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OCAN110701

November 7, 2007

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Request for Extension of Completion Date for Corrective Actions and
Modifications Required by Generic Letter 2004-02
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Dear Sir or Madam:

By letters dated August 31, 2005 (OCAN080501), December 15, 2005 (OCAN120504), and October 18, 2006 (OCAN100602), Entergy provided a response to Generic Letter (GL) 2004-02, *Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (PWRs)*, dated September 13, 2004 (OCNA090401), for Arkansas Nuclear One (ANO). In the August 31, 2005, correspondence, Entergy described plans for plant modifications that included the installation of a new sump strainer during the ANO-2 fall 2006 and the ANO-1 spring 2007 refueling outages. Entergy also described plans for evaluating the adequacy of the strainer design and to address chemical effects once test results to quantify the effect on head-loss were completed (as supplemented by the October 18, 2006, correspondence). In the December 15, 2005, correspondence, Entergy provided preliminary results of the downstream effects evaluation and stated that further evaluations were being performed to resolve the issue.

During the fall 2006 refueling outage (2R18) for ANO-2 and the spring 2007 refueling outage for ANO-1 (1R20), the original sump screens were replaced by new engineered strainers. These modifications represent a significant improvement over the original design by providing greatly increased strainer surface area (by approximately 20 times for ANO-2 and 10 times for ANO-1). Also, during 1R20 substantial amounts of insulation materials were removed from the ANO-1 reactor building.

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Based on plant-specific chemical effects testing recently performed, Entergy has determined that a containment buffer replacement is necessary for ANO-2 in order to address chemical effects. By letter dated October 5, 2007 (2CAN100703), Entergy requested a license amendment to replace the containment buffering agent during the upcoming spring 2008 refueling outage (2R19). Therefore, this letter requests an extension until restart following the ANO-2 spring 2008 refueling outage to complete the buffer replacement and other modifications determined to be needed to achieve compliance with GL 2004-02. In addition, Entergy has determined that additional time is needed to complete the analysis for ANO-1 and to change the sodium-hydroxide concentration, and therefore, requests an extension concurrent with the ANO-2 schedule. The basis for the proposed extension is provided in Attachment 1.

New commitments contained in this submittal are summarized in Attachment 2. If you have any questions or require additional information, please contact Natalie Mosher at 479-858-4635.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 7, 2007.

Sincerely,

RH Scheide for

DEJ/nbm

Attachments

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U. S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
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U. S. Nuclear Regulatory Commission
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Attachment 1

OCAN110701

Request for Extension of Completion Date for Corrective Actions
and Modifications Required by Generic Letter 2004-02

Request for Extension of Completion Date for Corrective Actions
and Modifications Required by Generic Letter 2004-02

1.0 Background

In GL 2004-02, the NRC requested licensees to perform a mechanistic evaluation of the potential for post-accident debris blockage and operation with debris-laden fluids to impede or prevent the recirculation functions of the emergency core cooling system (ECCS) and containment spray system (CSS) following postulated accidents for which these systems are required. By letters dated August 31, 2005, December 15, 2005, and October 18, 2006, Entergy provided a response to GL 2004-02. In the August 31, 2005, correspondence, Entergy described plans for plant modifications that included the installation of new sump strainers during the ANO-2 fall 2006 and the ANO-1 spring 2007 refueling outages. Entergy also discussed plans for evaluating the adequacy of the strainer design and to address chemical effects once test results to quantify chemical debris effect on head-loss were completed. In the December 15, 2005, correspondence Entergy provided preliminary results of the downstream effects evaluation and stated that further evaluations were being performed to resolve the issue.

Information Notice (IN) 2005-26, "Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment," dated September 16, 2005, informed licensees that recent research results indicated that a simulated sump pool environment containing phosphate and dissolved calcium can rapidly produce a calcium phosphate precipitate that, if transported to a fiber bed covered screen, produces significant head loss. This information is relevant to plants containing phosphate (e.g., plants using trisodium phosphate (TSP) as a sump pool buffering agent) and calcium sources (e.g., insulation, concrete) that may dissolve within the post-loss-of-coolant accident (LOCA) containment pool with sufficient concentrations to form calcium phosphate precipitate. These test results indicate that substantial head loss can occur if sufficient calcium phosphate is produced in a sump pool and is then transported to a preexisting fiber bed on the sump screen. IN 2005-26 is applicable to ANO-2 because TSP is used as the buffering agent and calcium silicate insulation is used within containment. Changing the buffer would provide considerable benefits in addressing chemical effects as discussed below.

