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August 28, 2003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Response to Generic Letter 2003-01
Arkansas Nuclear One, Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

REFERENCES:
1. Generic Letter 2003-01, Control Room Habitability, June 12, 2003
2. NEI 99-03, Revision 1, Control Room Habitability Guidance, March 2003

Dear Sir or Madam:

Entergy Operations, Inc. (Entergy) hereby submits a 180-day response to NRC Generic Letter 2003-01, Control Room Habitability (Reference 1), for Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2, respectively). Entergy has reviewed the actions requested by Generic Letter 2003-01 and has determined that the 180-day schedule for the completion of the requested actions is appropriate for ANO-1 and ANO-2. The attached report (Attachment 1) addresses the information requested by the generic letter. This response includes new commitments as summarized in Attachment 2.

If you have any questions, please contact David Bice at (479) 858-5338.

Sincerely,

Glenn R. Ashley

Glenn R. Ashley
Manager, Licensing

GRA/DBB/dbb

Attachments:

1. Response to Request for Information, Generic Letter 2003-01, Control Room Habitability
2. List of Regulatory Commitments

A102

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Attachment 1

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Response to Request for Information

Generic Letter 2003-01

Control Room Habitability

This letter is provided in response to Generic Letter (GL) 2003-01, Control Room Habitability, for Operating Licenses DPR-51 and NPF-6 for Arkansas Nuclear One, Units 1 & 2 (ANO-1 & ANO-2), respectively. The response follows the order in which information was requested in GL 2003-01 (Ref. 1). References to past or current correspondence which may provide additional information, should it be desired, are also included in this response. To simplify response reviews, the information requested in the generic letter is included below prior to each applicable response.

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 CRHSs are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing basis.***

   ANO Response:

   Control Room Facility Habitability Design Features

   The control rooms for ANO-1 and ANO-2 are located adjacent to each other. The two control rooms are separated by doors with louvers above, to limit interaction between the ANO-1 and ANO-2 systems. The normal air conditioning systems for the two control rooms are separate. The safety-related emergency ventilation systems, provided for control room habitability (CRH), are shared by the common control room envelope (CRE), comprised of the two control rooms. The CRE is designed and maintained to be as airtight as practicable. The two units have separate licensing basis documents.

   There are two normal ventilation systems, one for the ANO-1 side and one for the ANO-2 side. The air intake into each system is continuously monitored for radiation, chlorine, and smoke. Upon receiving a high radiation or high chlorine concentration signal from any of the normal air intakes, the CRE is isolated except for filtered outside air used for pressurization to minimize unfiltered air in-leakage. This arrangement assures redundancy in the monitoring system.

   The safety-related emergency control room ventilation system provided for CRH is comprised of two subsystems. Each subsystem includes a control room emergency ventilation system (CREVS) and a control room emergency air conditioning system (CREACS). The CREVS consists of two redundant filter trains, both of which are located outside the ANO-1 section of the common control room. Each filter train includes a centrifugal fan, a roughing filter, a high efficiency particulate (HEPA) filter, and a charcoal absorber. Besides recirculation and filtration of control room air, filtered outside makeup air is also provided to pressurize the control room in order to minimize unfiltered air in-leakage into the control room under isolated conditions. The CREVS is designed to reduce the potential control room operator dose from a radiological accident to within the General Design Criterion (GDC) 19 limits, based upon an unfiltered in-leakage rate of 10 cubic feet per minute (cfm). However, recent tracer gas testing indicates actual in-leakage rates are in excess of this value. This is discussed further in this response.

   The CREACS for both control rooms is maintained by redundant split-system type air handling units located in the ANO-2 portion of the control room. The internal air handling units and associated condensing units outside the control room are normally powered from vital buses in ANO-2, but one train can be temporarily powered from a vital bus in ANO-1. The condensing units are cooled by safety-related service water systems.

If smoke is detected in the inlet ductwork, the associated unit control room isolation dampers will close and normal supply and exhaust fans will de-energize automatically. Smoke detectors are also provided in the control room normal return ductwork of each unit to sense fire or smoke internal to the control room. Actuation of these detectors will isolate the normal recirculation flow path and allow purging of the associated control room. Features provided for isolation on smoke detection act to minimize the transfer of smoke from fires in areas outside the CRE.

Protection from prolonged exposure to smoke and/or noxious vapors is assured by the availability of self-contained breathing apparatus (SCBA) in the control room and the ability of control room operators to detect smoke or other vapors, manually isolate the control room envelope, then restore the control room atmosphere by manipulating the control room ventilation system (Ref. 2).

The ANO-1 control room ventilation systems are described in ANO-1 Safety Analysis Report (SAR) Sections 1.7.2 and 9.7.2.1. The ANO-2 control room ventilation systems are described in ANO-2 SAR Sections 1.2.2.10 and 9.4.1.

General Conformance with GDCs

The ANO-1 plant was originally designed and constructed to meet the intent of the GDC, as originally proposed in July 1967. The NRC published the revised GDC in July 1971 just before the Final Safety Analysis Report (FSAR) was docketed. ANO assessed the plant design against the revised GDC and presented the assessment in Amendment 25 of the FSAR. The NRC Safety Evaluation Report ("SER", Ref. 12) was based upon the version of the GDC in 1971 and concluded that the plant design conformed to the intent of the 1971 criterion. Section 1.4 of the ANO-1 SAR describes conformance with the GDCs.

