

Entergy Operations, Inc.
Route 3 Box 137G
Russellville, AR 72801
Tel 501-964-3588

Jerry W. Yelverton
Vice President
Operations AND

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2CAN029305

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Proposed ANO-2 Technical Specification to Revise
Containment Internal Pressure

Gentlemen:

Attached for your review and approval is an updated Large Break Loss of Coolant Accident (LBLOCA) evaluation and the associated proposed Technical Specification (TS) change for Arkansas Nuclear One, Unit 2 (ANO-2). This change will revise the containment internal pressure lower limit of TS Figure 3.6-1.

The new LBLOCA evaluation is performed utilizing the latest approved ABB-CE evaluation model which is in accordance with 10CFR50 Appendix K. This methodology has been used by other Combustion Engineering plants (Waterford-3, St. Lucie, and Calvert Cliffs). The new LBLOCA analysis also allows for up to 10% steam generator tube plugging.

In accordance with 10CFR50.91(a)(1), and using criteria in 10CFR50.92(c), Entergy Operations has determined that this change involves no significant hazards consideration. The bases for these determinations are included in the enclosed submittal.

Although the circumstances of this submittal are neither emergency or exigent, prompt review and approval of this proposed amendment is requested. We request that the effective date of this change be 30 days after NRC issuance of the amendment to allow for distribution and implementation of procedure revisions.

Very truly yours,

J. W. Yelverton

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JWY/jt
Attachments

9303020474 930224
PDR ADOCK 05000368
P PDR

ADD

cc: Mr. James L. Milhoan
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One - ANO-1 & 2
Number 1, Nuclear Plant Road
Russellville, AR 72801

Mr. Roby Bevan
NRR Project Manager, Region IV/ANO-1
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

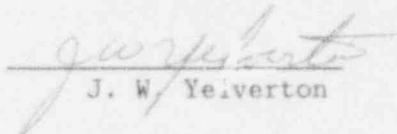
Mr. Thomas W. Alexion
NRR Project Manager, Region IV/ANO-2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Ms. Greta Dicus
Arkansas Department of Health
Division of Radiation Controls
and Emergency Management
4815 W. Markham Street
Little Rock, AR 72205

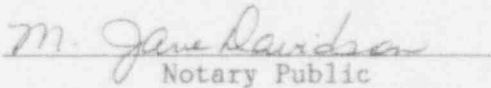
STATE OF ARKANSAS)
)
COUNTY OF POPE)
) SS

Affidavit

I, J. W. Yelverton, being duly sworn, subscribe to and say that I am Vice President, Operations ANO for Entergy Operations, that I have full authority to execute this affidavit; that I have read the document numbered 2CAN029305 and know the contents thereof; and that to the best of my knowledge, information and belief the statements in it are true.

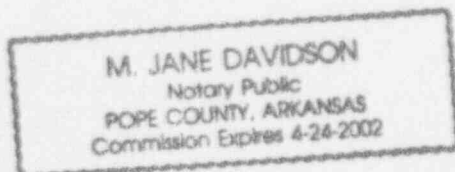

J. W. Yelverton

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for the County and State above named, this 24th day of February, 1992. ^{op}


Notary Public

My Commission Expires:

4-24-2002



ATTACHMENT
PROPOSED TECHNICAL SPECIFICATION
AND
RESPECTIVE SAFETY ANALYSES
IN THE MATTER OF AMENDING
LICENSE NO. NPF-6
ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNIT TWO
DOCKET NO. 50-368

Proposed Change

This proposed change revises ANO-2 TS Figure 3.6-1 containment internal pressure lower limit from 12.8 to 13.2 psia.

