



Entergy Operations, Inc.
1448SR 333
Russellville, AR 72802
Tel 479-858-4888

Jeffery S. Forbes
Vice President
Operations ANO

1CAN060401

June 24, 2004

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

SUBJECT: License Amendment Request
Proposed Operating License Amendment for Revised ANO-1 Control Room
Habitability Analysis
Arkansas Nuclear One, Unit 1
Docket No. 50-313
License No. DPR-51

REFERENCES:

- 1 Entergy letter dated August 28, 2003, *Response to Generic Letter 2003-01* (OCAN080304)
- 2 NRC letter dated April 24, 2002, *Arkansas Nuclear One, Unit No. 2 - Issuance Of Amendment Re: Increase In Licensed Power Level* (2CNA040207)

Dear Sir or Madam:

Pursuant to 10CFR50.90, Entergy Operations, Inc. (Entergy) hereby requests an amendment to the Arkansas Nuclear One, Unit 1 (ANO-1) Operating License No. DPR-51.

Entergy submitted the 180-day response to NRC Generic Letter 2003-01, *Control Room Habitability* (Reference 1), for ANO, Units 1 and 2. As part of our response, Entergy committed to submit revised calculations for ANO-1 using the guidance of Regulatory Guide 1.195 to derive a limiting unfiltered in-leakage into the control room envelope to meet the control room dose acceptance criteria without reliance on compensatory measures. This license amendment fulfills the action to revise the ANO-1 licensing basis on or before June 30, 2004.

The proposed change increases the Maximum Hypothetical Accident (MHA) doses to the control room for ensuring acceptable control room inleakage for compliance to 10CFR50, Appendix A, General Design Criterion 19. The increase in control room thyroid dose to 49.9 rem for the MHA results in a more than minimal change in dose consequences under criterion

A102

1CAN060401

Page 2 of 2

10CFR50.59 (c)(2)(iii). The proposed change is neither exigent nor emergency, but your prompt review is requested. Once approved, the associated SAR changes will be implemented and will be reflected in the next scheduled ANO-1 SAR amendment following approval.

There are no commitments being made as a result of this request. If you have any questions or require additional information, please contact Steve A Bennett at 479-858-4626.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 24, 2004.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Forbes". The signature is written in a cursive style and is positioned above the typed name "J Forbes".

JSF/sab

Attachments:

1. Analysis of Proposed Operating License Change
2. Proposed ANO-1 Safety Analysis Report Changes (Mark-ups)

cc: Dr. Bruce S. Mallett
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P. O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Mr. Thomas W. Alexion MS O-7D1
Washington, DC 20555-0001

Mr. Bernard R. Bevill
Director Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street
Little Rock, AR 72205

Attachment 1

1CAN060401

Analysis of Proposed Operating License Change

1.0 DESCRIPTION

The proposed amendment modifies Operating License No. DPR-51 for Arkansas Nuclear One, Unit 1 (ANO-1) to revise the ANO-1 Safety Analysis Report (SAR). The proposed change increases the Maximum Hypothetical Accident (MHA) doses to the control room for ensuring acceptable control room inleakage for compliance to 10CFR50, Appendix A, General Design Criterion (GDC) 19. The increase in control room thyroid dose to 49.9 rem results in a more than minimal change in dose consequences under criterion (c)(2)(iii) of 10CFR50.59.

2.0 PROPOSED CHANGE

Entergy submitted the 180-day response to NRC Generic Letter 2003-01, *Control Room Habitability* (Reference 1), for ANO, Units 1 and 2. As part of our response, Entergy committed to submit revised calculations for ANO-1 using the guidance of Regulatory Guide 1.195, *Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors*, to derive a limiting unfiltered in-leakage into the control room envelope to meet the control room dose acceptance criteria without reliance on potassium iodide (KI) administration. This proposed change to the ANO-1 licensing basis is being submitted on or before June 30, 2004 as committed in Reference 1.

