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

JUL 0 3 1984

Report Nos.: 50-369/84-07 and 50-370/84-07

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-369 and 50-370

License Nos.: NPF-9 and NPF-17

Facility Name: McGuire 1 and 2

Inspection at McGuire site near Charlotte, North Carolina

Inspector: _____ 6/21/84
R. H. Albright Date Signed

Accompanying Personnel: A. Stalker, EG&G of Idaho

Approved by: _____ 6/21/84
G. R. Jenkins, Section Chief Date Signed
Emergency Preparedness and Radiological
Protection Branch
Division of Radiation Safety and Safeguards

SUMMARY

Inspection on April 2-6, 1984

Areas Inspected

This routine, announced inspection involved 36 inspector-hours (4 inspector-hours on backshifts) on site in the areas of external exposure control, internal exposure control, independent inspection, and post-accident sampling system.

Results

Four violations were identified - 1) Failure of the reactor coolant post accident sampling system to be operable, 2) Failure to perform adequate evaluations of personnel exposure, 3) Failure to have and adhere to procedures for radiation protection, and 4) Failure to post the steam generator entrance with a flashing light.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*M. Sample, Projects and Licensing Engineer
*T. L. McConnell, Technical Services Superintendent
*T. J. Keane, Station Health Physicist
*J. Foster, Health Physics Coordinator
*K. Murray, Assistant Health Physicist
*C. Baily, Health Physics Dosimetry Supervisor
*S. Copp, Nuclear Engineer-Licensing
*M. Glover, Emergency Preparedness Coordinator
*R. P. Michael, Station Chemist
*W. Rasin, Design Engineer
*D. Mendezoff, Licensing Engineer
G. Terrell, Health Physics Coordinator
*L. Kimray, Power Chemistry Coordinator
L. Baker, RN, Station Nurse

Other licensee employees contacted included six technicians, one operator, two mechanics, and two office personnel.

NRC Resident Inspector

*R. Pierson, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on April 6, 1984, with those persons indicated in paragraph 1 above. The violations of Unit 2 license condition 2.C.10, 10 CFR 20.201(b) and Technical Specification 6.11 and 6.12.2 were discussed with licensee management. Licensee management acknowledged the violation of Technical Specification 6.12.2, but stated their disagreement that violations of Unit 2 license condition 2.C.10, and 10 CFR 20.201(b) had occurred.

The licensee was notified on or about April 27, 1984, that 1) the ability of the containment atmosphere post accident sampling system to provide a sample representative of the containment atmosphere and 2) results of dose calculations for an individual obtaining an atmosphere sample from the system would be unresolved items.*

*An Unresolved Item is a matter about which more information is required to determine whether it is acceptable or may involve a violation or deviation.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item (50-369/83-41-01) External exposure control - This item is discussed in paragraph 4 a. of the report.

4. Radiological Protection Activities During Extended Outages (83729)

a. External Exposure Control

10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as may be necessary for compliance with this part and are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. 10 CFR 20.101 establishes exposure limits. For external exposure control licensees provide personnel with TLD's in accordance with 10 CFR 20.202 to meet the survey requirements of 10 CFR 20.201(b). Technical Specification (TS) 6.11 requires procedures to be prepared consistent with the requirements of 10 CFR 20 and that the procedures shall be approved, maintained, and adhered to for all operations involving personnel radiation exposure. The nspector discussed the TLD program with corporate personnel. The TLD reading service is provided to the Duke Power Company nuclear stations by a corporate group. Personnel who read the TLDs ensure that the TLD being read belongs to the individual whose name appears on the outside of the badge by comparing the TLD card number with the number that appears on the name label outside the badge. There is a main and backup section of the TLD badge but the backup section is generally not used to determine an exposure if the main section does not yield an acceptable reading. The reason for not using the backup section to determine dose is that correction factors are not kept current for the backup area. Therefore, when the main TLD section does not yield an acceptable reading, the practice, as stated in procedure DL/O/B/ 1100/01, Step 4.6.8, is to use the individual's pocket dosimeter (PD) data from a computer printout. No other evaluation of the computer listed exposure is made. The inspector reviewed licensee information which indicates the computer exposure total is not a reliable source of PD exposure data and should not be used to determine dose without further investigation as to the completeness and accuracy of the record. Licensee documentation indicated (1) computer input errors up to ±250 mr, (2) individuals do not always turn in dose cards for days when they enter the radiation control area, and (3) as discussed later in this section, the results of dose evaluations for lost dosimetry are entered in the individual's computer dose only when turned in on a dose card and there are no assurances that this occurs. For the listed reasons the computer PD total may not be correct. The licensee did not question the practice of assigning computer PD totals when the TLD was not available to indicate the exposure. Lacking an acceptable TLD reading, to make an adequate evaluation of the exposure received, the PD total has to be verified and documented as correct before being assigned as an individual's exposure for a specific period in that PDs are not qualified as the official exposure recording device. During August 1983, the TLD reader malfunctioned and the exposure total in the