The ANO-2 plant was originally designed and constructed based upon the proposed 1967 GDC. Design and construction were thus initiated and proceeded to a significant extent based upon the 1967 criterion. After the revised GDC was published in 1971, ANO-2 attempted to comply with the newer criterion to the extent practical with respect to the 1971 GDC as discussed in Section 3.1 of the SAR. The NRC SER (Ref. 13) was based upon the version of the GDC in 1971 and concluded that the plant design conformed to the intent of the 1971 criterion.

Specific Conformance with CRH Regulatory Requirements (GDC 1, 3, 4, 5 and 19)

Criterion 1 – Quality Standards and Records

Structures, systems and components (SSCs) credited in support of CRH have been designed, fabricated, erected, tested and maintained as safety-related ("Q") SSCs, except for chlorine detectors, addressed separately below. The control rooms and associated CRH systems are contained within the Seismic Category 1 "Q" Auxiliary Building. Portions of the normal ventilation systems associated with the control room isolation function are "Q". The emergency filtration and emergency cooling systems are also safety-related. The "Q" classification of individual components is provided in the electronic equipment database. Safety-related SSCs are designed, constructed, operated and maintained in accordance with the Quality Assurance Program Manual (QAPM).

The chlorine detectors have been previously downgraded to "Non-Q" and the licensing basis has been changed in accordance with 10 CFR 50.59. Original chlorine detection system design features are consistent with the recommendations of Regulatory Guide (RG) 1.95, *Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release*, February 1975. However, since elemental chlorine is no longer stored or used on site or within a 5-mile radius of the plant site, the RG 1.95 recommendation for Seismic Category 1 designation is not necessary for ANO design requirements. A postulated seismic event, concurrent with transport failure and release of chlorine or other toxic gas offsite, is considered an incredible event. Activities are currently in progress to delete the chlorine detectors, based upon risk-based analysis meeting the intent of RG 1.78, Rev. 1, *Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release.* Note that the original ANO-1 and ANO-2 control room design does not strictly comply with the above regulatory guides since the design was substantially complete prior to the issuance of these guides.

Fire detectors are not safety-related. As noted earlier, features are also provided for isolation on smoke detection and act to minimize the transfer of smoke from fires in areas outside the CRE.

ANO is considered to be in full compliance with Criterion 1.

Criterion 3 – Fire Protection

Fire protection for ANO was originally designed and installed to satisfy requirements of building codes and portions of the Occupational Safety and Health Administration (OSHA), the National Fire Protection Association (NFPA), and the Nuclear Energy Property Insurance Association (NEPIA) guidelines. This resulted in the use of fire barriers, fire doors, fire and smoke detectors, sprinkler and deluge water systems, and hose stations. As a result of lessons learned from the Browns Ferry fire of March 1975, the ANO fire protection program was improved. Many changes were made to satisfy NRC criteria in Branch Technical Position (BTP) 9.5-1, 1976, and other staff positions including 10 CFR 50, Appendix R, Sections G, J, O, and L by reference from Section G.3. The design bases for the system are as follows:

- Structures, systems and components important to safety are designed and located to minimize, consistent with other safety requirements, the fire hazard. Noncombustible and heat resistant materials are used wherever practical throughout the unit.

- The Fire Protection System (FPS) is designed to minimize the effects of fires on structures, systems and components important to safety. It is designed to provide adequate capability to fight the fire hazard encountered in all plant areas.

Non-combustible and fire resistant materials are used wherever practical throughout the control rooms and three-hour rated fire barriers are used to isolate the control rooms from other areas. Penetrations of fire barriers, such as doorways, cable tray or conduit penetrations, and ventilation penetrations are protected to a rating equivalent to that of the barrier or evaluated using the guidance found in GL 86-10. Three-hour rated dampers and fire doors have been installed in ventilation duct and doorway penetrations of fire barriers. Cable tray penetrations of fire barriers have been upgraded to a design tested configuration to demonstrate a three-hour fire rating. Piping and conduit penetrations are sealed around the piping and conduit to prevent smoke transmittal; large conduits are also sealed internally. Materials used for air sealing of the control room boundary were selected to be compatible with fire barrier requirements.

The ANO-1 control room is equipped with a halon suppression system to suppress a fire that might occur in the electrical cabling. The halon system protects cabling above the control room and auxiliary control room (relay cabinet area which is part of the control room) drop ceiling and below the raised floor for the auxiliary control room. The ceiling and floor tiles are designed to contain the halon in the event of a discharge to maintain the concentration needed to suppress the fire. In the event of a complete discharge of halon and taking no credit for containment features, the halon concentration would be 1.96% in the common control room envelope and 4% in the ANO-1 control room, if confined to ANO-1 only. Both are below the 7% maximum concentration for habitability. No halon protection is provided for the ANO-2 control room.