ANO-1 SAR Section 11.2.4.2, *Reactor Building Shell*, is being modified to read:

In the event of a MHA, the shell shielding will reduce plant and offsite radiation intensities emitted directly from released fission products below levels as defined by: (1) onsite occupancy limits of 5 rem whole body dose and 50 rem thyroid and, (2) exclusion distance limits of 10CFR100.

ANO-1 SAR Section 14.2.2.6.7, *Control Room Doses*, is being modified to read:

The dose to the control room operator from reactor building and ES leakage has been assessed using the guidance of NRC Regulatory Guide 1.195. The Emergency Air Conditioning and Filtration Systems provided for the Control Room are described in Section 9.7.2.1. Iodine efficiencies of 95% for the recirculation filters and 99% for the outside filtered air used for control room pressurization are assumed. Unfiltered inleakage is assumed to be 52 cfm. The 30 day integrated dose to the thyroid of a control room operator from reactor building and ES leakage is 49.9 Rem.

There is no impact to the ANO-1 Technical Specifications (TS).

In Reference 1, Entergy had also committed to submit a license amendment to adopt TS Surveillance Requirements (SRs) that would verify control room habitability (CRH) per Technical Specification Task Force (TSTF) 448 and the final NRC position on CRH. Entergy still understands that TSTF 448 has not been approved. Therefore control room habitability verification testing is not being addressed in this submittal. As previously stated, the new surveillances will be addressed following approval of the TSTF.

3.0 BACKGROUND

The control rooms for ANO-1 and ANO-2 are adjoining each other. The two control rooms are separated, however, with louvers in the walls between the control rooms provide a common control room envelope (CRE). 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. The CRE is designed and maintained to be as airtight, as practicable. However, the two units have separate licensing basis for acceptable inleakage based on different accident analyses.

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 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 trains. Each train 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 was originally designed to reduce the potential control room operator dose from a radiological accident to within the GDC 19 limits, based upon an unfiltered in-leakage rate of 10 standard cubic feet per minute (scfm). However, recent tracer gas testing indicates actual in-leakage rates (30 scfm not including ingress and egress) are in excess of this value.

The original analysis of control room habitability for ANO-1 was established assuming 10 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 license amendment review for power uprate on ANO-2, Entergy performed a tracer gas test on the ANO control room envelope in the fall of 2001 to determine the actual in-leakage into the control room.

A calculation 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 self contained breathing apparatus (SCBA). This calculation reviewed accidents for which control room doses had been calculated to demonstrate compliance with GDC 19 in the ANO Licensing Bases. For ANO-1, consideration was given to the following accidents for which control room doses had been assessed:

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

The control room dose consequences of the other accidents described in Chapter 14 of the ANO-1 SAR were not previously calculated.

The design/licensing basis for the ANO-1 Main Steam Line Break, the Steam Generator Tube Rupture, and the Loss of Load accidents 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 were a fraction (< 10%) of the doses resulting from the MHA. Therefore, the control room doses from a CREA were judged to be bounded by those of the MHA at the same assumed unfiltered in-leakage rate.

The results of the analysis demonstrated that GDC-19 acceptance criteria could be met for unfiltered in-leakage of ≤ 26 scfm. With the issuance of KI as a compensatory measure, Entergy calculations demonstrated that GDC-19 limits would be met for unfiltered in-leakage of 340 scfm for the ANO-1 MHA. Therefore, ANO-1 is presently in an operable but degraded condition, with a measured in-leakage of 40 scfm (including 10 scfm due to ingress/egress), which is in excess of the 10 scfm 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.