computer for August was used as an individual's exposure. No evaluation of the completeness or accuracy of this record was made prior to assigning the computer total as the individual's August exposure. The inspector stated that assigning the PD totals as shown on the computer for a individual's exposure when the TLD is not available is a violation for failure to do an adequate evaluation of personnel exposure as required by 10 CFR 20.201(b) (50-369/84-07-01). Therefore, the procedure, DL/O/B/1100/01, used for assigning personnel exposure when the TLD is not available does not adequately implement the requirements of 10 CFR 20 as required by TS 6.11. This is a violation of T.S. 6.11 (50-369/84-07-02).

Through discussions with licensee personnel the inspector determined that the licensee calibrates the TLD reader monthly, performs QC checks daily, determines linearity annually and reads spiked badges from the plants monthly. This part of the TLD program appeared to be adequate.

The licensee General Office prepares a TLD/PD correlation report monthly. The report is generated by computer and lists TLD and PD differences outside a predetermined band. The band width varies with the individual monthly exposure total. The allowed difference above 280 mr is ±25%. Personnel who have appeared on the correlation print-out three consecutive months are flagged for further investigation. Normally, when the TLD/PD correlation report is received at the plant, the PD used during the exposure period in question is pulled for a calibration check. The individual's dose cards for that month are totaled for comparison to the computer totals. The results of the PD calibration check and the dose card total/computer exposure total are provided to the General Office. The inspector reviewed the plant response to the General Office for selected months in 1983. These licensee responses to the General Office TLD/PD report indicated that poor TLD/PD correlations were generally due to one of the following reasons: (1) dose cards were not turned in during the month (Failure to turn in dose cards was discussed in an earlier report as unresolved item no. 50-369/83-41-01), (2) the individual may have entered an incorrect badge number (this only occurred once in the plant responses reviewed by the inspector and did not appear to be malicious) (3) input errors mainly in the 40-50 mr range, however, a few incorrect entries were as high as ± 250 mr. Health Physics Manual Section 2.2, step 2.2.5 requires personnel to turn in dose cards on days when they enter the Radiation Control Area. The failure of personnel to turn in dose cards as required by Health Physics Manual, Section 2.2, Step 2.2.5 is a violation of TS 6.11. (50-369/84-07-02)

Health Physics Procedure HP/O/B/1000/03, Investigation of Potential Overexposures, is a procedure describing the exposure investigation required, if it is suspected that an overexposure may have occurred or the procedure may be used to evaluate exposures when dosimetry devices are lost in the plant. The completed exposure investigation, by the procedure, is required to be distributed to the individual's exposure file, to the individual, the system health physicist, and to the plant

files. Step 4.3.2 of the procedure requires that if the preliminary investigation does not indicate an overexposure occurred, the individual's dose card is to be retained until the final dose has been determined. Contrary to the procedure requirement that the dose card be retained until the final dose is determined, licensee representatives stated that it is the individual's responsibility to turn in a dose card with the dose as determined by the investigation. The inspector reviewed two completed investigations and checked the dose cards for these individuals. One individual lost both the TLD and PD. The investigation assigned the individual 75 mr for this RCA entry. This 75 mr was never entered on the individual's dose card and therefore was not entered in the computer as PD exposure. The individual would have been assigned only 60 mr for PD exposure accumulated prior to the entry when the TLD was lost. The computer PD total should have been 135 mr. The investigation performed for another individual who lost a pocket dosimeter determined that 15 mr should be assigned for the RCA entry. A review of the individual's dose card did not show the 15 mr and therefore was not indicated in the computer PD exposure. If this individual had subsequently lost this TLD or if the TLD could not be read, the total PD exposure would not be accurate. While the two exposure losses described above are not large, identical losses could occur with higher exposures. In the above examples, licensee personnel did not ensure that the exposures determined by investigation were entered on the dose card for entry into the computer exposure file. Failure to document exposure for radiation control area entries was discussed in an earlier report as unresolved item no. 50-369/83-41-01. The 2 examples described above indicate failures to follow procedures as required by TS 6.11. This is a violation of TS 6.11. (50-369/84-07-02)

The inspector observed that health physics personnel at control points do not ensure that personnel have their own dosimetry or that personnel have dosimetry. The inspector stated that health physics personnel should be aware of the potential for dosimetry misuse and check dosimetry at the control points. This was discussed with the station health physicist.