For ANO-1 and ANO-2, "Alternate Shutdown" is generally intended to describe that series of actions which are taken independently of the control rooms to achieve safe shutdown for a postulated exposure fire in Fire Area G. Fire Area G consists of the control room and Cable Spreading Room in each unit, as well as Health Physics Area, Upper South Electrical Penetration Room, Core Protection Calculator Rooms (both old and new locations), and the Printer Room adjacent to the ANO-2 control room. Procedures are provided for alternate shutdown of either unit.

ANO is considered to be in full compliance with Criterion 3.

Criterion 4 – Environmental and Missile Design Bases

The control rooms and related facilities are located within the Auxiliary Buildings, which are designed for high velocity 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. CRH systems and supporting safety-related systems are also protected against missiles through similar building design features.

During any of the postulated Design Basis Accidents (DBAs) the CREACS operates to maintain the control room atmosphere within suitable temperature and humidity limits for both emergency equipment operability and personnel occupancy. The system design is based on the combined ANO-1 and ANO-2 heat gain from safety-related control room equipment, occupancy, wall transmission, and lighting load.

High energy pipes are not located in or around the CRE. The service water line to the air conditioning unit VUC-9 in the ANO-1 control room is provided with a double wall to prevent flooding of the CRE in case of a pipe break. The effects of various pipe breaks outside ANO-1 containment on the control room and associated facilities are discussed in Appendix A-7 of the ANO-1 SAR. The effects of pipe breaks outside the ANO-2 containment are discussed in Section 3.6.4.1 of the ANO-2 SAR. In all cases, the control rooms will remain habitable and provide capability for safe shutdown and cooldown of the plant in the event of line breaks.

ANO is considered to be in full compliance with Criterion 4.

Criterion 5 – Sharing of Structures, Systems and Components

As noted above, the plant is provided with a central control room located in adjacent areas of the respective auxiliary buildings. The control panels and equipment are physically separated in the control room by a partition wall to eliminate interaction between ANO-1 and ANO-2 systems. Vent louvers above the partition are open to allow the emergency ventilation systems to be shared by both units. The intent of the design is to centralize facility control and yet ensure the safe operational status of each plant, even under accident conditions. Normal and emergency operation of common emergency ventilation systems is controlled by a single ANO-2 procedure, and ANO-1 and ANO-2 Operations personnel coordinate their response through this procedure.

ANO is considered to be in full compliance with Criterion 5.

Criterion 19 – Control Room

General

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

The ANO-2 control room is adjacent to and interconnected with the ANO-1 control room, both of which constitute the CRE during isolated conditions. Non-Seismic Category 1 kitchen and sanitary facilities are part of the ANO-1 control room, but outside of the emergency ventilation system envelope, and are available to the ANO-2 operators. Food, potable water and portable sanitary facilities can be brought to the control room, as needed.

Radiation Protection

Radiation protection is provided by shielding (walls and slabs), radiation monitoring, emergency filtration, and control room isolation and pressurization. The ANO-1 Maximum Hypothetical Accident (MHA) and the ANO-2 design basis Loss of Coolant Accident (LOCA) dictate the shielding requirement designs for the two control rooms. The radiation protection design bases for each unit have some differences, as noted below.

ANO-1:

The control room is designed to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions. Adequate radiation protection [with compensatory measures] has been provided to insure that radiation exposures to personnel occupying the control room during the 30-day period following a MHA will not exceed 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident (ANO-1 SAR Section 1.4.15).

The DBA defining the protection required for the plant main control room is the MHA. The accident condition is described in Chapter 14 of the SAR. The main control room design was based on the airborne fission product inventory in the reactor building following an MHA. The activity inventory of noble gases and halogens is shown in Chapter 14. Reactor building and control room shielding have been designed such that the doses to operating personnel for the duration of the MHA are less than 5 rem whole body, or its equivalent to any part of the body (ANO-1 SAR Section 11.2.4.1).

The NRC has interpreted the thyroid dose that is equivalent to 5 rem whole body to be 30 rem in Standard Review Plan (SRP) section 6.4. This criterion has also been established in the ANO Licensing Basis (Refs. 14 and 15).

An evaluation of the maximum allowable control room unfiltered in-leakage has been performed, demonstrating that ANO-1 could meet the GDC 19 criterion of 30 rem to the thyroid by allowing up to 26 cfm of unfiltered in-leakage after the limiting accident for control room dose, the ANO-1 Maximum Hypothetical Design Basis LOCA. This evaluation is documented in Calculation 91-E-0117-19 (Ref. 8). The evaluation illustrates that the limiting concern with unfiltered in-leakage in excess of design basis assumptions is the thyroid dose from inhalation.

Recent tracer gas testing of the common control room envelope at ANO has established an actual unfiltered in-leakage rate of 30 cfm, plus 10 cfm assumed for ingress and egress, for a total of 40 cfm (Ref. 16). The design/licensing basis for the ANO-1 MHA remains 10 cfm unfiltered in-leakage due to ingress/egress (ANO-1 SAR, Section 14.2.2.6.7). The measured 40 scfm unfiltered in-leakage is above the design basis value as well as the maximum calculated allowable in-leakage of 26 cfm following an ANO-1 MHA. Therefore, compensatory measures are required and have been established.

