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Joseph M. Farley Nuclear Plant
Response to Generic Letter 2003-01 – Control Room Habitability

Ladies and Gentlemen:

On June 12, 2003, the NRC issued Generic Letter (GL) 2003-01, "Control Room Habitability," requesting the submittal of information that demonstrates that the control room at each plant complies with the respective plant's current design and licensing bases and applicable regulatory requirements, and that suitable design, maintenance, and testing control measures are in place to ensure continued compliance. By letter dated August 4, 2003, Southern Nuclear Operating Company (SNC) submitted a proposed alternative course of action, including a schedule and associated justification, for developing responses to GL 2003-01 information requests. The enclosure to this letter provides SNC's response to GL 2003-01 information requests for the Farley Nuclear Plant (FNP).

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

L. M. Stinson

LMS/chm

Enclosure: SNC response to GL 2003-01

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SNC Response to GL 2003-01

Joseph M. Farley Nuclear Plant
Response to Generic Letter 2003-01 – Control Room Habitability

Enclosure

SNC Response to GL 2003-01

On June 12, 2003, the NRC issued Generic Letter 2003-01 and requested addressees submit responses to information requests related to Control Room Habitability Systems (CRHS). The following is Southern Nuclear Operating Company's (SNC) response for the Farley Nuclear Plant (FNP) to the generic letter. The information provided in this response reflects the design and licensing bases for FNP as presented in the FNP Final Safety Analysis Report (FSAR.)

NRC Request 1:

Provide confirmation that your facility's control room meets the applicable habitability regulatory requirements (e.g., GDC 1, 3, 4, 5, and 19) and that the CRHS are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing bases. Emphasis should be placed on confirming:

SNC Response 1:

Control Room Facility Habitability Design Features

The FNP control room is a common area to Unit 1 and 2 and is served by shared Heating Ventilation and Air Conditioning (HVAC) systems. The control room is located inside the auxiliary building which is between and adjacent to the containment buildings. The control room HVAC systems provide safety and comfort for operating personnel during normal operations and during postulated accident conditions. The control room HVAC systems and envelope boundary allow the control room to remain habitable during post-accident conditions. Sections of the Control Room Habitability (CRH) envelope consist of concrete walls, floor and ceiling to provide shielding for the control room operators. The design of the control room permits access and occupancy during normal and post-accident conditions.

The control room air conditioning and filtration system is designed with sufficient redundancy and separation of components to provide reliable operation under normal and emergency conditions.

The control room envelope (CRE) boundary maintains an air tight design. Penetrations into the control room are sealed to minimize inleakage. Non-safety related HVAC system duct penetrations are provided with isolation valves.

The Control Room Emergency Filtration System (CREFS) provides a protected environment from which operators can control the unit following an uncontrolled release of radioactivity. The CREFS consists of two independent, redundant trains that recirculate and filter the control room air in conjunction with the Control Room Air Conditioner System (CRACS), and two independent, redundant trains that pressurize the control room with filtered outside air. Each filter unit consists of a prefilter, a high efficiency particulate air (HEPA) filter, and an activated charcoal adsorber section for removal of gaseous activity (principally iodine). Each pressurization filter also contains a heater. Each train contains filter units, fans, ductwork, valves or dampers, and instrumentation which form the system.

To minimize inleakage, the control room is provided with normal and emergency pressurization systems designed to maintain slightly greater positive pressure than surrounding atmospheric conditions. The emergency pressurization systems maintains a positive 1/8" w.g. pressure in the control room with a filtered outside air makeup source.

The CRACS, a normal and emergency system, provides temperature control for the control room. A single train provides the required temperature control. The CRACS consists of two independent and redundant trains that provide cooling of recirculated control room air. Each train consists of cooling coils, instrumentation, and controls to provide for control room temperature control.

The CRACS maintains the temperature at or below the continuous duty rating for equipment and instrumentation. A single active failure of a component of the CRACS (with a loss of offsite power) does not impair the ability of the system to perform its design function. Redundant detectors and controls are provided for control room temperature control. The CRACS is designed in accordance with Seismic Category I requirements.

