



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

November 9, 1982

Report No. 50-335/82-33

Licensee: Florida Power and Light Company
9250 West Flagler Street
Miami, FL 33101

Facility Name: St. Lucie 1

Docket No. 50-335

License No. DPR-67

Inspection at St. Lucie site near Ft. Pierce, Florida

SUMMARY

Inspection on September 17-24, 1982

Areas Inspected

This special, unannounced inspection involved 75 inspector-hours on site reviewing the circumstances where sewage containing low levels of radioactivity was released offsite and a review of corrective actions associated with the offsite contaminated land. Inspection of plant related activities are summarized in Details I. Inspection of offsite activities are summarized in Details II.

Results

In the areas inspected, two apparent violations were found (inadequate surveys and failure to post a radioactive materials area) and one apparent deviation was found (failure to meet commitments in FSAR).

REPORT DETAILS I

Inspector: John R. Wray 10/18/82
J. R. Wray Date Signed

Approved by: K. P. Barr 10/12/82
K. P. Barr, Section Chief Date Signed
Technical Inspection Branch
Division of Engineering and Technical Programs

1. Persons Contacted

Licensee Employees

- *C. M. Wathy, Plant Manager
- *R. R. Jennings, Technical Staff Supervisor
- *H. F. Buchanan, Health Physics Supervisor
- *A. W. Bailey, QA Operations Supervisor
- *J. J. Walls, QC Inspector

NRC Resident Inspector

- S. Elrod, Senior Resident Inspector
- *H. Bibb, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on September 24, 1982, with those persons indicated in paragraph 1 above.

3. Licensee Action on Previous Enforcement Matters

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Chronology of Events

On Friday, September 10, 1982, a sink or wash trough in the Radiation Controlled Area became clogged. During the repair it was suspected that the drain did not go to the radioactive waste system as originally assumed by plant personnel. The sink was immediately isolated over the weekend. On Monday, September 13, 1982, the drain was tested with dyed water and found

to drain to the sewage treatment system. Radiation survey results taken outside the Radiation Controlled Area on sewer drain lines at manholes and at the sewage disposal plant indicated two to three times background. The liquid effluent from the sewage treatment system is routinely sampled and monitored for accountability purposes. No liquid releases above Technical Specification or 10 CFR 20 limits have been recorded. A sample of the sludge taken at the sewage treatment facility indicated Cobalt-60 levels of $1.0\text{E}-06$ microcuries per gram.

Two truck loads of sludge have been removed and disposed of offsite since initial operation of the sewage treatment system on December 4, 1979. These disposals occurred on January 8, 1982, and June 27, 1982. Prior to the sewage treatment system becoming operational, sanitary wastes were piped to a septic tank. Between plant start-up and initial use of the sewage treatment facility, the septic tank was pumped and its contents disposed of at the Ft. Pierce Sewage Treatment Plant many times (approximately daily and more often during extended outages). The residue from both treatment plants was dumped in the same designated field by one contractor. At the time of this inspection, the licensee had not yet surveyed the Ft. Pierce Sewage Treatment Plant. Those survey results will be reviewed during a subsequent inspection. A sanitary sewage treatment plant concentrates radioactivity deposited by the liquid stream. Periodic sampling of the liquid is not expected to identify greater than minimum detectable activity (MDA) because of the low levels in the liquid stream. Due to the concentrating effect of the treatment process, low level buildup is seen in solid samples. The licensee conservatively estimates that less than 10 millicuries may have been released to these fields since initial unit operation. Surveys were made at the dump site to isolate areas that needed clean up. The contaminated dirt has been collected and will be properly packaged for shipment to a licensed burial site.

The inspector reviewed surveys of the contaminated systems and areas since this system discrepancy was identified. The inspector also examined records of sampling results and surveys performed prior to liquid and gaseous releases and radwaste shipments. All surveys appeared to be adequate. However, no prior surveys or evaluations were performed on the sewage treatment sludge prior to disposal offsite. 10 CFR 20.201 states that each licensee shall make such surveys as may be necessary for the licensee to comply with the regulations. 10 CFR 20.301 states that no licensee shall dispose of licensed material except: (a) by transfer to an authorized recipient; (b) to a sanitary sewage system if readily soluble or dispersible in water and the radioactivity is less than specified limits; or (c) as provided in 10 CFR 20.303, 10 CFR 20.306, or 10 CFR 20.106. The inspector informed the licensee that failure to perform adequate surveys to assure compliance with waste disposal limits of 10 CFR 20.301 is a violation of 10 CFR 20.201(b) (82-33-01).

