of 48 hours and that the 48 hour period was the determining factor and not the fact that DEI was exceeded for a much shorter period of time, which did not require that the reactor be shutdown.

Based on the above discussion, Allegation Numbers 2850058009 and 2850058109 were not substantiated.

Allegation Number 2850058158 stated that the DEI sample preparation procedure was radically changed in 1982 and that this modification was not included in the written procedure and the valve lineup was also changed.

The inspectors reviewed versions of Procedure FNP-O-RCP-717, "Dose Equivalent Iodine-131 Determination," in effect in 1982. Rev. 0 of RCP 717 was prepared May 27, 1981, and issued August 6, 1981. Rev. 0 was basically a renumbered reissue of FNP-O-RCP-191 (same title). As best as could be determined, from information made available by the alleger, the alleger was concerned with a change in the analysis procedure whereby sodium hydroxide was added to the reactor coolant sample prior to evaporation to dryness and the change was not reflected in a revised procedure. The inspectors reviewed copies of DEI procedures dating back to December 13, 1977, when Revision 2 to FNP-O-RCP-191 was prepared. This was the occasion of the inclusion of a sodium hydroxide addition step to the sample preparation procedure. This appeared to have been the only substantive change made to the sample preparation steps of the procedure from 1977 to 1983. Since the change was well documented and did not occur in the time-frame of the allegation concerns, this portion of the allegation was not substantiated.

The valve line-up for reactor coolant sampling for Unit 1 was listed in Procedure FNP-1-RCP-372. In the 1981-1983 time-frame, the inspector was unable to identify specific changes in valve lineup by procedure review. Valve lineup was performed by reactor control room operators and was verified by count room technicians who performed the sampling operations but did not perform the valve lineup. It would, however, not be unusual to change valve lineups. In a complex liquid system such as the primary coolant sampling system of a PWR, re-routing of sample flow may be dictated by circumstances such as leaking or defective valves which often are in locations inaccessible for maintenance or replacement while the reactor is operating. Such changes are carefully reviewed by plant supervision under provisions of 10 CFR 50.59 to assure that a representative sample is safely obtained. In the absence of more specific information, this allegation could not be reviewed further. Since the alleger did not specifically imply that any Technical Specification, safety, or procedural requirements had been violated with respect to the valve lineup concern and since no substantive change in DEI preparation procedure could be identified in the 1982-1983 time-frame, this allegation was not substantiated.

Conclusions

The allegations were not substantiated.

b. Allegation: Out-of-Specification Dose Equivalent Iodine (DEI)

Description

If a DEI sample was out-of-specification (O.O.Sp), then another sample would be taken until one was found that was within specification (2850058139).

It was not uncommon to repeat sample analyses until one (sample) was in specification and use that one result and discard the others (2850058164).

Discussion:

The inspectors discussed multiple sampling and counting techniques with licensee personnel and reviewed procedures which provided guidance to count room personnel regarding sample tracking, analysis and radiochemistry data review. The following procedures were reviewed: (1) FNP-O-AP-017, "Conduct of Operations-Chemistry and Health Physics Group," Revision 2, 12/1/80; (2) FNP-O-RCP-700, "General Instructions to Counting Room Personnel," Revision 9, 10/11/87; and (3) FNP-O-RCP-736, "Guidelines for Radiochemistry Data Review," Revision 3, 6/30/87. Procedure FNP-O-RCP-700 provided guidance for the establishment of radiochemistry logs, data review, and corrective actions. This procedure indicated that all analytical results should be recorded in appropriate logs or records.

Regarding the issue of resampling and counting practices, FNP-O-AP-17 (Revision 2) Step 6.2.7 indicated that results of tests which did not fall within the specified limits or which indicated an abnormality for which no prior abnormal history existed should be rechecked within eight hours. Additionally, results indicating a violation of TS or a violation of prescribed Steam Generator Chemistry Specifications would be immediately rechecked. The procedure also stated that if O.O.Sp. conditions were confirmed, the Shift Supervisor and the appropriate Chemistry and Health Physics Foreman or Section Supervisor were to be notified immediately.

At the present time (January 1988), count room personnel are provided guidance in FNP-O-RCP-700 (Revision 9) regarding log keeping, data review, and corrective action. Step 3.2 of this procedure stated that if a radiochemistry result was O.O.Sp. and no immediate prior abnormal history existed, the O.O.Sp. result should be confirmed immediately. The procedure also stated that if the result was confirmed to be O.O.Sp., both the initial and confirmatory results should be recorded and annotated. If the result was confirmed to be O.O.Sp., a Radiochemistry Incident Report (RIR) was to be initiated. This procedure tasked the Data Control Technicians to verify that O.O.Sp. results were annotated and that an RIR had been written for O.O.Sp. results. The Counting Room Foreman was to ensure that appropriate corrective actions had been taken or were in progress for O.O.Sp.

parameters and unusual events. Step 3.2 of FNP-O-RCP-700 described additional actions to be taken when a radiochemistry result was unusual (results that were within specification, but markedly different from previous results). For an unusual result, the procedure tasked the analyst to determine the cause, verify the result, and initiate a RIR if no explanation for the unusual result could be found.

Although the procedures above provided general guidance for handling O.O.Sp. radiochemistry results, they did not specify which results would be used to satisfy the TS surveillance requirements. Licensee representatives indicated that for O.O.Sp. radiochemistry results, the current practice was to resample and perform the appropriate analysis since recounting alone would not eliminate such factors as possible sampling errors or the possibility of cross-contamination that may have pre-existed on a sample container. The licensee indicated that the results of the sample collected last would normally be used for meeting the TS surveillance requirements.

Findings:

The practice of resampling and recounting was documented in past and current procedures utilized by the radiochemistry staff. It is considered good practice to trend radiochemistry data and compare current results with historical data. Data that may appear O.O.Sp. should be verified by resampling. The licensee was adequately proceduralized so that appropriate management attention would be given to results that were O.O.Sp. It was the licensee's practice to task the technicians to collect samples, to analyze and record the sample results, and to notify appropriate supervisory personnel as to when the sample results were O.O.Sp. Responsibility for data interpretation, review, and approval was assigned to technical supervisors.

The aspect of the allegation (2850058139) regarding resampling and analysis for O.O.Sp. sample results was verified as factually correct; however, the resampling issue is not of safety significance when one recognizes that resampling was not only practiced, but encouraged or required by procedure if one suspected that a data point was an outlier and was either outside of statistical limits or not in accordance with expected historical trends.

Conclusions:

The allegations were partially substantiated in that multiple samples were taken when results were O.O.Sp., but no violations or deviations were identified in that, such sampling appeared to be implemented appropriately.

c. Allegations: Unmonitored Release of Radioactive Water Caused by Failure of Count Room Personnel to Follow Procedures

The following allegations appeared to be related to the same Refueling Water Storage Tank (RWST) release event and were reviewed as one item by the inspectors:

Description

There was a release of liquids containing radioactive material without prior sampling and creek soil showed contamination (2850058088).

Reactor makeup water released without sampling (2850058229).

Line ruptured in the reactor makeup water storage tank and radioactive water leaked onto the ground (2850058247).

Barrier water was released without being monitored (2850058324).

Barrier water was released without being sampled or if sampled, found contaminated and released anyway (2850058345).

Discussion:

Based on the lack of specific information provided in the allegations listed above, it was not possible to positively establish a date as to when the event(s) occurred. The inspectors reviewed several Plant Event Reports (PER) and noted that PER No. 82-003, dated January 27, 1982, described two incidents involving water leaking from a penetration in the Unit 1 Refueling Water Storage Tank (RWST) missile shield annulus which occurred on January 13, 1982, and on January 20, 1982. On January 13, 1982, the source of the water was a combination of a leak in a level instrument on the RWST, caused by freezing, and an accumulation of rainwater. The annulus water was sampled and analyzed and it was determined that all isotopes except tritium were less than the maximum permissible concentration (MPC) at the time of the leak. The remaining entrapped water was pumped back to the Auxiliary Building where it was processed as liquid radwaste. On January 20, 1982, rainwater had again accumulated in the RWST annulus and required disposal. A counting room technician informed the shift chemist that there was no activity in the recent accumulation of rainwater within the RWST annulus. The water was subsequently drained to the yard drain system following the report of no activity. On January 21, 1982, a chemistry technician reported a documentation deficiency to the effect that the water accumulated in the RWST annulus had not been sampled and analyzed prior to release. Licensee supervision was then notified that the annulus water had probably been drained without sampling. In a licensee investigation initiated on January 21, 1982, it was determined that the annulus water had been drained to the yard drain system without sampling and analysis, in violation of plant procedures. The counting room technician who made the incorrect report was removed from his position of shift responsibility. Additionally, the technician was counseled and was required to complete appropriate retraining and

requalification prior to returning to a position of shift responsibility.