Calculation 91-E-0117-19 (Ref. 8) demonstrates that GDC-19 limits would be met for unfiltered in-leakage $\leq$ 340 cfm for the most limiting design basis LOCA fission product release if a compensatory action is taken to issue potassium iodide (KI) to the control room operators. With credit taken for this compensatory measure, GDC 19 limits would be met. Procedural guidance is provided for the Operations Shift Manager to administer KI.

ANO-2:

An evaluation of the maximum allowable control room unfiltered in-leakage has been performed, demonstrating that ANO-2 could meet the GDC 19 criterion of 30 rem to the thyroid by allowing up to 61 cfm unfiltered in-leakage for the limiting accident, the Maximum Hypothetical Design Basis LOCA. This evaluation is documented in Calculation 91-E-0117-16 (Ref. 20). The ANO-2 SAR has been changed to reflect this new in-leakage value.

Total unfiltered air leaking into the control room for the condition of control room isolation is assumed to be 61 cfm. This leakage includes 10 cfm in-leakage attributed to ingress and egress of plant personnel through the control room doors during accident conditions (ANO-2 SAR, Section 9.4.1.1.2). With actual unfiltered in-leakage of 40 cfm as noted above, ANO-2 meets GDC 19 radiation dose requirements.

Toxic Gases and Smoke

The only toxic gas considered in the ANO-2 licensing basis is chlorine. Chlorine was previously stored at the plant site for water treatment, which is now accomplished by other methods. Presently, chlorine is not stored in large quantities at the plant site, nor are there any significant sources of chlorine stored within five miles of the site. Chlorine detection features are as noted in the section on Design Features above. For more details, see the response to Item 1b.

Protection against external sources of smoke is provided as noted in the section on Design Features. In the event of a control room fire, alternate shutdown provisions are provided as noted in the response to Criterion 3 above.

Shutdown Outside the Control Rooms

For ANO-1, in the event that the control room must be evacuated, equipment at appropriate locations outside the control room is provided, including necessary instrumentation and controls to maintain the unit in a safe condition (hot standby). In addition, the potential capability for subsequent cooldown to cold shutdown is provided in the event the control room has to be evacuated and is not accessible for a long period of time under the conditions where no accident has taken place and the control room remains intact.

For ANO-2, instrumentation and controls are provided outside the control room at various locations so that the plant may be safely brought to hot shutdown and potentially to cold shutdown. A remote shutdown panel is provided outside of the control room. The panel is designed to Seismic Category 1 requirements and is located in a Seismic Category 1 area.

Administrative Control Programs

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 controlled corporate design and licensing procedures. Identification and control of CRE barrier breaches is included in the ANO Fire Watch Program procedure.

Conclusion:

The ANO control rooms and associated systems meet the applicable requirements of GDCs 1, 3, 4, 5 and 19. At present, compensatory measures are required for ANO-1 to maintain compliance. These measures are discussed further in this response. The CREVS and CREACS have been designed, constructed and configured in accordance with the design and licensing basis. Through controlled plant processes, these systems are operated and maintained in accordance with the licensing and design basis.

(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 CRE habitability. Describe how and when you performed the analyses, tests, and measurements for this confirmation.

ANO Response:

The original design basis analysis of control room habitability for ANO-1 was established assuming 10 standard cfm (scfm) unfiltered in-leakage into the control room with an unpressurized, closed recirculation system that continuously recirculated air inside the control room through charcoal filters. During the operating license review for ANO-2, the control room emergency ventilation systems were upgraded in response to NRC staff concerns involving radiation protection. The upgraded systems were described in Amendment 39 to the ANO-2 FSAR in 1976. The upgraded systems were designed to minimize air in-leakage by pressurizing the control room with 33 scfm of outside air through charcoal filter beds. In addition, vestibule entrances to the control room (two doors in series) were credited to further reduce in-leakage during ingress and egress to 3 scfm. The 3 scfm assumed the control room is sufficiently pressurized following the event such that there is no in-leakage except from ingress and egress through the control room. This updated design was reviewed in the ANO-2 SER in Section 6.4.1. To resolve NRC concerns that not all entrances to the control room were true vestibules, the assumed in-leakage during ingress and egress was increased to 10 scfm as documented in Amendment 11 to the ANO-2 SAR in 1993.

During the license amendment review for power uprate on ANO-2, Entergy committed to perform a tracer gas test on the ANO control room envelope in the fall of 2001 to determine if the actual in-leakage into the control room was consistent with the accident analysis (Ref. 19).

Calculation 91-E-0117-19 (Ref. 8) was performed to determine maximum allowable in-leakage without compensatory measures, as well as the maximum allowable in-leakage for possible compensatory measures. Consideration was given to administratively lowering ANO-1 allowable reactor building leakage, issuance of KI to control room operators, and use of SCBAs.

This calculation reviewed accidents for which control room doses had been calculated to demonstrate compliance with GDC 19 in the ANO Licensing Basis.