Plant employees leave their TLDs in an open rack in an entrance hallway. The TLDs are easily picked up by individuals other than the owner by accident or on purpose. Licensee personnel stated that 3-4 TLDs are lost from this rack each month. Some are returned to the rack, some are not. The inspector stated that other plants have experienced misuse of TLDs by personnel trying to keep their exposure low and thus possibly prolonging their work period at the plant. The inspector stated that the licensee should investigate the need for better security for dosimetry stored in the TLD racks. Licensee management acknowledged the inspector's concerns during the exit interview.

The inspector discussed with the station health physicist control of the reactor vessel sump during periods when the incore detector

thimbles are withdrawn from the core. The entrance to the area is kept locked and during periods when the thimbles are retracted, the key is kept by the station health physicist. During a tour of the

Unit 1 containment, the inspector observed the sump entrances to be properly posted and locked. The inspector had no further questions.

During a tour of the facility, the inspector noted that a door into a posted high radiation area was open and not barricaded as required by TS 6.12. Review of a survey for the room indicated the highest general area radiation level to be 100 mr/hr. No one was in the room and no one appeared to be guarding the room to prevent personnel entry. After the inspector stood at the entrance to the room for about 30 seconds, a health physics technician approached. The technician stated that he was controlling entrance to the room and was approximately 15 feet from the door to the room when the inspector went to the door. The individual stated that the concrete bunker in the room contained a filter reading 300 R/hr on contact. A shield plug over the area containing the filter indicated approximately 100 mr/hr general area and 300 mr/hr on contact. The technician stated that with the plug removed, the general area above the hole would reach 5 R/hr. At this time, there was an overhead hoist connected to the plug ready to lift. The technician was also attempting to watch a reactor coolant filter change out about 15 feet away from him while he was guarding the entrance to the previously described room. The filter was to be moved to the filter bunker in the room. Two technicians, including the technician watching the entrance to the concrete bunker area, were assigned to the job. The inspector was concerned that the individual was not providing adequate attention to guarding this room especially when there was the potential of high dose rates at the filter bunker with the shield plug removed. The filter storage room and the filter change out job were inside an area which has doors that can be locked to provide adequate high radiation area control. The inspector stated that a guard for a high radiation area should be in a position to control the area in order to prevent personnel entry into the room. Licensee management acknowledged the inspector's concerns.

TS 6.12.2 requires that the RWPs for high radiation areas greater than 1000 mrem per hour shall state the work area dose rate on the RWP. The inspector reviewed RWPs for work inside the steam generator channel head. Work area dose rate is not written on RWPs posted at the dress out area. The dose rate information is available in the health physics office or from the HP technician at the work site. Due to the requirement for personnel to go to the health physics lab prior to going to the work area in order to receive radiological information and due to the health physics coverage afforded this job, licensee control over the work appeared to be adequate to inform personnel of work area dose rates. This area will be reviewed during a future inspection.

The inspector discussed with a health physics technician, the controls in place for the steam generator (SG) work. Prior to reporting to the job site personnel stop in the health physics lab where they are briefed on the latest radiation surveys and are given their available stay time. Protective clothing used for the SG jumpers was one set of cotton coveralls, rubber wet suit, and an air line respirator. The SG jumpers also had TLDs and PDs at the following locations: head, chest, back, wrists, thighs, ankles, gonads, and upper arms. A health physics technician at the SG manway provided surveys and controlled stay time for the SG jumpers. Health physics controls for the SG work appear to be adequate.

b. Internal Exposure Control

10 CFR 20.103(c) requires that the medical qualifications of respirator users shall be determined annually. The licensee requires station personnel under 45 years of age to receive an initial physical from a physician. The next three years, physicals are given by the plant nurse who determines medical qualifications from guidance given her by a doctor. Personnel over 45 years of age see the doctor annually. The inspector reviewed a letter from the corporate medical doctor which stated the guidelines for the nurse to use for the annual physicals and gave specific nurses the authorization to sign his signature to the physical. The doctor is therefore responsible for the nurse determination. The nurse at the licensee facility is specifically authorized to sign the doctor's name. The inspector selectively reviewed medical qualifications signed by the nurse for the doctor. No violations or deviations were identified.