In order to ascertain the approximate quantity of radioactive material released to the yard drain system, the licensee obtained a sample of a puddle of water remaining on the floor of the RWST annulus on January 21, 1982. The volume of water drained was conservatively estimated to be 4,359 gallons, based on the depth of rainwater in the annulus prior to draining. The puddle sample results were considered to be a conservative estimate of the actual drained water due to the additional time (approximately 12 hours) available for the activity to leach from the concrete to the puddle water. Based on the puddle sample results and the volume of water drained, the licensee estimated that 1.7 E-03 curies was released to the yard drain system (see Section 4.d for quantities of each isotope). The sample results indicated that Co-60, Co-58, Mn-54, and Nb-95 were present. Conservative estimates of isotopic concentrations in the drained water were less than the maximum permissible concentration values of 10 CFR 20, Appendix B, Table II, Column 2 for liquid effluents and were less than the reportable quantity (one curie) specified in the Unit 2 TS. The Unit 1 TS in effect at that time did not contain a specific reportable concentration or quantity limit.

The inspectors also noted another similar incident involving an overflow of the Reactor Makeup Water Storage Tank (RMWST) on February 12, 1982. This event was documented in PER No. 82-006 dated March 23, 1982. During this event Chemistry and Health Physics personnel were notified that water was flowing out of the shield barrier around the RMWST. The Operations staff was notified and immediately ceased ongoing tank filling operations. The Chemistry staff sampled and analyzed the spill water and determined that all isotopes were less than 10% of MPC, with the exception of tritium, which was approximately 20% of MPC. Approximately 4,000 gallons of water was released in this event. Subsequent investigation by the licensee indicated that shield barrier penetrations located approximately 82 inches above the bottom were not sealed, allowing flow out of the barrier at that height. The filling of the tank had commenced on the night shift but this information was not passed on to the day shift plant operators during the shift turnover. The day shift operators did not observe or question the rising level on their logs and did not receive a high water level alarm. As part of the immediate corrective actions, the operators secured makeup to the RMWST, secured the yard drains, and deenergized all electrical components affected. The Chemistry and Health Physics group placed barrier tape around the spill area, sampled the spill water, and assisted operations in securing the yard drains.

Findings:

Based on the information contained in the Plant Event Reports (PERs) noted above, it was apparent that there were at least two events

involving the inadvertent release of quantities of liquid from the RWST or RMWST containing radioactive material without prior sampling and one intentional release that occurred without prior sampling. It appeared that the events described in PER 82-003 and PER 82-006 were documented adequately. Information pertaining to the releases was readily available. The allegations were generally factual; however, none of the allegations contained information pertinent to safety matters which had not been adequately investigated and reported by the licensee. The allegations did not involve safety issues that were inappropriately resolved by the licensee and thus were not substantiated.

Conclusion:

The allegations were partially substantiated, in that events similar to those identified in the allegations did occur. No violations or deviations were identified in that licensee corrective actions were appropriate.

d. Allegations: A Counting Room Technician Made a False Report and the Report of the Incident was Destroyed.

Description

There was an unmonitored release from the missile shield around the refueling water storage tank and reactor makeup water tanks in the winter of 1980 or 1981. The report of the incident was destroyed (2850058123).

A counting room technician was "too lazy" to get a sample from the missile shield and told the control room it was okay to release the water when it had not been sampled (2850058124).

A sample was not collected from the barrier of the refueling water storage tank and the water was released unmonitored (2850058226).

An employee was severely reprimanded for not taking a sample but saying he had done so (2850058246).

An employee falsified results and told the control room operators that the barrier water could be released when it had not been sampled (2850058255).

In February 1981, an employee did not sample the barrier water and produced a false document (2850058300).

Discussion:

The inspectors reviewed PERs, RIRs, health physics records, counting room logs, counting room multi-channel analyzer printouts and FNP incident reports for the period of January 1, 1982, through June 30, 1983. Three incidents were identified which involved unmonitored

releases from the reactor water storage tank and reactor makeup water storage tank missile shields on January 13, 1982, January 20, 1982, and February 12, 1982. All of the allegations referenced above apparently pertained to these three incidents. A number of occasions were noted where controlled releases were made to the plant yard drain system and where water was pumped to the plant liquid radwaste system for processing. This discussion addresses only the unmonitored releases and one "controlled release" made following a counting room technician's failure to sample and analyze contaminated water as required by procedure.

PER 82-003, dated January 27, 1982, contains details of the incidents of January 13, 1982, and January 20, 1982. As noted in Section 4.c of this inspection report, on January 13, 1982, water was discovered trickling from a penetration of the RWST missile shield and into the plant yard drain system in an uncontrolled and unmonitored release. The source of the water was a leak from a level measuring device, caused by freezing, and an accumulation of rainwater. Analyses were made which enabled the licensee to determine that the total radioactivity released was significantly less than 1 curie (the TS threshold for reportability) and that all isotopes except tritium were less than the maximum permissible concentration for unrestricted areas at the time of the leak. The remaining entrapped water was pumped to the Auxiliary Building and was processed through the normal radwaste pathway. The leak was corrected and possible penetrations were caulked to prevent further leakage of entrapped water.

PER 82-003 also reported that on January 20, 1982, rainwater had again accumulated in the RWST missile shield annulus and required disposal to prevent an unmonitored release. A counting room technician was requested to sample and analyze the accumulated water. The counting room technician subsequently reported to the shift chemist that there was no radioactivity in the rainwater accumulated in the RWST missile shield annulus; on the basis of this verbal report, the accumulated water was drained to the unmonitored yard drain system for disposal. It was later determined that the counting room technician had not taken the sample as requested and that as a result of the licensee's followup investigation, the release was categorized as an uncontrolled and unmonitored release. The counting room technician who made the false report was removed from his position of shift responsibility and received additional counseling and disciplinary action.

Licensee actions taken to determine the significance of the unmonitored release of January 20, 1982, included sampling of water remaining on the floor of the RWST missile annulus on January 21, 1982, and sampling of water on January 21-23, 1982, from the yard drain pathway approximately midway between the plant and the point of discharge to the Chattahoochee River. The water sample from the annulus floor contained the following concentrations of radioactivity:

Isotope	Concentration (μCi/ml)	MPC (μCi/ml)
Co-60	3.86 E-05	5 E-05
Mn-54	4.01 E-06	1 E-04
Co-58	6.03 E-05	1 E-04
Nb-95	2.14 E-06	1 E-04

The maximum volume of water calculated to have been released from the annulus was 4,359 gallons, based on the depth of water in the annulus prior to draining. The activity of the water was considered to have been the product of leaching of contamination from the concrete annulus wall and floor which occurred in the incident of January 13, 1982. The sample analysis was considered conservative as the result of the approximately 12 hours of time available (between the time of release and time of sampling) for activity to leach from the concrete to the puddle water. Using puddle water sample analysis results and the calculated volume of water released, the licensee determined that the maximum amount of activity released was 0.0017 curies (1.7 E-03 Ci) and that the total MPC percentage in the released water was 143% of MPC (10 CFR 20, Appendix B, Table II, Column 2) prior to dilution in the yard drain system (Co-60: 77.2%, Mn-54: 4%, Co-58: 60%, Nb-95: 2%, total 143%).

In three samples from the yard drain outfall pathway, no activity other than naturally occurring isotopes was found.

On January 26, 1982, approximately one-half inch of rain had accumulated in the annulus. This water was sampled and analyzed at less than 10% of MPC for all isotopes, with total activity approximately an order of magnitude less than the January 21, 1982, sample of annulus puddle water.

Backup documentation for the above appeared in Health Physics Survey Record HPS No. 1-82-0208, recorded at 1100 hours, January 13, 1982, concerning soil sample results, and in counting room MCA printouts for eight liquid and soil samples.

The third uncontrolled and unmonitored release concerned a release of water from the missile shield barrier around the RMWST. Details were provided in PER 82-006 and in IR 1-82-007, February 12, 1987. On February 12, 1982, at about 10:45 am, water was found flowing out of the missile shield of the RMWST. Security personnel notified Chemistry and Health Physics, who in turn notified control room operations personnel, who stopped flow input to the RMWST. An inoperative high level alarm did not signal the potential for tank overflow and operators did not properly track or question the increase in tank level. Shield penetrations approximately 82 inches above bottom were not sealed and allowed flow through the barrier and from there to the yard drain system. Approximately 4,000 gallons of reactor makeup water was estimated to have spilled to the yard drain system. Sampling and analysis of the spilled water determined that all isotopes were less

than 10% of MPC, with the exception of tritium, which was at 20% of MPC (for unrestricted release).

A number of allegations, including Allegation Number 2850058123, above, concerned "disappearance" of RIRs or Incident Report (IR). In discussions with plant supervisory personnel, it was stated that plant reports had a certain priority rating or hierarchy which was dependent on supervisory perception of the importance or significance of the incident or event being described or reported. In order of decreasing importance or significance, these were: (1) PERs; (2) IRs; and (3) RIRs. IRs and RIRs are typically hand-written on a printed form by technicians or reactor operators and reviewed by plant management. PERs are prepared by senior plant staff supervisors in formal type-written format and are reviewed at Plant Manager and Corporate Manager levels. Plant supervisory personnel stated that it was not uncommon for an event to be written up on all three levels but that the lower-ranking IRs and RIRs were often cancelled because of duplication and the report numbers of the IRs and RIRs re-assigned. Since IRs and RIRs are based on other written records or on retrievable data, such as charts, graphs, printouts and logs, and are not categorized in the plant TS as permanent records, the cancellation of IRs and RIRs was considered to be an internal administrative prerogative of licensee management. In each case of "destruction" or "disappearance" of IRs or RERs, the licensee produced adequate documentation in PERs describing each incident in detail.