For ANO-1, consideration was given to the following accidents for which control room doses had been assessed:

- The maximum hypothetical accident or MHA, (maximum hypothetical design basis large break LOCA)
- The Fuel Handling Accident (FHA)

The control room dose consequences of the other accidents described in Chapter 14 of the ANO-1 SAR have not been calculated. For the Main Steam Line Break, the Steam Generator Tube Rupture, and the Loss of Load accidents described in the SAR, since the design/licensing basis for ANO-1 doesn't assume iodine spiking or concurrent loss of offsite power, the release terms and durations of these accidents have historically been judged such that the control room doses from these accidents are bounded by those of the MHA. For the Control Rod Ejection Accident (CREA) as described in the ANO-1 SAR, the offsite doses at the Exclusion Area Boundary and Low Population Zone are a fraction (< 10%) of the doses resulting from the MHA. Therefore, the control room doses from a CREA are judged to be bounded by those of the MHA at the same assumed unfiltered in-leakage rate.

The results of the assessment demonstrated that GDC-19 acceptance criteria could be met for unfiltered in-leakage of ≤ 26 cfm. With the issuance of KI as a compensatory measure, Entergy calculations demonstrated that GDC-19 limits would be met for unfiltered in-leakage ≤ 340 scfm for the ANO-1 MHA.

For ANO-2, consideration was given to the following accidents for which control room doses had been assessed:

- MHA
- Fuel Handling Accident
- Steam Generator Tube Rupture (SGTR)
- Control Rod Ejection Accident
- Main Steam Line Break (MSLB)
- Locked Rotor
- Feed Water Line Break (FWLB)

The result of this review and evaluation determined that for ANO-2, the most limiting accident was the MHA. It was demonstrated that GDC 19 acceptance criteria for this accident could be met for unfiltered in-leakage of ≤ 61 cfm. With the issuance of KI as a compensatory measure, Entergy calculations demonstrated that GDC 19 limits would be met for unfiltered in-leakage ≤ 900 scfm for the ANO-2 MHA.

In early November 2001, Entergy conducted a tracer gas test at ANO with the support of NCS Corporation and Lagus Applied Technology, Inc. The results of this test were reported to the NRC on January 14, 2002, in Attachment 1 of Reference 3. These tests indicated a maximum unfiltered in-leakage of 134 scfm including 10 scfm due to ingress and egress. The in-leakage values reported from the tracer gas test that exceeded the GDC 19 allowable values for ANO were documented in the ANO corrective action program on November 1, 2001.. A compensatory measure to issue KI was credited in the condition report's operability evaluation. Entergy informed the NRC of this compensatory measure (Ref. 3).

ANO identified two actions which could reduce the unfiltered in-leakage to 40 scfm (including 10 scfm for ingress and egress). These actions were:

- Repair seals on the doors and housing of the ANO-1 Control Room Emergency Recirculation Fan VSF-9, to remove 45 scfm of in-leakage. This included a confirmatory test of the VSF-9 housing to confirm the latter corrected condition.

- Establish administrative controls to have an operator open the double doors leading from the Health Physics Area to the Turbine Building prior to having a condition where the 4160V Vital Switchgear Exhaust fans actuate under a radiological event.

Entergy proposed in Reference 3 that the acceptance criterion of 61 scfm unfiltered in-leakage be incorporated as the new design bases assumption. The testing was performed in support of the ANO-2 Power Uprate license amendment request (Ref. 4). Entergy considered the completion of these actions sufficient to bring ANO-2 into compliance with GDC 19 limits with no further credit for compensatory actions. The NRC SER for Amendment 244 (Ref. 5) referred to the above action plan, and found ANO-2 would meet GDC 19. In a letter dated May 14, 2002 (Ref. 6), Entergy reported the completion of these actions.

ANO-1 is presently in an operable but degraded condition, with measured in-leakage of 40 scfm (including 10 scfm due to ingress/egress), which is in excess of the 10 cfm described in the SAR and the 26 scfm determined to be the maximum acceptable unfiltered in-leakage to meet GDC 19 limits without compensatory measures in the operability evaluation (Ref. 8). With the issuance of KI as a compensatory measure, Entergy calculations demonstrate that GDC 19 limits would be met for unfiltered in-leakage ≤ 340 scfm for the ANO-1 MHA.

(b) That the most limiting unfiltered inleakage into your CRE is incorporated into your hazardous chemical assessment. 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>ANO Response</u>:

The only toxic gas considered in the ANO licensing basis is chlorine. The SER for ANO-2, Section 6.4.2, *Toxic Gas Protection Provisions* states the following:

"Control room habitability following a postulated toxic gas release is required to ensure that operators can continue to monitor and, if required, control plant operations. Chlorine has been identified as the only material that, if released, would pose a potentially serious operator hazard. Chlorine is stored in one ton cylinders about 500 feet from the control room intakes. Provisions such as quick acting chlorine detectors and self-contained breathing apparatus will be provided to protect the operator against a chlorine release. We have reviewed these provisions against the guidelines of Regulatory Guide 1.95 and have found them to be adequate. We conclude the plant's toxic gas protection is adequate."

As noted earlier, chlorine was previously stored at the plant site for water treatment, which is now being achieved by other methods. Presently, chlorine is not being stored in large quantities at the plant site, nor is there any significant source of chlorine (or other toxic materials) stored within five miles of the site.