During normal operation, the CRACS provides fresh outside air to the control room. Redundant radiation monitors and smoke detectors are located in the computer room air conditioner air intake. A high radiation or smoke detection signal will isolate the control room from non-safety ventilation systems. Redundant smoke detectors are also located in the computer room air conditioner return air ductwork. The control room operator can initiate CREFS trains by manual switches in the control room. The CREFS is automatically actuated by a Phase A Containment isolation signal which also isolates the control room ventilation. Upon receipt of an actuation signal, the CREFS initiates filtered ventilation and pressurization of the control room.

The automatic actuation of CREFS acts to terminate the supply of unfiltered outside air to the control room, initiate filtration, and pressurize the control room. These actions are necessary to ensure the control room is kept habitable for the operators stationed there during accident recovery and post accident operations by minimizing the radiation exposure of control room personnel.

The radiation monitor actuation of control room isolation during movement of irradiated fuel assemblies or core alterations, alerts the operators to the need for manual initiation of the CREFS which will ensure control room habitability in the event of a fuel handling accident.

As a contingency, self-contained breathing apparatus (SCBA) are located in and just outside the control room for protection against exposure to smoke and/or noxious vapors.

General Conformance with General Design Criteria (GDC)

FNP was designed on the basis of the proposed GDC which were published in the Federal Register on July 11, 1967. Since February 20, 1971, when the Commission published the GDCs, FNP complied with the newer criteria to the extent practical, recognizing previous design commitments. As a result, the NRC review assessed the plant design against the GDC published in 1971 and concluded that the design conformed to the newer criteria. The FNP Safety Evaluation Report (NUREG-75/034) was issued on May 2, 1975.

Specific Conformance with Regulatory Requirements – GDC 1, 3, 4, 5 and 19

Criterion 1 – Quality Standards and Records

Structures, systems and components (SSC) which support Control Room Habitability (CRH) have been designed, fabricated, erected, tested and maintained as safety related. The control room and associated CRH systems are located within a Seismic Category 1 building. Portions of the normal ventilation systems associated with the control room isolation function are classified and maintained as safety-related. The emergency filtration systems and cooling systems are safety-related. Safety-related SSC are designed, constructed, operated and maintained in accordance with the FNP Quality Assurance Program.

FNP conformance with Criterion 1 is confirmed.

Criterion 3 – Fire Protection

FNP conforms to the guidance of Appendix A to Branch Technical Position (BTP) ASB 9.5-1 and complies with the applicable sections of 10 CFR 50 Appendix R.

Structures, systems and components important to safety are designed and located to minimize the fire hazard. Fire Protection systems are designed to minimize the effects of fires on SSC important to safety. Adequate means are provided to mitigate the fire hazard encountered in the plant.

Non-combustible and fire resistant materials are used wherever practical throughout the CRE and fire barriers are used to isolate the CRE from other areas. Penetrations in fire barriers, such as doorways and ventilation penetrations, are protected with fire dampers or fire doors.

The FNP control room is equipped with portable fire extinguishers and a CO_2 reel feed system located just outside the control room doors.

For FNP, "Alternate Shutdown" is generally intended to describe a series of manual actions that are taken independently of the control room to achieve safe shutdown for a postulated fire in the control room. Procedures are provided for alternate shutdown of either unit using the respective Hot Shutdown Panels in the auxiliary building. Appropriate procedures and equipment are available and staged for use by the station fire brigade in coping with a fire in the control room.

FNP conformance with Criterion 3 is confirmed.

Criterion 4 – Environmental and Missile Design Bases

The control room is located within the CRE, which is designed for missile impact. In addition, all control room entrances are protected by missile barriers. Concrete walls and slabs surrounding the control room are at least 18 inches thick and also serve as radiation shielding. The control room habitability systems are also protected against missiles through similar building design features.

During any postulated Design Basis Accident (DBA), the safety-related air conditioning systems maintain the CRE temperature and humidity within limits for both emergency equipment operability and personnel occupancy. The system design is based on the combined Unit 1 and Unit 2 heat gain from safety-related control room equipment, occupancy, wall transmission, and lighting load.

The effects of various pipe breaks outside containment on the CRE and associated facilities have been considered and in all cases, the CRE will remain habitable and provide the capability for safe shutdown and cooldown of the plant.

FNP conformance with Criterion 4 is confirmed.

