U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-341/84-27(DRSS)

Docket No. 50-341 License No. CPPR-87

Licensee: Detroit Edison Company
2000 Second Avenue
Detroit, MI 48226

Facility Name: Enrico Fermi Nuclear Power Station, Unit 2

Inspection At: Fermi Site, Monroe, MI

Inspection Conducted: July 9-13 and 25, 1984

Inspectors: L. J. Hueter — 8/10/84 Date

C. F. Gill — 8/10/84 Date

Approved By: L. R. Greger, Chief
Facilities Radiation
Protection Section — 8/10/84 Date

Inspection Summary

Inspection on July 9-13 and 25, 1984 (Report No. 50-341/84-27[DRSS])
Areas Inspected: Routine, announced inspection of preoperational radiation protection program for Unit 2. The inspection included organization, staffing, training, radiation protection procedures, facilities, instruments, equipment, status of certain NUREG-0737 items, status of certain preoperational systems, demonstrations and tests, IE Bulletins and Circulars, a review of HEPA/charcoal filter housing drain systems, seismic concerns regarding support of several process monitors, drain systems for equipment racks and for valve stem leak-off, open items, and location of area radiation monitors. The inspection involved 93 inspector-hours on site by two NRC inspectors.
Results: No items of noncompliance were identified.

DETAILS

1. Persons Contacted

B. Beal, Startup Test Engineer
*J. Bobba, General Supervisor of Radwaste
*L. Bregni, Nuclear Engineer - Licensing
*W. Colbert, Director - Nuclear Engineering
*R. Eberhardt, Radiation Protection/Chemical Engineer
J. Green, Systems Engineer
*E. Griffing, Assistant Manager - Nuclear Operations
*W. Jens, Vice President - Nuclear Operations
E. Juarez, Training
L. Karas, Systems Test Engineer
*P. Lavely, Site Health Physicist
*R. Lenart, Superintendent - Nuclear Production
*W. Lipton, General Supervisor - Health Physics
*W. McNeil, Systems Engineer
D. Messerli, Lead Systems Test Engineer
*W. Miller, Supervisor - QA
M. Mitchell, Startup Test Engineer
T. Mitchell, Systems Test Engineer
G. Montgomery, Startup Test Engineer
*P. Nadeau, Quality Technician - Licensing
*T. Nickelson, Startup Engineer
G. Preston, Acting Operations Engineer
R. Rateick, Principal Engineer, Operating Experience Review Group
*R. Salmon, Lead Startup Test Engineer - I&C
*A. Shoudy, General Supervisor - Nuclear Engineering
*R. Slottke, Systems Engineer
*F. Sondgeroth, Nuclear Engineering
L. Stephens, Systems Completion Engineer
T. Tarn, System Test Engineer
*G. Trahey, Director - NQA
S. Veale, Rad/Chem Engineering Assistant
A. Wegele, Senior Engineer - Licensing

W. Bartlett, Engineer, Atlan-Tech, Inc./Nuclear Technology/Engineering
C. Cole, Engineer, Atlan-Tech, Inc./Nuclear Technology/Engineering
*R. Hearn, Engineer, Atlan-Tech, Inc./Nuclear Technology/Engineering
R. Huggins, Engineer, Atlan-Tech, Inc./Nuclear Technology/Engineering
K. Lange, Engineer, Impell Corporation
J. Pagliaro, Lead Engineer, Impell Corporation
G. Quillin, Engineer, Atlan-Tech, Inc./Nuclear Technology/Engineering

*P. Byron, NRC Senior Resident Inspector
M. Parker, NRC Resident Inspector

*Denotes those present at the exit meeting.

2. General

The preoperational inspection, which began about 8:00 a.m. on July 9, 1984, was conducted to examine the preoperational radiation protection program, radwaste systems, certain systems demonstrations and tests, open items, Bulletins and Circulars, and progress made on certain NUREG-0737 items. The inspection included tours of the turbine building, auxiliary building reactor building, radwaste building, and a part of the facility housing the Technical Support Center (TSC).

3. Licensee Action on Previous Inspection Findings

(Closed) Open Item (341/84-05-05): The licensee has completed the construction of a shield wall in front of two former doors, a personnel door and a roll-up door, both of which had previously been replaced by concrete blocks. Completion of this activity satisfies the only concern raised in the July 1981 Safety Evaluation Report regarding plant shielding in response to NUREG-0737 Task Item II.B.2.

4. Organization, Staffing and Training

The inspectors reviewed staffing changes, the radiation protection technican qualification program, the respiratory protection program, and the whole body counting program.

Several staffing changes have been made since the last radiation protection inspection in early March 1984. R. Eberhardt, former General Supervisor of Chemistry, has recently been promoted to Radiation Protection/Chemical Engineer replacing J. Leman who has transferred to the maintenance department. W. Terasic, promoted from within the chemistry department to General Supervisor of Chemistry, has many years of experience.

W. McArthur, a KLM Engineering consultant, is currently spending less than 10 percent of his time in assisting the RPM (although he is providing other services to the licensee). P. Collopy of KLM Engineering, a certified Power Reactor Health Physicist who was providing two thirds of his time assisting the RPM, has been replaced by E. Scalsky of KLM Engineering, who has had five years experience as an RPM at Oyster Creek. Mr. Scalsky has been assisting the RPM since mid-June and his services are planned to continue into commercial operation. D. Bird of KLM Engineering, who was beginning full time work with the licensee in the ALARA program, has terminated employment with the contractor. The ALARA program is now under the supervision of E. Scalsky. Two ALARA training positions have been created in the program. Two contractor radiation protection technicians, one from Rad Services and one from KLM Engineering, will fill these ALARA positions and assist E. Scalsky in the program.

Another change has occurred in the staffing of the position "Health Physics Supervisor of Operations." H. Higgins, a DECO employee with a Nuclear Navy (ELT) background, now holds the position.