As discussed in Reference 1, in order to retire this compensatory measure, Entergy committed 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 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 is being 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) is being maintained. No concurrent LOOP for the Steam Generator Tube Rupture (SGTR), Main Steam Line Break (MSLB), and Loss of Load (LOL) accidents is being assumed. The control room dose consequences using TS RCS and secondary coolant iodine activity limits have been validated through sensitivity evaluations not to be bounding for control room operator doses for the SGTR, MSLB, LOL and Loss of Onsite AC (LOAC) as described in the SAR and by TS dose equivalent iodine 131 limits.
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, *Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors*. However, the calculated gap fractions assumed are consistent with RG 1.77 and footnote 7 of Regulatory Guide 1.195 (10% for iodines and noble gases) with no additional radial peaking factor applied. The containment was assumed to leak at the leak rate incorporated in the technical specification at peak accident pressure for the first 24 hours,

and at 50% of this leak rate for the remaining duration of the accident. In addition, a fifty percent reduction, due to natural deposition, in the amount of radioactive material available for leakage from the containment was taken. Although these three items are consistent with RG 1.77, this does not imply that ANO-1 is committing to the requirements of RG 1.77.

4.0 TECHNICAL ANALYSIS

4.1 Design Basis

An evaluation of the maximum allowable control room unfiltered in-leakage performed using current licensing basis assumptions demonstrated that ANO could meet the Standard Review Plan (SRP) criterion of 30 rem to the thyroid with up to 26 scfm unfiltered in-leakage following an ANO-1 MHA. The evaluation illustrated that the limiting concern with unfiltered in-leakage in excess of design basis assumptions is the thyroid dose from inhalation.

Tracer gas testing (TGT) of the common control room envelope at ANO in 2001 established an actual unfiltered in-leakage rate of 30 scfm. Accident dose analyses assume an additional 10 scfm for ingress and egress, for a total of 40 scfm. However, the design/licensing basis for the ANO-1 MHA is 10 scfm unfiltered in-leakage due to ingress/egress only (ANO-1 SAR Section 14.2.2.6.7). Since the measured unfiltered in-leakage is above the design/licensing basis value, as well as above the maximum calculated allowable in-leakage of 26 scfm, compensatory measures were required and have been established since conduct of the TGT.

4.2 Design Input Considerations

New or revised control room dose consequences have been calculated for the various accidents identified above. The current ANO-1 design/licensing basis analysis input and assumptions are unchanged unless noted below:

Control Room Dose Calculations: Control room dose calculations were previously performed for MHA and FHA only. New calculations that address control room dose consequences associated with CREA, MSLB, SGTR, LOL and LOAC have been performed. These new calculations utilize the current ANO-1 design/licensing basis input and assumptions that were used in performing the offsite dose calculations, except as identified below.

Acceptance Criteria: The revised acceptance criteria of NRC Regulatory Guide 1.195 have been adopted. These criteria are ≤ 5 rem whole body, ≤ 50 rem thyroid and ≤ 50 rem skin.

Source Term: The ANO-1 source terms were recalculated using ORIGEN-ARP and assuming 102% of the current licensed power level of 2568 MWt. The previous source terms for the MHA were based on TID-14844 and assumed 101.1% of 2568 MWt; for the FHA, the previous source terms were based on the ORIGEN II code and assumed 103% of an updated power level of 2772 MWt. The new source term development included

performance of sensitivity studies to identify the enrichment and burnup that provide the worst case values. The revised source terms are provided in Table 1.

Spray fraction: The actual net free volume of the ANO-1 reactor building and its sprayed fraction were updated. Although the results of these calculations had an insignificant impact on doses, the previous sprayed-fraction calculation utilized information that was developed while the plant was still under construction. The revised calculation provides a better basis for the values used in the analyses. The revised sprayed fraction is 89%; unsprayed is 11%.

Atmospheric Dispersion Factors: The χ/Q values from calculations previously used for the ANO-2 extended power uprate analyses (already reviewed and approved by the NRC for use on that unit) were used in the new and revised ANO-1 calculations. Tables 2 through 5 provide the updated χ/Q values used in the new ANO-1 analyses.

