U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-440/88006(DRSS); 50-441/88003(DRSS)

Docket Nos. 50-440; 50-441 Licenses No. NPF-45; CPPR-149

Licensee: Cleveland Electric Illuminating Company
Post Office Box 5000
Cleveland, OH 44101

Facility Name: Perry Nuclear Power Plant, Units 1 and 2

Inspection At: Perry Site, Perry, Ohio

Inspection Conducted: May 2-5, 1988

Inspector: J. Foster W. Snell for
Team Leader 6/22/88
Date

Accompanying Personnel: B. Crea

G. Bethke

K. McBride

Approved By: W. Snell W. Snell, Chief
Emergency Preparedness Section 6/22/88
Date

Inspection Summary

Inspection on May 2-5, 1988 (Reports No. 50-440/88006(DRSS); 50-441/88003(DRSS))
Areas Inspected: Special, announced inspection of the following areas of the Perry Nuclear Power Station emergency preparedness program: Emergency Response Facility Appraisal; reviews of radioactive release assessment and meteorological information; and reviews of the design and operation of the Technical Support Center and Emergency Operations Facility. The inspection involved one NRC inspector and three contractor personnel.
Results: The licensee's facilities for emergency response were found to be adequate (IP 82412). No violations, deficiencies or deviations were identified.

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DETAILS

1.0 Persons Contacted

Cleveland Electric Illuminating Company

*A. Kaplan, Vice President, Nuclear Operations
*G. Dunn, Compliance Engineer
*R. Vondrasek, General Supervisor, CRS
*R. Farrell, Manager, Perry Services
*B. Ferrel, Operations Engineer
*T. Corbett, E-Plan Training, PPTD
*J. Anderson, Onsite Emergency Planner
*D. Hulbert, Supervisor, Emergency Planning Unit
C. Jones, PPTD/LCS
K. Pech, Manager, Mech. Dcs., NED
J. Fronckowiak, Lead Audit Engineer, NQAD
W. Hilbish, System Engineer (Technical) HVAC
T. Barada, Design (HVAC)
S. Nguyen, Electrical Engineer
J. Senay, Electrical Engineer
J. Shannon, Electrical Engineer
J. Spiesman, System Engineer (Telephones)
A. Rabah, Lead Engineer, PPTD/TS System Computer Engineering Unit

In addition to those listed, other licensee representatives and contractors were contacted.

*Denotes those persons attending the exit meeting held on May 5, 1988.

2.0 Licensee Actions on Previously-Identified Open Items

a. (Open) Open Item 440/79018-BB: Audibility problems in high noise areas, related to IE Bulletin 79-18. The licensee has committed to complete action on this item by the end of the first refueling outage. These actions are tracked in the licensee's commitment tracking system under items No. P00070, No. L00585, and No. L00586. This item will remain open.

b. (Closed) Open Item 440/87010-01; 441/87002-01: Overall evaluation of the Emergency Operations Facility (EOF) Heating, Ventilating, and Air Conditioning System (HVAC). The inspector reviewed documentation which indicated that the licensee had reviewed the overall reliability of the EOF HVAC system. The drive belt on air handling unit, previously identified as a factor in the system's previous unreliability, was corrected by aligning the drive sheaves. Additional modifications to the system, including installation of equipment to allow initiation of the isolation mode from the unit control panel, are planned. This item is closed. A new Open Item (440/88006-03) will be opened to track the findings of this inspection. See Section 6.1.

3.0 Assessment of Radioactive Releases

A review was performed of documentation associated with the pre-operational appraisal of the licensee's dose assessment program, observations of the system, and documentation from licensee submittals to the NRC. This review indicated that the program meets NRC requirements. This area was therefore not evaluated during this Emergency Response Facilities (ERF) Appraisal. Documentation reviewed in making this determination included:

Licensee submittal, offsite doses based on containment leakage, dated May 1983
NUS Report on Dose Assessment System & Meteorology dated December 1984
NRC Report No. 440/84024(DRSS), dated December 1984
NRC Report No. 440/85009(DRSS), dated May 1985
NRC Report No. 440/85075(DRSS), dated December 1985
NRC Report No. 440/86009(DRSS), dated April 1986
NRC Report No. 440/87010(DRSS), dated June 1987
NRC Report No. 440/87021(DRSS), dated December 1987
Perry SSER 4, Section 13.3.2

