

February 27, 2008

Vice President, Operations
Arkansas Nuclear One
Entergy Nuclear Operations
1448 S. R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 - REQUEST FOR ADDITIONAL
INFORMATION FOR LICENSE AMENDMENT REQUEST REGARDING
IMPLEMENTATION OF AN ALTERNATE SOURCE TERM (TAC NO. MD7178)

Dear Sir or Madam:

By letter dated October 22, 2007, Entergy Operations, Inc. (the licensee), submitted an amendment request for the implementation of an alternate source term (AST) at Arkansas Nuclear One, Unit 1 (ANO-1).

The U.S. Nuclear Regulatory Commission staff has reviewed the request and determined that we require additional information to complete our review. A request for additional information is enclosed. This request was discussed with David Bice of your staff on February 19, 2008, and it was agreed that a response would be provided by March 14, 2008. If the response is not provided by March 14, 2008, or does not provide the information needed for us to continue our review, we may proceed to act on your application to implement an alternate source term consistent with 10 CFR 2.108, "Denial of application," for failure to submit sufficient information in the application.

If you or your staff have any questions concerning the resolution of this matter, please contact me at (301) 415-1445.

Sincerely,

/RA/

Alan B. Wang, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Request for Additional Information

cc w/encl: See next page

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ADAMS Accession No.: ML080510441

(*) RAI memo dated

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DATE	2/27/08	2/22/08	2/8/08	2/27/08

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Arkansas Nuclear One

(2/12/2008)

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REQUEST FOR ADDITIONAL INFORMATION
REGARDING LICENSE AMENDMENT REQUEST FOR APPLICATION
OF THE ALTERNATE SOURCE TERM
ARKANSAS NUCLEAR ONE, UNIT 1
ENTERGY OPERATIONS, INC.

By letter dated October 22, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML073030537), Entergy Operations, Inc. (the licensee), submitted a license amendment request (LAR) for the implementation of an alternate source term (AST) at Arkansas Nuclear One, Unit 1 (ANO-1). The U.S. Nuclear Regulatory Commission (NRC) staff has determined that the proposed LAR contains insufficient information for NRC staff to reach a determination of reasonable assurance of safety for implementation of an AST at ANO-1.

The design-basis accident (DBA) source term is a fundamental assumption upon which a significant portion of the facility design is determined. The NRC staff reviews all aspects of its implementation. To do the review, the NRC staff will need detailed justification and explanation of assumptions made, methodologies used, and conservatisms applied to the dose consequence calculations. A summary of results and tables of parameter inputs for accidents listed in Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," does not provide sufficient information for the NRC staff to make a reasonable assurance determination regarding the safety of the proposed AST LAR.

In a December 19, 2007, teleconference, the licensee stated that the proposed AST LAR implemented RG 1.183 in its entirety. As such, the NRC staff prepared these questions following the outline of RG 1.183. The NRC staff expects additional RAIs will be necessary to obtain more details or clarifications of the supplemental information provided in response to these questions.

The licensee cited precedents from two boiling-water reactor plants that are not directly applicable for ANO-1. The NRC staff suggests that the licensee review AST amendment precedents from South Texas Project, Units 1 and 2 (ADAMS Accession No. ML070890474), Palisades Plant (ADAMS Accession No. ML062830385) and St. Lucie Plant, Unit 2 (ADAMS Accession No. ML072180333). These precedents provide the appropriate level of information needed for the NRC staff to commence its review. The licensee is also encouraged to review NRC Regulatory Issue Summary (RIS) 2006-04, "Experience with Implementation of Alternative Source Terms," prior to responding to these questions.

The following RAI reflects the fundamental level of information that the NRC staff expects in an initial application for an AST amendment and is necessary for the NRC staff to begin a review of the proposed AST LAR.