Findings:

The incident(s) referenced in the allegations were adequately reported and documented. Regulations and TS applicable at the time of release did not require the filing with the NRC of a Licensee Event Report or other special report. Detailed PERs were prepared and filed and were available for inspection. The inspector's review of the PERs indicated that the incidents appeared to have been investigated and reported in an adequate manner and that appropriate remedial actions appeared to have been taken.

With regard to improper actions by plant operating and counting room personnel, the licensee stated that appropriate disciplinary action had been taken; the disciplinary actions were detailed in plant records reviewed by the inspectors. The appropriateness of such action was considered to be a licensee administrative concern and was not evaluated from the restricted technical review viewpoint of the inspectors.

The allegations were essentially factual but did not contain information pertinent to safety matters which had not been adequately investigated and reported by licensee staff and on that basis were not substantiated.

Conclusion:

The allegations were partially substantiated, in that events similar to those outlined in the allegations did occur. No violations or deviations were identified in that appropriate events were investigated and reported and that appropriate remedial actions were taken.

e. Allegations: Disappearance or Changes to Count Room Logbooks

The fourteen allegations detailed below were perceived to be either specific to records of the FNP "Counting Room" or applicable to counting room records.

Description

Counting room log books have disappeared (2850058034, 2850058087, 2850058142, 2850058329, 2850058236, 2850058125, 2850058313).

Pages were missing from a counting room log (2850058266).

White-out was commonly used to alter records (2850058311, 2850058222).

Some log book entries contained nonprofessional comments (2850058331, 2850058348).

Logs were not complete (2850058342).

Numbers (analytical results) were manipulated (2850058262).

Discussion

The time period of concern in the above allegations was from mid-1982 through mid-1983. The inspectors requested the licensee to provide the count room logbooks for all of 1982 through mid-1983. The count room logs were retrieved from storage at FNP Document Control within an elapsed time of two hours of the inspectors' request. The log books were in the form of bound logbooks, similar to a Wilson-Jones S-149 account book. In all, eight logbooks were provided, covering the period of September 24, 1981, through July 28, 1983, without a break. It was noted that periodic transfer of completed count room log books to the Document Control Department is a plant requirement for long-term retention. This appeared to account for the alleged "disappearance" of logbooks from the count room.

In reviewing the documents from which the allegations were taken, it was concluded that the principal allegation concerns of "non-professional" were what could be loosely described as "scribbling" and inappropriate remarks. The inspectors' review of the logbooks concluded that these factors did not appear to be out of the ordinary for hand-written log books. It was not uncommon, for example, to find whole shifts or full days when, according to the logs, no work was

done. The quality of the logbook entries, in general, was poor and would be considered "non-professional" if reviewed during an inspection of current licensee counting room operations.

Findings:

The inspector reviewed the eight logbooks discussed above. The logbooks appeared to be in good condition, considering the amount of handling such logs receive. The logs appeared to be complete, with no missing pages, although some torn pages had been patched using cellophane tape. Occasional use of "white-out" to correct a word or date was observed; such use was usually initialled. No evidence of use of "white-out" to cover large areas was noted. Based on the availability of the logbooks and the inspectors' review of log entries, none of the allegations were substantiated.

Conclusion:

None of the allegations were substantiated.

f. Allegation: Environmental Contamination

Description

Creek near alleger's home may be contaminated from plant discharge (2850058189, 2850058075).

Discussion

The allegations taken out of context, did not contain detailed information. There was no information as to the name or location of the creek, the location of the alleger's home, the nature of the plant discharge (radioactive gaseous, radioactive liquid, sanitary liquid discharge, etc.), or the location of the creek relative to plant discharge.

In the inspector's review of the alleger's concerns as to FNP discharges in general, the principal point of concern would appear to be the potential or actual presence of transuranic radionuclides in the plant's liquid discharges to the Chattahoochee River.

The licensee's discharges of potentially radioactive liquid waste to the Chattahoochee River have historically been substantially (several orders of magnitude) below regulatory limits and at the point of release to the Chattahoochee River have been well below the Lower Limit of Detection (LLD) in the Plant TS.

Since any stream in the Chattahoochee River watershed would be a tributary to the Chattahoochee and since the alleger did not state that he resided within a flood plain of the Chattahoochee, it would be reasonable to assume that any liquid discharges to the Chattahoochee

could not, by any reasonably conceivable path, be contaminating the unnamed creek near the alleger's residence.

Findings

The inspectors, during the review of this and other allegations relative to radioactive discharges from FNP, examined records of radioactive liquid and gaseous plant effluents, summary reports of radioactive effluents, environmental monitoring reports, and inspection reports of prior inspections in the period of 1981 through 1987. The inspectors found no evidence of radioactive liquid or gaseous releases from FNP which could have resulted in detectable quantities of radioactive contaminants being deposited in offsite locations.

The alleger did not provide information specific to his concern(s), i.e., did not specify reasons for the suspected existence or occurrence of detectable radioactive contamination in the vicinity of his residence as the result of verifiable radioactive liquid or gaseous discharges from FNP. The alleger also neglected to state the name of the creek near his residence, or the location of the creek and residence relative to the FNP. Since all streams in the Dothan, AL area and in the Chattahooche River watershed are tributary to the Chattahoochee, it is highly unlikely that plant liquid releases to the Chattahoochee could contaminate a local stream.

The inspectors' review was limited to the technical aspects of the allegation and to available records and reports. Within the defined limits, nothing was found to substantiate the allegation. On this basis, the allegations were not substantiated.

Conclusion

The allegations were not substantiated.

g. Allegation: Plant Contamination

Description

Contaminated water from the decontamination room drained into Unit 2 which had no radiological controls at the time (2850058252).

Discussion

The allegation concerns an event which took place during the period March 30, 1979, to May 11, 1979. This event was investigated and reported by the plant staff in a 245 page incident report and was the subject of an NRC Inspection on May 21-25, 1979 (Inspection Report No. 50-348/79-21, issued June 15, 1979), in which the licensee was cited for a violation of NRC regulations.

Findings

The event was adequately investigated and reported by the licensee. The NRC's inspection of the event resulted in the licensee being given a violation for noncompliance with NRC regulations. While the allegation was essentially correct in its factual statements, the circumstances of the allegation were adequately reported and reviewed at the time of the event and appropriate actions were taken. The allegation was not substantiated as a new and unreviewed safety item.

Conclusions:

The allegation was partially substantiated, in that an event similar to the one described in the allegation did occur. No violations or deviations were identified.

h. Allegation: Resin and Charcoal Analysis

Description

During resin and charcoal analyses, the computer was programmed as if the sample was homogeneous in radioactivity, but the resins or charcoal floated to the top, away from the detector, giving counting results showing lower amounts of radioactivity than were actually present (2850058296, 2850058105, 2850058083).

Discussion

The inspectors reviewed past and current procedures related to the sampling and characterization of primary and secondary coolant demineralizer resins and of disposable demineralizer resins and charcoal used in liquid radwaste processing. Specifically, Revision 0 (6/29/83) and Revision 8 (9/15/86) to Procedure FNP-O-RCP-809, "Isotopic Characterization of Radioactive Materials for Offsite Shipments and/or Burial," were reviewed. In Revision 0 of Procedure FNP-O-RCP-809, Step 4.2 described the sample collection method for bead resins and in Revision 8, Step 5.3 described the sample collection method for the disposable demineralizer resins and charcoal beds. In order to obtain a primary or secondary resin sample or charcoal sample from the spent resin or charcoal storage tanks, either the "Isolok" sampling system or grab sampling techniques would be utilized. The licensee described current sample collection techniques in which a resin sample was collected by either the "Isolok" system or grab (core) sampling techniques, and in which an amount of resin was weighed in a tared planchet. The planchet was placed in a petri dish and then counted on the Ge(Li) gamma spectroscopy system using a "disk" geometry.

Licensee representatives described previous resin and charcoal sampling preparation procedures in which a known amount of material was placed in a vial containing approximately 15 milliliters of water. The vial

was then capped, shaken, and counted using a homogeneous "liquid" vial geometry. Using this methodology, the assumption of a homogeneous "liquid" vial geometry was technically incorrect. It was noted, however, that the results would have been conservatively biased on the high side, that is, overestimated, since the resin and charcoal would have settled to the bottom of the vial and thus would have been closer to the detector. The inspectors performed tests using water and resin and charcoal specimens and obtained the same results.

The inspectors noted that in FNP-O-RCP-809, Revision 8, Step 5.3 described the following: (1) collect and transfer a core sample to an appropriate container (such as a plastic bag or bucket): (2) slurry the material to homogenize the sample and extract a representative amount of the resin/carbon for counting; and (3) perform a spectroscopic analysis on the sample to determine an isotopic relative abundance or concentration.