Entergy installed replacement strainers during the fall 2006 and the spring 2007 refueling outages for ANO-2 and ANO-1, respectively. These modifications are more fully described below under *3.2 Mitigative Measures*. The evaluations of the adequacy of the strainer design to handle the predicted post-LOCA debris and chemical loads are being evaluated in accordance with Nuclear Energy Institute (NEI) 04-07, Volume 1, "Pressurized Water Reactor Sump Performance Methodology," and NEI 04-07, Volume 2, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to NRC GL 2004-02," Revision 0, dated December 2004, with justifiable refinements. These evaluations show that in order to ensure compliance with GL 2004-02, additional modifications and a license amendment are required for ANO-2 as described in *2.1 Additional Modifications* and *2.2 License Amendments*. Additional time to complete the analysis for ANO-1 and to change the sodium-hydroxide concentration is also needed as described in *2.0 Reason for the Request for Extension*.

2.0 Reason for the Request for Extension

Entergy's strategy for resolution of GL 2004-02 for both of the ANO units includes analysis of the downstream effects on the fuel per WCAP-16793-P, "Evaluation of Long-Term Cooling Associated with Sump Debris Effects," which is currently under NRC review. The current schedule to complete this analysis and the strainer certification/qualification reports with supporting analyses is spring 2008 as shown in *3.1 Plant-Specific Technical/Experimental Plan*.

Entergy's strategy for resolution of GL 2004-02 for ANO-1 also includes changing the sodium-hydroxide (NaOH) concentration to control the post-accident upper pH limit to a lower value (approximately 9) in order to address chemical effects. This will be administratively controlled until a license amendment is processed. Finalizing the analyses/reports and changing the sodium-hydroxide concentration are the primary reasons for the ANO-1 request for extension.

Entergy's strategy for the resolution of GL 2004-02 for ANO-2 also includes replacing the containment buffering agent to reduce chemical effects. Implementation of this strategy requires additional modifications and a license amendment as discussed below.

2.1 Additional Modifications

The following modifications are considered necessary to bring ANO-2 into full compliance with GL 2004-02:

- (1) Containment Sump Buffering Agent Replacement – A measure expected to reduce the magnitude of chemical effects is the replacement of the TSP buffer with sodium tetraborate (NaTB). This replacement will require a modification and a license amendment. Additional chemical effects options are currently under review by Entergy.
- (2) Additional insulation modifications including reactor vessel head shroud insulation change, additional fibrous insulation removal, and calcium-silicate insulation banding.

2.2 License Amendments

Buffer replacement – See 2.1 (1) above. Technical Specification 3.6.2.2 specifies the type and quantity of the buffering agent. A license amendment is required to implement the change from TSP to NaTB and was requested in correspondence dated October 5, 2007.

3.0 Technical Basis for Proposed Extension

Entergy considers that the conditions at the ANO units meet the criteria identified in SECY-06-0078, from L. A. Reyes, NRC Executive Director for Operations, to NRC Commissioners, "Status of Resolution of GSI-191, "Assessment of Debris Accumulation on PWR Sump Performance," dated March 31, 2006, for extension beyond the completion date of December 31, 2007, specified in GL 2004-02. The SECY criteria are:

Proposed extensions to permit changes at the next outage of opportunity after December 2007 may be acceptable if, based on the licensee's request, the staff determines that:

- *The licensee has a plant-specific technical/experimental plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties.*
- *The licensee identifies mitigative measures to be put in place prior to December 31, 2007, and adequately describes how these mitigative measures will minimize the risk of degraded ECCS and CSS functions during the extension period.*

For proposed extensions beyond several months, a licensee's request will more likely be accepted if the proposed mitigative measures include temporary physical improvements to the ECCS sump or materials inside containment to better ensure a high level of ECCS sump performance.

The ANO units meet these criteria as described below.

3.1 Plant-Specific Technical/Experimental Plan

In the August 31, 2005, correspondence, Entergy submitted a description of the actions it is taking to address GL 2004-02, and updated that response in the December 15, 2005, correspondence. The key actions of the plan are summarized below.