R. Hite, Senior Radiological Engineer with responsibility for dosimetry, terminated employment at the end of June. He has been replaced by D. Halper (M.S. in Health Physics), who formerly had responsibility for a subpart of the dosimetry program. D. Halper's former responsibilities are being assumed by R. Koback (M.S. in Health Physics) of Rad Services, a recent graduate who worked at the facility last summer.

The licensee now has nine radiation protection technicians contracted from Rad Services, three of whom are instrument specialists for maintenance and calibration of survey meters. This is over and above other radiation protection personnel contracted from Rad Services mentioned earlier in this section. It represents an increase of two Rad Services technicians over the number contracted during the previous inspection. Since one former Rad Services technician terminated, the current number represents three new technicians all of whom have the training and experience to meet ANSI qualifications as senior technicians. The licensee still employs the 13 DECO radiation protection technicians but one technician position is now open since the advancement of H. Higgins to the position of "Health Physics Supervisor of Operations." Fifteen DECO employees, including all the radiation protection technicians, have completed six-week tours at the Monticello plant during the recent outage at that facility and have gained valuable experience and training during outage conditions.

The radiation protection technician qualification program for 19 technicians ranges from 83% to 100% complete with an overall completion of about 93%. A delay in completion of the qualification program resulted from the decision to add seven new modules to the program, two involving equipment and five involving demonstration of other tasks. The licensee anticipates completion of the technician qualification program for all 19 technicians by the end of August.

Construction of the respiratory equipment cleaning, maintenance, and storage facility is now complete and furnishings are installed. A group of workers have been trained in cleaning and maintenance. To date, respirator fit testing, training and medical evaluations have been completed for a total of about 190 persons including both DECO and contractor employees. The licensee does not plan to officially initiate the respiratory protection program (take credit for protection provided) until some time after fuel load. The licensee plans to notify the Commission in writing as required by 10 CFR 20.103(g) before official initiation of the program.

Baseline whole body counts have now been completed for a total of 905 persons including both DECO and contractor personnel. This represents about 90% of those who have been trained for unescorted access to radiologically controlled areas. An additional 1000 employees who are not expected to enter controlled areas have been given General Employee Training (GET) but will not be permitted unescorted access to controlled areas.

Items remaining to be completed in this area include the radiation protection technician qualification program, respirator fit testing, training and medical evaluations, and baseline whole body counts. Open Item 341/84-05-01 remains open.

5. Radiation Protection Procedures

The inspectors reviewed the status of radiation protection procedures needed by fuel load.

Of all the radiation protection procedures considered necessary for fuel load, all are complete except for six. Two of the procedures, involving Eberline PING operation and calibration, are in the redraft stage. The other four are in the final approval process. The latter four procedures involve calibration of Ludlum neutron meters, radioactive liquid tank leakage, indirect bioassay, and Q.C. for the health physics body burden analyzer.

Since the inspection conducted in early March, 1984, NRR has reviewed the licensee submitted offsite dose calculation manual (ODCM). Following the review, NRR submitted to the licensee a list of comments and requests for additional information. The licensee stated that a thorough review is being made of the initial ODCM submittal to provide response to the specific NRR requests and to provide other information considered appropriate following the licensee's review. The licensee plans to respond to NRR by July 31, 1984.

Items remaining to be completed in this area include six radiation protection procedures and NRR's final review of the ODCM. Open Item 84-05-02 remains open.

6. Facilities, Instruments, and Equipment

The inspectors reviewed the status of installation of personal decontamination, equipment decontamination and respiratory equipment facilities; and installation and operability of portal monitors.

The personal decontamination facility will be completed following installation of a sink. The equipment decontamination facility is nearing completion; some additional furnishings are to be installed and electrical hookup is needed for some machines. The respiratory equipment cleaning, maintenance, storage and issuance facility is basically complete. Of the eleven proposed IRT portal monitors, nine are now installed and seven are operable. The seven operable portal monitors are installed at the following locations: two at the primary access in the security building; three at the alternate access in warehouse B; one at the chemistry laboratory; and one at the health physics control point. The two portal monitors planned for the control room are now installed (except for electrical hookup of one of the units) but neither is operational. Two additional portal monitors are on order, one to be used as a backup at the health physics control point and one for an alternate control point. The licensee intends to have all eleven units (with the possible exception of the alternate control point) operational before fuel load; however, if a portal monitor at an exit point is inoperable, frisking with a hand held probe is intended to be used.

Items remaining to be completed in this area include installation of two portal monitors and operability of these monitors as well as two other portal

monitors, and completion of the personal decontamination facility and the equipment decontamination facility. Open Item 341/84-05-03 remains open.

7. Process and Radwaste Effluent Monitors

The inspectors reviewed the status of initial calibration and preoperational testing of process and radwaste effluent monitors; reviewed plans for calibration/linearity checks of monitors during startup; discussed licensee plans to determine the noble gas residence time in the off-gas system charcoal beds; determined status of set point determinations for monitors; and observed the status of installation and in-place testing of HEPA and charcoal filters in various filter trains.

The licensee has about 23 process and radwaste effluent monitors, many of which have multiple detectors. General Electric, Gulf (General Atomics), and Eberline monitors are utilized. As reflected in the proposed technical specifications, the iodine and particulate detectors will serve as trending devices only. The monitor vendors and types of detectors for liquids, gases and steam (main steam lines) are briefly described in Inspection Report 50-16/84-01; 50-341/84-05.

None of the process and radwaste effluent monitors have been source calibrated or preoperationally tested by the licensee except the off-gas monitors which are nearing completion of calibration with krypton-85 gas. At the time of the last inspection, early March 1984, some calibration procedures had been written and approved and source calibration of monitors was expected to begin in earnest in about three weeks. However, unanticipated problems were encountered resulting in the licensee contracting with Atlan-Tech, Inc./ Nuclear Technology/Engineering and with Impell Corporation. These two firms now have about ten people on site to assist in procedure writing, procurement of calibration sources and related calibration equipment, and to provide other services as needed to expedite source calibration of process and radwaste effluent monitors (which is a prerequisite of preoperational testing of these monitors). The licensee still plans to perform fluid (gas and liquid) calibration/linearity checks of monitors, using plant generated sources, during startup.