In response to NRC Question 310.18 during the initial licensing of ANO, which asked about toxic materials shipped on nearby roads, waterways, rails or pipelines, ANO responded that "the information necessary to determine which chemicals may be shipped on nearby rail, barge, and highway routes and the frequency of such shipments is not reasonably available." The same question stated the analysis should be in accordance with Regulatory Guide 1.78, with ANO stating "The ANO-2 control room was not designed to meet the requirements of Regulatory Guide 1.78 since the design was substantially complete prior to issuance of this guide." However, the response did credit installation of the chlorine detectors and did evaluate other onsite chemicals deemed to be hazardous per RG 1.78, including carbon dioxide, compressed nitrogen and sulfuric acid. Nevertheless, more recent analyses have considered the effects of offsite toxic gas releases.

As noted in the NRC SER for License Amendments 192 for ANO-1 and 191 for ANO-2 (Ref 7):

"...the release of chlorine or other hazardous chemicals is not part of the initial condition of a design basis accident or transient analysis that assumes a failure of or presents a challenge to the integrity of a fission product barrier. Since the release of toxic gases is not assumed to initiate or occur simultaneously with design basis accidents or transients involving challenges to fission product barriers, the chlorine detection system is not part of a success path for the mitigation of those accidents or transients."

Based upon the above, the NRC staff concluded that the requirements for "chlorine (toxic gas) detection systems do not meet the criteria of 10 CFR 50.36", and the associated Limiting Conditions for Operation and Surveillance Requirements may be removed from the Technical Specifications (TSs). As a result the existing TS provisions and bases have been relocated to the Technical Requirements Manuals of both units. ANO does not consider toxic gas events and other design basis accidents to occur simultaneously.

With regard to the effect of toxic releases from offsite transportation incidents, the most recent complete analysis was performed in 1997, using probabilistic safety assessment methods to determine the effects of offsite toxic gas releases. In this analysis, chlorine detectors were not credited and no credit was taken for control room design in limiting the exclusion radius. The evaluation concluded that the probability of a release affecting the control room from offsite barge, train and highway incidents within the five mile radius was on the order of 1E-06 releases per year.

Current activities are now underway to develop a basis for removing the chlorine detectors using risk informed methodologies and methods described in Regulatory Guide 1.78, Rev. 1. The absence of chlorine and other toxic materials within five miles of the site has been recently re-confirmed as part of these activities. The current analysis has been prepared and is presently in review.

SCBAs are available in the control room for protective action following a toxic gas release or during any emergency. As noted above, no credit is taken for control room design in limiting the effects of toxic gas releases. Therefore, unfiltered in-leakage is not considered in the analysis.

Reactor Control Capability

In the event of a fire/smoke event within the control room or within other areas, ANO credits a series of actions which are taken independently of the control rooms to achieve safe shutdown.

In order to achieve and maintain long-term post-fire safe shutdown, the plant must be transitioned from an assumed 100% power operating condition to cold shutdown. Based upon the plant evolutions required, safe shutdown manual actions may be broken down into two categories:

1. Manual actions required to achieve and maintain stable hot standby mode of operation.

2. Repair actions required to transition from hot standby / hot shutdown to cold shutdown, or maintain cold shutdown.

The separation requirements identified in 10 CFR 50, Appendix R, Section III.G.1 and III.G.2 are applicable to systems/equipment required to maintain stable hot standby conditions only, thus maintaining safe shutdown. There are no requirements for cold shutdown systems/equipment other than they must be repaired within 72 hours. Cold shutdown conditions are not required to be achieved within any timeline requirements. Accordingly, the feasibility of cold shutdown repair actions need not consider the availability of emergency lighting, time, or manpower.

Protection of plant operations staff from the ancillary effects of fire such as smoke and heat are currently being assessed to ensure ingress and egress pathways and remote control stations are accessible and habitable for the time period necessary to complete the required manual action. Consideration is given to the capability to ventilate, exhaust, or isolate the room of fire origin, the proximity and elevation differences of the fire with respect to the location in which the manual action must be performed, and the presence of installed fire barrier components. Additional consideration is given to installed automatic suppression systems as a means of limiting smoke and heat generation. In those instances in which smoke is deemed to potentially impair the operator's ability to successfully complete the desired action, or the action requires an extended stay time, the availability of pre-staged SCBA equipment within the power-block is considered a mitigating feature because all Operations personnel tasked with completing such actions are SCBA-qualified. To further minimize any impacts of smoke on Operations personnel the pathways typically designated for travel include stairways that are either fire rated enclosures or are located in large volume areas, such as the turbine building, that are equipped with smoke venting capability.

(c) That your Technical Specifications verify the integrity of your 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 E-741), 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, explain how and on what frequency you confirm your CRE integrity.