A. INTEGRITY OF FACILITY DESIGN BASIS

1. Paragraph 50.67(b) of Title 10 of the *Code of Federal Regulations* (10 CFR), "Accident source term," requires that applications under this section contain an evaluation of the consequences of applicable DBAs previously analyzed in the plant's updated final safety analysis report (UFSAR). Also, RG 1.183 provides guidance to licensees of operating power reactors on acceptable applications of AST; the scope, nature, and documentation of associated analyses and evaluations; consideration of impacts on analyzed risk; and content of submittals. RG 1.183 Regulatory Position 1.1.3, "Integrity of Facility Design Basis," states in principal that a complete reassessment of all facility radiological analyses would be desirable.
 - a. Provide details regarding the scope of the ANO-1 AST application as defined in RG 1.183 Regulatory Positions 1.2 and 1.3.
 - b. Please list the ANO-1 current licensing basis (CLB) dose consequence events as described in its UFSAR (see RG 1.183 Regulatory Position 1.3.2).
2. RG 1.183 Regulatory Position 1.3.3, "Use of Sensitivity or Scoping Analyses," states that it may be possible to demonstrate by sensitivity or scoping evaluations that existing analyses have sufficient margin and need not be recalculated.
 - a. For any CLB dose consequence DBAs that were not re-evaluated as part of this AST LAR, provide the justification for omitting these from the AST DBA analysis and explain if they will be removed from the proposed updated AST licensing basis for ANO-1 (see RG 1.183 Regulatory Position 1.3.4).
 - b. For the dose consequence DBAs that have been evaluated for the proposed AST LAR, provide the basic parameters used in the analyses. For each parameter, please indicate the CLB value, the revised value where applicable, as well as the basis for any changes to the CLB. The NRC staff requests that the licensee expand the information in the Attachment 3 tables of the ANO-1 LAR to include CLB parameters whether or not the individual parameter has changed for this amendment (see RG 1.183 Regulatory Positions 1.3.2 and 1.3.4 and RIS 2006-04).

B. ACCIDENT SOURCE TERM

1. Describe in detail the specific assumptions including the fuel type, cycle length, fuel enrichment, fuel burnup, core power, calculation methodology and conservative assumptions used to determine the inventory of fission products in the reactor core available for release in the ANO-1 AST reanalysis for the analyzed dose consequence DBAs. Describe in detail how ANO-1 met (or

deviated from) the guidance in RG 1.183 Section 3.0 and the specific accident appendices of RG 1.183.

2. Describe the specific assumptions used for the recalculation of the ANO-1 reactor coolant source term (see RG 1.183 Regulatory Position 3.5). Describe in detail the analysis methods and the change in the ANO-1 iodine appearance rates and iodine spiking, and if any assumptions are different from the ANO-1 CLB calculations. Also, provide the regulatory basis for the changes from the ANO-1 CLB calculations.
3. Provide the details of how the amount of fuel damage was determined for each AST DBA other than the loss-of-coolant accident (LOCA) (see RG 1.183 Regulatory Position 3.6).
4. Provide the basis for not performing the locked rotor analysis for the ANO-1 AST LAR. Include a discussion and provide a design basis reference that concludes no fuel damage as an analyzed consequence of a locked rotor event (see Appendix G and RG 1.183 Regulatory Position 3.6).

C. DOSE CALCULATIONAL METHODOLOGY

1. Describe the major assumptions and methodology for determining the ANO-1 offsite and control room dose consequence values using the AST. List the conservative assumptions used as outlined in RG 1.183 Regulatory Position 4.1 and describe how the assumptions conform or deviate from the regulatory guidance. Discuss and justify any deviations from the ANO-1 current design basis or deviations from RG 1.183 guidance.
2. Outline the major sources of control room accident radiation exposure to control room personnel as outlined in RG 1.183 Regulatory Position 4.2.
3. Describe how your proposed AST amendment conforms or deviates from RG 1.183 Regulatory Position 4.2.2 and describe in detail the control room dose models as outlined in RG 1.183 Regulatory Position 4.2.3.
4. Describe the credit taken for engineered safety features, as outlined in RG 1.183 Regulatory Position 4.2.4, that mitigate airborne activity within the control room.
5. Describe any credit taken for ANO-1 control room protective equipment as outlined in RG 1.183 Regulatory Position 4.2.5.
6. Describe other dose consequences affected by the ANO-1 AST LAR including those outlined in Appendix I of RG 1.183. RG 1.183 Regulatory Position 4.3 suggests that, "[t]he guidance provided in Regulatory Positions 4.1 and 4.2 should be used, as applicable, in re-assessing the radiological analyses identified in Regulatory Position 1.3.1, such as those in NUREG-0737 (Ref. 2). Design envelope source terms provided in NUREG-0737 should be updated for consistency with the AST. In general, radiation exposures to plant personnel

identified in Regulatory Position 1.3.1 should be expressed in terms of TEDE [total effective dose equivalent].”

7. Integrated radiation exposure of plant equipment should be determined as suggested by RG 1.183 Regulatory Position 1.3.2. Describe any changes made to the ANO-1 radiological assessments associated with equipment qualification based on the application of the AST for ANO-1 using the guidance provided in Appendix I and RG 1.183 Regulatory Position 6.