Background

Over the past 10 cycles, changes have been made in the ANO-2 fuel design and core physics parameters which have affected the Large Break Loss of Coolant Accident (LBLOCA) analysis. These changes, in addition to any identified input parameter discrepancies have been evaluated case by case. To address each issue, a conservative change to the appropriate input parameters was made in the affected portion of the LBLOCA analysis, which was then reevaluated to determine the effect on the results. Operating margin to the linear heat rate assumed in the LBLOCA analysis has been used to offset any negative changes (i.e. the present LBLOCA analysis is based on a peak linear heat rate of 12.1 kW/ft, reduced from 14.5 kW/ft assumed in the original Safety Analysis Report (SAR) LBLOCA analysis). The latest such changes were identified in our letter 2CAN079201, dated July 9, 1992 (Reference 1), which resulted in a reduction in the linear heat rate from 13.5 kW/ft to 12.1 kW/ft to account for changes in the cycle 10 core physics and a discrepancy identified in the allowable initial containment conditions.

In an effort to consolidate all of the changes and discrepancies that have been identified over the years and restore operating margin to the linear heat rate limit, a complete LBLOCA reanalysis was performed. The current ANO-2 LBLOCA Analysis is based on CENPD-132P Supplement 2-P. As required by the Combustion Engineering LBLOCA Safety Evaluation Report (SER) (Reference 2), the reanalysis required that the ANO-2 analysis be updated to the CENPD-132 Supplement 3-P-A (Reference 3) methodology whenever a full reanalysis was necessary. During this effort to update the analysis and consolidate all of the changes, the input parameters were also reviewed and adjusted accordingly to account for potential future changes (see Anticipated Plant Changes under the Discussion section). A steam generator tube plugging limit of 10 percent is one such change that has been incorporated into the new LBLOCA analysis.

Discussion

As indicated above, the ANO-2 LBLOCA analysis has been re-performed utilizing the latest approved Combustion Engineering evaluation model (Reference 3). The ANO-2 input parameters have therefore been updated to the new model requirements. Additionally, the inputs were reviewed to ensure the present plant design conditions were being correctly modeled and potential future plant changes were considered. All inputs and calculations were developed by ASEA Brown Boveri Combustion Engineering (ABB-CE) using the approved evaluation model methodologies. The supporting calculations for the ANO-2 LBLOCA input parameters and analysis are maintained by ABB-CE in Windsor, Connecticut. The input parameter changes are summarized below in the following four categories:

- 1) Latest Evaluation Model Updates
- 2) Past Cycle Changes

- 3) Present Plant Data
- 4) Anticipated Plant Changes

Latest Evaluation Model Updates

Several changes were made to the evaluation model from CENPD-132P Supplement 2-P to CENPD-132 Supplement 3-P-A which required the input parameters to be updated. Hence, the ANO-2 input parameters were reviewed and updated to conform to the new model. Changes to the evaluation model which impact the input parameters are: a) the limiting single failure, b) analytical nodalization modifications, and c) axial power shape sensitivity study.

A new limiting failure of "no single failure" is referenced in CENPD-132 Supplement 3-P-A. The present limiting single failure assumed for ANO-2 is that of a Low Pressure Safety Injection (LPSI) pump failure (based on Supplement 2-P). This new limiting single failure allows both LPSI pumps to operate. All High Pressure Safety Injection (HPSI) and LPSI pump flow out the break (flow not assumed to go to the core) is modeled to reduce containment backpressure per CENPD-132 Supplement 3-P-A. This additional reduction in containment backpressure has been determined to result in higher PCTs. Therefore, the limiting failure of no single failure was assumed in the new ANO-2 LBLOCA analysis.

Changes identified in CENPD-132 Supplement 3-P-A to the CEFLASH-4A computer code have allowed for modifications to the nodalization in the reactor vessel lower plenum region and broken pump discharge (cold) leg. These nodalization changes have been incorporated into the ANO-2 input parameters.

CENPD-132 Supplement 3-P-A also documented a sensitivity study on axial power distribution. The axial power shape assumed for ANO-2 was verified to be consistent with that of the limiting case determined by the sensitivity study.