ANO Response:

Technical Specification Task Force (TSTF) 448 modifies the current Improved Technical Specification (ITS) standards of NUREGs 1430-1434 to include requirements for in-leakage testing and is currently under NRC review. The TSTF retains the NUREG requirement to verify the flow rate of filtered outside makeup air through the emergency ventilation systems and adds requirements for testing in accordance with ASTM E741 or other method that may be approved by the NRC in the future. The ANO-1 TSs contain a Surveillance Requirement (SR) that verifies the filtered outside makeup air flow through the CREVS every 18 months. By measuring the air flow, added assurance is maintained that non-filtered in-leakage will be minimized and that the results of the last tracer gas test have not been significantly altered. However, neither ANO unit has a TS SR for ΔP testing. Currently, Entergy has submitted a request for modification of the aforementioned ANO-1 SR such that it would apply to the emergency fan unit associated with ANO-1 only. This same submittal, dated June 30, 2003 (1CAN060302), also requests the addition of a like SR that is applicable to the emergency fan associated with ANO-2. The requested TS modifications are necessary due to the different design of the two fans which result in separate makeup air flow acceptance criteria.

Because the CREVS is a shared system that supports both ANO control rooms, a TS change request has also been submitted for ANO-2 (a non-ITS plant) to incorporate the same NUREG SR requirements discussed above for verifying filtered outside air makeup flow rates. This proposal was submitted as part of the ANO-2 conversion of TS Section 6.0, Administrative Controls, by letter dated June 30, 2003 (2CAN060303). Assuming the approval of the aforementioned amendments (currently anticipated by December 2003), both ANO TSs will be consistent with the current NUREGs with regard to filtered makeup air flow testing.

ANO supports adoption of the remaining portions of TSTF 448 as currently proposed. However, the NRC is expected to comment on TSTF 448, which may lead to further revisions to its wording. Although ANO anticipates that future changes to TSTF 448 will also be acceptable, a commitment to adopt the TSTF in its entirety cannot be made at this time. However, ANO does commit to submit to the NRC proposed changes to both unit's TSs that will capture the intent of the current TSTF and final NRC position within six months following the approval of the TSTF for adoption (currently anticipated by December 2003). The timing of this commitment assumes that TSTF 448 will be included in the Consolidated Line Item Improvement Process (CLIIP) for adoption.

Because ANO has a well-established program for monitoring and maintaining the integrity of the control room boundary, has already performed a tracer gas test, and has proposed to adopt makeup air flow testing for both units, delaying further TS changes with regard to in-leakage testing until TSTF 448 is approved provides acceptable assurance that control room integrity will continue to be maintained.

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

<u>ANO Response</u>:

ANO-1 is presently in an operable but degraded condition, with measured in-leakage of 40 scfm (including 10 scfm due to ingress/egress), which is in excess of the 10 cfm described in the SAR and the 26 scfm determined to be the maximum acceptable unfiltered in-leakage to meet GDC 19 limits without compensatory measures in the operability evaluation (Ref. 8). The compensatory measure to issue KI to control room operators as described above is in effect. Entergy calculations demonstrate that GDC 19 limits would be met for unfiltered in-leakage $\leq$ 340 scfm for the most limiting ANO-1 design basis loss of coolant accident fission product release while using KI.

The provision of KI thyroid blocking tablets has been employed at several nuclear power plants as an interim compensatory measure. The NRC has acknowledged the use of KI as an interim compensatory measure having a protection factor of 10 (SER for Amendment No. 183 for the NPPD Cooper Nuclear Station, dated April 7, 2000). The protection factor of 10 is also consistent with the industry guidance found in NEI 99-03 (Ref. 9), Appendix F, *Compensatory Measures Allowable on an Interim Base.*

The guidance of NEI 99-03 Appendix F states that plant procedures should be in place to direct administration of KI to control room personnel. An Emergency Plan Implementing procedure allows the Operations Shift Manager to administer KI as determined necessary to protect the operators from iodine intake in excess of GDC 19 limits. In addition, a separate procedure ensures that adequate supplies of KI are available in the control room area. The provisions for administration of KI to control room operators will ensure interim compliance with the provisions of GDC 19 until design bases resolution is reached for ANO-1.

In order to retire this compensatory measure, Entergy plans to submit calculations for ANO-1 for the maximum hypothetical design basis large break LOCA (MHA), the fuel handling accident (FHA), and the control rod ejection accident (CREA) using the guidance of Regulatory Guide 1.195 (Ref. 17) to derive a limiting unfiltered in-leakage into the CRE to meet the control room dose acceptance criteria without reliance on KI administration. The following clarifications and exceptions are applicable to this commitment:

1. The current licensing basis will be maintained, which does not assume a postulated concurrent loss of offsite power (LOOP) during a CREA. Neither the ANO-1 design or licensing basis requires demonstration of the ability to cooldown to cold shutdown with a concurrent LOOP following a CREA.

2. The current licensing basis for TS limits on dose equivalent iodine in the Reactor Coolant System (RCS) and secondary coolant (no consideration of iodine spiking) will be maintained, with no concurrent LOOP for the Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB), and Loss of Load accidents being assumed. The control room dose consequences at present TS RCS and secondary coolant iodine activity limits will be validated through sensitivity evaluations not to be bounding with regard to control room operator doses for SGTR, MSLB, Loss of Load and Loss of Onsite AC as described in the SAR and by TS dose equivalent iodine 131 limits for the RCS and secondary coolant. Neither the ANO-1 design or licensing basis requires demonstration of the ability to cooldown to cold shutdown with a concurrent LOOP following a SGTR, MSLB, or Loss of Load Accident.