Breathing Rate: The breathing rate of $3.5 \times 10^{-4} \text{ m}^3/\text{s}$ (NRC Regulatory Guide 1.195) was used in all analyses except the FHA. The current CR dose calculations for the FHA assume $3.47 \times 10^{-4} \text{ m}^3/\text{s}$, so this value was maintained for the additional cases. The values are essentially identical and the difference has a negligible (<1%) impact on the FHA results.

Plateout: Credit for plateout of radioactive iodines inside containment following a CREA has been taken. The current CREA offsite dose calculations do not take this credit.

Fuel Handling Delay Time: The delay time after shutdown prior to handling fuel was decreased from 100 hours to 72 hours for the FHA analyses.

4.3 Results:

Entergy calculated new control room dose consequences for the following accidents:

- Maximum Hypothetical Accident (MHA) which is the maximum hypothetical design basis large break LOCA for ANO-1
- Fuel Handling Accident (FHA)
- Control Rod Ejection Accident (CREA)
- Main Steam Line Break (MSLB)
- Steam Generator Tube Rupture (SGTR)
- Loss of Load (LOL)
- Loss of All AC Power (LOAC)

Assuming a control room unfiltered in-leakage of 52 scfm, the dose results (in rem) of the calculations performed are as follows:

Accident	Whole Body	Thyroid	Skin
MHA	0.57	49.9	20.3
FHA	3.2E-2	10.4	2.4
CREA	8.46E-3	24.87	0.29
MSLB	7.1E-7	0.16	1.4E-5
SGTR	4.9E-2	2.85	3.30
LOL	3.5E-8	7.8E-3	6.9E-7
LOAC	6.5E-7	0.15	1.3E-5

These results show that the MHA remains bounding for ANO-1 with the thyroid dose most limiting (least margin to acceptance criteria). The FHA results are without ESF or purge filtration credit. Section 14.2.2.6.7 of the ANO-1 SAR currently reports the 30 day integrated dose to the thyroid of a control room operator from reactor building and ES leakage to be 18.93 Rem.

Based on the above results, the GDC 19 acceptance criteria are met for all ANO-1 accidents with control room unfiltered in-leakage of 52 scfm. Since this value exceeds the actual, tested unfiltered in-leakage of 30 scfm by greater than 10 scfm (to account for ingress/egress), the control room will no longer require compensatory measure to ensure design and licensing basis compliance. Therefore, reliance on issuance of KI and credit for this compensatory measure can be retired upon NRC acceptance of this license amendment request.

Table 1
ANO-1 Source Terms

The following table presents the core radionuclide inventory for current rated power including 2% uncertainty (2619.36 MWt).

Isotope	(Ci)	(Ci/MW)
i131	7.100E+07	2.711E+04
i132	1.037E+08	3.958E+04
i133	1.443E+08	5.509E+04
i134	1.584E+08	6.048E+04
i135	1.379E+08	5.263E+04
kr83m	7.815E+06	2.984E+03
kr85*	6.109E+05	2.332E+02
kr85m	1.578E+07	6.023E+03
kr87	3.148E+07	1.202E+04
kr88	4.338E+07	1.656E+04
xe131m	8.849E+05	3.378E+02
xe133	1.386E+08	5.290E+04
xe133m	4.202E+06	1.604E+03
xe135	3.339E+07	1.275E+04
xe135m	3.077E+07	1.175E+04