The licensee is still planning to introduce about 80 millicuries of krypton-85 in the off-gas system, just upstream of the charcoal beds, to evaluate the effectiveness of the charcoal beds in hold-up of noble gases. The licensee will assure that Byproduct Material License No. 21-02335-10 authorizes use of krypton-85 for this purpose.

As noted in Inspection Report 341/84-05, a software program is functional (pending NRR approval of the ODCM) for quantifying releases and establishing various monitor setpoints for actions such as required trips, isolation functions, and actuation of certain filter trains, etc.

The status of filter installation and in-place testing for efficiency for HEPA and HEPA/charcoal filter trains is essentially unchanged from that described in Inspection Report 50-16/84-01; 50-341/84-05.

Items to be completed in this area include initial source calibration and preoperational testing of process and radwaste effluent monitors; fluid (gas and liquid) calibration/linearity checks of monitors during startup; evaluation of effectiveness of off-gas system charcoal beds in providing hold-up time for noble gases; establishment of setpoints for monitors; and installation and in-place testing of HEPA and charcoal filters in various filter trains. Open Item 341/84-05-04 remains open.

8. Preoperational Systems Demonstrations and Tests

The inspectors reviewed the status of assigned preoperational systems demonstrations and tests in the areas of process and radwaste effluent monitors and liquid,gaseous and solid waste processing, sampling and effluent systems.

No preoperational systems demonstrations and tests have been completed for review by the inspectors since the last inspection. According to licensee personnel, the following systems demonstrations and tests are at the percentage completion indicated:

D-1100.001	Process Monitors - GE	60%
D-1110.001	Process Monitors - General Atomic	0%
D-1110.002	Process Monitors - Eberline	0%
G-1120	Liquid Radwaste Collectors	0%
G-1125	Liquid Radwaste, Floor Drain	0%
G-1135	Solid Waste System	0%
N-6200	Off-Gas System	50%
P-3320	Process Sampling (Reactor Building)	45%
P-3321	Process Sampling (Turbine Building)	75%
P-3322	Liquid and Solid Waste Process Sampling (Plant)	75%
P-3323.001	Postaccident Sampling System	0%

Licensee personnel stated that the Eberline systems for monitoring/sampling accident range iodine, particulate, and noble gas effluents are installed but that the communications portion is not yet operable. Some additional construction is needed for the postaccident sampling system. Preoperational testing is expected to begin about September 1 for both of these systems.

The licensee is getting ready to load asphalt into the asphalt solidification system for some preliminary testing before beginning preoperational testing.

Items to be completed in this area include preoperational testing/demonstration of process and effluent monitors; liquid, gaseous, and solid waste processing; and effluent systems. Open Item 341/84-05-08 remains open.

9. Status of Certain NUREG-0737 Action Items

The inspectors reviewed the status of the post-accident sampling system; the accident range effluent monitoring/sampling system for noble gas, iodine, and particulates; containment high range radiation monitors; and in-plant iodine sampling.

a. NUREG-0737 II.F.1.1 and 2 - Noble Gas, Iodine, and Particulate Monitors/ Samplers

The items identified in Inspection Report 50-16/84-01; 50-341/84-05 (Open Item 341/84-05-10) to be completed in this area are still incomplete. In addition, a number of other items were identified during this inspection. Concerns include the ability of the installed equipment to obtain representative samples, potential design feature problem areas, system studies needed, and significant delays in system calibration and preoperational testing.

Section H.II.F.1 of Appendix H to the FSAR contains the description of the systems which the licensee has installed to accommodate the requirements of NUREG-0737, Item II.F.1, Attachments 1 and 2. The Radwaste, Turbine, and Service Building ventilation exhausts are monitored by Eberline SPING-3 systems which trip the vent fans upon a high radiation level alarm. The licensee has not yet determined the trip setpoints, the corresponding ability of the iodine and particulate SPING-3 filters to accommodate the mass loading associated with the noble gas setpoints, the activity loading and efficiency of the filters, and procedures to collect, transport, and analyze the filters within the constraints of GDC-19 dose limitation guidelines. If these determinations do not incorporate the NUREG-0737 design basis shielding source term, 100 µCi/cc of gaseous radioiodine and particulates deposited on sampling media for 30 minutes with an average gamma energy of 0.5 Mev, a formal deviation from this criterion must be obtained by the licensee from NRR. The inspectors noted, in Table H.II.F.1-1, page H.II.F.1-11 of Appendix H to the FSAR, that the Turbine Building ventilation exhaust SPING-3 does not possess the required NUREG-0737 noble gas range. The licensee must request a formal deviation from this criterion from NRR or correct this deficiency. The Reactor Building exhaust plenum is monitored by an Eberline SPING-4 system which has a high radiation level alarm without an automatic ventilation fan trip feature. In addition, this SPING-4 monitoring system does not have the capability to collect representative samples of radioactive iodines and particulates in the range dictated by Table II.F.1-2 of NUREG-0737. If this sampling capacity is not added to this system, or if an automatic fan trip feature (with appropriate setpoint) is not added to this system, then a formal deviation from this criterion must be requested from NRR. The fifth potential post-accident release pathway is the Standby Gas Treatment System (SGTS), Division I and II, exhaust. The SGTS exhaust is monitored by a SPING-3 for the lower ranges and an AXM-1 system for higher ranges. The Eberline AXM-1 system consists of two noble gas detector assemblies (SA-14 and SA-15) with a sample flow rate, through a 3/8" O.D. stainless steel tube, of 6 ℓ/m and a grab sampler assembly, SA-16, with sample flow rate, through an approximate 1/16" O.D. stainless steel tube, of 0.1 ℓ/m. Several concerns, described below, are associated with the AXM-1 system.