Criterion 5 – Sharing of Structures, Systems and Components

As noted previously, FNP Units 1 and 2 share a common control room. The control room air conditioning and filtration system is designed with sufficient redundancy and separation of components to provide reliable operation under normal and emergency conditions.

The worst case single active failure of a component of the control room air conditioning and filtration system, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

FNP conformance with Criterion 5 is confirmed.

Criterion 19 – Control Room

The FNP control room habitability systems include radiation shielding, redundant emergency air filtering and air conditioning systems, radiation monitoring, and fire protection equipment.

The FNP control room is common to both units. Sanitary facilities and potable water are located in the control room, and food can be brought to the control room as needed. Radiation protection is provided by shielding (walls and slabs), radiation monitoring, emergency filtration, and separate and independent control room isolation and pressurization systems.

The FNP control room is designed to operate the nuclear power units safely under normal conditions and to maintain it in a safe condition under accident conditions. Adequate radiation protection has been provided to ensure that radiation exposures to personnel occupying the control room during the 30-day period following a design bases accident will not exceed 5 rem whole body, or its equivalent to any part of the body. The loss of coolant accident (LOCA) is the limiting radiological event.

Current evaluations of the LOCA accident demonstrate that FNP meets the GDC 19 criterion of 5 rem integrated whole body dose with up to 10 ft^3/min of unfiltered inleakage. The evaluations illustrate that the thyroid portion of the dose is the limiting concern for unfiltered inleakage in excess of design basis assumptions.

Toxic Gases and Smoke

The design of the FNP CRE meets the guidance outlined in Regulatory Guides 1.78, Rev 0 and 1.95, Rev 0. The compliance of FNP with these documents is summarized below.

Chlorine is the only toxic gas located on the plant site that could affect plant safety if released. Single container quantities at 150 pounds or less of gaseous chlorine are stored onsite in one location. On-site storage of gaseous chlorine is in accordance with the NRC acceptance criteria contained in the Regulatory Guides. Therefore, FNP complies with the guidance of Regulatory Guide 1.78 and 1.95.

All industrial facilities located within five miles of FNP and all materials currently manufactured, stored, or transported in the vicinity of FNP, have been assessed for control room habitability and determined to pose no threat to FNP.

In the event of fire/smoke external to the control room, equipment and procedures are available to maintain habitability of the control room. During normal operation, the Computer Room Air

Conditioning System provides fresh outside air to the control room. Redundant smoke detectors are located in the computer room air conditioner air intake. A smoke detection signal will isolate the control room from non-safety ventilation systems. Redundant smoke detectors are also located in the computer room air conditioner return air ductwork. Smoke detection signal from the return air detectors will isolate the control room from non-safety ventilation systems. The control room operator can initiate CREFS trains by manual switches in the control room. The FNP fire response procedures provide direction for removing smoke from the control room.

Shutdown outside the Control Room

In the event that the control room must be evacuated due to internal fire/smoke, equipment is provided at appropriate locations outside the control room, including necessary instrumentation and controls to maintain the unit in a safe condition. Remote Hot Shutdown Panels located in the Auxiliary Building provide the capability to safely shut down the respective unit outside of the control room. Portable air packs and multiple egress paths are available to facilitate evacuation to the Hot Shutdown Panels.

FNP conformance with Criterion 19 is confirmed.

Conclusion

The FNP CRE and associated systems conform to the applicable requirements of GDCs 1, 3, 4, 5 and 19. No compensatory measures are required.

Procedural controls are provided to ensure continued compliance with the CRH design and licensing basis. Controlled plant procedures are provided for operation, maintenance, instrument calibration and testing of control room habitability systems. Plant configuration, including design documents, licensing documents, equipment databases, calculations, specifications, reports, etc., is maintained through design control and licensing procedures. CRE barrier breaches are identified and controlled by design control and station procedures. Therefore, the CRHS are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing bases.

NRC Request 1(a):

That the most limiting unfiltered inleakage into your CRE (and the filtered inleakage if applicable) is no more than the value assumed in your design basis radiological analyses for control room habitability. Describe how and when you performed the analyses, tests, and measurements for this confirmation.