*Note: kr85 is used in the FHA dose calculation only

Table 2
MHA Input Parameters

<u>Parameter</u>	<u>Input Value</u>
Power level for analysis (102%)	2619 MWt
Fraction of iodine in the reactor building atmosphere	0.25
Fraction of noble gases released from the core	1.0
Iodine species distribution	0.91 elemental 0.04 organic 0.05 particulate
RB Net Free Volume	1.81E6 ft ³
Unsprayed Volume	2.00E5 ft ³ (rounded up)
Sump Volume	51122 ft ³
Sprayed Volume	1.61E6 ft ³
Initial fraction	0.11 unsprayed 0.89 sprayed
RB mixing rates	6667 cfm unsprayed to sprayed 6667 cfm sprayed to unsprayed
RB leak rates	0.2%/day <=24 hrs 0.1%/day >24 hrs, or
sprayed	2.24 cfm <=24 hrs 1.12 cfm >24 hrs
unsprayed	0.278 cfm <=24 hrs 0.139 cfm >24 hrs
PREVS effective efficiency	45%
Spray Removal Rates	
elemental	10 hr ⁻¹ until DF=200, then 0 (t=21.6 hrs)
organic	no removal
particulate	2.33 hr ⁻¹ until DF=50 then 0.233hr ⁻¹ (t=1.7 hrs)
Spray Initiation	300 sec
CR χ/Q	4.36E-3 s/m ³ 0-2 hrs 3.05E-3 s/m ³ 2-8 hrs 1.36E-3 s/m ³ 8-24 hrs 8.66E-4 s/m ³ 1-4 days 7.36E-4 s/m ³ 4-30 days
CR Breathing Rates	3.5E-4 m ³ /s for duration of the event
CR Occupancy Factors	1.0 0-24 hrs 0.6 1-4 days 0.4 4-30 days
CR Volume	40,000 ft ³
CR Unfiltered Inleakage	52 cfm
CR Filtered Inleakage	333 cfm (bounding)

<u>Parameter</u>	<u>Input Value</u>
CR Recirculation Flow	1667 cfm
CR Intake Filter Efficiency	99%
CR Recirculation Filter Efficiency	95%
Dose Conversion Factors (DCF)	ICRP 30
Dose Conversion Factors (DCF)	Federal Guidance Report 12, Table III.1 column headed "Skin"

ESF Leakage Portion

Fraction of iodine in the sump	0.5
Iodine species distribution	0.97 elemental 0.03 organic
ESF Leakage Rate	391 cc/hr (2.301E-4 cfm)
Time to Recirculation	4257 sec (1.1825 hr)
Plate Out	0.9

Table 3
FHA Input Parameters

<u>Parameter</u>	<u>Input Value</u>
Power level for analysis (102%)	2619 MWt
Peaking Factor	1.8
Control Room Volume	$4.00 \times 10^4 \text{ ft}^3$
CR unfiltered inleakage	52 cfm [42 + 10 cfm]
CR filtered inleakage	333 cfm (bounding)
CR out leakage	385 cfm [333 + 52 cfm]
CR recirculation	1667 cfm
CR occupancy factor (0-24 hrs)	1.0
Breathing Rate (CR)	$3.47 \times 10^{-4} \text{ m}^3/\text{s}$
Control Room χ/Q (0-2 hrs)	$3.55 \times 10^{-3} \text{ s/m}^3$
CR filter efficiency	
recirc (2" filter)	95%
intake (2-2" filters)	99%
Dose Conversion Factors (DCF)	ICRP 30
Fuel Release Fraction	
Noble Gases (except Kr-85)	10%
Kr-85	30%
Halogens	12%
Plate out	0%
Iodine Form	
Inorganic	99.75%
Organic	0.25%
Pool Decontamination Factors	
Inorganic Iodine	133
Organic Iodine	1