NUREG-0737 specifies that effluent monitoring systems should collect representative samples. Possible difficulties with the licensee's systems in this area include: (1) isokinetic maintenance; (2)

reduced pressure compensation; (3) heat tracing; and (4) sample line loss correction factor determination. These concerns are individually discussed in the following four paragraphs.

The problem of obtaining isokinetic samples was noted in Inspection Report 50-16/84-01; 50-341/84-05 (Open Item 341/84-05-10). In that report the inspectors noted numerous bends in sample lines, long lines, and mixing chambers prone to air flow turbulence that might compromise sample representativeness. In response to the inspector's concerns the licensee noted that they (Systems Engineering) were investigating the potential of sample bias in the isokinetic sampling lines and that evaluation of the radwaste building vent isokineticity and the potential for isokinetic sample bias would be discussed and resolved with the NRC by Systems Engineering and Licensing. These concerns were not resolved during this inspection because the appropriate system engineer was not available. The licensee will need to demonstrate that each of the five post-accident effluent monitoring systems is designed to obtain an isokinetic, representative sample. (This demonstration should include a calculational verification of the isokinetic design of the probe openings and the physical measurement of particulate spectrum line losses.) Of particular concern to the inspectors is the AXM-1 system, in which the SA-16 grab sample assembly is required to isokinetically divert 0.1 ℓ/m from the GSP-1 Grab Sample Pallet Assembly sample line which, in turn, is required to isokinetically divert 6 ℓ/m from the SGTS exhaust. A licensee representative has agreed to supply the inspectors with documentation showing that all five post-accident effluent monitoring systems meet the NUREG-0737 design requirement which states that flow control devices are to have the capability of maintaining isokinetic conditions with variations in stack or duct design flow velocity of ± 20%.

The measurement of the radioactivity of the gas flowing through the detection chambers of the licensee's five post-accident effluent monitoring systems may have to be compensated to reflect the reduced pressure of the chamber relative to the pressure at the point of sample intake. Nuclear power facilities holding an operating license or construction permit were informed of this problem by IE Information Notice No. 82-49, "Correction for Sample Conditions for Air and Gas Monitoring," dated December 16, 1982. According to a licensee representative, the installed Eberline effluent monitoring systems do not contain design flaws of the type discussed in IE IN 82-49. Documentation to that effect will be made available to the inspectors. If the installed equipment does not automatically correct for this pressure drop, station procedures would need to be written to make manual corrections. The inaccessibility of the AXM-1 Noble Gas Pallet Assembly flow meter and pressure gauge, as discussed later in this report, would then represent a significant system design flaw.

The inspectors noted that none of the post-accident effluent monitoring system sample lines were heat traced. Heat tracing appears necessary to preclude water traps, to minimize deposition of iodine vapor and particulates on the inner surfaces of sampling lines, and to prevent

excessive moisture on the collector which may destroy filter media usefulness either by blocking the air passageways or by weakening the filter media to a point that it tears or breaks easily. It was noted by the inspectors that an Eberline published description of the AXM-1 stated that the moisture content of the incoming sample must be such that condensation does not occur in the sample. It may be necessary to extend the heat tracing to include the collector or to install heaters to ensure that the collector temperature is maintained well above the dewpoint. A licensee thermal analysis should determine if a spiral winding or single strip heat trace is needed and which type of thermal insulation, if any, is needed.

The licensee has not yet arrived at correction factors for sample line losses due to iodine plateout and particulate deposition. As clarified in footnote 12 of Table 3 of Regulatory Guide 1.97 (Revision 3), "collection of representative samples" means obtaining the best samples practicable given the exigencies that attend the accident environment; line losses or line deposition should be empirically predetermined and appropriate loss correction factors should be applied.

Potential post-accident effluent monitoring system design feature problem areas include: (1) the AXM-1 Noble Gas Pallet Assembly sample line flow meter and pressure gauge are located in the SGTS room (Division I and II), which is inaccessible post-accident; (2) the AXM-1 Grab Sample Pallet Assembly sample collector shield cask has reduced mass thickness on the ends with the usual two inches of lead replaced by stainless steel, the intake side stainless steel severely bevelled, and straight line shine pathways from sample media through the entrance and exit ports; (3) because the quick disconnect attachments on the shielding cask are not self-sealing, station procedures should consider backflushing the AXM-1 sample line with clean air before disconnecting and removing the sampler in its shield cask; (4) it may be necessary for the licensee to build a local shielded area for storing a potentially highly contaminated AXM-1 grab sampler SA-16 shield cask which would have been replaced by fresh timed grab sample SA-16 collector; (5) the licensee should consider obtaining an additional SA-16 assembly for each SGTS division as a spare when both the purchased SA-16 assemblies are either out of service due to contamination or unavailable due to laboratory analysis; (6) a better means of arriving quickly at the sample collection time should be developed (an automatic timer could be added to the AXM-1 grab sampler system) (7) the flow meters on the AXM-1 Noble Gas Pallet Assemblies located in the SGTS rooms, as discussed as part of Open Item 341/84-05-10 in Inspection Report 50-16/84-01; 50-341/84-05, are still oriented to the wall and cannot be used; (8) penetrations (1-505W and 1-506W) still exist through the four foot shield wall between the SGTS rooms and the auxiliary building area containing the SGTS effluent SPING-3 and AXM-1 Grab Sample Pallet Assemblies; (9) the AXM-1 Bulk Filter Assembly may not have adequate iodine mass loading capabilities to prevent contamination of the noble gas detector assemblies, SA-14 and SA-15; and (10) it was noted by the inspectors that neither of

the AXM-1 Bulk Filter Assemblies (BFA-1) in the SGTS rooms were shielded and that the Division I BFA-1 was aligned with an existing penetration which passes through the four-foot shield wall between the SGTS room and the auxiliary building area containing the SGTS effluent SPING-3 and AXM-1 Grab Sample Pallet Assemblies.

