U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-483/92011(DRSS)

Docket No. 50-483 License No. NPF-30

Licensee: Union Electric Company
Post Office Box 149
St. Louis, MO 63166

Facility Name: Callaway Nuclear Power Station

Inspection At: Callaway Site, Callaway County, Missouri

Inspection Conducted: July 27-31, 1992

Inspector: Cynthia D. Pederson for David W. Nelson
Radiation Specialist Date 8/24/92

Approved By: Cynthia D. Pederson for William G. Snell, Chief,
Radiological Controls Section 2 Date 8/24/92

Inspection Summary

Inspection on July 27 through 31, 1992 (Report No. 50-483/92011(DRSS))
Areas Inspected: Routine announced inspection of the radiation protection, radioactive waste and transportation programs including: organization, management controls and training; audits and appraisals; external exposure control; internal exposure control; control of radioactive materials, contamination, and surveys; maintaining occupational exposures ALARA; and solid waste and transportation (Inspection Procedure 83750, 86750).
Results: One violation was identified for a failure to perform a 10 CFR 50.59 evaluation for the storage of radioactive waste in the Radwaste Fenced Storage Yard.

Areas for which improvement appears to be merited are: radiological practices in the auxiliary, fuel and radwaste buildings and the hot machine shop (HMS) (Section 10); housekeeping in the auxiliary and radwaste buildings and the HMS (Section 10); and the large number of personnel contamination incidents (PCIs) (Section 6 (c)).

A number of strengths were identified including: improvements in the 1992 Quality Assurance (QA) audit of the Health Physics (HP) department (Section 5); the ALARA program (operational and planning) (Section 8); the hot particle and internal dose assessment programs (Section 6); and the reduction in total station dose for Refuel 5 (Section 6).

DETAILS

1. Persons Contacted

*J. Blosser, Manager, Callaway Plant
*F. Eggers, Supervising Engineer, Quality Assurance
*C. Graham, Supervisor, Health Physics Technical Services
*M. Evans, Superintendent, Training
*J. Kovar, Quality Assurance Engineer
*J. Laux, Quality Assurance Manager
*J. Neudecker, Supervisor, Health Physics Operations
*S. Petzel, Engineer
*G. Randolph, Vice President, Nuclear Operations
*C. Stretch, Senior Health Physicist
*R. Roselius, Superintendent Health Physics

*B. Bartlett, Senior Resident Inspector

The inspectors also interviewed other licensee personnel during the course of the inspection.

*Denotes those present at the exit meeting on April 10, 1992.

2. General

This inspection was conducted to review aspects of the licensee's radiation protection, radioactive waste and transportation programs. The inspection included tours of radiation controlled areas, observations of licensee activities, review of representative records and discussions with licensee personnel.

3. Licensee Action on Previous Inspection Findings (IP 83750)

(Closed) Open Item 483/92006-03. Inadequate controls over the receipt of radioactive materials.

The licensee has contacted its vendors to remind them to attach "radioactive materials" labels to the exterior surface of all packages containing radioactive material sent to the Callaway Plant. In addition, responsible receiving dock personnel were trained to identify packages containing radioactive material. This item is closed.

4. Organization, Management Controls and Training (IP 83750)

The inspector reviewed the licensee's organization and management controls for the radioactive waste management, effluent monitoring, and transportation programs, including: organizational structure, staffing, delineation of authority and management techniques used to implement the program; and experience concerning self identification and correction of program implementation weaknesses.

The licensee's radiation protection and radioactive waste management organization remains essentially as described in previous inspection reports. Staffing within both the chemistry and radioactive waste and the health physics (HP) departments have remained very stable.

As a part of the licensee's long-term organizational and personnel development plan, the current Health Physics Superintendent (Radiation Protection Manager) will enter senior reactor operator licensing training in December 1992, and the Superintendent of Training (ST) will assume his duties. The inspector reviewed the qualifications of the ST and raised concerns about whether or not the individual met the requirements of Regulatory Guide 1.8 to serve as the Radiation Protection Manager. This matter is considered an Inspection Followup Item (IFI) and was discussed at the exit meeting. (IFI 483/92011-01).

The inspector attended one of the Health Physics Retraining classes. The class was one of several in a course titled "Rad Chem Retraining - Health Physics Operations." During the class the students reviewed several Suggestion Occurrence Solution (SOS) radiological occurrence reports and two NRC Information Notices (92-30 and 92-22). Each student was given a course training manual prior to the start of the course and it contained not only an outline for each class but additional information as well (sections of the regulations, Information Notices, Institute of Nuclear Power Operations documents, court judgements, SOSs). The manuals were well written, organized and contained an abundance of useful information. The inspector spent only one hour in class and was unable to form an opinion about quality of the presentation.