Table 4
CREA Input Parameters

<u>Parameter</u>	<u>Input Value</u>
Power level for analysis (102%)	2619 MWt
Iodine species distribution	0.91 elemental 0.04 organic 0.05 particulate
RB Net Free Volume	1.81E6 ft ³
RB leak rates	0.2%/day <=24 hrs 0.1%/day >24 hrs, or 2.515 cfm <=24 hrs 1.257 cfm >24 hrs
PREVS effective efficiency	45%
CR χ/Q	4.36E-3 s/m ³ 0-2 hrs 3.05E-3 s/m ³ 2-8 hrs 1.36E-3 s/m ³ 8-24 hrs 8.66E-4 s/m ³ 1-4 days 7.36E-4 s/m ³ 4-30 days
CR Breathing Rates	3.5E-4 m ³ /s for duration of the event
CR Occupancy Factors	1.0 0-24 hrs 0.6 1-4 days 0.4 4-30 days
CR Volume	40,000 ft ³
CR Unfiltered Inleakage	52 cfm
CR Filtered Inleakage	333 cfm (bounding)
CR Recirculation Flow	1667 cfm
CR Intake Filter Efficiency	99%
CR Recirculation Filter Efficiency	95%
Dose Conversion Factors (DCF)	ICRP 30
Dose Conversion Factors (DCF)	Federal Guidance Report 12, Table III.1 column headed "Skin"

Table 5
MSLB/SGTR/LOL/LOAC Input Parameters

<u>Parameter</u>	<u>Input Value</u>
Activity Released - MSLB - SGTR - LOL - LOAC	4.73 equivalent Ci ¹³¹ I 13.91 equivalent Ci ¹³¹ I and 2.561E4 equivalent Ci ¹³³ Xe 3.8E-2 equivalent Ci ¹³¹ I 7.1E-1 equivalent Ci ¹³¹ I
CR χ/Q - MSLB - SGTR, LOL, LOAC	3.15E-3 s/m ³ 0-2 hrs 1.90E-2 s/m ³ 0-2 hrs
CR Breathing Rates	3.5E-4 m ³ /s for duration of the event
CR Occupancy Factor	1.0
CR Volume	40,000 ft ³
CR Unfiltered Inleakage	52 cfm
CR Filtered Inleakage	333 cfm (bounding)
CR Recirculation Flow	1667 cfm
CR Intake Filter Efficiency	99%
CR Recirculation Filter Efficiency	95%
Dose Conversion Factors (DCF)	ICRP 30
Dose Conversion Factors (DCF)	Federal Guidance Report 12, Table III.1 column headed "Skin"

5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

ANO-1 Compliance with 10CFR50, Appendix A, General Design Criterion 19 - 10CFR50, Appendix A, GDC 19 requires a control room be maintained in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.

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 an accident 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 14.15). The design basis accident which defines the protection required for the control room is the MHA. This accident condition is described in Chapter 14 of the ANO-1 SAR. The NRC has interpreted the thyroid dose that is equivalent to 5 rem whole body to be 30 rem in Section 6.4 of the SRPs. With the thyroid dose acceptance criterion of 50 rem allowed by Regulatory Guide 1.195, the ANO control rooms will be maintained in a safe and habitable configuration to meet GDC 19.

Evaluation of ANO-1 Safety Analysis Report – ANO-1 SAR Section 11.2.4.2, Reactor Building Shell currently states,

*In the event of a MHA, the shell shielding will reduce plant and offsite radiation intensities emitted directly from released fission products below levels as defined by:
(1) onsite occupancy limits of 5 rem whole body dose and 30 rem thyroid.*

The thyroid dose acceptance criteria is being revised to be 50 rem per NRC Regulatory Guide 1.195.

ANO-1 SAR Section 14.2.2.6.7 *Control Room Doses*, currently states:

The dose to the control room operator from reactor building and ES leakage has been assessed. The Emergency Air Conditioning and Filtration Systems provided for the Control Room are described in Section 9.7.2.1. Iodine efficiencies of 95% for the recirculation filters and 99% for the outside filtered air used for control room pressurization are assumed. Unfiltered inleakage is assumed to be 10 cfm. The 30 day integrated dose to the thyroid of a control room operator from reactor building and ES leakage is 18.93 Rem.

This SAR section is being modified to provide an allowed control room inleakage of 52 cfm, which results in a MHA thyroid dose of 49.9 rem using the guidance of NRC Regulatory Guide 1.195.