SNC Response 1(a):

System Description

The FNP CRE was designed to be pressurized to prevent unfiltered inleakage. The original analyses assumed 10 ft^3/min unfiltered inleakage to account for ingress/egress door opening. The accidents analyzed include the LOCA, Fuel Handling Accident (FHA), Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB) and Locked Rotor (LR). The accident analysis shows that LOCA is the limiting event for control room inleakage.

The control room was designed to meet the dose requirements of 10 CFR 50, Appendix A, General Design Criterion 19. The control room doses were analyzed based on the following design parameters:

A. Containment isolation signal from the engineered safety features actuation system automatically switches the control room HVAC system from normal to emergency mode of operation.

B. High radiation levels entering the control room will automatically isolate the normal air systems with the pressurization and recirculation systems being manually initiated by the operator.

C. The control room is pressurized to greater than or equal to 1/8" water gauge positive differential pressure with a redundant air intake on the auxiliary building roof. The air intake rate is 300 ft^3/min in the emergency mode. Deep bed charcoal filters (6 in.) at the intake have 98.5 % efficiency for removal of all forms of iodine. This design was assumed to eliminate the possibility of any unfiltered leakage into the control room. However, an unfiltered inleakage of 10 ft^3/min will be conservatively assumed for a period of 30 days to account for the inleakage due to intermittent personnel ingress/egress.

D. The control room recirculation system flow rate is 3,000 ft^3/min. This system has a filter efficiency of 94.5 % (2 in.) for all forms of iodine.

The system is designed to provide an environment with controlled temperature and humidity to ensure both the comfort and safety of the operators and the integrity of the control room components.

Tracer Gas Testing

A characterization test of the CRE with Train A CREFS in operation was performed on May 18, 2004. The purpose of this test was to assure that the CRE could be treated as a single zone, a requirement of ASTM E741. This was accomplished by taking gas samples throughout the envelope following injection of a "puff" of tracer gas (Sulfur Hexafluoride, SF_6) that quickly raised the concentration of tracer gas in the envelope to a target value. Analysis of samples taken throughout the CRE was then performed to confirm the uniformity of tracer gas concentrations in the envelope. The results from the analyses of these samples indicated that the CRE could be considered as a single zone.

Constant injection inleakage tests were performed: (1) with CREFS Train A in operation the night of May 18, 2004, (2) with CREFS Train B in operation the night of May 19, 2004, (3) with the Control Room HVAC Systems in normal mode operation (Train B) the night of May 20, 2004 and (4) with CREFS Train B in operation and the Control Room open to the Mechanical Equipment Room, (with duct fire damper inspection doors removed) the night of May 21, 2004. For the constant tracer gas injection technique, when the concentration in the return air from the CRE reached equilibrium, a series of timed samples were taken from the make-up (outside) air and the main air-handler return air. These concentrations along with the flow of tracer gas injected into the CRE provided a measure of the unfiltered inleakage.

The fifth test was a concentration decay test performed with both the A and B train CRACS operating in isolation-recirculation mode the night of May 20, 2004. For the concentration decay technique, samples from the envelope are taken over time and analyzed for tracer gas concentration. The air exchange rate was determined from these samples and in combination with the air volume of the rooms, produced the airflow leakage rate.

These tests provided the following inleakage results:

Testing Mode	Measured leakage ft^3/min	Analysis value is used in	Value used in Current Analysis ft^3/min
Pressurization	25	LOCA	10
Isolation	33	FHA	197
Normal alignment	87	Hazardous Chemicals	2,350
Isolation	33	Smoke	N/A, Assessment does not require a value

Based on the results of these test, the only value outside the current licensing bases assumed values is the allowable unfiltered leakage during the control room emergency pressurization mode. The as-found value was 25 ft^3/min which exceeds the 10 ft^3/min assumed in the control room dose analysis for loss of coolant accident (LOCA.)

SNC performed an operability evaluation using NRC Generic Letter No. 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," as guidance. The operability analysis used as-measured and as-tested input parameters for, containment leakage, filter efficiencies, ECCS recirculation loop leakage and conservative source terms. The results of the operability analysis support an increase in the allowed unfiltered inleakage that far exceeded the as-found inleakage of 25 ft^3/min. No compensatory measures were required.

To address this outstanding operability evaluation, a new analysis for the limiting accident, LOCA, was provided to the NRC for review and approval in SNC letter NL-04-1473 dated August 25, 2004. This new analysis supports an allowable inleakage of 53 ft^3/min for the LOCA event. Upon approval of the analysis by the NRC, the FSAR will be revised to reflect this higher allowed inleakage number and the current operability evaluation will be cleared.