5. Independent Inspection Effort (92706)

During tours of the facility, the inspector observed posting, labeling, and control of radiological areas and containers of radioactive material for compliance with 10 CFR 20, TS and plant procedures. TS 6.12.2 requires that high radiation areas above 1000 mr/hr in a PWR containment which are not readily locked shall be posted, baricaded and marked by a flashing light. The inspector discussed with licensee personnel posting of the area around the open SG manways during February-March 1984. The dose rate as indicated by surveys was above 1000 mr/hr at the manway. The inspector determined from plant management that during periods when personnel were not working in or guarding SGs B, C, or D, no flashing light marked the SG manway as required. This is a violation of TS 6.12.2 (50-370/84-07-03)

6. Post-Accident Sampling System (PASS) (25559)

NUREG-0737, Item II.B.3 described criteria for a post-accident sampling system for sampling reactor coolant and containment atmosphere under accident conditions without incurring a radiation exposure to any individual in excess of the limits. The McGuire Unit 1 facility was required by license condition 2.C.11 to have the PASS installed prior to January 1,

1982. The McGuire Unit 2 was required by license condition 2.C.10.b to have a high-radiation sampling system for obtaining reactor coolant and containment atmosphere samples under degraded core accident conditions operable prior to exceeding 5% power.

The following is a summary of the inspection.

a. A review of the system design and installation was made. The review included spot checking and tracing selected lines in the sampling system and comparing these with the drawing and sample panel description. The Unit 2 containment air sampler has a modification that is not shown on the drawings. This modification is a dead leg on the sample inlet used to provide a pressure indication for proper sample correction calculations. This modification is not shown on the system drawings and was not included in the dose calculations for taking a sample of the containment atmosphere. A Region II review of the details concerning this item concluded that the licensee must determine if this system modification invalidates dose calculations conducted pursuant to paragraph 6 of NUREG-0737, Item II.B.3., regarding exposure limits for personnel obtaining samples following an accident. This item will remain unresolved pending the licensee's evaluation (50-369/84-07-04). Also, the liquid and gaseous samplers do not correspond to the design documents.

b. The operating procedures were reviewed for conformance to existing station requirements. The post-accident sampling system operating procedures have been prepared, reviewed and approved in accordance with station procedures. However, during the operational testing conducted for this inspection, it was discovered that there was an error in the calculation of the dilution volume for the containment air samples.

c. The training program and records were reviewed. The licensee has a training program to ensure that personnel are trained to operate the PASS reactor coolant and containment atmosphere panels. The licensee had documented classroom and hands-on training. An adequate number of technicians have been trained to operate the system. Documentation for retraining and replacement training was also reviewed.

d. The system design was reviewed with respect to meeting the intent of NUREG-0737, Section II.B.3. The following problems have been identified:

   (1) The liquid reactor coolant sample is not returned to containment, instead it is sent to a 5000 gallon waste tank. No analysis has been made for the long term consequences of using this tank for the storage of the waste from this system.

   (2) Vents on each of the four sample cabinets are not filtered through HEPA and charcoal filters. They vent directly to the Auxiliary Building.

(3) The sump pump in the containment air sample cabinets is not connected to a closed system. A bucket is necessary to drain the sump.

(4) The containment air sample lines are not heat traced although the licensee is planning to install heat tracing.

e. The system was operated to actually collect a sample from the Unit 2 reactor coolant hot leg sample point and from the Unit 2 containment atmosphere. The samples were subjected to all of the tests that would be normally run by the system. The Unit 2 containment atmosphere hydrogen monitor train A was placed into service and a measurement made. The containment hydrogen monitor behaved as expected and is acceptable. The containment air sample for both noble gases and iodine were measured to be less than detectable which is what was expected. An earlier test bypassed the dilution capability to assure that the system could draw a containment atmosphere sample. A detailed review of the sample results subsequent to the inspection indicate that the results of the test are not acceptable. While the isotope concentrations for longer lived isotopes compared well with routine samples, the shorter lived isotopes did not compare well and indicate the system may have a dead leg. The shorter lived isotopes indicated that the mixture had decayed for about 6 hours before sampling. All known delays between sampling and counting were accounted for and corrected. This is an unresolved item pending outcome of further tests on this system that show the system can obtain samples representative of containment atmospheres. (50-370/84-07-05)

The acceptability of licensee's results were determined from NUREG 0737 criteria and where criteria were not stated in NUREG 0737, NRC -generated acceptance criteria were used. The NRC acceptance criteria were transmitted to the corporate office for the Oconee Plants on July 8, 1982. The subject of the letter containing the criteria was a post implementation review of PASS by the NRC staff. While a similar letter was not addressed to the McGuire facility, the letter was available to corporate personnel who designed the PASS for all Duke Power Plants. The PASS systems for the Duke Power Plants are essentially the same.