4.0 Meteorological Information

A review was performed of documentation associated with the pre-operational appraisal of the meteorological system, observations of the system, and documentation from licensee submittals to the NRC. The review indicated that the licensee's system was acceptable in terms of adequacy, representativeness, and reliability, and therefore this area was not evaluated during this ERF Appraisal. Documentation reviewed in making this determination included:

NUS Report on Dose Assessment System and Meteorology dated December 1984
NRC Report No. 440/85009(DRSS) dated May 1985
NRC Report No. 440/85060(DRSS) dated December 1985

5.0 Technical Support Center

5.1 Location and Habitability

The TSC is located in the basement of the service building, which is adjacent to the control building. The TSC is served by a dedicated HVAC system which includes both a normal and an emergency air filtration package. The emergency train includes a roughing filter, two high efficiency particulate air (HEPA) filters and a charcoal filter (adsorber). In the emergency mode, the emergency train is placed in service upstream of the normal filter train. A March 31, 1983 licensee submission concerning design intentions for the emergency response facilities, Section 2.6 stated, "The TSC is provided with habitability features equivalent to the Control Room (CR)" and "The TSC ventilation system is equipped with HEPA and charcoal filters and will function in a manner comparable to the CR ventilation system, but will not be Seismic Category 1 qualified,

redundant, and not instrumented in the CR." These statements implied that the system would, like most CR HVAC systems, pressurize the TSC with filtered air to prevent intrusion of radioactive or hazardous materials.

The Perry Control Room HVAC operates in a true isolation mode during emergency situations. This isolation is achieved through the use of two series valves, with rubber seats, in both the outside air inlet line and the exhaust line. The as-built TSC ventilation system works at zero pressurization in the emergency mode, but unlike the system in the Control Room, has no complete isolation from outside atmosphere. The mechanical equipment room, which contains the ventilation trains, is not isolated and has both a direct inlet of outside, unfiltered air and one or two exhaust fans discharging to outside atmosphere while in the emergency mode.

Discussion with licensee personnel and a document review indicated that no overall system operability or functional testing is performed.

During the appraisal, the system was placed in the emergency mode and all components reviewed by the inspection team. The following problems were noted:

- The position indication for Damper DM4 (return air to suction end of HEPA filter train) was inoperative. Indication stayed in the shut position as the damper cycled to the open position for emergency actuation.

- The position indication lamps for Damper DM3 (outside air to the mechanical equipment room) were burned out or inoperative.

- The current initiation logic for the TSC HVAC system does not open Damper DM1 (outside air inlet to the HEPA/Charcoal filter train), but does leave open Damper DM3 (outside air to the mechanical equipment room, not filtered). Either one or both of the two mechanical equipment room exhaust fans continue to run to exhaust room air to outside (depending on temperature). This lineup creates the following situation:

  - Air from the mechanical equipment room is being exhausted from the TSC envelope. Outside air which makes up the air volume exhausted is brought into the TSC envelope via an unfiltered path.

  - Only recirculated air in the TSC envelope passes through the emergency filter train (HEPA/Charcoal). Any imbalance in the ventilation system will cause unfiltered, outside air to be drawn into the TSC envelope, either from the mechanical equipment room or via doors or other unsealed penetrations. Per the system operating procedure, SOI-M52, "TSC Ventilation System", Damper DM1 is only opened when

it is necessary to draw fresh air into the facility. It was noted during the test run of the system that air was flowing outward through all TSC boundary doors; this air had to be made up via some unfiltered source.

Problems related to the TSC HVAC system, noted above, were considered as an Open Item (440/88006-01).

HEPA and charcoal filter testing procedures for the TSC HVAC system were reviewed and found satisfactory. Other maintenance checks on the system are performed under a "Repetitive Tasks" tracking program. These checks consist of checking items such as air handling unit lubrication and drive belt tightness.