ANO-1 Technical Specifications - ANO-1 TS Surveillance Requirement (SR) 3.7.9.4 and SR 3.7.9.5 require that every 18 months the verification of the makeup flow rate of VSF-9 to be between 300 and 366 cfm and 2VSF-9 to be between 418.5 and 511.5 cfm when

supplying the control room with outside air, respectively. These surveillance requirements are unaffected by the proposed change.

5.2 No Significant Hazards Consideration

The proposed amendment modifies Operating License No. DPR-51 for Arkansas Nuclear One, Unit 1 (ANO-1) to revise the ANO-1 Safety Analysis Report (SAR). The proposed change increases the Maximum Hypothetical Accident (MHA) doses to the control room for ensuring acceptable control room inleakage for compliance to 10CFR50, Appendix A, General Design Criterion (GDC) 19. The increase in control room thyroid dose to 49.9 rem for the MHA results in a more than minimal change in dose consequences under criterion (c)(2)(iii) of 10CFR50.59.

Entergy Operations, Inc. has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three criteria set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed changes adopt new dose acceptance criteria in Regulatory Guide 1.195 for calculating radiological consequences of design basis accidents. The proposed change increases the allowable unfiltered inleakage to 52 scfm which increases the licensing basis thyroid doses for ANO operators to 49.9 rem for the ANO-1 Safety Analysis Report MHA. The new MHA doses are within NRC approved guidance. The proposed change does not impact the probability of an accident previously evaluated in the SAR.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The accident analysis performed in establishing new control room unfiltered inleakage value of 52 scfm were primarily performed using the existing licensing basis for the ANO-1 SAR. However, a new thyroid dose acceptance criterion of 50 rem was used per Regulatory Guide 1.195 instead of the previous Standard Review Plan thyroid dose limit of 30 rem. Dose consequences of non-LOCA events (except for the Fuel Handling Accident) were not historically calculated in the ANO-1 SAR. The doses had been assumed to be a fraction of the doses resulting from the MHA. New analyses of these control room doses confirmed them to be bounded by the revised MHA control room doses.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

Even though the ANO-1 SAR reported doses for the MHA are being increased in the proposed change, they are still within the NRC acceptance criteria of Regulatory Guide 1.195. Other assumptions are consistent with the current ANO-1 licensing basis or previously NRC approved assumptions within the industry. The increase in allowable inleakage by the proposed change maintains the operator doses within GDC 19 limits with no compensatory measures to reduce thyroid uptake.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Entergy concludes that the proposed amendment(s) present no significant hazards consideration under the standards set forth in 10CFR50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.3 Environmental Considerations

The proposed amendment is confined to (i) changes to surety, insurance, and/or indemnity requirements, or (ii) changes to record keeping, reporting, or administrative procedures or requirements. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(10). Therefore, pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

A similar change was approved by the NRC for ANO-2 (Reference 2) during the power uprate for that unit. However, Regulatory Guide 1.195 acceptance criteria were not utilized in the ANO-2 analysis.

Attachment 2

1CAN040601

Proposed ANO-1 Safety Analysis Report Changes (Mark-ups)

ARKANSAS NUCLEAR ONE
Unit 1

$V_o =$ fission yield for isotope i

- B. One hundred percent of the noble gases, 50 percent of the halogens and one percent of the solid fission products are released to the containment.
- C. The isotopes in "B" above are uniformly distributed in the containment, taken to be a cylinder with free volume of 1.9×10^6 ft³. No credit is taken for shielding by the internal structures in the containment. Credit is taken for the 3-foot, 9-inch containment wall.
- D. No credit is taken for containment leakage, plateout of iodines or effectiveness of the containment spray system in removing fission products from the containment atmosphere. The only decrease in source strength is decay.

The 30-day integrated dose from containment shine is 210 mrem.

In determining the dose from cloud shine all of the above assumptions apply except that the containment leakage is conservatively assumed to be 0.2%/day for the duration of the accident.

The leakage is taken to be at the control room roof level and passed directly over the control room, continuously for 30 days. The dose to personnel from cloud shine is 950 mrem.