No violations or deviations were identified. One IFI was identified.

5. Audits, Surveillance and Self Assessments (IP 83750)

The inspector reviewed the extent, thoroughness and results of the one Quality Assurance (QA) audit performed since the last inspection. No surveillances were performed since the last inspection.

The inspector reviewed the 1992 audit of the health physics program and noted a significant improvement over the 1991 audit. The 1992 audit was well written and organized; comprehensive; and unlike the 1991 audit which tended to concentrate on procedural adherence the 1992 audit was based on performance. The audit examined HP activities within six areas (ALARA, Internal and External Dosimetry, Control of Radioactive Material, Control of Access, Surveys and Postings, and Control of Contamination). Each activity was assessed for effectiveness based on performance. The audit found that, in general, HP activities were performed effectively and in accordance with programmatic requirements. Two activities within the Control of Contamination area, however, were found to be unacceptable (decontamination of the refuel cavity and the effectiveness of reducing the personnel contamination incidents (PCI)). In addition, seven SOSs were issued for findings; at least one in each of the areas examined. The findings included: the failure of Merlin-

Gerin (MG) DM 90 electronic dosimeters due to immersion in water or seepage of liquids; continuing problems with material being turned into the hot machine shop (HMS) or tool crib decontamination areas without the proper "Request for Decontamination" tags; bagged radioactive material not marked with the highest contact dose rate; incomplete inventories of packaged contaminated material sent to Storehouse #2 for long-term storage; and multiple examples of failures to update postings and/or survey sheets. The inspector discussed each of the findings with both QA and Health Physics but was unable to determine the effectiveness of the corrective actions taken to address the findings since the audit had only been released officially for less than 30 days. The two unacceptable activities (decontamination of the fuel cavity and PCIs) will be discussed in Section 7.

A review of the SOSs written to address the findings did raise concerns about the identification of root causes and the effectiveness of recommended corrective actions. For example, missing decontamination tags and unmarked bags had been reported in the 1991 audit as well as several earlier SOSs. The inspector observed missing decontamination tags and unmarked bags during a tour of the HMS. Clearly, past actions to correct these deficiencies were ineffective. When QA found that MG electronic dosimeters (ED) were failing due to immersion in laundry water, the audit was not expanded to determine why dosimeters where getting past access points unnoticed. The only proposed corrective action directed HP to find ways to waterproof the EDs. Another example of inappropriate corrective actions involved two other findings: incomplete inventories and failures to update surveys. Although not reported in the audit, updates to surveys, inventories and other similar activities improved throughout the outage indicating that as technician (mostly contract technicians) performance improved many of these problems were alleviated. Corrective actions included, in part, assigning additional experienced technicians to manage contract technician activities; however, there was no mention of the need to expand and/or improve contract technician training. In general, the licensee's SOS program is effective in identifying and correcting deficiencies (see below), however, these examples may indicate that the program may have weaknesses. This concern was raised at the exit meeting.

The inspector reviewed several hundred SOSs (radiological occurrence reports (ROR) as well as ALARA suggestions) written since January 1, 1992. The task was possible due, in large part, to the licensee's very good computerized SOS reporting and tracking system. The inspector noted that a majority of the SOS occurrence reports were of minor concern and each was clearly documented; each was addressed in a timely manner and in most cases (see above) the corrective actions taken were appropriate. In addition, the inspector noted that the number of SOSs (RORs and ALARA suggestions) written by HP personnel had dropped significantly since the summer of 1991. QA noted, in a study in progress, that approximately 75 percent of the SOSs written by HP personnel during the last two years were written in the first year. This rapidly declining trend was not seen in the number of SOSs written

by other departments. HP technician input into the SOSs is a valuable resource and a decline in that input may indicate a weakness in the program. Although QA had not completed the study by the end of the inspection and the reasons for the decline had not been determined, QA did discuss the preliminary findings at the exit meeting.

No violations or deviations were identified.