6. Prior Reviews

During construction the wash trough and drain piping was installed pursuant to drawing no. 8770-G-890 "Reactor Auxiliary Building and Drainage." The drawing indicates that the system is piped to the sewer system. The drawing also indicates two toilets and a urinal which were considered to be potentially contaminated by plant personnel are piped to the sewer system. These facilities have been isolated and an engineering change request has been initiated to reroute the drain piping to the radwaste system. A licensee representative stated that since March 1978, which was the plant's initial extended outage, the wash trough has been used for decontamination, mostly respirator decontamination.

Section 9.2.6 of the updated FSAR entitled "Potable and Sanitary Water System" states that the potable and sanitary water system is not connected to any system which is a potential source of radiation and that since all sanitary waste water is routed to the sewage treatment plant, the potable and sanitary water system will therefore not act as a radiological contamination source. Section 9.3.3 of the FSAR, "Equipment and Floor Drainage System," states that wastes from radioactive drain will be collected for sampling, analysis and processing as required, to assure that releases to the environment are in accordance with the limits established by 10 CFR 20.

The inspector stated that based on the above, it appeared that the wash trough, toilets, and urinal were not designed for regular use as contaminated equipment.

On May 6, 1980, the NRC issued IE Bulletin No. 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment." The bulletin required each licensee with an operating license to review their facility design and operation to identify systems that are considered as nonradioactive (or described as nonradioactive in the FSAR), but could possibly become radioactive through interfaces with radioactive systems. In particular, special consideration was requested to be given to sanitary waste system. In response to Bulletin 80-10, the licensee indicated in letter L-80-219 dated July 9, 1980, that review revealed no additional routine sampling analysis or monitoring programs over and above existing procedures were required. This result was based on a review of the plant's nonradioactive systems as requested by the bulletin.

This review performed by Power Plant Engineering stated that the Sanitary Waste System is physically separated from any radioactive or contaminated source. The inspector stated that the review conducted in response to Bulletin 80-10 was inadequate because it did not identify the connection of the sanitary waste system with a contamination source. This inadequate review in response to Bulletin 80-10 and failure to comply with sections of the FSAR is a deviation from commitments to the Commission (32-33-02).

7. Subsequent Reviews

Since September 13, 1982, when the wash trough was tested and found to drain to the sewage treatment system, the licensee has performed extensive reviews of drain systems and equipment throughout the Reactor Auxiliary Building. Dye studies have been performed for flow verification where visual piping walk downs were not possible. The inspector noted that these studies had not been completed at the time of the inspection. Appendix B to the plant Technical Specification Section 5.6.2.c appears to require a preliminary 10 day report and a comprehensive 30 day report following a confirmed measured level of radioactivity in an environmental medium exceeding ten times the control station value. The inspector discussed with licensee representatives further system flow tests and checks which appear to be needed for the comprehensive report. Included in the list were drains in the Steam Generator Blowdown Building and samples from nonradioactive effluent pathways such as from the waste oil storage tank, the neutralization pond, storm drain settling ponds, and Steam Generator Blowdown Building septic tank. The inspector stated that the report will be reviewed and followed up during a future inspection (82-33-03).

8. Plant and Dump Site Tours

The inspector accompanied by a licensee representative walked down the sewage drain system on site and examined offsite activities at the dump site. The licensee is using sodium iodide crystal and micro R meters to identify contaminated dirt at the dump site. The approach, methods, and procedural control in the field appear to be appropriate. The sewer lines onsite inside manways appear to be clean of sludge for the most part with fixed radioactivity in the conduit accounting for most of the reading. The sewage treatment facility consists of six operating units including aerators, settling tanks and a chlorination unit to control odorous and pathogenic bio-organism. Based on an average Cobalt-60 concentration of $1.0\text{E}-06$ microcuries per gram, it appears that greater than 10 microcuries of Cobalt-60 is contained within the present system. This amount is greater than 10 times 10 CFR 20 Appendix C quantities. The licensee has agreed to clean out the system and return it to the status of a non-radioactive system.

10 CFR 20.203(e) states that each area which contains any radioactive material (other than natural uranium or thorium) in an amount exceeding 10 times the quantity of such material specified in Appendix C of 10 CFR 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "Caution (or Danger) Radioactive Materials."

The licensee did not post the sewage treatment plant as a radioactive materials area until after notified of the requirement during the onsite tour on September 23, 1982. The area was immediately posted in the proper manner. The inspector stated that failure to properly post a radioactive materials area was a violation of 10 CFR 20.203(e) (82-33-04).

REPORT DETAILS II

Inspector: D. M. Montgomery
D. M. Montgomery, Chief, IM&EP Section

10-14-82
Date Signed

Accompanied by: P. C. McPhail

Reviewed by: J. R. Jenkins
for J. Philip Stone, Director, EPOS

10/14/82
Date Signed

1. Persons Contacted

Licensee Employees

- *C. M. Wethy, Plant Manager
- *H. F. Buchanon, Health Physics Supervisor
- *B. Summers, Health Physics Staff

Other licensee employees contacted included 3 technicians.