In Procedure FNP-O-RCP-726, "Release of Potentially Radioactive Material from Non-Designated Release Points," Revision 5, dated 10/30/86, the inspectors noted that the licensee added Appendix A: "Preparation of Disposable Hittman Resin Samples." The Appendix to this procedure specified that weighed resin samples should be placed in a planchet and into a covered petri dish and then on a Ge(Li) detector to determine if the sample quantity was too large. Large sample quantities could cause the multichannel analyzer (MCA) to exceed an administrative limit of 10 percent dead time (see Section 4.i for a discussion of dead time). The procedure contained instructions that sample quantities were to be reduced until the dead time of the MCA was less than 10%. After the appropriate amount of sample had been determined, the sample mixture in the planchet was removed from the petri dish and placed in a fume hood. The liquid in the resin mixture was then evaporated under a heat lamp. The dried resin sample was weighed and placed in a covered petri dish for gamma spectroscopy analysis. Finally, the sample was counted and analyzed in accordance with FNP-O-RCP-728, "Operation and Calibration of Multichannel Analyzer Systems."

The inspectors noted in Revisions 8A and 8B to FNP-O-RCP-726, that Appendix A, "Preparation of Disposable Hittman Resin Samples," had been inadvertently deleted; however, in Revision 8C (dated 1/5/88), Appendix A was added back to the procedure. It was noted that Revision 0 to FNP-O-RCP-726, "Release of Potentially Radioactive Material from Non-Designated Release Points," dated July 20, 1984, did not contain guidance as to the use of an appropriate counting geometry and the determination of isotopic concentrations of samples from the disposable demineralizer resin and charcoal beds.

Findings

The allegation specified that the resins (and charcoal) samples floated to the top (of the vial containing the liquid) away from the detector,

giving counting results showing lower amounts of radioactivity than was actually present. It appeared that the allegation was incorrect in the cases of both resin and charcoal. Resin and charcoal samples, upon shaking with water, in accordance with directions, almost immediately sank to the bottom of the vial, yielding higher counting results than actually present. Although the assumption of a homogeneous liquid geometry was technically incorrect, the results would have been conservatively biased on the high side since the resin or charcoal would have been concentrated closer to the detector. The allegation was in error as to resin and charcoal floating in water; on this basis, the allegation was not substantiated.

Conclusions

The allegation was not substantiated.

i. Allegations: Counter Dead Time

Description

Ge(Li) counters (Multichannel Analyzers) were operated with excessive dead times (up to 30%) resulting in lower results. These analyses were performed and results were used at management's direction (2850058084, 2850058107, 2850058275).

Discussion

The dead time of a multichannel analyzer (MCA) system is normally comprised of the processing time of the analog-to-digital converter (ADC) and the memory storage time. The processing time per channel of the ADC is equal to the period of the clock oscillator. Once the pulse has been digitized, it generally requires a few microseconds to store the digitized pulse in memory. The total dead time is the period of time in which the MCA control circuit holds the input gate closed. Percent dead time meters (typically displayed as "percent busy" meters) are usually driven by the input gate which indicates the fraction of time the gate is closed. The purpose of the input gate is to block pulses from reaching the ADC during the time required to digitize a previous pulse.

The inspectors reviewed past (1981-1983) procedures which were utilized when operating the multichannel analyzer systems. Revisions 0 (8/19/81), 1 (9/9/82), and 2 (2/15/83) to procedure FNP-0-RCP-728, "Operation and Calibration of Multichannel Analyzer Systems," were reviewed. All three revisions contained guidance (Step 4.1) on limiting dead times to less than 10%. Although the revisions to the procedure noted above prescribe dead time limits, the dead time indicators for the multichannel analyzer systems in use (Canberra Model 8180 and Nuclear Data Model 66) were meter readouts which provided only gross indications of percent dead time. Although the Nuclear Data System had the capability to display "elapsed real time" and "elapsed

live time" so that one could calculate and have a record of the dead time, current computer software was not capable of reporting the elapsed real time and elapsed live time for this system. Thus, computer-generated sample analysis reports did not provide "hard copies" of the multichannel analyzer system dead time information.

Finding:

The allegation specified that Ge(Li)/MCA counters were operated with excessive dead times, resulting in lower results. Since the computer-generated sample analysis reports did not provide data on MCA dead time (due to software limitations), it was impossible to ascertain from a records review standpoint whether or not the MCAs were operated with "excessive" dead times. Discussions with count room personnel in 1986 and with other licensee representatives during the current inspection indicated a maximum of ten percent dead time was allowed by procedures and that the dead time was normally kept to three percent or less. The allegation could not be substantiated by record review.

Conclusion:

The allegations were not substantiated.

j. Allegation: Errors in Tritium Analysis Procedures

Description

Procedure for release of tritium to river was in error, allowing higher levels discharged than it indicates. FNP 726 or 729 contains errors for permissible amounts that can be released into an uncontrolled environment (2850058021, 2850058183).

Discussion:

The inspectors reviewed the following procedures related to tritium analysis:

(1) FNP-O-RCP-716, Tritium Analysis, Revision 0, 12/30/81

(2) FNP-O-RCP-716, Tritium Collection and Analysis Using Liquid Scintillation Methods, Revision 1, 2/23/83

(3) FNP-O-RCP-716, Tritium Determination, Revision 6, 11/16/87

(4) FNP-O-RCP-726, Release of Potentially Radioactive Material from Non-Designated Release Points, Revision 8, 8/31/87

(5) FNP-O-RCP-729, Operation and Calibration of Liquid Scintillation Systems, Revision 1, 2/11/87

It was noted that Procedure FNP-O-RCP-716 specified the use of an aqueous-based scintillation cocktail for sample preparation. The licensee used sets of calibration standards containing both quenched and unquenched tritium standards for calibration of the liquid scintillation counter. The calibration sets had been prepared by qualified vendors. The set of unquenched tritium standards contained toluene-based solutions while the set of quenched standards contained aqueous-based solutions. The inspectors noted that in Procedure FNP-O-RCP-726, "Release of Potentially Radioactive Material from Non-Designated Release Points," Step 4.2.10 required tritium analyses to be performed for the release of any water-based material. FNP-O-RCP-726 did not require tritium analyses for oil-based mixtures containing water. This type of material was presently being stored onsite.

Findings:

The inspectors, during this inspection, and in a review of prior inspections specific to tritium analyses and analysis procedures through NRC's confirmatory measurements program, found no evidence of errors in FNP procedures FNP-O-RCP-726 or FNP-O-RCP-729. The allegations were not substantiated by procedure review or by review of confirmatory measurement program results.

Conclusions:

The allegations were not substantiated.

k. Allegation: Problems with Computer Software

Description

Computer software to evaluate gaseous releases (Regulatory Guide 1.21 Report) had significant problems (2850058234).

Discussion:

The inspectors reviewed the FNP Semiannual Effluent Release Reports from July 1, 1981 through June 30, 1987. The inspectors observed that a revised effluent release report for the period January 1, 1983, through June 30, 1983 was submitted to the NRC by letter dated April 26, 1984. The licensee's letter of transmittal explained that the revision was necessary due to skewed stability class data in the original report as a result of meteorological hardware failure and a data acquisition hardware deficiency. Additionally, the revised semiannual effluent report also reflected the correction of several errors in the offsite dose calculation computer software. As a result of correcting the input data and the software errors, the calculated total curies of radioactive material released and resulting doses changed. The revised gaseous releases for January 1-June 30, 1983, period were approximately three times greater for fission and

activation gases and sixteen times greater for releases of iodine than those releases reported in the initial submittal. Additionally, the revised report indicated that roughly half the amount of particulates were released as compared to the initial submittal. The revised tritium releases did not vary significantly from the initial report. The revised calculated total body and skin doses for gaseous releases were less than the doses reported in the initial report. On the other hand, the revised estimated organ dose due to particulates and iodine was approximately nine times higher than the organ dose reported in the initial semiannual report. In both the initial and revised reports, the calculated doses were well within the limits established by the licensee's TS, NRC regulation 10 CFR Part 20, and Environmental Protection Agency regulation 40 CFR Part 190. A comparison of the initial and revised gaseous release and dose summaries is provided below:

Semiannual Effluent Release Summary
January 1 - June 30, 1983

	Initial	Revised
Gaseous Releases	(curies)	(curies)
1. Fission and Activation Gases	5.52 E+3	1.86 E+4
2. Iodines	2.73 E-3	4.49 E-2
3. Particulates	1.47 E-3	8.57 E-4
4. Tritium	1.04 E+2	1.19 E+2
	Initial	Revised
Gaseous Doses		
1. Total Body	7.84 E 0 mrem	3.42 E-1 mrem
2. Skin	1.39 E 0 mrem	7.12 E-1 mrem
3. Particulate & Iodine - organ dose	6.16 E-2 mrem	5.74 E-1 mrem

Finding:

Based on a review of past semiannual effluent release reports and other information provided by the licensee, it was apparent that the licensee had documented, reported and corrected several errors in the offsite dose calculation computer software which was used to generate the semiannual effluent release reports (Regulatory Guide 1.21 report). The licensee identified the problem, corrected the errors, and submitted a revised semiannual effluent release report for the period January 1-June 30, 1983. The initial and revised values were within NRC limits and regulations. The licensee identified the problems and took timely corrective actions.