6. External and Internal Exposure Control (IP 83750)

The inspector rev[illegible] the licensee's hot particle dose assessment and internal dose assessment programs. The inspector reviewed procedures, past dose assessments and discussed with the licensee their plans for implementing the new 10 CFR part 20. In addition, the inspector reviewed the licensee's program for reducing personnel contamination incidents.

a. Hot Particle Dose Assessment

The licensee has a very good hot particle dose assessment program. The licensee calculates doses for all hot particles found on skin or modesty garments with activities of greater than 10,0[illegible] corrected counts per minute (ccpm) and if the dose excee[illegible] 50 mRem it is recorded. The licensee uses two computer pro[illegible] to calculate dose (Quince and Varskin) and since both programs are so user friendly, HP technicians routinely perform the dose assessments for all but the highest activity particles. In addition, the procedures and forms used to record, track and assess hot particles are comprehensive, easy to follow and simple to use. The licensee continually upgrades the program as new information is made available and the computer programs are upgraded. During Refuel 5, 25 skin dose assessments were performed. Of those only 11 personnel were assigned a skin dose and the highest dose assigned was 3.282 Rad to a worker's chin.

b. Internal Dose Assessment

The licensee has made substantial progress in incorporating the new 10 CFR 20 requirements into their internal dose assessment program. The licensee has already began employing ICRP 30 methodology to determine internal dose and uses the inhalation model (a conservative approach) to determine dose for a majority of the uptakes. The licensee still uses a two crystal whole body (WB) counter; one crystal for the thyroid and one for the lungs. This limits their ability to track clearance through the gut (the ingestion pathway), therefore the licensee uses bioassays to track some isotopes. The licensee calculates internal dose using a computer program named REMedy. The program uses ICRP methodology and is capable of reporting internal dose in maximum permissable concentration hours (MPC-hrs) as well as percent of the Annual Limit of Uptake (ALI) and Combined Effective Dose Equivalents (CEDE). The WB counter is used routinely for annual assays and

upon termination of employment. Non-routine counts are done on any worker who enters a contaminated area; on any worker found to have a hot particle on the skin above the shoulders; and upon demand by a worker or HP. During Refuel 5, approximately 2000 WB counts were performed and of those about 600 were non-routine. In all, only 12 WB counts resulted in a dose calculation and the highest assigned dose was 10 mRem. The licensee is committed to implementing the new 10 CFR 20 by January 1993, and this very good program should meet that goal.

c. Personal Contamination Incidents

Following Refuel 4, the licensee set up a task force to determine why the number of PCIs were steadily increasing and recommend corrective actions for reducing them. PCI totals for each of the first four refuel outages were: 97 for Refuel 1, 141 for Refuel 2, 193 for Refuel 3, and 297 for Refuel 4. The task force collected and analyzed a tremendous amount of data and made numerous recommendations, many of which were implemented prior to Refuel 5. The trend, however, continued and even increased during Refuel 5 (523 PCIs). The task force continued to collect data during Refuel 5 and issued a report following the outage. The report provided an analysis of the data collected and identified several areas for improvement. The report found:

a. Of the 523 PCIs, 173 (33%) were on the skin and 371 (66%) on the clothing. A majority of the clothing contaminations could be attributed to residual contamination on protective coveralls, clean area incidents, and the use of the Tool Monitor. 121 PCIs were found on workers exiting clean areas and most of those were found on feet (shoes). A significant number of the clothing contaminations (185) were found on "modesty" garments brought in by the workers. The plant does not supply "modesty" garments and many of the PCIs found on those garments were detected using the Tool Monitor. Conclusion: no clear pattern was established although the number of PCIs on "modesty" garments did indicate that inadequate laundering of protective clothing (PC) may have been a factor.

b. The number of PCIs increased significantly following certain discrete activities. PCIs in the contaminated as well as the clean areas increased following the removal of the steam generator manways, installing and removing nozzle dams, the spraying of removable coating on the fuel cavity walls and grinding activities within containment. Conclusion: in some cases, contamination containment failed and a large number of PCIs were released and found their way into the clean areas.

c. The activity and size of the PCIs had changed. The PCIs were less active than those found during earlier outages and

they were smaller in size. There also appeared to be an increase in the number of particles found during surveys. The licensee also noted that source term decreased in some areas and increased in others. This may have resulted from early boration, the flushing of a number of crud traps and installing 0.45 micron filters in their water systems. Conclusion: PCIs were increasing in number and harder to detect (less activity).