Additional technical evaluations which have not yet been completed by the licensee include: (1) a detailed time and motion dose study to determine if the AXM-1 Grab Sample Pallet Assembly SA-16 sample and shielding cask could be collected, transported and analyzed without exceeding the GDC-19 dose criteria (5 rem whole body and 75 rem extremity); (2) determination of the range overlap between the individual noble gas detector assemblies in each post-accident effluent monitoring system considering the radionuclide spectrum distribution as a function of time after shutdown; (3) calculation of iodine and particulate SPING-3 filter activity and dose rate after this SGTS monitoring unit switches over to the AXM-1 system, considering NUREG-0737, Item II.F.1.2 source criteria; and (4) the post-accident effluent systems' filter media qualifications need to be determined such as whether the silver zeolite (or charcoal) will accommodate the iodine mass loading associated with the II.F.1.2 source term, whether the collection efficiencies of the sample media are adequate for the existing residence times,and whether the face velocity over the sample media is within acceptable limits.

The inspectors noted significant delays in calibrating and preoperational testing of the post-accident effluent monitoring systems. It was also noted that procedure EP 540, Revision 0, "Manual Off-Site Radiological Dose Assessment Calculational Procedure - Airborne Releases - Overview," had a sensitivity curve for the Reactor Building Exhaust Plenum SA-9 noble gas channel of the SPING-4 which is expressed in cpm per µCi/cc of the theoretical core noble gas mix as a function of time post-shutdown. In discussions with licensee representatives, it was discovered that this curve was supplied by a consultant and was apparently based on SA-9 calibration data from another client. The licensee agreed to correct the sensitivity curve, as necessary, after their SA-9 received its in-situ calibration. The licensee stated that the vendor primary calibrations for all Eberline post-accident effluent monitoring systems would be made available for inspector review. The licensee's in-situ calibration program was initiated as a result of licensee quality assurance findings at Eberline. The licensee plans to obtain mock-ups of SA-9 sample tubes filled with various noble gas of sufficient number and concentration to meet the NUREG-0737 criteria for determining detector assembly sensitivity as a function of energy and concentration. The licensee may also include the use of solid sources to assure proper energy dependency determination. Another licensee has obtained gaseous SA-9 sensitivities quite different from the vendor type test primary calibration and found that the sensitivity dropped rapidly with high count rate. The inspectors reminded the licensee that correction methodology would need to be developed to correct for cpm per µCi/cc (of a given gaseous mix) sensitivity variation with

count rate (or concentration) and that the energy dependency determination should extend to include short lived noble gases, i.e., 3 Mev. The licensee proposes to make use of grab gaseous samples, during system operation, whenever possible in lieu of theoretical sensitivity curves. If so, appropriate assumptions need to be developed to extrapolate from the most recent grab sample to assure that detector sensitivity is kept updated in the system software. The AXM-1 Grab Sample Pallet Assembly has the capability of obtaining a grab gaseous sample of the SGTS effluent but the SPING-4 apparently does not have this capability for the Reactor Building Exhaust Plenum and therefore would not be able to obtain the proposed grab gaseous samples for use in conjunction with the SA-9 theoretical sensitivity curve as a function of time post-shutdown. Although the need to update detector sensitivities considering radionuclide distribution as a function of time after shutdown (NUREG-0737, Clarification II.F.1.1.(4)(b)) applies to all post-accident noble gas effluent detector assemblies, from the channel which begins at 10^{-7} μCi/cc of Xe-133 equivalent through the full range, the licensee representive contacted expressed tentative plans for meeting this requirement only for the SA-9 assembly. If the licensee does not plan to comply with this NUREG-0737 item, a formal deviation must be obtained from NRR.

Station procedures and personnel training will be required to accommodate the technical aspects discussed in this inspection report for the post-accident effluent monitoring systems.

Items to be completed in this area include: (1) calibration of noble gas effluent monitors; (2) preoperational testing of noble gas, iodine and particulate monitoring/sampling systems; (3) modifications necessary for reading the flow meters on the Eberline AXM units; (4) evaluation of potential problems in obtaining representative samples from various air ducts; (5) sample line loss correction factors determination; (6) sample line heat tracing and installation detail design work; (7) adequacy analyses of design specifics; (8) detailed time and motion sampler collection and analysis dose study; (9) station procedures; (10) personnel training; (11) technical evaluations; and (12) NUREG-0737, II.F.1.1(4)(b) detector assembly response curve development. Open Item 341/84-05-10 remains open.

b. <u>NUREG-0737 II.F.1.3 - High Range Containment Monitors</u>

The two high range containment monitors, General Atomic Model RD-23, have been re-installed after removal due to construction activity. The 1E electrical power supply cables to the monitors have not yet been reconnected and tested. A licensee representative stated that in-situ source calibration, electronic in-situ recalibration, and preoperational testing have not been performed.

NUREG-0737, Table II.F.1-3 requires three types of calibration for the Containment High Range Monitors: (1) calibrate and type-test representative specimens of detectors at sufficient points to demonstrate linearity through all scales up to 10^6 R/hr; (2) prior

to initial use, certify calibration of each detector for at least one point per decade of range between 1 R/hr and 10^3 R/hr; and (3) in-situ calibration by electronic signal substitution is acceptable for all range decades above 10 R/hr but at least one decade below 10 R/hr shall be by means of calibrated radiation source. The monitors are also required to respond to photon energies from 60 Kev to 3 Mev, with linear energy response (±20%) for photons of 0.1 Mev to 3 Mev.