The allegation was essentially factually correct; however, as noted above, the licensee had identified and reported problems with the offsite dose calculation computer software and had corrected the errors in a timely manner acceptable to the NRC. The allegation was not considered to be of safety significance and did not constitute a previously unreported and unreviewed safety matter.

Conclusion:

The allegation was partially substantiated, in that the licensee had made changes to effluent release reports, but these changes were transmitted to the NRC. No violations or deviations were identified in that, errors were appropriately corrected and no regulatory limits were exceeded.

1. Allegation: River Water in Condenser

Description

A leak allowed river water to get to the condenser and the plant should have been shut down immediately (2850058218).

Discussion:

Operation of the secondary coolant (steam) system of the plant with high concentrations of sodium as a result of river water ingress, while known to produce deleterious effects in the steam system, is not considered by the NRC to be a safety concern at this time and as such is not a reportable item under the TS or any applicable NRC regulations or guidelines. The PWR Owners Group Guidelines on plant chemistry recommend that the system be operated at less than 20 ppb (parts per billion) of sodium in the steam generator "blowdown "

The inspectors' review of plant sodium chemistry records indicated several periods from 1977 to 1983 when secondary-side sodium levels exceeded the licensee's administrative control level of 70 ppb. Duration of high sodium levels ranged from 1 to 5 days. In each case, the plant was either shutdown or brought to a low power level while leaking condenser tubes were located and plugged. It appeared that the Unit 1 condenser had experienced the most problems, with approximately 221 tubes having been plugged as of January 5, 1988. The Unit 2 condenser, as of October 1, 1987, only had 81 tubes plugged. Records indicated that some tubes had been plugged for mechanical reasons (e.g., vibration) while others were plugged for chemical reasons (e.g., to stop river water intrusion). In each instance, sodium levels dropped to levels of $\leq$ 70 ppb after work was completed.

Under FNP administrative procedures and management organization, decisions on plant actions and responses are the responsibility of plant supervisory staff.

Finding:

No Technical Specification requirements were violated. The NRC has no technical specifications regarding secondary system chemistry; however, for the past several years, NRC has encouraged plants to adopt improved chemical control programs in both primary and secondary coolant systems.

The statements made in the allegation were essentially correct but the allegation was without substance as to the licensee's actions being contrary to NRC regulations or guidelines. On that basis the allegation was not substantiated.

Conclusion:

The allegation was partially substantiated, in that an event did occur. No violations or deviations were identified.

m. Allegation: Environmental Controls or Reports Inaccurate

Description

Environmental control procedures did not reflect "what was really going on" (2850058102).

Discussion:

The inspectors reviewed the licensee's Semi-Annual Radioactive Effluent Release Reports for 1983 through 1986 and the licensee's Environmental Operating Reports for the same period. The inspectors' review of the licensee's effluent release reports, of environmental operating reports, and of past inspections of environmental activities -- all of which appeared to confirm that the licensee's environmental control procedures were satisfactory -- indicated that the overall program of control, monitoring, and verification was adequate and in compliance with the plant TS and with applicable regulatory guidance.

Finding:

The inspectors' review of plant operations relative to radioactive effluents and of environmental monitoring found that the licensee appeared to be in full compliance with the plant TS and with applicable regulations and guidelines concerning control of radioactive liquid and gaseous effluents, effluent monitoring, and environmental monitoring. No basis was found to substantiate the allegation.

Conclusion:

The allegation was not substantiated.

n. Allegation: Inadequate Equipment to Perform Alpha Analyses

Description

Plant had inadequate equipment to do proper alpha analysis (2850058094).

Discu sion:

TS Tables 4.11-1 and 4.11-2 require periodic samples of liquid and gaseous effluents to be analyzed for "gross alpha" activity. By "gross alpha" is meant counting of all detectable alpha activity. "Gross alpha" should not be interpreted to include analyses of alpha emission energy for identification of specific radionuclides or chemical separation for identification of specific alpha-emitting radionuclides.

During this inspection 50-348, 364/88-01, January 4-7, 1988, and in a number of previous inspections, the inspectors determined that the licensee had provided equipment for gross alpha measurements of a nature and type considered by the NRC to be adequate for gross alpha analyses. Further, this or similar equipment had been in use at the licensee's facility in the time frame of 1981-1984, the period covered by the allegations. Such equipment was considered adequate to meet current requirements, guidelines and regulations.

It should be recognized that current regulatory guidance does not recommend or require licensees to perform qualitative or quantitative analyses for specific alpha emitting nuclides or for specific transuranic nuclides, even though the technology is available to perform such analyses. Detailed analyses, utilizing chemical separation techniques and elaborate detection devices, performed at other facilities have shown that at the maximum fuel burnup or maximum integrated neutron flux (nvt) accumulated by power reactor fuel in the course of normal operation, the fission product and activation product radioactivity remains the dominant health hazard and is appropriately the controlling factor in determining MPCs for airborne activity (in-plant and effluents) and for activity in in-plant fluids, liquid samples (reactor coolant samples) and effluents. (Ref. 1*, also discussions with NRR staff and ONRR staff).

The licensee's equipment and procedures for alpha radiation detection and measurement were reviewed and found to be adequate to meet all existing technical specification and regulatory requirements.

Findings

Based on the above discussion, it was concluded that the licensee's provisions for gross alpha activity determinations met the requirements

*Reference 1: "Evaluation of Airborne Alpha Emitter Hazards at a Nuclear Power Plant," E. M. Goldin, Radiation Protection Management, Vol. 4, No. 6 (Nov/Dec 1987), pp. 64-66.

of the TS and were in conformance with NRC regulations and were therefore adequate. The licensee's equipment was found to be adequate and on that basis, the allegation was not substantiated.

Conclusion:

The allegation was not substantiated.

o. Allegation: Alpha Analyses Not Done Correctly

Description

Alpha analyses were not done correctly to determine if it was natural radioactivity (2850058095).

Discussion:

TS Tables 4.11-1 and 4.11-2 require periodic samples of liquid and gaseous effluents to be analyzed for "gross alpha" activity. Plant operating procedures, in the Health Physics area, specify that alpha-detecting survey instruments be used in certain circumstances to determine levels of "gross alpha" contamination of material surfaces and that "gross alpha" detecting counting equipment be used to determine "gross alpha" activity collected on air samples and "smears." None of the above procedures or requirements specify that any analyses, measurements, or determinations be made to determine if detectable alpha activity was of "natural" origin (i.e., U-235, U-238, Th-232), or if it was "transuranic" in origin (i.e., Pu-239, Pu-242, Am-241, Cm-242). There are no NRC regulations or guidelines requiring identification of alpha activity as to its being of "natural" or "transuranic" origin.

During this inspection 50-348, 364/88-01, January 4-7, 1988, and in a number of previous inspections, the inspectors determined that the licensee had provided equipment for gross alpha measurements of a nature and type considered by the NRC to be acceptable for gross alpha analyses. Further, this equipment or similar equipment had been in use at the licensee's facility in the time frame of 1981-1984, the period covered by the allegations. Such equipment is considered adequate to meet current requirements, guidelines and regulations.

The determination of whether alpha activity is of natural or transuranic origin can be made by one of two or more basic processes. One requires time-consuming chemical separation and concentration processes involving a substantial amount of analytical skills and time over a period of about a month at a high monetary cost, followed by gross alpha determination of the processed sample. A second process involves alpha energy pulse height analysis using solid state detectors and computer-based analytical equipment. With samples involving both natural and transuranic nuclides with concurrent high levels of fission and activation product contaminants, it is usually necessary to go

through chemical separation and re-concentration steps prior to placing the prepared sample into the counting chamber.

The techniques for alpha spectrum analysis described above do not produce the precise results which are inherent in either of the most commonly used detectors employed in gamma spectrum analysis -- the germanium lithium (GeLi) detector or the intrinsic (high purity) germanium (Ge) detector. In either the GeLi or intrinsic Ge detector systems, the pulses can be analyzed or evaluated with a high degree of precision, while a comparable degree of precision is not attained with the alpha spectrometer. One problem lies in the relatively large number of different transuranic nuclides which can be present in irradiated fuel. In a typical analysis, 18 or more separate alpha energies may be present, ranging from 4.90 MeV up to 6.12 MeV, with several of those falling within 10 keV of emissions of other nuclides. With resolution of detectors nominally specified at about 20 keV, it follows that sharp peak definition is not seen in most analyses of transuranics, especially with samples of unprocessed materials, such as smears or air samples.

Findings:

The licensee's procedures, equipment, and methodology meet regulatory requirements for alpha analyses and have been determined to be adequate to protect the health and safety of FNP employees and of the general public. Based on the above discussion, no basis was found to substantiate the allegation.

Conclusions:

The allegation was not substantiated.

p. Allegation: Environmental Monitoring

Description

Environmental monitoring was not adequate (2850058031).