The reactor coolant liquid sample system operation yielded the following results.

(1) The reactor coolant dissolved hydrogen results do not meet the ±5 cc/kg criterion. 0 cc/kg was measured vs. 46 cc/kg normal. Data from a 3/26/84 run shows acceptable results but all other historical data was not acceptable.

(2) The stripped gas radionuclides were all less than detectable when in fact they should have been detected. ^{135}Xe was detected but low by a factor of 20.

Nuclide	PASS (uCi/cc)	RCS Normal
Kr-85m	$<1.23 \times 10^{-4}$	1.22×10^{-3}
Kr-87	$<5.66 \times 10^{-4}$	2.34×10^{-3}
Xe-133	$<2.24 \times 10^{-4}$	3.0×10^{-3}
Xe-135	3.10×10^{-4}	6.47×10^{-3}
Xe-135m	$<9.9 \times 10^{-5}$	1.06×10^{-4}

Data from 3/26/84 run was acceptable. No other historical data was observed by the inspector.

(3) The boron level in the diluted reactor reactor coolant was outside of the ±50 ppm criterion.

PASS	RCS
564 ppm	659 ppm

Historically, 19 out of 22 determinations were outside of the ±5% acceptance criterion.

(4) Chlorides in the reactor coolant cannot be measured accurately due to a design problem which contaminates the sample with chloride from the reference pH electrode which is filled with saturated KCl solution. Due to system design, all reactor coolant samples must pass through this pH meter.

(5) The radionuclide content of the diluted reactor coolant sample is as follows:

Radionuclide	PASS	RCS
F-18	8.31×10^{-2}	1.04×10^{-1}
Na-24	$<6.4 \times 10^{-3}$	1.94×10^{-3}
I-131	$<4.7 \times 10^{-3}$	4.56×10^{-4}
I-132	$<8.8 \times 10^{-3}$	6.92×10^{-3}
I-133	$<4.9 \times 10^{-3}$	4.10×10^{-3}
I-134	$<5.3 \times 10^{-2}$	9.90×10^{-3}
I-135	$<2.6 \times 10^{-2}$	7.02×10^{-3}
Cs-138	$<9.2 \times 10^{-3}$	1.25×10^{-2}

There is no other historical data for this sample due to the low activities.

The historical data for the Unit 1 PASS for Boron and hydrogen analysis shows the same variability as Unit 2. (16 out of 24 boron analyses were outside of the ±5% or ±50 ppm criterion and only one of the H_2 analyses was within ±5 cc/kg.)

(f) Plant administrative procedures are in place for the periodic testing of the post accident sampling system. The historical data

reviewed by the inspector came from the performance of these tests. However, there are no acceptable performance criteria stated in the procedure or a procedure defining what is to be done in the event, the performance criteria are not met.

License condition 2.C.10 for Unit 2 required the liquid post accident sampling system (PASS) to be operable before exceeding 5% power. The functions that the PASS is expected to perform are specified in NUREG-0737, item II.B.3. Item II.B.3 requires the PASS to be capable of analyzing reactor coolant samples for chloride, dissolved hydrogen, certain gaseous radionuclides (e.g. noble gases), and boron. The reactor coolant PASS contaminates all coolant samples with chlorides, thus making chloride analysis for an accident less severe than a LOCA inaccurate. The system, as described earlier, has not demonstrated the ability to reliably provide a reactor coolant gas sample for the purpose of measuring dissolved hydrogen. The licensee did not test the ability of the installed system to measure dissolved hydrogen prior to start-up of Unit 2.

On April 5, 1984, a Unit 2 reactor coolant noble gas sample was not demonstrated to be representative of the noble gases in the reactor coolant. The ^{135}Xe concentration determined from this test was a factor of 20 below the actual concentration in the coolant. The ^{135}Xe concentration for this test was low but was above the MDA. The Unit 1 PASS is essentially identical to the Unit 2 systems and has had the same problems since its installation in 1982. The licensee therefore had adequate prior knowledge of PASS inadequacies. Licensee corporate and plant personnel discussed system problems and decided that while the PASS did not meet the NRC criteria, the system did fulfill the Duke Power design functions and was operable because a sample could be taken. The inspector stated that the reactor coolant PASS was not considered operable because the system, due to the inability to provide accurate results, could not perform its intended function and that the failure to have an operable PASS before Unit 2 exceeded 5% power during May 1983 is a violation of license condition 2.C.10. (50-370/84-07-06)