The inspectors were supplied a copy of part of GA document E-255-978, "Energy Response Test and Dose Rate Calibration of Model RD-23 High-Range Radiation Monitor Detector," dated May 1981. Table 1 on page 5 of this document gives the measured prototype calibration sensitivity as a function of energy from 43.5 kev to 4.5 Mev with a variation of sensitivity within the NUREG guidelines. The monitor dose rate given in this same table varies from 1 to 5.17 x 10^6 R/hr with sufficient points to demonstrate linearity through the required NUREG-0737 range. Certification source calibrations were conducted by the manufacturer January 27, 1982, at only two points, 10 R/hr and 50 R/hr, as opposed to calibrations at one point per decade between 1 R/hr and 1000 R/hr specified in NUREG-0737. This discrepancy and corrective options were discussed at an exit meeting on March 9, 1984 (Inspection Report No. 50-16/84-01; 50-341/84-05); the licensee stated that the required calibration would be performed or a deviation would be requested from NRR for this item.

Items remaining to be completed in this area include: (1) 1E power supply reconnection and testing; (2) in-situ source calibration; (3) electronic in-situ recalibration; (4) certification calibration; and (5) preoperational testing of the high range containment monitor system. Open Item 341/84-05-06 remains open.

c. NUREG-0737 II.B.3 - Post Accident Sampling

A General Electric (GE) system is being installed for reactor coolant and containment atmosphere sampling. The rerouting and replacement of certain liquid sample lines in accordance with a GE design change to eliminate a problem of dissolved gases in liquid samples has been completed. However, some further minor modifications are now planned. Also, the connection of two lines which were inadvertently switched during initial construction will be properly connected. The faulty relays previously identified have now been replaced. No preoperational testing of the system has been done nor have the test procedures been finalized. Approximately 60% of the initial checks which are performed as a prerequisite to preoperational testing are now complete. Sampling procedures have been written and approved with provisions to include specific settings and indicators after all changes and tests of the system are complete. According to licensee personnel,systems training for technicians will be conducted once every six months, covering procedural review and physical sample collection. Preoperational testing is expected to begin about September 1, 1984, and last for two weeks. Several potential problem areas noted during a tour of the system are discussed below.

The proposed method of calibrating the liquid sample dilution system was discussed with a licensee representative. He indicated that the present plan is to collect 0.1 ml of demineralized water in the sample valve, dilute the sample by syringe with an additional 10 ml of demineralized water, and then determine the calibration of the system by observing how close the total collection volume is to 10.1 ml. This proposed calibration method does not appear viable. The length of the dilution flow path is between four and five feet. The liquid line losses alone would preclude the use of the proposed method. The licensee representative stated that he would contact station chemistry to aid in developing a chemical tracer calibration method for the liquid sample dilution system. The present plans are to test the system over the operational pressure and temperature range with wetted and unwetted dilution lines.

Some of the heat tracing for the containment atmosphere sample lines stops at the system housing. In order to prevent condensation and potential damage to the sample media, it may be necessary to extend the heat tracing to the gaseous grab sample connection, including the iodine cartridge filter. A licensee representative stated that the heat tracing would be extended to the sample collection location or a justification for the current or alternate design would be prepared. Also, the licensee has not yet empirically determined containment atmosphere sample line loss correction factors for iodine and particulates.

A method should be developed to indicate when either of the reactor coolant sample coolers (E-604 and E-605) are experiencing primary-secondary leakage and procedures modified to make appropriate corrections in the sample analysis results. According to a licensee representative the coolant water discharge from the coolers is monitored to give an indication of contamination. He stated that he would also compare the theoretical pressure difference between the tube and shell sides of the coolers to determine the preferential leakage direction. The progress on addressing this issue will be reviewed during a future inspection.

The small volume liquid sample vial vents directly to the PASS room atmosphere. It may be necessary to hardpipe this vent to the suppression pool atmosphere return line, as is the large volume liquid sample vial.

After discussion with the inspectors, a licensee representative filed Startup Field Report (SFR) Number 3249 which addresses many aspects of the above problem areas. The response to this SFR will be reviewed during a future inspection.

The licensee needs to prepare a detailed time and motion dose study to determine if it is possible to obtain and analyze reactor coolant and containment atmosphere samples without radiation exposures to any individual exceeding the GDC-19 dose criteria (5 rem whole body and 75 rem extremity). This analysis, along with the proposed ingress, egress routes, will be reviewed during a future inspection.

Items remaining to be completed in this area include (1) system modification; (2) preoperational testing; (3) training personnel in use of procedures for sample collection, handling, and analysis; (4) development of a viable liquid sample dilution system calibration method; (5) containment atmosphere sample line heat tracing justification or modification; (6) determination of containment atmosphere sample line loss correction factors for iodine and particulates; (7) development of a reactor coolant sample analysis correction factor methodology for cooler primary-secondary leakage; (8) justification for or modification of the small volume liquid sample vial vent design; (9) resolution of the concerns expressed in SFR No. 3249; and (10) detailed time and motion sample collection and analysis dose study. Open Item 341/84-05-07 remains open.

d. NUREG-0737 III.D.3.3 - In-Plant Iodine Sampling

The licensee has initiated purchase orders for two Ludlum samplers on hand carts for the TSC and EOF. These units will be fitted with a particulate filter and silver zeolite cartridge and a NaI single channel analyzer to determine iodine concentrations. The units have not yet arrived on site. The exact placement of equipment and associated training and procedures, for accurately determining the airborne iodine concentration in areas within the facilities where plant personnel may be present during an accident, will be reviewed during a future inspection.

10. Filter Housing Drain Systems

Several ESF and non-ESF HVAC filter housings were inspected to ascertain if the design and construction commitments made in Appendix A to the FSAR for filter housing drain systems have been met. The systems reviewed were the Technical Support Center (TSC) emergency makeup air system, the Control Room (CR) emergency makeup air and recirculation system and the Standby Gas Treatment Systems (SGTS). Regulatory Guide 1.52, Revision 2, March 1978 (Regulatory Position 3.h) and Regulatory Guide 1.140, Revision 1, October 1979 (Regulatory Position 3.e) state that the filter housing water drains should be designed and constructed in accordance with the recommendations of Section 4.5.8 of ERDA 76-21 and Section 5.6 of ANSI N509-1976. These recommendations include piping all unplugged drains to the radwaste system and individually valving, sealing, or otherwise protecting drain lines from individual chambers of the housing to prevent bypassing of contaminated air around filters or adsorbers through the drain system.