Discussion:

The inspector reviewed the licensee's Annual Environmental Operating Reports for the years 1983 through 1986 (the 1987 report was anticipated to be issued approximately April 30, 1988). The data contained in the reports appeared to be consistent with the requirements of TS Sections 6.9.1.6 and 6.9.1.7 and of the guidelines of Regulatory Guide 4.8 (December 1975). The reports contained all of the information required by NRC for the reporting of monitoring of plant effluent radioactivity in the environs of FNP. None of the four reports indicated the presence of significant quantities of radioactive material in the environment which would be indicative of abnormal quantities of radioactive effluents from FNP.

It was noted that in 1986, environmental monitoring stations in the FNP environs collected samples of radioactive material attributable to releases from the Chernobyl accident of April 1986. At the request of the NRC and the Environmental Protection Agency (EPA), special samples of air particulates and radioiodine, rain water, milk, forage materials, and soil were collected and analyzed from May 5, 1986, through June 2, 1986. Evidence of increased activity was detected in those samples beginning May 12, 1986, and reached a peak between May 13-May 15, 1986. The effects of this release were detected in environmental samples in the FNP monitoring program for about five months.

The environmental monitoring program for the FNP was inspected three times between 1981 and 1986:

Inspection Report #	Inspection Period	Report Issue Date
50-348/81-24; 50-364/81-27	October 27-30, 1981	November 17, 1981
50-348, 364/83-01	January 11-14, 1983	February 3, 1983
50-348, 364/85-01	January 7-11, 1985	February 3, 1985

In each of the three inspections conducted between 1981 and 1986, the environmental monitoring program was found to meet the criteria and guidelines set forth in the Technical Specifications for FNP and in NRC Regulatory Guides 4.1, "Measuring and Reporting of Radioactivity in the Environs of Nuclear Power Plants," 4.2, "Preparation of Environmental Reports for Nuclear Power Stations," 4.8, "Environmental Technical Specifications for Nuclear Power Plants," and 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

The environmental monitoring program for FNP was conducted on a contract basis with environmental sample media being collected and analyzed by the Eberline Instrument Corporation and the University of Georgia Center for Applied Isotope Studies.

The State of Alabama and the State of Georgia conducted additional independent environmental surveillance sampling operations in the plant environs. Environmental samples were collected and analyzed by the State of Georgia Department of Natural Resources.

The licensee and all of the contractors and State facilities participating in the FNP environmental monitoring program were required to participate in cross-check programs with the EPA and in other inter-laboratory analytical comparative programs to verify the validity of their analysis programs.

Finding(s):

The inspector's findings were:

(1) The licensee's environmental monitoring program met all of the requirements and guidelines applicable to the program and was considered to be adequate.

(2) The alleger's concerns appeared to arise from a general misunderstanding or lack of comprehension of the principles of radioactive decay of short-lived radionuclides having long-lived decay products and a lack of familiarity with the environmental monitoring programs conducted by the licensee.

Conclusion:

The allegation was not substantiated.

q. Allegation: Public Not Being Informed

Description

The public is not getting proper information with regard to the release of radioactive materials into the environment (2850058199).

Discussion:

The inspectors reviewed the licensee's Annual Environmental Operating Reports for the years of 1983 through 1986, and NRC Inspection Report Nos. 50-348/81-24, 50-364/81-27; 50-348, 364/83-01, and 50-348/, 364/85-01, which were concerned with environmental monitoring. The inspector also reviewed the licensee's Semi-Annual Radioactive Release Reports for January 1983, through June 1987. The Annual Environmental Operating Report for 1987 and the Semi-Annual Radioactive Release Report for July-December 1987 had not been received as of the end date of the inspection.

The Annual Environmental Operating Reports, the Semi-Annual Radioactive Release Reports and the cited NRC RII inspection reports appeared to provide the required information and appeared to confirm that the licensee was operating the plant within the prescribed bounds for control of releases of radioactive material to the environment, for monitoring of effluent releases, and for monitoring the environment to determine the effects of the releases on the environment. These reports are routinely placed in the local, State and Federal Public Document Rooms and are available for public and media scrutiny.

Finding:

The inspector found that the licensee was in compliance with applicable regulations and guidelines for the reporting and dissemination of

information concerning environmental releases of radioactive material. On this basis, the allegation was not substantiated.

Conclusion:

The allegation was not substantiated.

r. Allegation: Waste Gas Decay Tank System Inadequate

Description

Waste gas decay system at Farley is inadequate (2850058258).

Discussion:

The design of the FNP Waste Gas Decay tank (WGDT) system was reviewed and found acceptable during the plant licensing process and was inspected and found adequate in preoperational inspections. Since reactor operation began, routine onsite inspections and reviews of semi-annual effluent release reports have audited the operation, maintenance, and surveillance of the WGDT system.

The function and purpose of the WGDT system is to retain or "hold up" the offgases from degasing of primary coolant and primary coolant system gas spaces. During the course of plant operations, the offgasing process removes a mixture of radioactive and nonradioactive gases from the primary coolant system; these gases are both radioactive and potentially explosive. The mixture of radioactive gases, as extracted, consists primarily of noble gases such as xenon and krypton, most of which have relatively short half lives. If these gases were to be released at the time of extraction, offsite radiation doses to the population could be unacceptably high. If these gases can be retained for more than about 30 days following removal from the primary coolant system, radioactive decay will have reduced the radioactivity contents to a small fraction of its "time zero" activity content.

That the FNP WGDT systems were operating and performing their purpose and function satisfactorily was evidenced by the fact that the offsite radiation doses were within NRC limits. Of 12 operational pressurized water reactor sites in Region II in calendar year 1986, the last year for which comparative release data was available, four multiple-unit sites had higher releases of noble gas than FNP, while four multiple-unit sites and three single unit sites had lower releases than FNP.

Finding:

The inspector found that operating experience with the WGDT system indicated that the system was performing in an adequate manner, confirming the licensing evaluation of the systems' design as adequate. On this basis, the allegation was not substantiated.

Conclusion:

The allegation was not substantiated.

s. Allegation: Liquid Waste

Description

Liquid waste was sent to the reactor makeup water storage tank (RMWST) even though the chemistry was out of specification (2850058220).

Discussion:

The inspectors reviewed the documentation from which this allegation was taken and found it did not contain sufficient specific information to permit the allegation to be adequately defined and reviewed. The alleger did not specifically state that waste had been sent to the RMWST but only that an individual had told the alleger that he was planning to do so (hearsay); the alleger further did not state that the action had actually taken place and did not state the approximate date(s) on which the conversation or event allegedly took place.

The alleger was not specific as to what was meant by "chemistry was out of specification." It is noted that the words "chemistry" and "radiochemistry" are often used interchangeably in nuclear plants.

Finding:

The inspector found the allegation to be sufficiently vague and nonspecific that there was no reasonable probability of finding confirming data in a technical records search. On this basis, the allegation was not substantiated.

Conclusion:

The allegation was not substantiated.

t. Allegations: Fuel Damage

Description

Licensee said there was no cladding failure, but when the (reactor) head was removed, 11 fuel bundles were damaged (2850058006).

Twenty fuel bundles failed sipping, but only four were reported as failed. These four were other than the 11 visibly damaged (2850058007).

There was more than one fuel pellet fragment but the report to NRC said only one pellet was not intact (2850058008).

Counting room technicians realized there was gross fuel damage but management was not receptive to this information (2850058065).

The licensee had fuel pellets and pieces of rods that littered the canal all the way from the reactor core to the spent fuel room (2850058089).

Licensee management was told that the increase in zirconium in sample analyses indicated that the fuel cladding was being worn away. No one cared about that (2850058090).

Several fuel bundles fell apart (2850058097).

Alleger personally witnessed several bundles falling apart in the transfer canal (2850058116).

Fuel was damaged during fuel handling (2850058127).

There were loose fuel pellets in the core (2850058140).

Licensee management refused to believe they had fuel damage even though the evidence was overwhelming (2850058261).

Counting room technicians realized Farley had a failed fuel problem but management did its best to ignore the situation and to cover it up (2850058284).

Discussion:

In 1982, FNP Unit 1 began experiencing higher than expected reactor coolant system and offgas radioactivity levels, both of which are indications of fuel cladding damage. The licensee had a TS Limiting Condition for Operation (LCO) on the amount of radioactivity in the primary coolant of 1.0 microcurie per gram dose equivalent iodine (DEI) (TS 3.4.9.a). If the licensee exceeded this value for more than 48 hours, the unit was required to be in hot standby within 6 hours; "hot standby" was tantamount to plant shutdown.

When the licensee began to experience indications of damage, the NRC resident inspectors were informed, as was NRR. The licensee sent a letter to the NRC (August 16, 1982) and a Licensee Event Report, No. LER 83-005/01T-0, dated February 11, 1983, documenting the situation. The fuel damage was not unexpected because at least one other plant (Trojan) had previously experienced similar consequences resulting from baffle jetting on fuel rods.

The NRC monitored the situation closely through the Resident Inspectors and through frequent inspections by specialist inspectors from Region II. The plant continued to operate until a scheduled refueling outage in January 1983. During the outage, the licensee found and reported eleven damaged fuel assemblies. During refueling, the

licensee also found and reported fuel pellets and fuel rod debris in and around the reactor vessel. The damaged fuel assemblies and four others, which were found and reported to be leaking through "sipping" tests, were stored in the spent fuel pool (See LER 83-005/01T-0).