Based upon the above findings, with the exception of the Open Item above, this portion of the licensee's program is adequate.

5.2 Functional Capabilities

5.2.1 Power Supplies

The TSC is supplied with extremely reliable power. All computer systems, receptacles, lighting, radios, and other 110 VAC devices are supplied with power by two uninterruptable power supply (UPS) systems. The TSC loads are split between these two UPS systems. Each UPS consists of a 180 cell, 390 VDC battery bank which is charged with a rectifier which is supplied with non-1E power from 480 VAC plant load centers. The DC power passes through an inverter to supply the TSC load distribution panels (120 - 208 VAC). The UPS systems are rated at one hour following loss of AC supply, based on full load, but should last longer with judicial load stripping. In the event power is not returned prior to battery exhaustion, a backup 480 to 120/208 VAC transformer parallels each UPS. The feeds for these backup transformers is from a 480 VAC emergency diesel backed stub bus (off the 1E plant bus). All of the 480 VAC which supplies the UPS and transformer systems could be supplied from any of the offsite 345 KV incoming lines. The TSC heating ventilating and air conditioning (HVAC) system is supplied with power from the same 480 VAC stub buses described above (diesel backed). All TSC communications systems are supplied with reliable power. The major systems and their respective power supplies are listed below:

- Emergency Notification System (ENS) circuit: TSC UPS A.

- Site PBX: Normal AC, Battery, and diesel backed stub bus.

- Blue Emergency Response network (for communication among ERFs, State and County): Normal AC, Battery, and diesel backed stub bus.

- OPX circuit (Corporate phone system): Normal AC, battery, and diesel in downtown Cleveland.

- Health Physics Network (HPN): ALLTEL Central Office Switch with normal commercial telephone system battery backup.

5.2.2 Data Analysis

The TSC is equipped with satisfactory drawings, status boards, and other supplies necessary to analyze available data.

Based upon the above findings, this portion of the licensee's program is adequate.

5.3 Regulatory Guide 1.97 Variable Availability

All R.G. 1.97 variables are input to the Emergency Response Information System (ERIS) computer system. This includes all necessary thermal-hydraulic, meteorological, and radiological parameters necessary to perform the TSC functions.

The licensee's report on the implementation of RG 1.97 was available.

Based on the above findings, this portion of the licensee's program is adequate.

5.3.1 Computer Data

The ERIS computer system has four terminals in the TSC area. The system has over 120 different displays available, using all of the R.G. 1.97 variables. Online system trending plots are available for about 3.5 hours of historical data. Data older than 3.5 hours is stored on magnetic tape.

Based on the above findings, this portion of the licensee's program is adequate.

5.3.2 Manual Data

Adequate status boards are available in the TSC for backup to the ERIS system. The status boards provide adequate space and layout for trending several parameters. Reliable communications systems between the control room and the TSC are provided.

Based on the above findings, this portion of the licensee's program is adequate.

5.3.3 Data Adequacy

Based on the above findings, this portion of the licensee's program is adequate.

5.4 Data Collection, Storage, Analysis and Display

The system used to provide this function was procured in totality from General Electric. Their designation for the system is ERIS. This system has other capabilities and components besides those specifically used for TSC and/or Emergency Operations Facility (EOF) Data Collection Storage Analysis and Display. Those capabilities and those portions of the ERIS system exclusively dedicated to other functions were not evaluated.

5.4.1 Methods of Data Collection

Data acquisition for the EOF and the TSC falls into two categories: (1) computer collected data and (2) manually collected data.

The manually collected data is from offsite and not easily amenable to automated collection and display. Examples of the latter category are regional weather forecasts and information from the local authorities.

Computer collected data is processed by the ERIS system. This system consists of redundant Digital Equipment Company (DEC) VAX 11/780's with associated display terminals. Real Time Analysis and Display (RTAD) system serves as the primary VAX computer supporting ERF functions. The Transient Analysis computer system (TRA) VAX 11/780 based computer provides backup for the RTAD and has the ability to execute the same software as the RTAD and support ERF functions if needed. Both VAX's collect data from devices designated as "data formatters" which collect data from multiplexer units connected to the analog and digital input modules.