D. ANALYSIS ASSUMPTIONS AND METHODOLOGY

1. Describe the codes, calculation methods and inputs used to evaluate the dose consequences from the ANO-1 analyzed DBAs as suggested in RG 1.183 Regulatory Position 1.5. State if these codes and calculation methods are part of the licensee's Appendix B, to 10 CFR Part 50, quality assurance program as outlined in RG 1.183 Regulatory Position 5.1.1.
2. In the ANO-1 LOCA analysis, the licensee has taken credit (Attachment 3 Table 6 of the ANO-1 submittal) for sump pH [potential of hydrogen] control. Provide a detailed justification including calculation assumptions for assuming this pH control for the AST dose consequence LOCA analysis (see RG 1.183, Appendix A).
3. Provide a description of the ANO-1 transport assumptions as outlined in Regulatory Position 3 of Appendix A to RG 1.183.
4. During power operations, does ANO-1 routinely purge primary containment? If so, describe the affect on the ANO-1 LOCA dose consequence analysis as outlined in Appendix A to RG 1.183.
5. Describe in detail the assumptions and justifications for airborne radioactivity reduction in containment by containment spray systems as outlined in Appendix A to RG 1.183.
6. Provide the detail and justification, as outlined in Appendix A to RG 1.183, for the elemental iodine decontamination factor used in the ANO-1 AST LOCA analysis as outlined in Appendix A to RG 1.183.
7. Provide the justification for the ANO-1 AST LOCA assumed engineered safety feature (ESF) leakage provided in Attachment 3 Table 6 of the ANO-1 submittal as outlined in Appendix A to RG 1.183.
8. Describe the leakage paths and release points related to this assumed ESF leakage in question 19 above.
9. Describe in detail how you arrived at the iodine partition coefficient of 0.1 as related to question 19 above.

10. Provide the detailed assumptions you used for determining quantity, if any, of ESF leakage back to the Refueling Water Storage Tank and the affect this release path has on the ANO-1 LOCA accident dose consequence analysis as outlined in Regulatory Position 5.2 of Appendix A to RG 1.183.
11. Provide the detailed assumptions used for determining all DBA parameters used for the DBAs as outlined in the RG 1.183 appendices and any other accidents re-evaluated for the proposed AST amendment from the ANO-1 CLB.
12. Provide details on the timing of events (i.e., manual operations, cool down rates, timing of Steam Generator and control room isolation) associated with all the DBAs analyzed for the ANO-1 AST submittal.

E. METEOROLOGY ASSUMPTIONS

1. Regarding the October 22, 2007, alternative source term license amendment request for ANO-1 and the atmospheric dispersion factors (i.e., χ/Q values) used in the dose analyses, Attachment 1 states:

“The control room χ/Q values from the 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 ANO-1 calculations. Attachment 3 provides the updated χ/Q values used in the new ANO-1 analyses.”

 - a. For both onsite and offsite χ/Q values previously approved for ANO-1, please provide reference information (e.g., document dates, page or table numbers listing the χ/Q values) documenting approval of the specific values.
 - b. For any prior ANO-2 approvals now being applied to ANO-1, provide reference information (e.g., document dates, page or table numbers listing the χ/Q values) documenting the approval of the specific values and justify why the χ/Q values are appropriate for use in this license amendment request for ANO-1.
 - c. For new or updated χ/Q values which were not already specifically approved, provide the input files (electronic files for data input into computer codes) and a discussion of the assumptions used to generate the χ/Q values, summary output files, and/or cite references where this information has been previously docketed. Include figures, generally drawn to scale showing true north, with all postulated release and intake locations clearly indicated and from which distance, height and direction inputs can be reasonably approximated.
 - d. Which χ/Q values were used to model unfiltered inleakage into the control room and why is use of these χ/Q values appropriate?

- e. Do the accident scenarios and generated χ/Q values model the limiting doses considering multiple release scenarios including those due to loss of offsite power or other single failures?

F. ADDITIONAL INFORMATION

1. In order to improve the efficiency and resources expended to complete the NRC staff's review, please provide an RG 1.183 conformance table that outlines the ANO-1 conformance with the specific regulatory positions.
2. In order to improve the efficiency and resources expended to complete the NRC staff's review, please provide a NRC RIS 2006-04 conformance table.
3. Provide for NRC staff review, the ANO-1 proposed final safety analysis report (FSAR) Markup, as suggested by RG 1.183 Regulatory Position 1.5, or revised UFSAR pages outlining the ANO-1 revised AST licensing basis. RG 1.183 Regulatory Position 1.6 outlines the FSAR update requirements including a reference to 10 CFR 50.71.