Past Cycle Changes

All of the following changes which have occurred over the past 10 cycles (as documented in cycle-specific reload reports under the provisions of 10CFR50.59 which are subsequently incorporated into chapter 4A of the SAR) have been incorporated into the new LBLOCA analysis:

- 1) Difference in fuel pin conditions (fuel augmentation factor, gap conductance, centerline temperature, gas pressure, etc.)
- 2) Introduction of fuel batches that have HID-1 spacer grids
- 3) Removal of the hot rod augmentation penalty
- 4) Addition of debris resistant fuel batches
- 5) Increased plugging of steam generator tubes
- 6) Reduction of the linear heat rate
- 7) Reduction in the initial containment temperature
- 8) Reduction in the initial containment pressure

Present Plant Data

Most of the input parameters were not affected by the changes made in the evaluation model, past cycle changes, or anticipated changes. For these unaffected input parameters, the original calculations were utilized. Updates were made to any input parameter for which better information was available. In particular, bounding input parameters which originally were used to model ANO-2 and the uncompleted Blue Hills plant were updated to reflect ANO-2 specific numbers.

Anticipated Plant Changes

Based on past experiences at ANO-2 and other ABB-CE plants, changes were made to input parameters to alleviate tight operating margins and to accommodate changing plant conditions. Some of these changes are reflected in Tables 1 and 2. Other input parameter changes to allow for 10 percent steam generator tube plugging, maximum Refueling Water Tank (RWT) temperature of 120 °F, and minimum HPSI and LPSI flow of 678 gpm and 3222 gpm per pump, respectively were also incorporated.

Tables 1 and 2 compare the relevant input changes made to the general system design and containment model. These tables of information are similar to those given in the SAR. Input parameters for the containment heat sink data used in the new analysis are given in Table 6.2-35 of Attachment 1 (previously SAR Table 6.3-10). These heat sink parameters are the same as those used in the original LBLOCA analysis except for small round-off differences. However, errors have been identified in the Safety Analysis Report (SAR) Table 6.3-10 with regards to the paint thickness for heat sink 7 (0.0037 ft versus 0.0004 ft), concrete thickness for heat sink 9 (1.8219 ft versus 2.70 ft), and the surface area for heat sink 9 (118,000 ft² versus 68,000 ft²). These new values are consistent with the original LBLOCA analyses and constitute corrections to the SAR table only.

The only input parameter change which is considered more restrictive than the present allowable Technical Specification limits is that which limits the initial containment pressure. The ANO-2 LBLOCA analysis assumes initial containment conditions which result in the lowest peak building pressure following a LOCA. Per 10CFR50 Appendix K, the conservative analysis assumption is to minimize containment pressure. Lower PCTs are expected as a result of an increase in the initial containment pressure. Using an initial containment pressure lower limit of 13.2 psia rather than 12.8 psia in the LBLOCA analysis, necessitates a change to present Technical Specifications (Figure 3.6-1) to ensure a conservative constraint. Other Technical Specification input parameters which are reflected in the LBLOCA reanalysis use the Technical Specification limit or a value which is more conservative.

Conservative input parameters, with respect to the Technical Specification limits, were used when modeling such parameters as the HPSI and LPSI flow, and Safety Injection Tank (SIT) pressures and inventory. Future Technical Specification changes may be requested based on these conservative parameters in conjunction with ongoing efforts to update the small break LOCA evaluation.

The emergency core cooling system (ECCS) performance and minimum containment pressure analyses are in section 6.3.3.2 of the ANO-2 SAR. The revision to this section and the addition of section 6.2.1.6 as a result of the new analysis is given in Attachment 1 (note the references are numbered sequentially for Attachment 1 and have not been assigned a SAR reference number). A comparison of the SAR input parameters to the new analysis is given in Tables 1 and 2 and a comparison of the results in Table 3.

The SAR analysis indicated the limiting break as a 1.0 Double Ended Guillotine break in the Pump Discharge (DEG/PD) with a PCT of 2078°F. For Cycle 10, this limiting SAR break size was evaluated and resulted in a PCT of 2086°F (Reference 1). A new break size of 0.6 DEG/PD has been determined as the limiting break utilizing the latest approved evaluation model with the updated ANO-2 input parameters. A PCT of 2142°F is predicted for the new limiting break, which is below the 2200°F limit defined in 10CFR50.46. The maximum clad oxidation was calculated as 8.9 percent and the maximum core wide oxidation is less than 0.843 percent which are also within the allowed limits of 17 percent and 1 percent respectively. The latest approved ABB-CE evaluation model does not utilize the new best-estimate uncertainty analysis allowed by 10CFR50.46, but rather conforms to Appendix K requirements, and therefore is considered to be conservative.