The TSC emergency makeup air system filter housing has six valved drain lines which tie into a common header with individual water trap loop seals before each cross-tie. The common header leads, unmonitored, to the sanitary sewage system via a funnel floor drain. Four of the drain lines have manually operated valves whose closure criteria are apparently not currently enveloped by administrative control procedures. The two drain lines for deluge system runoff have solenoid operated check valves which are activated by the remote deluge system controls. The inspectors were informed by a licensee representative that approximately two feet of

water head is needed to open these valves after the solenoid receives the signal to open. He stated that an adjustment of the check valve setpoints is not scheduled to be part of the system pre-operational test. The inspectors were informed by the licensee representative that no methodology or procedure had been developed to ensure that the individual drain line loop seal remains filled with water.

The CR emergency makeup and recirculation system filter housings do not yet have their drain systems installed. Each housing has six capped drain openings. Licensee representatives informed the inspectors that it may be possible to run the CR filter housing drain lines through the floor to a two inch drain line which leads to the radwaste system via a four inch floor drain. The feasibility of the proposed design depends, among other criteria, on whether the present system is sized to accommodate the increased flow due to the two CR filter housing deluge system discharge pathways. Licensee representatives contacted acknowledged the need to individually valve, seal, or otherwise protect drain lines from individual chambers of the housings to prevent bypassing of air around filters or adsorbers through the drain system but were not ready to discuss proposed design revisions with the inspectors. The inspectors noted that the deluge system manual control valve was mounted next to the charcoal adsorber area on the outside of the filter housing. This placement does not appear acceptable because if high temperatures require activation of the deluge system, the deluge control valve may well be too hot to operate manually.

The two SGTS filter housings each have ten water drain lines, six of which are capped. The two drain lines in each housing in compartments before and after the HEPA filter have manually operated shutoff valves installed. Licensee representatives contacted did not believe that the closure criteria for these valves are currently under administrative control by procedure. In each housing, the two drain lines associated with moisture separator runoff do not contain shutoff valves. All four uncapped drain lines, in each housing, discharge to a common header which eventually leads to the radwaste system via a stand pipe to an equipment drain system. The stand pipe appears to represent about a one foot water head above the common header and to be about two inches below the elevation of the lowest housing drain line. The licensee should affirm that the arrangement and line sizing of this drain system are such that the stand pipe will be able to adequately discharge without water backing into the filter housing. The licensee appears to have no mechanism, at present, to ensure that the SGTS filter housing drain water seal system maintains the proper fill level. The recommendation given in Section 4.5.6 of ORNL NSIC-65 is to use an automatic makeup system to maintain proper water level and to conduct regular inspections of the level to ensure reliable operation. The licensee has committed to follow this guidance in their FSAR, Appendix A response to Regulatory Position 3.h of Regulatory Guide 1.52, Revision 2, March 1978.

The above findings were discussed with the licensee. The inspectors requested that the licensee check the other station filter housings to see if they have similar deficiencies and to take action to correct any identified deficiencies. This survey should include a physical walkdown of each filter housing drain system from origin to radwaste system

terminus. The licensee representatives were reminded that filter bypass concerns exist for: (1) ESF and non-ESF systems (normal and accident operational conditions); (2) positive and negative pressured housings (both in leakage and outleakage); (3) systems with and without charcoal adsorbers; and (4) all types of HVAC systems (effluent, makeup, and recirculation). The progress on addressing this issue will be reviewed during a future inspection.

Items to be completed in this area include: (1) elimination of potential filter bypass due to improper filter housing drain line configurations of the TSC emergency makeup air and SGTS systems; (2) rerouting the TSC emergency makeup air system filter housing drain discharge to the radwaste system or justification of an alternate design which would preclude unmonitored or uncontrolled potentially contaminated liquid effluent pathways; (3) establishment of administrative control over the closure position for filter housing drain line valves; (4) inclusion in filter housing pre-operational test procedures of drain line check valve setpoint verification, air leak tightness confirmation of all drain line valves, and loop seal water level control systems; (5) design and installation of the Control Room emergency makeup air and recirculation system filter housing drain line systems and relocation of the deluge manual control valve; and (6) conducting an FSAR commitment survey of the station filter housing drain system design and construction, and taking corrective action as applicable. This matter remains open pending the results of the licensee commitment survey. (Open Item 341/84-27-01)

11. Drain Systems for Instrument Racks and for Valve Stem Leak-Off

A cursory review was made concerning the lack of hard piping to the radwaste drain system for both instrument racks and valve stem leak-off. Concerns regarding the large number of instrument racks throughout the plant which do not have hard piped drain systems to prevent potential spillage and/or airborne problems from contaminated liquids in the instrument lines were identified. Such problems could occur from performance of surveillance activities, calibrations, venting, draining and removing instruments from service, etc. Licensee personnel have indicated that present plans involve use of plastic tubing routed directly to a radwaste drain or alternately to a container which in turn would be discharged to a radwaste drain.

A similar concern involves the lack of piping for valve stem leak-off drain openings on numerous valves in the ECCS system and the shut-down cooling system. Some of these drain openings reportedly have been welded shut, some plugged with cork, and others left open to the atmosphere. This represents a potential source of leakage which could result in floor and airborne contamination and would be of particular significance under accident conditions. These concerns were discussed during the exit. The licensee agreed to evaluate the concerns. The inspectors will review the concerns in further detail during a future inspection. Items to be completed include evaluation of the provisions for draining instrument racks and valve stem leak-off. (Open Item 341/84-27-02)

12. Seismic Concerns Identified During Plant Tours

During the inspectors' plant tours, observation of several process and high range containment radiation monitor installations raised potential concerns regarding seismic considerations.