It is not uncommon for a nuclear power plant to experience fuel cladding failures. The limits established by the NRC for radioactivity in the coolant ensure that plants do not operate with a significant fraction or percentage of failed fuel. During the operating cycle prior to the Unit 1 refueling outage in January 1983, the plant did not exceed the TS activity limits for steady state operation. On occasion, the DEI radioactivity levels temporarily "spiked" above the level for steady state operation as a result of plant transients (e.g. reactor trip or startup). Such spikes are considered normal operational events.

During the time frame when the plant operated with fuel defects, and during the subsequent refueling outage, NRC Resident Inspectors and radiation specialist inspectors from RII inspected the licensee's activities. Specialist inspections included:

1. Radiochemical confirmatory measurements inspection of radiochemistry procedures and split sample results (Inspection Report NOo.50-348/82-04, February 1982).

2. Inspection of health physics (HP) audits, organization, training, procedures and waste handling (Inspection Report No. 50-348/82-19, July 1982).

3. Inspection of worker dose control, surveys, facilities, and effluents (Inspection Report No. 50-348/82-24, September 1982).

4. Inspection of contamination control, dose control, training and surveys (Inspection Report No. 50-348/82-29, November 1982).

5. Environmental monitoring (Inspection Report No. 50-348/83-01, January 1983).

6. Inspection during Unit 1 outage, including training, dose control, internal uptake control, contamination control, and surveys (Inspection Report No. 50-348/83-05, February 1983).

7. Evaluation of the licen 's worker dose control and contamination control ams (Inspection Report No. 50-348/83-12, April 1983).

8. Evaluation of the licensee's determination of transuranic content of solid - ste shipments, control of radioactive material, contamination control and high radiation area and

radiation area controls (Inspection Report No. 50-348/83-16, June 1983). This inspection resulted in an unresolved item concerning the potential for waste shipped to Barnwell for burial to have slightly exceeded the limit for transuranics (10.8 nanocuries per gram vs the limit of 10 nanocuries per gram).

9. Inspection of alpha contamination resulting from the improper cleaning of a smoke detector (Americium 241), which lead to alpha contamination of the laundry and contamination spread to the control room (up to 10^6 dpm on a desk). This incident was found and corrected by the licensee. No violation (Inspection Report No. 50-348/83-20, August 1983).

10. Independent measurements inspection of radiochemistry analyses, included evaluation of procedures in use and sample result comparison (Inspection Report No. 50-348/83-08, February 1983).

11. Inspection of effluent monitoring, contamination surveys, and transuranic content of solid waste (program found acceptable) (Inspection Report No. 50-348/83-32, December 1983).

12. A post-outage inspection of a specific alleged overexposure event and alpha contamination around the spent fuel pool during the outage (Inspection Report No. 50-348/84-06, February 1984).

The documentation available for the period of concern in the allegations did not support the substance of the allegations, i.e., that the licensee was not aware of fuel damage or did not recognize, admit or report fuel damage, and attempted to "coverup" the extent of damage.

Findings:

Licensee reports and notifications to NRC and results of NRC onsite inspections indicated that the licensee had adequately reported the fuel damage conditions as well as the associated radiological conditions. On this basis, the allegations did not contain any new information on safety matters that had not previously been reported to NRC and which had not been previously inspected or reviewed by NRC.

Conclusion:

The allegations were not substantiated.

5. Responses to Alleger Questions

An alleger, requesting information on plutonium discharges from FNP in addition to other unrelated subjects, asked the specific questions listed below and requested an NRC response.

(1) How much plutonium has been discharged to the river at the FNP?

(2) How much greater is the scaling factor than ten (10) for determining plutonium as discussed in Inspection Report 50-348/84-06?

(3) Why was there a revised effluent report for January 1-June 30, 1983?

(4) Why would neptunium be discharged when Unit 2 did not have failed fuel?

(5) Why is plutonium not accounted for in discharges to the environment?

(6) What analytical method is currently used to make the determination as to the amounts of plutonium discharged into the river at the FNP?

(7) What analytical method was used to make this determination in 1982 and 1983?

(8) What analytical method was used in area surveys for radioactive contamination in 1982 and 1983 at the FNP?

Discussion:

(1) How much plutonium has been discharged to the river at the FNP?

Response:

Unit 1 of the FNP went into commercial operation in 1977. Unit 2 went into operation in 1981. The simplistic response to this question is that since 1977, when the first unit went into operation, there has been no reportable release of plutonium in either liquid or gaseous effluents (discharges) from either or both units of the FNP. The official NRC records of releases from FNP show no discharge of plutonium.

The above statements require explanation as to what the State and Federal regulations and NRC reporting requirements are with respect to plutonium - or for any radioactive contaminant present in plant effluents. For completeness, it will also be necessary to describe the methods used to determine the radiological status of plant effluents.

Plant radiological effluents are measured or "monitored" using a number of sampling, analysis and monitoring techniques. The basic Federal requirements in these matters are listed in the FNP TS. With respect to plutonium in plant effluents, the sampling monitoring requirements for radionuclides appear in FNP TS Table 4.11-2 for gaseous effluents and in FNP TS Table 4.11-1 for liquid effluents. For gaseous effluents, a monthly composite sample from each potentially radioactive release point is required to be collected and analyzed for "gross" alpha activity at a Lower Limit of Detection (LLD) of 1 E-11 µCi/cc; isotopic analysis for plutonium is not required. For liquid effluents, the TS requirements call for a quarterly composite of all liquid waste batch releases and a monthly composite of liquid waste continuous releases, analyzed for "gross" alpha activity at a LLD of 1 E-07 µCi/ml. A monthly composite sample of the FNP discharge to the Chattahoochee River is also collected and analyzed.

The alleger's concern appears to be the potential presence of plutonium in plant discharges and likely arises out of the reported presence of traces of Neptunium-239 (Np-239) in FNP liquid effluents. Since Neptunium-239 has been reported in plant effluents, and since all Np-239 "decays" or "changes" into plutonium (Pu-239), it might seem obvious that there must also be plutonium present in plant effluents.

For the first half of 1987 (the most recent data reported), FNP (Units 1 and 2 combined) reported releasing 32 microcuries of "gross alpha" radioactivity in liquid effluents (3.2 E+01 µCi or 3.2 E-05 Ci) and 2.49 E-05 Ci (25 microcuries) of Np-239. No plutonium was detected or reported.

The volume of processed liquid waste released from FNP systems in the first six months of 1987, prior to mixing and dilution in the cooling tower water discharge, was 4.33 E+11 milliliters (or about 115 million gallons); this was further diluted in the 5.89 E+13 milliliters (15 billion gallons) of water released from the cooling towers before being discharged into the river, where it was further diluted in the stream flow of the Chattahoochee.

Each atom of Np-239 decays into an atom of Pu-239. Half of the Np-239 changes to Pu-239 every 2.36 days. Within three weeks, for all practical purposes, all of the Np-239 released would be converted into Pu-239. However, due to the much longer half-life of Pu-239 (2.41 E+4 years), the remaining radiation concentration, which is based on the number of atoms decaying in a certain time period, is much lower; 2.49 E-05 Ci of Np-239 becomes 6.55 E-12 Ci of Pu-239. The average concentration of Pu-239, based on the measurement of Np-239 prior to release, would have been 1.5 E-23 Ci/ml (1.5 E-17 µCi/ml) in the process water from the plant or 1.1 E-25 Ci/ml (1.1 E-19 µCi/ml) after being mixed with

the cooling tower discharge and prior to further mixing and dilution in the Chattahoochee River.

All of the above calculated concentrations of plutonium were substantially below Technical Specification requirements for detection levels (LLD), below Technical Specification discharge limits and below 10 CFR 20, Appendix B criteria and as such were not reportable.

(2) How much greater is the scaling factor of ten for determining plutonium as discussed in Inspection Report 50-348/84-06?

Response

Inspection Report 50-348/84-06 did not discuss a value for a scaling factor for determining plutonium. The "greater than a factor of ten" referred only to differences between scaling factors as computed separately by the licensee and by the licensee's vendor for some twenty individual radionuclides. The intent or purpose of the contractor development program was to establish scaling factors relating "key" or "signature" radiations from easily detected and identified specific nuclides which would then be correlated to quantities of difficult-to-measure radionuclides, such as plutonium, iron-55 and strontium-89/90.

It was because the differences between the licensee's calculated scaling factors (which were based on actual measurements) differed from those provided by the licensee's contractor (which were based on modelled computer program calculations) (and on report of data from other operating nuclear power plants) by values greater than ten that the contract was subsequently cancelled and the calculational scaling factor concept was abandoned by the licensee. The scaling factors which were developed are still considered to be proprietary information and cannot be divulged at this time. The point is moot because the program was cancelled as infeasible and was not utilized for quantifying plutonium.

(3) Why was there a revised effluent report for January 1-June 30, 1983?