As noted above, the new ANO-2 LBLOCA analysis assumes an initial containment pressure of 13.2 psia, which is more restrictive than the present Technical Specification limit of 12.8 psia. Therefore, ANO-2 Technical Specification Figure 3.6.1 is being revised to reflect a more restrictive minimum pressure limit of 13.2 psia. This will ensure the input parameters for the new ANO-2 LBLOCA analysis are conservative with respect to the Technical Specification limits.

Determination of No Significant Hazards Considerations

An evaluation of the proposed Technical Specification changes has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards consideration using the standards in 10CFR50.92(c). A discussion of those standards as they relate to this amendment request follows:

Criterion 1 - Does Not Involve A Significant Increase in the Probability or Consequences of An Accident Previously Evaluated.

Containment internal pressure is not an event initiator of any accident analyzed in the ANO-2 Safety Analysis Report (SAR) and does not affect the probability of occurrence of any event previously analyzed. Therefore, this change does not increase the probability of any accident previously evaluated.

Increasing the initial containment pressure from 12.8 psia to 13.2 psia is in the conservative direction and will not result in an increase in the consequences of the LBLOCA analysis. This change is requested based on a LBLOCA analysis that has included cumulative cycle fuel design and core physics changes, anticipated plant changes (10% tube plugging), and utilization of the latest approved evaluation model. The sum of these changes have resulted in an increase in the LBLOCA PCT. A new PCT of 2142°F has been calculated, which remains bounded by the 2200°F limit as defined by 10CFR50.46. Due to dose calculations for the LBLOCA being totally independent from the ECCS analysis (based on Technical Information Document 14844), the increase in PCT does not affect the dose calculations. Therefore, this change does not constitute a significant increase in the consequences of an accident previously evaluated.

Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.

The proposed change does not involve any design changes, or plant modifications. The new lower limit for containment pressure represents more restrictive limitations than that imposed by the present Technical Specifications and constitutes a conservative change in plant operation. Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

The new LBLOCA analysis performed and referenced in this submittal will not modify the plant. The analysis was performed using the latest ABB-CE approved evaluation model and conservative input parameters to bound the ANO-2 design. Use of the new ANO-2 LBLOCA input parameters and evaluation model does not create the possibility of a new or different kind of accident from any previously evaluated.

Criterion 3 - Does Not Involve a Significant Reduction in a Margin of Safety.

The Region of Acceptable Operation of ANO-2 TS Figure 3.6-1 has been evaluated and shown to result in peak containment pressures within the design pressure as was the case with the original analyses. As indicated above, the LBLOCA analysis is not negatively impacted by this change, but due to the combined evaluation with other conservative input parameter changes, a higher PCT is calculated.

The new LBLOCA analysis performed for ANO-2 was done with an approved evaluation model that complies with the requirements of Appendix K, and has resulted in a higher PCT (2142 °F versus 2086 °F for cycle 10) and greater core wide clad oxidation (0.843 % versus 0.617%). These results are attributed to the input parameter changes. Although the PCT and core wide clad oxidation has increased, the results still are in compliance with the acceptance criteria set forth in 10CFR50.46 which establish limits and required design margins, and therefore, does not involve a significant reduction in a margin of safety.

Therefore, based on the reasoning presented above and the previous discussion of the amendment request, Entergy Operations has determined that the requested change does not involve a significant hazards consideration.