Lead shielding blankets, surrounding the sodium iodide detectors, were attached to and supported by the general service water and reactor building component cooling water (RBCCW) piping. The licensee is proposing to replace the lead blankets with permanently attached lead pigs to provide shielding. Also, the inspectors observed a high range containment monitor that was apparently attached to the same seismic support provided for another component in the drywell. Licensee personnel had also identified the seismic concern with the liquid monitors and have initiated a startup field report. The seismic concern involving support of high range containment monitors was discussed during the exit meeting. Followup of these seismic concerns will be performed during a future inspection by other NRC inspectors specializing in this area.

Items to be completed in this area include evaluation of seismic concerns regarding high range containment monitor and liquid monitor installations. (Open Item 341/84-27-03)

13. Bulletins and Circulars

(Closed) Open Items (341/79-19-BB and 341/79-20-BB): "Packaging of Low-Level Radioactive Waste for Transport and Burial and Packaging, Transport and Burial of Low Level Radioactive Waste." The licensee has taken all of the actions described in these bulletins to assure the safe transfer, packaging and transport of low-level radioactive waste. These actions include designation of responsible personnel, providing approved procedures, maintaining current copies of appropriate licenses and regulations, training and periodic retraining of personnel, and provision for management controlled audits.

(Open) Open Item (341/77-14-CC): "Separation of Contaminated Water Systems from Noncontaminated Plant Systems." The licensee reviewed plant systems to identify all interconnections between contaminated and noncontaminated water systems and reviewed the interconnection design to assure that separation has been provided. The licensee's review included the core spray system, standby liquid control, RHR service water, torus water system, CRD equipment storage and repair facility, discharge line of emergency hotwell supply pump, condensate storage tank system, radwaste evaporators, offgas system, auxiliary steam system, closed loop cooling system, general service water, circulating water system and sanitary sewer system. However, during the course of this inspection, the inspectors identified a potential source for contamination of the sanitary sewer system not identified during the licensee's review. The deluge system for the charcoal filters in the HEPA/charcoal filter train in the HVAC system for the Technical Support Center (TSC) drains directly to the sanitary sewer system rather than to the radwaste system or to a hold-up tank.

This item will remain open pending establishment of a means to prevent the potential contamination of the sanitary sewer system via the TSC filter drain.

(Open) Open Item (341/80-10-BB): "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment." As noted in Inspection Report 50-16/84-01; 50-341/84-05, provisions had not yet been completed for sampling or monitoring five nonradioactive systems that could possibly become contaminated through interface with radioactive systems. Procedures have now been developed and approved for routine sampling of four of the five systems. These four systems are the demineralized water system, the auxiliary steam system, the RHR service water system, and the sanitary sewer system. The licensee still plans to utilize three monitors, one near the compressor and one each near the interface of the station air system with the reactor water clean up system and with the radwaste system. The licensee still does not anticipate having these monitors installed and operational until the beginning of the first refueling.

This item will remain open pending installation of the monitors or institution of an interim proceduralized sampling program.

14. Location of Area Radiation Monitors

As noted in Inspection Report 50-16/84-01; 50-341/83-03, the licensee had performed a cursory review of the installed location of 44 area monitors throughout the plant for proper placement to best perform their design function. A more in-depth review and evaluation was then performed by Plant Design Services resulting in the recommendation that changes be made to three area monitoring systems; one involving relocation of the detector, one involving relocation of the flashing beacon, and the other involving relocation of both detector and beacon. For area monitor N-109, located in the northwest corner room in the sub-basement of the reactor building, where the RHR pump and a sump are the greatest potential sources of activity, the detector will be moved so that there will be no intervening shielding between it and the sump as well as the RHR pump. For area monitor N-112, located in the tip room on the first floor of the reactor building (a locked room with administratively controlled entrances) the beacon will be relocated for optimum effectiveness. For area monitor N-132, located near the blow-out panels on the first floor of the auxiliary building, both the detector and beacon are being relocated to eliminate shielding interference resulting from the sampling room of the post-accident sampling system. Engineering Design Package (EDP) 1311 has been prepared and is under review to carry out these relocations of detectors and beacons. The licensee anticipates completion of the relocations by mid-August 1984.

Items remaining to be completed in this area include relocation of area radiation monitor detectors and/or beacons for area radiation monitors N-109, N-112, and N-132. Open Item 341/83-03-01 remains open.

15. Exit Meeting

The inspectors met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on July 13, 1984. The subject of drain systems for instrument racks and for valve stem leak-off was subsequently discussed in a telephone conversation with the site health physicist on July 25, 1984. In response to certain items discussed by the inspectors, the licensee:

a. Committed to review the seismic mounting detail and analysis for the high range containment monitors. (Section 12)

b. Committed to evaluate the potential problems associated with instrument racks and valve stem leak-off openings which are not hard piped to the radwaste system. (Section 11)

c. Acknowledged the inspectors' comments regarding licensee delays in calibration of process and radwaste effluent monitors and in preoperational testing of these monitors as well as liquid, gaseous, and solid radwaste systems.(The inspectors noted that increased licensee attention appeared needed in these areas to ensure timely completion.) (Sections 7, 8 and 9)

d. Acknowledged the inspectors' concerns regarding the ability of the post-accident effluent radiation monitors to meet the criteria of NUREG-0737, Item II.F.1, Attachments 1 and 2. (Section 9.a)

e. Acknowledged the inspector identified potential problem areas associated with the Post-Accident Sampling System. (Section 9.c)

f. Acknowledged the inspectors' observation that the reviewed HVAC filter housing drain systems did not appear to meet the FSAR, Appendix A design and construction commitments. (Section 10)

g. Acknowledged inspector concerns with respect to the lack of heat tracing and empirically determined sample line loss correction factors for the post-accident effluent and containment atmosphere sampling systems. (Sections 9.a and 9.c)