d. HP technicians at one access point used the Tool Monitor to survey garments and found a number of PCIs on garments that had passed the personnel contamination monitors (PCM). Although both instruments were set at the same sensitivity (5,000 dpm) the Tool Monitor's geometry may have increased its ability to detect low activity particles. The use of the Tool Monitor may have created a problem for the licensee. By procedure, any > 100 ccpm particle or area contamination found on the skin or "modesty" garment is considered a PCI and must be documented. A worker who passes through a PCM without an alarm is considered to be free of contamination and any item that passes a frisk is considered to be clean. The use of the Tool Monitor went beyond the procedural requirements for detecting PCIs and artificially increased the number of recorded incidents. Conclusion: the licensee may reconsider using the Tool Monitor to survey garments and/or consider changes to their procedures. In addition, the licensee will consider supplying "modesty" garments to workers and/or dropping the requirement that contaminated "modesty" garments be recorded as PCI's.

e. "Modesty" garments may have been contaminated by poorly laundered protective clothing. The licensee ran an experiment: new PCs were laundered and passed through the Tool Monitor. A significant number of them were found to be contaminated. The licensee routinely monitors laundered PCs and rejects those that exceed certain set limits. The licensee sets, within limits, the sensitivity of the laundry monitor to reject a certain percentage of laundered PCs. If they set the limit too low the monitor rejects too many PCs and the plant can't function. Conclusion: consider supplying "modesty" garments and stop recording garment contamination as PCIs.

Following the study, HP wrote an action plan to address the findings of the report. Recommended actions included: pursuing improved laundry processing, supplying company owned "modesty" garments, reduce contamination source term by aggressive action to clean up and decontaminate containment and improving the plant's decontamination methodology (hot water, vacuum cleaners, steam/hydro). The plan was in draft form during the inspection and the dates for implementing recommended actions had not been established The licensee hopes to

have most of the plan approved and implemented before the next refuel outage.

After touring the facility (Section 10), interviewing HP personnel and reviewing the report and action plan, the inspector came to the several conclusions. A number of the action plan items (supplying "modesty" garments for example) would only reduce the number of PCIs recorded and not the amount of the source term. Other issues were not discussed. Those include: the amount of contaminated material stored in the auxiliary and radwaste buildings (Section 10); the size of the zone surrounding contaminated equipment and the fuel pool (Section 10); controlling contamination at the source (manway covers, nozzle dams, grinding activities); and housekeeping practices in several of the buildings (Section 10).

No violations or deviations were identified.

7. Control of Radioactive Material (IP 83750)

During the review of the 1992 Audit of HP, the inspector noted a finding concerning contaminated material stored in Warehouse #2. During a tour of the warehouse, the inspector noted a large number of metal boxes containing contaminated materials, stored in several locations within the building. The material, mostly equipment, is used for outage activities and the licensee has been storing it in the warehouse for a number of years. The building has several fire alarms but lacks any radiation monitoring equipment. The procedure to store the material in the warehouse had been written in 1988, and at that time it was decided that this activity did not constitute a change to the FSAR or warrant a 50.59 evaluation. Upon further review, the licensee had asked its corporate office to perform a 50.59 evaluation and was waiting for the results. The licensee also stores contaminated material in a metal building atop the auxiliary building and will ask the corporate office to perform a 50.59 evaluation.

During a tour of the Radwaste building the inspector noted several containers of radioactive waste stored outside in a fenced area behind the Radwaste building. When asked, the licensee indicated that radioactive waste had been stored in the area for several years. In November of 1991 the licensee initiated an engineering evaluation to determine the acceptability of storing radioactive waste in the fenced area. The evaluation found that the storage of radioactive waste in the fenced area was not consistent with the FSAR and all radioactive waste must be stored indoors. Further, if the licensee decided to store waste in the fenced area the FSAR would need to be changed and a 10 CFR 50.59 evaluation performed. Radwaste personnel were unaware of this report's conclusions and were unaware of the approximate time they began storing waste in the area. The failure to perform a 10 CFR 50.59 evaluation to justify the storage of radioactive waste in the fenced area behind the Radwaste building is a violation of NRC requirements. (Violation 483/92011-02)

One violation and no deviations were identified.

8. Maintaining Occupational Exposures ALARA (IP 83750)

The inspector reviewed the licensee's program for maintaining occupational exposures ALARA, including: ALARA group staffing and qualification; changes in ALARA policy and procedures, and their implementation; and establishment of goals and objectives, and effectiveness in meeting them. Management techniques, program experience and correction of self-identified program weaknesses were also reviewed.

The ALARA group was augmented with five additional personnel during Refuel 5. Following the outage, the group returned to its pre-outage total of two personnel; the ALARA planner and coordinator both of whom are former radiation/chemistry supervisors. Both individuals have extensive ALARA experience and the program appears to run efficiently. The group hopes to have three improvements implemented before the next outage. Those include: increased input of ALARA concerns into work packages, updating of the process (computerization) to assure that revisions to packages are reported to the ALARA coordinator and the computerization of the grid system for containment work scheduling. These improvements should enhance an already very good ALARA program.