Table 1
General System Parameters

<u>Quantity</u>	<u>SAR Value</u>	<u>New Value</u>
Reactor Power Level (MWt)	2882	2900
Peak Linear Heat Rate (kW/ft)	14.5*	13.5
Gap Conductance at Peak Linear Heat Rate (BTU/hr-ft ² -F)	1633*	1572
Fuel Centerline Temperature at Peak Linear Heat Rate (°F)	3478*	3359
Fuel Average Temperature at Peak Linear Heat Rate (°F)	2192*	2129
Hot Rod Gas Pressure (psia)	1206*	1114
Moderator Temperature Coefficient at Initial Density ($\Delta k/k/^\circ\text{F}$)	$+0.5 \times 10^{-4}$	$+0.5 \times 10^{-4}$
Total System Flow Rate (lbs/hr)	120.4×10^6	119.9×10^6
Core Flow Rate (lbs/hr)	116.2×10^6	115.7×10^6
Initial System Pressure (psia)	2250	2250
Core Inlet Temperature (°F)	557.5	556.7
Core Outlet Temperature (°F)	616.8	616.8
Safety Injection Tank Pressure (psia)	615	550
Safety Injection Tank Gas/Water Volume (ft ³)	470/1380	500/1350

*Cycle specific analyses input assumptions, such as that performed for Cycle 10, are not reflected in the SAR table.

Table 2
Containment Physical Parameters

	<u>SAR Value</u>	<u>New Value</u>
Net Free Volume (ft ³)	1.82 x 10 ⁶	1.82 x 10 ⁶
Containment Initial Conditions		
Humidity (%)	100	100
Containment Temperature (°F)	90*	60
Initial Pressure (psia)	14.7*	13.2
Initial Time for:		
Spray Flow (seconds)	20.0	20.0
4 Fans (seconds)	9.0	0
Containment Spray Water:		
Temperature (°F)	40	40
Total Flow Rate, Both Pumps (gpm)	4800	4800
Individual Fan Cooling Capacity at 300°F (Btu/sec)	28,663	28,663

*Cycle specific analyses input assumptions, such as that performed for Cycle 10, are not reflected in the SAR table.

Table 3

Peak Clad Temperatures and Oxidation Percentages
For the Break Spectrum

SAR Results

<u>Break</u>	<u>Peak Clad Temperature (°F)</u>	<u>Clad Oxidation (%)</u>	
		<u>Local</u>	<u>Core-Wide</u>
1.0 DES/PD	2066	11.33	<0.580
0.8 DES/PD	2066	11.33	<0.602
0.6 DES/PD	2062	11.13	<0.578
0.5 ft ² S/PD	1978	9.37	<0.444
1.0 DEG/PD	2078	11.82	<0.617
0.8 DEG/PD	2070	11.48	<0.610
0.6 DEG/PD	2055	10.83	<0.534

New Analysis

<u>Break</u>	<u>Peak Clad Temperature (°F)</u>	<u>Clad Oxidation (%)</u>	
		<u>Local</u>	<u>Core-Wide</u>
1.0 DES/PD	2129	8.58	<0.672
0.8 DES/PD	2129	8.58	<0.684
0.6 DES/PD	2122	8.43	<0.697
1.0 DEG/PD	2132	8.64	<0.714
0.8 DEG/PD	2135	8.72	<0.756
0.6 DEG/PD	2142	8.90	<0.843
0.4 DEG/PD	2112	8.21	<0.705

DES/PD - Double Ended Slot in Pump Discharge

S/PD - Slot in Pump Discharge

DEG/PD - Double Ended Guillotine Pump Discharge

References

- 1) ANO Letter 2CAN079201, "Proposed ANO-2 Technical Specifications to Revise Containment Parameter Limits and Reduce Peak Linear Heat Rate Limit", July 9, 1992.
- 2) NRC Letter Dennis M. Crutchfield (NRC) to A. E. Scherer (CE), "Safety Evaluation of Combustion Engineering ECCS Large Break Evaluation Model and Acceptance for Referencing of Related Licensing Topical Reports", July 31, 1986.
- 3) CENPD-132P, "Calculative Methods for the C-E Large Break LOCA Evaluation Model", August 1974.

CENPD-132P, Supplement 1, "Calculational Methods for the C-E Large Break LOCA Evaluation Model", February 1975.

CENPD-132P, Supplement 2-P, "Calculational Methods for the C-E Large Break LOCA Evaluation Model", June 1975.

CENPD-132, Supplement 3-P-A, "Calculative Methods for the C-E Large Break LOCA Evaluation Model for the Analysis of C-E and W Designed NSSS", June 1985.