RTAD and TRA VAX's are equipped with large capacity disk drives (450 Megabytes [MB]) on which the data is stored on rotary files (those whose oldest information is overwritten by current data records as soon as the file size reaches its maximum). At the time of the appraisal, the time during which data was resident on the rotary file was 3 hours and 28 minutes. Capabilities also exist to download the rotary file or portions of it to magnetic tape for purposes of later analysis and/or archival storage.

Computer collected data is of both analog and digital form and is comprehensive in terms of site-wide coverage. The digital data is further broken down into simple digital data and pulse data. The pulse data is from the control rod position sensors and is considered as a separate type of input. The number of data points collected is variable. At the time of the appraisal, the following breakdown between analog, digital, and pulse data points was being used.

Analog Sensors	Digital Sensors	Pulse Sensors	Total Number of Sensors
980	1036	177	2193

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2 Data Displays

ERIS information in the TSC is displayed by 4 Toshiba (model sys80018001) color terminals. The ERIS system contains over 100 different display screen formats that are selectable from a master menu. Each display device has a display limitation of 100 screen formats from the menu (this is a hardware limitation). At the time of this appraisal, 120 displays had been defined, and in order to view all defined displays, stored displays of interest can be substituted for active displays on the menu list, or two CRT's with different display sets can be used.

The legibility and labeling of the variables displayed on the screens was found to be good. The organization of the screens was found to be helpful in interpreting the data displayed. The screens are updated in a timely manner. The provision of four display units in the TSC is felt to be adequate. User access to the display units is unimpeded and operation of them is to a large degree self evident. User documentation is available. User selectable trending displays show a 30 or 60 minute time window.

Based upon the above findings, this portion of the licensee's program is adequate. However, the following items are suggested for program improvements:

- The licensee should consider implementing intelligent CRT devices that will allow a larger number of screen formats to be accessed. This would eliminate having to load in stored displays when they are needed and are not available. It would also avoid having to use two display CRT's to look at complete display sets.

- The licensee should consider developing the capability for direct selection of displays from any current display. This would provide faster display response for users already familiar with possible screen format displays. As the system is presently configured, users must always return to the main menu to select screen formats to display.

5.4.2.1 Time Resolution

The ERIS system has the ability to create composed data points, i.e., data generated from multiple sensor readings by some pre-selected algorithm, such as power to flow ratios or bulk temperatures. The time resolution of the composed points varies from 4 to 20 seconds. The sensor data itself is sampled every 1/2 second.

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2.2 Signal Isolation

Signal isolation between the ERIS system and other plant data acquisition systems is provided by fiber optic cables. Section G of the generic safety evaluation report for ERIS type systems (Reference Docket No. 00007447) finds that this is a suitable method for signal isolation.

Based on observation of the data displayed by the ERIS system and a review of the calibration that is performed on the system, there is no evidence of signal degradation. The data acquisition modules (microcomputer based front ends), that feed the ERIS system and provide the interface between the ERIS system and the safety grade portion of the plant instrumentation and the first layer of isolation and their mountings are a safety grade installation. This has the effect of ensuring that the isolation has the same demonstrable level of integrity as the plant safety system.

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2.3 Data Communications

The display terminals in the TSC are connected to the RTAD processor with 9600 bits per second lines. Error detection and correction was reported by licensee personnel to be done for display CRT's as well as other communication devices.

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2.4 Processing Capabilities

System usage was observed through use of a utility provided as part of the operating system for the computer that was running the Real Time Analysis and Display (RTAD) process. The minimum duty cycle observed was more than 80 percent. Additionally, on requesting a random series of screen formats from four CRT's concurrently unused processor capability ranged from 15 to 0 percent. Under heavy loading (e.g., during an accident) computer processing capability could be degraded.

Section B of the generic safety evaluation report defines the design goal maximum duty cycle to be 30 percent. While part of the goal free duty cycle was undoubtedly reserved for future expansion, a more important reason to leave some free capacity is so that the system can respond to the additional load placed on it during a severe plant transient. Some of the anticipated load comes from terminal usage. During a severe transient, all ten terminals (four in the TSC, three in the CR, two in the EOF, and one for special assignment) could be anticipated to be in use, calling for new displays and trending information.