The total 30-day dose from containment shine and cloud shine is 685 mrem.

The Emergency Air Conditioning and Filtration Systems provided for the control room are described in Section 9.7.2. The evaluation of control room operator doses given in Section 14.2.2.6 shows that the dose received during the 30 days following a postulated LOCA is less than the limits of 10 CFR 50 General Design Criterion 19.

11.2.4.2 Reactor Building Shell

The reactor building shell is a reinforced prestressed concrete structure which serves two main shielding purposes:

- A. During normal operation, it shields the surrounding plant structures and yard areas from radiation originating at the reactor vessel and the primary loop components. Together with additional shielding inside the containment, the concrete shell will reduce radiation levels outside the shell to below 1.0 mrem/hr in those areas which are occupied by personnel either on a permanent or routine basis.
- B. In the event of a MHA, the shell shielding will reduce plant and offsite radiation intensities emitted directly from released fission products below levels as defined by: (1) onsite occupancy limits of 5 rem whole body dose and ~~50~~ 30 rem thyroid and, (2) exclusion distance limits of 10CFR100. The concrete roof of the reactor building has been specifically designed to reduce radiation contributions from sky-shine. Activities inside the reactor building during an MHA and the off-site doses associated with the MHA are given in Chapter 14.

ARKANSAS NUCLEAR ONE
Unit 1

D = beta skin dose, rem

$(DCF)_i$ = beta skin dose per curie of isotope i, $\text{rem}\cdot\text{m}^3/\text{Ci}\cdot\text{sec}$

X/Q_T = Same as defined above

Q_{IT} = Same as defined above

The beta skin dose is shown in Table 14-52

14.2.2.6.6 Effects of Engineered Safeguards Systems Leakage during the Maximum Hypothetical Accident

The Reactor Building Spray System pumps and LPI pumps are located in sealed rooms of the auxiliary building through which air does not circulate. Cooling is accomplished by a closed cycle ventilation system which blows room air over cooling water coils. Therefore iodine leaking from these pumps is not exhausted through the plant vent by the ventilation system. A flow path does exist from LPI and the Reactor Building Spray Pumps through the penetration rooms and into the Reactor Building. Leakage from portions of this flow path outside the sealed rooms has been evaluated to assess the dose impact. Offsite dose estimates from containment and ES leakage are shown in Table 14-52.

Iodine leaking from the HPI pumps and portions of the HPI System flow path is not contained in sealed rooms. This leakage has been evaluated to assess the impact upon the MHA doses even though recirculation through the HPI System in the piggyback mode is expected only for certain small break LOCAs. The additional dose from HPI System leakage, using source terms consistent with the minimal fuel damage expected during small break LOCAs, was determined to be less than 0.04 rem thyroid for both the 2 hour exclusion distance and 30 day low population zone dose. Therefore, no significant offsite doses result from these sources, and the radiation released is as low as practicable.

14.2.2.6.7 Control Room Doses

The dose to the control room operator from reactor building and ES leakage has been assessed using the guidance of NRC Regulatory Guide 1.195. The Emergency Air Conditioning and Filtration Systems provided for the Control Room are described in Section 9.7.2.1. Iodine efficiencies of 95% for the recirculation filters and 99% for the outside filtered air used for control room pressurization are assumed. Unfiltered inleakage is assumed to be 52 ~~40~~ cfm. The 30 day integrated dose to the thyroid of a control room operator from reactor building and ES leakage is 49.9 ~~48.93~~ Rem.

14.2.2.7 Waste Gas Tank Rupture

In this accident, it is assumed that a waste gas tank ruptures releasing the waste gas it contains into the auxiliary building. The radioactive waste gas is then assumed to be carried out the plant vent by the Auxiliary Building Ventilation System. In this analysis, it is assumed the plant vent remains open. In addition, no decay of radioisotopes is assumed after the waste gas tank rupture occurs.