<u>NRC Request 1(b):</u>

That the most limiting unfiltered inleakage into your CRE is incorporated into your hazardous chemical assessments. This inleakage may differ from the value assumed in your design basis radiological analyses. Also, confirm that the reactor control capability is maintained from either the control room or the alternate shutdown panel in the event of smoke.

<u>SNC Response 1(b):</u>

Hazardous Chemical Assessment

The FNP CRE was tested for inleakage in May 2004. The test report, issued July 16, 2004, indicated that the inleakage was 87 ft^3/min above the normal outside air intake. The total flow of outside air and inleakage is bounded by our current hazardous chemical analysis.

An evaluation of off-site hazardous materials has been performed to identify any previously unreviewed hazards to the control room personnel due to an accidental release of toxic chemicals stored or transported within a five-mile radius of FNP. This evaluation concluded that no new hazards were identified and that the requirements of Regulatory Guide 1.78 continue to be satisfied.

Therefore, the most limiting unfiltered inleakage into the FNP CRE is incorporated into the hazardous chemical assessments.

Smoke Assessment

A qualitative assessment (based on Regulatory Guide 1.196 and NEI 99-03) of smoke events was performed to ensure that safe shutdown capability for FNP is not adversely affected by a postulated fire/smoke event. This evaluation concluded that a fire/smoke event at FNP will not prevent the control room operators from initiating a safe shutdown of the Unit 1 or Unit 2 reactor from either the control room or the hot shutdown panel rooms.

The primary plant features and controls that support this include:

- HVAC and Smoke removal systems
- Physical plant barriers and barrier configurations
- Adequately arranged and redundant egress pathways
- Smoke detection and fire suppression systems
- Automatic operating dampers to control smoke migration

Therefore, the reactor control capability is maintained from either the control room or the hot shutdown panel in the event of smoke.

<u>NRC Request 1(c):</u>

That your technical specifications verify the integrity of the CRE, and the assumed inleakage rates of potentially contaminated air. If you currently have a ΔP surveillance requirement to demonstrate CRE integrity, provide the basis for your conclusion that it remains adequate to demonstrate CRE integrity in light of the ASTM E741 testing results. If you conclude that your ΔP surveillance requirement is no longer adequate, provide a schedule for: 1) revising the surveillance requirement in your technical specification to reference an acceptable surveillance methodology (e.g., ASTM E741), and 2) making any necessary modifications to your CRE so that compliance with your new surveillance requirement can be demonstrated.

If your facility does not currently have a technical specification surveillance requirement for your CRE integrity, explain how and at what frequency you confirm your CRE integrity and why this is adequate to demonstrate CRE integrity.

<u>SNC Response 1(c):</u>

FNP currently performs a positive pressure surveillance of the Control Room envelope every 18 months per Technical Specifications (TS). The CRE tracer gas testing performed in May 2004, as described in response 1(a), revealed that some amount of inleakage exists despite FNP's ability to successfully demonstrate a positive pressure in the CRE. As a result, FNP is adding inleakage surveillance to the TS based on the model TS and TS Bases provided by the NRC as an acceptable means to implement Regulatory Guide 1.196. This TS change was submitted in SNC letter NL-04-1473, dated August 25, 2004. No modifications to the CRE are required to demonstrate compliance with the new surveillance requirements of the TS.

NRC Request 2:

If you currently use compensatory measures to demonstrate control room habitability, describe the compensatory measures at your facility and the corrective actions needed to retire these compensatory measures.

SNC Response 2:

No compensatory measures are needed or used at FNP to demonstrate Control Room Habitability.

NRC Request: 3:

If you believe that your facility is not required to meet either the GDC, the draft GDC, or the "Principal Design Criteria" regarding control room habitability, in addition to responding to request 1 and 2 above, provide documentation (e.g., Preliminary Safety Analysis Report, Final Safety Analysis Report sections, or correspondence) of the basis for this conclusion and identify your actual requirements.

SNC Response 3:

FNP Units 1 and 2 conform to the GDCs referenced in GL 2003-01 as discussed in item 1 above.