The plant's person-Rem totals for Refuel 5 showed a distinct improvement over those of Refuel 4. Total dose for Refuel 5 was 314 person-Rem compared to 416 person-Rem for Refuel 4. In addition, 314 person-Rem compared favorably to the total doses for Refuel 2 and 3 (242 and 252 person-Rem respectively). The licensee took a conservative approach to calculating the total dose goal of 440 person-Rem for Refuel 5. They set a baseline dose goal of 250 person-Rem for routine activities by summing the recorded dose for each activity from previous outages and deducting approximately 10 percent. To this goal they added the dose goals (projected dose minus approximately 10%) for all other non-routine activities. With the exception of the work done on the primary side of the steam generators, all other major work categories came in under goal. The total dose for work done on the primary side steam generator was 7 percent over estimate (104 person-Rem estimated compared to 112 person-Rem actual). The ALARA group noted a significant improvement in management support throughout the outage. By establishing a conservative dose goal and improving it by more than 100 person-Rem, the licensee demonstrated very good performance.

No violations or deviations were identified.

9. Transportation of Radioactive Material (IP 86750)

Since January 1, 1992, the licensee made approximately 40 shipments of radioactive material including five shipments of radioactive waste sent to SEG, a waste processing facility, for incineration. None of the shipments were found to have violated any NRC, DOT or state requirements. An SOS was written for one shipment when a vendor

discovered that the recorded maximum dose rates on several of the packages sent to them by the plant were low by as much as 50 to 100 mRem. The vendor did not report this as a violation; the dose rates were within the limits for an exclusive use Low Specific Activity (LSA) shipment. The investigation found that the contract technician performing the surveys may have used the wrong response time setting and/or surveyed the packages too quickly. This appeared to be an isolated incident and the SOS did not recommend a corrective action.

No violations or deviations were identified.

10. Plant Tours (IP 83750, 83729)

The inspector toured the auxiliary, turbine, fuel and radwaste buildings, warehouse #2, the fenced radioactive waste storage area building behind the radwaste building and the calibration lab. The inspector observed the following:

* There appeared to be an excessive amount of contaminated material (instruments, hoses, equipment) stored in hallways, stairwells and rooms in the auxiliary building. For example, the inspector noted bagged contaminated hoses hanging on the walls in a majority of the rooms, 20 to 30 contaminated air sampling pumps stored in one stairwell, contaminated chemistry sample containers and several portable high efficiency particulate air filter units stored in a hallway, and bagged contaminated equipment left sitting outside of equipment storage areas. In addition, roped areas around contaminated equipment and/or contaminated areas appear to be larger than required. For example, whole areas around pumps were roped off even though only one small area on the pump was contaminated (a valve for instance) and a contaminated zone of approximately 4 to 5 feet was left around the fuel pool.

* Poor housekeeping practices in the auxiliary and turbine buildings including: debris (paper, towels, pens and tools) on the floors in hallways and rooms, contaminated protective clothing laying on the floor in several areas, dress out bags laying on the floor, gloves, towels, and other debris laying on table tops and instruments in chemistry sampling areas, and multiple examples of inadequate housekeeping in the hot machine shop.

* Poor radiological control practices in the auxiliary and radwaste buildings including: multiple examples of contaminated drain lids that had been removed and the open drain left unattended, several examples of "contaminated area" signs hung across entrances to contaminated areas that were left hanging to the side (each was hung behind a closed door), one example of a box of contaminated material stored in a non-radioactive materials locker, and several examples of "radiation area" and "caution radioactive materials" signs that had fallen off walls and/or containers.

No violations or deviations were identified.

11. Exit Interview (IP 83750, 86750)

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on July 31, 1992, to discuss the scope and findings of the inspection.

During the exit interview, the inspector discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. Licensee representatives did not identify any such documents or processes as proprietary. The following matters were specifically discussed.

a. Inspector concerns regarding the excessive number of PCIs during Refuel Outage 5. (Section 6)

b. Inspector concerns regarding housekeeping practices in the auxiliary and radwaste buildings and the HMS. (Section 10)

c. Inspector concerns regarding poor radiological controls in the auxiliary and radwaste buildings. (Section 10)

d. Inspector concerns regarding the lack of a 10 CFR 50.59 evaluation for the fenced radioactive waste storage area. (Section 7)