NRC Resident Inspector

*H. Bibb

*Attended exit interview

2. Exit Interview

The portions of the inspection scope and findings which relate to the offsite surveys and cleanup activities were summarized on September 21, 1982, with those persons indicated in paragraph 1 above.

3. Unresolved Items

Unresolved items were not identified during this portion of the inspection (offsite activities).

4. NRC Response

Upon notification by the licensee that licensed material had been transferred to an unrestricted area, the NRC dispatched a survey team with the NRC mobile laboratory. The mobile laboratory arrived at the site on September 17, 1982. The initial inspection team directed their activities to surveys and review of corrective actions associated with the contaminated land. On September 22, 1982, an additional inspector arrived onsite to investigate the events that led to unauthorized release of radioactive material. The chronology of events is discussed in paragraph 5 of Details I.

5. Survey of Disposal Site

- a. Following a determination that radioactive material had been discharged to the sanitary sewer system, licensee representatives contacted the company that had disposed of sludge from the sewage treatment plant. The disposal company's records showed that the material had been spread on fields approximately 10 miles east of the plant (hereafter referred to as the disposal site). The general area is shown in Figure 1 and is licensed by the State of Florida's Department of Environmental Regulation for such disposal. The disposal site is pasture land and is used for grazing beef cattle. The records showed that sludge from the sewage treatment system had been dumped in fields 2A and 3.
- b. On September 14, 1982, licensee representatives contacted the Florida Department of Health and Rehabilitative Services and notified them that contaminated waste may have been transferred to the disposal site. On September 15, 1982, representatives from the licensee and the State of Florida performed direct radiation surveys of fields 2A and 3. The surveys showed slightly elevated radiation levels in field 3 and normal background levels in field 2A. Soil and grass samples were collected by FP&L and the State of Florida. These samples were analyzed by gamma-ray spectroscopy and showed elevated levels of Co-60, presumably from the disposal of material from the St. Lucie plant. Detailed surveys of field #3 showed that the contamination was primarily confined to an area of about 20 feet to 60 feet. The highest measured Co-60 concentration in soil samples was 100 pCi/gram. The highest Co-60 concentration in grass was 5 pCi/gram. The grass samples contained some soil attached to roots which would tend to increase the measured concentration from Co-60 in the soil.
- c. Aerial surveys of the entire disposal area (approximately 1100 acres) were carried out by the State of Florida using a helicopter supplied by FP&L to determine if contaminated sludge had been dumped in other areas. Aerial surveys were performed at a elevation of approximately 75 feet with a 7-inch diameter x 6-inch thick plastic scintillator connected to a rate meter. Surveys of the 20 ft. x 60 ft. contaminated area demonstrated that the aerial measurements were quite sensitive and capable of measuring changes in direct radiation levels as low as 1 microR/hour or less. These surveys detected slight increases in radiations levels at locations in field 3 about 400 ft. from the area initially identified. Subsequent surveys by field teams using sensitive survey instruments confirmed some areas with elevated radiation levels. These locations were not as large in area as the previously identified location and appeared to be discrete areas of a few square meters or less. These locations were identified with wooden stakes for additional surveys including soil sampling. These surveys were not complete by the conclusion of this inspection and the licensee was continuing the surveys to determine areas that would have to be excavated. The aerial surveys showed that only field #3 had detectable levels of radiation from disposal of contaminated sewage.

6. Corrective Actions by the Licensee

- a. The licensee excavated the upper layer of soil and grass in the 20 ft. x 60 ft. contaminated area down to a depth of 6 to 12 inches. The excavated material was placed in metal boxes designed for low level waste and transferred to the St. Lucie site for interim storage prior to shipment to a low-level radioactive disposal site. The State of Florida set an interim criteria for soil contamination of 0.5 pCi/gram. Analysis of soil samples after excavation showed that this level of decontamination had been achieved.
- b. The other area with elevated radiation levels covered a larger area with lower average contamination levels. The concentration of Co-60 in soil samples from some of the discrete contaminated locations were comparable to those observed in the 20 ft. x 60 ft. area. The State of Florida proposed a soil limit of 5 pCi/gram for Co-60 averaged over one square meter for this area. The proposed criteria was discussed with regional EPA and NRC representatives and found to be acceptable and consistent with previous criteria for similar situations.
- c. Direct radiation surveys and soil analyses were still in progress at the conclusion of the inspection. Licensee representatives agreed to complete the surveys and remove contaminated material in order to meet the limit of 5 pCi/gram. The State of Florida will perform confirmatory surveys after the licensee completes corrective action to verify the licensee's results. These surveys will include direct radiation surveys and analyses of grass, soil, ground water, and pond water samples.