More importantly, the process that provides composed data points is not an invariant process. This means that the amount of system resources required for this real time process is not predictable without load testing the system as it's configured for the Perry plant. Load testing would need to be designed to consider a variety of simulated plant transient conditions. The existing safety margin of about 15 percent is inadequate to cover the possible variation in the demand on system resources of a process that is using about 40 percent of the available resources at steady state normal operation. This was considered as an Open Item (440/88006-02).

Based upon the above findings, with the exception of the Open Item, above, this portion of the licensee's program is adequate.

5.4.2.5 Data Storage Capacities

There is a 450 MB disc dedicated to the rotary file that holds the data for trending analysis. The current length of this file is 3 hours 28 minutes. In addition, the capability exists to download this data to magnetic tape for analysis at a later time.

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2.6 Model and System Reliability and Validity

Examination of existing program documentation shows that it was executed in a very professional manner. Licensee contacts reported that routine surveillance is done to verify that CR instrumentation data points and ERIS points do not vary significantly.

Verification and validation of the system is addressed in Section C of the generic safety evaluation report. It was found acceptable, subject to further NRC staff review of:

- A sample of test procedures with acceptance criteria for test runs
- The Validation Test Report
- A summary of the problems found during the test and how they were resolved.

None of the above were available for review at the time of this appraisal. An NRC staff evaluation of them was furnished for the consultant's review during this appraisal.

Based upon the above findings, and subject to favorable resolution of the above items, the licensee's program is adequate.

5.4.2.7 Reliability of Computer Systems

For the 90 days preceding this appraisal the ERIS system had an availability of more than 99.5 percent based on the system logs. The overall availability since system startup has been greater than 98 percent.

Based upon the above findings, this portion of the licensee's program is adequate.

5.4.2.8 Manual Systems

See Section 5.3.2.

5.4.2.9 Environmental Control Systems

The design specification for the computer room in the TSC where the ERIS hardware is located is a temperature of 65 to 75 degrees F and relative humidity of 40 to 60 percent. This is well within the design envelope specified by the manufacturer.

Based upon the above findings, this portion of the licensee's program is adequate.

6.0 Emergency Operations Facility

6.1 Location and Habitability

The primary EOF is located in the training center approximately 0.4 miles south of the power block and the backup EOF is located 10.5 miles to the southeast of the site in the CEI Concord Service Center. These locations satisfy Option 1 of NUREG-0737, Supplement 1.

Power to the onsite EOF is provided via a 4160 VAC feed from a non-1E, Unit 2 bus (H21). Bus H21 can be supplied from the Unit 1 or 2 startup transformers or from the Unit 1 or 2 auxiliary transformers. At the EOF, the 4160 is routed through redundant 4160 to 480 VAC transformers outside the training building. EOF loads are normally supplied by the "B" transformer, but can be supplied through the "A" transformer if a failure should occur in the "B" transformer.

The more important loads in the EOF, such as lights, computer terminals and radios, are supplied with power via a battery backed UPS system. The UPS would be capable of providing power to important loads for approximately an hour following a loss of AC power. Several ceiling mounted normal lighting units in the EOF have an internal, permanently sealed, battery backup power supply. Unlike most backup lighting systems previously reviewed, this system does not require continuous preventive maintenance.

The backup EOF is supplied with power from a different section of the CEI grid than that which supplies the Perry Station, and it has an emergency diesel generator in the event that normal power is lost. Therefore, power supplies to the EOFs are satisfactory.

The primary EOF has a HEPA filter train installed which is placed in series with the normal air handling equipment for the building in the event of an outside radiological problem. Like most near-site EOFs, the system does not maintain a positive pressure in the EOF and does not include charcoal filtration. The EOF HVAC system was tested in the emergency mode during the appraisal and the following problems noted:

- The outside air damper (F-11) on one of the two roof mounted supply fan housings (Fan "A") failed to close. The damper appeared to remain about 30% open. If the "A" fan were selected as the running fan in the emergency actuation procedure (which allows either the "A" or "B" fan to be selected), outside air would be drawn into the building and distributed throughout the EOF without the air having passed through any HEPA filtration.