3. The present licensing basis concerning the evaluation of the dose consequences of a CREA at ANO-1 pre-dates the requirements of Regulatory Guide 1.77 (Ref. 18). In addition, the calculated gap fractions are significantly less than those recommended in Footnote 7 of Regulatory Guide 1.195 (10% for iodines and noble gases). A radial peaking factor is not presently applied to the source term. These two factors combined with the conservative assumption that the containment leaks at the leak rate incorporated in the TSs at peak accident pressure for the first 24 hours, and at 50% of this leak rate for the remaining duration of the accident, present difficulties for ANO-1 control room dose. ANO proposes to demonstrate that the reactor building leak rate after a CREA will be substantially less than the leak rate incorporated in the TSs at the peak accident pressure defined in the TSs associated with containment leak rate testing.

The above commitments are listed in Attachment 2 of this response. Entergy intends to submit these calculations along with a license amendment by June of 2004 and will notify the NRC if the submittal of this information will be delayed for any reason.

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

<u>ANO Response</u>:

ANO-1 and ANO-2 meet the intent of the GDCs that are associated with GL 2003-01. A detailed discussion of the GDCs as they apply to both ANO units may be found in response to Item 1 above.

References:

1. Generic Letter 2003-01, Control Room Habitability, dated June 12, 2003.
2. Condition Report CR-ANO-C-1995-0075.
3. Entergy Letter to NRC dated January 14, 2002, "Submittal of Tracer Gas Test Results and Action Plan for ANO-2 Control Room Habitability for Power Uprate" (2CAN010201).
4. Entergy Letter to NRC dated December 19, 2000, "Application for License Amendment to Increase Authorized Power Level" (2CAN120001).
5. NRC Safety Evaluation Related to Amendment No. 244, April 4, 2002 (2CNA040207).
6. Entergy Letter dated May 14, 2002, "Completion of Control Room Habitability Actions for ANO-2" (2CAN050202).
7. NRC Safety Evaluation Related to Amendment Nos. 192 (ANO-1) and 191 (ANO-2), July 13, 1998 (0CNA079805).
8. Calculation 91-E-0117-19, Determination of Maximum Allowable Unfiltered Control Room Unfiltered Inleakage, September 15, 2001.
9. NEI 99-03, Revision 0, Control Room Habitability Guidance, June 2001.
10. ANO-1 SAR
11. ANO-2 SAR
12. ANO-1 Original SER dated June 6, 1973.
13. ANO-2 Original SER dated November 11, 1977.
14. ANO-2 SER 166 dated September 28, 1995 and SER 222 dated September 29, 2000.
15. ANO-1 SER 184 dated September 20, 1996.
16. Condition Report CR-ANO-C-2001-0607.
17. Regulatory Guide 1.195, Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors, May 2003.
18. Regulatory Guide 1.77, Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors, May 1974.
19. Entergy Letter to NRC dated August 21, 2001, "Response to Request for Additional Information Regarding Radiological Dose Assessment Related to the ANO-2 Power Uprate License Application" (0CAN080108).
20. Calculation 91-E-0117-16, ANO-2 MHA CR and Offsite Dose Analysis, November 29, 2001.

Attachment 2

0CAN080304

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Submit license amendment to adopt TS SR(s) that verify CRH meeting the intent of TSTF 448 and final NRC position. It is Entergy's understanding that TSTF 448 will be included in the Consolidated Line Item Improvement Process (CLIIP).	**X**		**6 months following availability of TSTF 448 for adoption**
Entergy will submit MHA, FHA, and CREA calculations for ANO-1 using the guidance of Regulatory Guide 1.195 to derive a limiting unfiltered in-leakage into the CRE to meet the control room dose acceptance criteria without reliance on KI administration. The following clarifications and exceptions are applicable to this commitment: **1. The current licensing basis will be maintained, which does not assume a postulated concurrent loss of offsite power (LOOP) during a CREA.** **2. The current licensing basis for TS limits on dose equivalent iodine in the Reactor Coolant System (RCS) and secondary coolant (no consideration of iodine spiking) will be maintained, with no concurrent LOOP for the Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB), and Loss of Load accidents being assumed. The offsite and control room dose consequences at present TS RCS and secondary coolant iodine activity limits will be validated through sensitivity evaluations not to be bounding with regard to control room operator doses for SGTR, MSLB, Loss of Load and Loss of Onsite AC as described in the SAR and by TS dose equivalent iodine 131 limits for the RCS and secondary coolant. (continued)**	**X**		**June 30, 2004**

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
3. The present ANO-1 licensing basis analysis of CREA dose consequences pre-dates the requirements of RG 1.77. In addition, the calculated gap fractions are significantly less than those recommended in Footnote 7 of RG 1.195. A radial peaking factor is not presently applied to the source term. These factors combined with the conservative assumption that the containment will leak at the leak rate incorporated in the TSs at peak accident pressure for the first 24 hours, and at 50% of this leak rate for the remaining duration of the accident present difficulties for ANO-1 control room dose. ANO proposes to demonstrate that the reactor building leak rate after a CREA will be substantially less than the leak rate incorporated in the TSs at the peak accident pressure defined in the TSs associated with containment leak rate testing.			