7. Independent Measurements

- a. NRC inspectors performed direct radiation surveys in field #3 at various times during the inspection to verify readings reported by the licensee. In general these readings were consistent with the licensee's measurements. In addition, soil and grass samples were collected and analyzed by gamma-ray spectroscopy in the NRC: RII mobile laboratory. Soil samples were also split with the State of Florida to demonstrate comparability of measurements. Splits with the licensee could not be accomplished since sample geometries of NRC and the licensee were not compatible. NRC analysis of portions of samples counted by the licensee showed that the results were within a factor of two. The results of NRC analyses of soil and grass are given in Table 1. Soil samples from field #2A showed no Co-60 contamination which confirms the direct radiation measurements. Samples from field 3 (20 ft. x 60 ft. area) after excavation showed no detectable Co-60. Soil and grass samples collected from the areas in field #3 before excavation showed one soil and one grass sample with detectable concentrations of Co-60. The results of samples counted by NRC, FP&L, and the State of Florida are given in Table 2. The results of samples counted by NRC and the State of Florida showed excellent agreement.

8. Exposure Pathways

An analysis of the potential exposure pathways from the contaminated site was performed by the inspector. The two most significant pathways were direct radiation exposure from Co-60 gamma radiation for an individual occupying the contaminated area and ingestion of Co-60 in beef from cattle grazing on the grass from the contaminated area. Since the disposal site is pasture land and has not been occupied by humans, the direct exposure pathway would have been insignificant. The soil decontamination criteria will assure that the residual direct radiation exposure will be within the variation of the natural background in Florida, and land use will not have to be restricted. The dose associated with consumption of beef grazing on the contaminated site was calculated using the methodology of Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents," with the following assumptions:

- a. cattle consumed grass at the highest measured Co-60 concentration of 5 pCi/gram during the entire year.
- b. an individual consumed only beef raised on the contaminated pasture.
- c. annual consumption of 95 kg. of beef.

The annual dose was calculated to be 17 mrem/year. Since the cattle in this particular field graze over approximately 120 acres and the contaminated area is less than 1 acre, the estimated dose would be at least 100 times lower or less than 0.2 mrem/year. Based on the above analysis, the inspector noted that during the period when the area was contaminated, it is unlikely that anyone received a measurable radiation dose.

Tomato
Field

200 Acres
Field No. 1

80 Acres
Field
No. 1B

200 Acres
Field No. 2

200 Acres

Field No. 1A

100 Acres
Field No. 2A

WOODS

GLADES CUT-OFF ROAD

40 Acres
Field No. 3B

125 Acres

Field No. 3A

120 Acres

Field No. 3

TABLE 1

NRC GAMMA SPECTRAL ANALYSES OF ENVIRONMENTAL SAMPLES
FROM DISPOSAL SITE

<u>Sample Type</u>	<u>Location</u>	<u>Co-60 Concentration, pCi/gram</u>
Grass	Field #3 Grid Before Decontamination	2.5 ± 0.3
Soil	Field #3 Grid Before Decontamination	2.3 ± 0.2
Grass	Field #3 Grid Before Decontamination	Less than 0.5
Soil	Field #3 Grid Before Decontamination	Less than 0.3
Soil	Field #3 F3-6 After Excavation	Less than 0.06
Soil	Field #3 F3-6 After Excavation	Less than 0.04
Soil	Field #3 F3-6 After Excavation	Less than 0.07
Soil	Field #3 F3-6 After Excavation	Less than 0.07
Soil	Field #3 F3-6 After Excavation	Less than 0.07
Soil	Field #3 F3-6 After Excavation	Less than 0.04
Soil	Field #3 F3-6 After Excavation	Less than 0.04
Soil	Field 2A, #20	Less than 0.09
Soil	Field 2A, #21	Less than 0.05
Soil	Field 2A, #25	Less than 0.05
Soil	Field 2A, #26	Less than 0.04
Soil	Field 2A, #27	Less than 0.08
Soil	Field 2A, #28	Less than 0.01

TABLE 2

COMPARISON OF NRC ANALYSES WITH FP&L & STATE OF FLORIDA

Co-60 Concentration, pCi/gram				
<u>Sample Type</u>	<u>Location</u>	<u>NRC</u>	<u>State of Florida</u>	<u>FP&L</u>
Soil	Field #3 F3-6 Before Excavation	1.5 ± 0.1	1.8 ± 0.2	—
Soil	Field #3 F3-6 Before Excavation	0.25 ± 0.06	0.40 ± 0.07	—
Soil	Field #3 F3-6 Before Excavation	20.5 ± 0.5	—	39
Soil	Field #3 F3-6 Before Excavation	84 ± 1		37