Response

The licensee indicated in a letter to the NRC dated April 26, 1984, that the revision to the January 1 - June 30, 1983, Semiannual effluent report was necessary due to skewed stability class data in the original report as a result of a meteorological hardware failure and a data acquisition hardware deficiency. This revision also reflects the correction of several errors in the offsite dose calculation computer software. As a result of correcting the input data and the software errors, the calculated total curies of radioactive material released and resulting doses

changed. In both the initial and revised reports, doses were well within the limits established by the Farley Nuclear Plant Technical Specifications.

As noted in the licensee's explanation above, several items were changed. The NRC reviewed the revised report and accepted the licensee's explanation.

(4) Why would neptunium be discharged when Unit 2 did not have failed fuel?

Response

The assumption which was apparently made in this question was that it is necessary to have a significant amount of "failed" fuel in order for Neptunium-239 to be present in the reactor coolant and in liquid waste.

Every operating power reactor has a certain amount of neptunium (Np-239) circulating in the reactor coolant. Neptunium begins forming in the coolant stream of all reactors from the day of startup. There are several potential sources of Np-239 in a reactor. At low concentrations, there is some disagreement as to which source is dominant. "Pinhole" sized penetrations or defects of the zircalloy fuel cladding are believed to be present when the fuel is manufactured and also develop during reactor operation. Some Np-239 may escape into the coolant through the pinholes. Some Np-239 is also attributable to the presence of "tramp" uranium, which consists of traces of uranium contamination on the outside of the fuel cladding as the result of manufacturing operations. Another possible contributor is the presence of 3 to 5 parts per million of natural uranium in the zirconium used to produce the zircalloy cladding and structural material in the reactor core.

All of the above sources can contribute to the Np-239 inventory; however, it is generally believed that most of the Np-239 comes from the tramp uranium. Pinholes are not generally considered to be of sufficient magnitude to be classified as "failed fuel."

At the time of concern of this question, Unit 2 was being operated with no reported "failed fuel" but probably had a sufficient amount of tramp uranium in the fuel clad to produce detectable levels of Np-239. This circumstance would not require reporting or declaration of "failed fuel" by the licensee.

(5) Why is plutonium not accounted for in discharges to the environment?

Response:

NRC Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Rev. 1, June 1974, does not require the licensee to perform isotopic analyses of alpha-emitters in liquid or gaseous plant releases; therefore, there is no specific requirement for identification of any alpha emitting nuclides which would comprise the components of "gross alpha activity" (which is required to be reported). Since TS 6.9.1.9 requires the licensee to report semiannual summaries of plant effluents as outlined in Regulatory Guide 1.21, the licensee is not required to specifically account for plutonium in plant releases to the environment.

(6) What analytical method is currently used to make the determination as to the amounts of plutonium discharged into the river at the Farley Nuclear Plant?

Response:

See the responses to Questions 1 and 5. The licensee is not required, under current NRC regulations and guidelines, to determine the amounts of plutonium discharged into the river at the FNP. Liquid effluents are sampled and analyzed for gross alpha activity; based on the level of alpha activity recorded to date in FNP discharges, any plutonium present is below 10 CFR Part 20, Appendix B, Table II, Column 2 limits for discharge to the environment.

(7) What analytical method was used to make this determination in 1982 and 1983?

Response:

Determination of plutonium in plant releases was not a regulatory requirement in 1982 and 1983. Also see responses to Questions 1, 4, 5, and 6, above.

(8) What analytical method was used in area surveys for radioactive contamination in 1982 and 1983 at the FNP?

Response:

The question is not specific and a response requires certain assumptions as to the intent of the question. An "area survey" is considered to be a radiation survey of an in-plant area, such as a building, room, cell, vault, or a designated portion of any of the foregoing. Since all of the previous questions were concerned with the environment outside of the plant, the question was

interpreted as probably being applicable to "environmental" areas or areas of property outside of the owner-controlled property. Additionally, "analytical methods" are considered to be concerned with laboratory analytical procedures which go beyond the normal counting and analysis methods employed in a typical reactor plant counting room, in other words "gross alpha" detection and counting, and isotopic-identification of gamma-emitters by gamma spectroscopy.

"In-plant" area surveys are typically made by a multiple-step approach involving "sweeping" the area with beta-gamma sensitive radiation survey meters to determine ambient background levels and to pinpoint local high radiation zones called "hot spots." Next, a Geiger-Mueller tube detector survey meter (or similar device) is used at floor level to determine "hot spots" which could indicate the presence of localized contamination; a survey meter is used in a "sweeping" mode designed to cover every square foot of floor surfaces. Surfaces of structures, objects, walls, etc., are also "swept" to try to pinpoint spots of contamination. Next, "smears" are taken with paper "wipes" or disks, to determine the levels of "removable" contamination with an area approximately 4 inches square (16 square inches or about 100 cm^2) being covered. Depending on circumstances, coverage by "smears" would range from about one per square foot to 5 to 10 smears per room area of 300 to 500 square feet. Smears are first surveyed for possible excessive radiation levels which could result in contamination of lab counters; the smears are then counted for gross beta and alpha activity on gas flow proportional counters. Depending on circumstances, any unusual levels on smears may be evaluated for isotopic content using a gamma scintillation spectrometer.

Environmental areas, that is, areas outside of the licensee-controlled property or site boundary are not surveyed by meter, except in highly unusual circumstances. External radiation levels are measured by a grid of thermoluminescent dosimeters (TLDs). Contamination in the environment is assessed by collecting samples of river water, river bed sediments, foliage, soil, vegetables, milk and well water. Samples are processed in the laboratory to a form compatible with the counting or analytical equipment. No environmental samples are required to be counted for gross alpha activity or specific plutonium.

6. Semi-Annual Effluent Release Reports (84723, 84724)

FNP TS 6.9.1.8 requires the licensee to submit, within 60 days after January 1 and July 1 of each year, routine radioactive effluent release reports covering operation during the previous six months.

The inspectors reviewed the licensee's Semi-Annual Radiological Release Reports for the periods of July 1 through December 31, 1986, and of

January 1, 1987, through June 30, 1987. The effluent release data summarized in the following table was obtained from the referenced reports.

TABLE: RADIOACTIVE EFFLUENT RELEASE SUMMARY
FARLEY NUCLEAR PLANT, UNITS 1 AND 2

LIQUIDS (in Curies)

Period	Fission and Activation Products Ci	Gross Alpha Ci	Np-239* Ci	Tritium Ci
7/1-12/31/86	8.89 E-02	2.88 E-05	1.45 E-05	5.45 E+02
1/1-6/30/87	5.84 E-02	3.20 E-05	2.49 E-05	4.66 E+02

GASES (Curies)

Period	Fission and Activation Products Ci	Gross Alpha Ci	Np-239 Ci	Tritium Ci	I-131 Ci
7/1-12/31/86	1.73 E+03	0	NR**	1.07 E+02	9.3 E-04
1/1-6/30/87	7.32 E+02	0	NR**	6.84 E+01	2.80 E-04

*Determined by Gamma Spectrographic Analyses
**NR = not reported

In reviewing the reports, the inspectors noted that FNP reported no unplanned or abnormal releases during the reporting periods.

Allegations involving releases of radioactive materials, especially Np-239, in past years have questioned why the licensee does not report the presence of plutonium in plant releases (see Section 4.u of this inspection report). Since Np-239 (neptunium 239) was reported in FNP liquid effluents in the Semi-Annual Radiological Release Reports reviewed above, the inspector included the following evaluation of the significance of Np-239 and Pu-239 discharges in this inspection report.

The allegation concerns likely arose from the reported presence of traces of Np-239 in FNP liquid effluent releases. Since Np-239 (half-life 2.36 days) decays in Pu-239 (half-life of 24,390 years or 8.9 million days) within a few weeks of discharge, it may seem logical to assume that there should be an equal amount of plutonium distributed to the environment as a result of plant releases. In one sense, the assumption is correct--for every atom of Np-239 which decays, an atom of Pu-239 is produced. What is usually not considered is that radioactive materials are measured in terms of their radioactivity or emission rate and that limits are set in terms of such rates and not by the atom, mass, or weight of the material. Comparing equal

masses or weights on a radioactive emission rate scale, Np-239 is found to be almost four million times as radioactive as Pu-239.

In the 12-month period covered in the two reports discussed above -- from July 1, 1986, to June 30, 1987 -- the reported release of Np-239 in FNP radioactive liquid effluents (both units combined) was 3.94 E-05 Ci -- or about 40 microcuries of Np-239. The average radioactivity concentration of Np-239 reaching the Chattahoochee River in the liquid effluent stream was 6.7 E-13 µCi/ml, which was about four-and-a-half million times less than the MPC for Np-239 (3 E-06 µCi/ml).

Within three weeks of discharge, all of the Np-239 released in liquid effluents would have decayed into Pu-239. The radioactivity of Pu-239, atom-for-atom, is almost four million times less than that of Np-239, so the total activity of the Pu-239 resulting from the release of 40 microcuries (40 µCi) of Np-239 was about 1.0 E-06 µCi. 1.0 E-06 µCi of Pu-239, if it were to be assumed as being present when released from the plant, would have had an average concentration at the point of release of about 1.8 E-20 µCi/ml, which is a factor of 2.8 E+14 less than the MPC for Pu-239 (5 E-06 µCi/ml), substantially below detection limits and well within regulatory limits.