- The damper (F-5) which bypasses the HEPA filter train with return air (in emergency mode) and with outside makeup air (in the emergency mode with outside makeup air being supplied via Damper F-1) failed to shut completely in the emergency mode of operation. The damper appeared to remain about 40% open. The failure of this damper to shut defeats the design of the system by allowing recirculated and fresh outside air to bypass the HEPA filter train.

- Manual Damper 1D-1 is located above a hallway acoustic ceiling tile. Operation of the damper is manual and is performed by a person standing on a ladder. The damper position cannot be seen, and it must be operated by feel. Proper positioning of the damper is dependent on it being in the proper position at the beginning of the emergency mode lineup. As a minimum, an observable position indicator should be added to this damper.

- Manual Damper 1D-3 is similar to damper 1D-1 described above. The operating lever for 1D-3 can be seen, but no position indication is annotated on the duct or operator.

- Isolation Doors 107 and 109 (in the emergency mode lineup checklist) are labeled Doors "B" and "A" respectively.

EOF HEPA filter test procedures were reviewed and no problems noted. The rest of the EOF HVAC system is maintained under a "Repetitive Tasks" tracking system. This tracking system checks individual items such as Freon levels in chillers, lubrication of air handling unit motors, and drive belt tightness. No formal overall system operability testing procedures are in use for the EOF HVAC system. Implementation of such procedures would avoid problems such as those described above (e.g., failure of dampers to properly position).

The observed problems with the EOF HVAC System were considered as an Open Item (440/88006-03).

Based upon the above findings, with the exception of the Open Item, Above, this portion of the licensee's program is adequate.

6.2 Functional Capabilities

6.2.1 Data Analysis Adequacy

The primary EOF is provided with two ERIS terminals which have the same capability as that described under the TSC section of this report. Status boards in the EOF are equally acceptable to those in the TSC.

Based upon the above findings, this portion of the licensee's program is adequate.

6.2.2 Backup EOF

As discussed in Section 6.1 above, the backup EOF meets the requirements of Option 1 of NUREG-0737, Supplement 1, and it has reliable power and communications capability. A tour of the backup EOF indicated that it has more than adequate space, supplies (including plant drawings and procedures), a backup power source, and access control. Additional space would be available in the nearby load control center, if needed.

Based upon the above findings, this portion of the licensee's program is adequate.

6.2.3 Reliability

Power supplies for the EOF were described under Section 5.2.1. The telephone systems serving the EOF are the same as those provided in the TSC. Attention to the HVAC problems noted in Section 5.2.1 will improve the reliability of the EOF.

Based upon the above findings, this portion of the licensee's program is adequate.

6.3 Regulatory Guide 1.97 Variable Availability

Variable availability in the EOF is the same as for the TSC, with the following exception (see Section 5.4.2). The ERIS terminals in the EOF function like those in the TSC except that it was noted that an occasional hardware failure causes one of the displays to overwrite old displays, thus rendering the information unreadable. This overwrite problem should be repaired, since it would be worse during a transient than during the steady state power operations under which the system was evaluated. This was considered as an Open Item (440/88006-04).

Based upon the above findings, with the exception of the Open Item, above, this portion of the licensee's program is adequate.

6.4 Data Collection, Storage, Analysis and Display

The EOF and the TSC share the same data collection and display system. Two of the ERIS system display terminals are located in the EOF. They are connected via modems and 9600 baud lines to the VAX Unibus structure rather than directly as are the terminals in the TSC. From a software operational standpoint they are indistinguishable from the terminals in the TSC. The only hardware difference is the use of phone lines and modems rather than direct connection. One of the display terminals in the EOF was not working correctly as discussed in Section 6.3.

Based upon the above findings, this portion of the licensee's program is adequate.

7.0 Exit Interview (30703)

The team leader and consultants met with the licensee representatives denoted in Section 1 on April 28, 1988. The team leader summarized the scope and results of the inspection and discussed the likely content of the inspection report. The licensee did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.