(1) Completed Actions

- (a) Installation of new sump strainer modifications during the fall 2006 refueling outage for ANO-2 and during the spring 2007 refueling outage for ANO-1
- (b) Removal of substantial amounts of insulation at ANO-1 during the last two refueling outages (1R19 and 1R20)
- (c) Preliminary evaluation of debris generation, debris transport, and downstream effects calculations

(2) Actions in Progress

- (a) Strainer debris head loss testing
- (b) Chemical effects testing using plant-specific methodology (including autoclave and solubility testing)
- (c) Re-evaluation of debris generation and debris transport
- (d) Downstream effects re-evaluation in accordance with the recently revised topical report

(3) Planned Actions

- (a) ANO-1 sodium-hydroxide concentration change currently scheduled for December 2007, but no later than spring 2008
- (b) Installation of ANO-2 modifications as described in 2.1 above during 2R19 which is scheduled to begin spring 2008
- (c) License amendment for ANO-2 as described in 2.2 above required for implementation prior to restart following 2R19
- (d) Fuel downstream effects analysis for ANO-1 and ANO-2 expected in spring 2008
- (e) Issue strainer certification/qualification report expected in spring 2008 (based on buffer change, shroud insulation replacement, and any other potential debris removals deemed necessary for ANO-2 and based on analysis completion for ANO-1)
- (f) Licensing basis update for both ANO units 60 days after completion of 2R19

The extent of the modifications and analyses already performed and those in progress and planned demonstrate that Entergy has developed a plant-specific technical/experimental plan, with milestones and schedule to address outstanding technical issues.

3.2 Mitigative Measures

Entergy has put in place the following mitigative measures that minimize the risk of degraded ECCS and CSS functions during the extension period.

- (1) Installation of replacement sump strainers – During the ANO-2 fall 2006 and ANO-1 spring 2007 refueling outages, the original containment sump screens (approximately 200 ft² each) were replaced. The replacement strainers are a modular design and have a surface area of 2715 ft² and 4837 ft², for ANO-1 and ANO-2, respectively. The strainers consist of modules with perforated screen in a pocket design. The perforated holes are sized to 1/16" diameter. These strainers were designed to minimize fiber debris bypass to reduce downstream effects and to provide a substantial increase in available strainer surface area. The new strainers provide increased margin against blockage and excessive wear of downstream components due to debris in the water.
- (2) The majority of the fiberglass and calcium-silicate insulation in the ANO-1 steam generator cavities was replaced with reflective metal insulation during the steam generator replacement outage (1R19). During the subsequent refueling outage (1R20), efforts to further reduce potentially detrimental insulation types in the steam generator cavities continued by removing most of the remaining fiberglass insulation and adding banding to portions of the remaining calcium-silicate insulation.
- (3) In addition to the plant modifications described above, current mitigative measures in response to NRC Bulletin 2003-01 "*Potential Impact of Debris Blockage on Emergency Sump Recirculation at PWRs,*" are in place and continue to be in effect. Entergy's response to NRC Bulletin 2003-01 is documented in correspondence dated August 7, 2003 (OCAN080302), June 10, 2004 (OCAN060402), August 31, 2005 (OCAN080502), and October 19, 2005 (OCAN100504). By letter dated December 29, 2005 (OCNA120513), the NRC staff concluded that Entergy's compensatory measures implemented to reduce the risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions were responsive to and met the intent of Bulletin 2003-01.

These measures include:

- (a) Training to the licensed operators to present the mechanisms and potential consequences of sump clogging
- (b) Procedural guidance within the emergency operating procedures on symptoms and identification of sump blockage
- (c) Severe accident management guidance to consider refilling the refueling water tank should sump blockage become a concern
- (d) Containment cleanliness assured by procedural controls that apply after each containment entry and prior to plant startup from an outage
- (e) Foreign material exclusion assured by procedural controls that apply to inspection, operation, maintenance, and outage activities
- (f) Procedural guidance ensures that containment drainage paths are unblocked
- (g) Procedural guidance ensures sump cleanliness and integrity

(3) In addition to the above:

- (a) Engineering procedure ensures that as part of the engineering change process, materials (including insulation, coatings, debris, etc.) that are introduced to containment are identified and evaluated to determine if they could affect sump performance or lead to downstream equipment degradation
- (b) Engineering procedure ensures that configuration control of insulation and coatings inside containment are maintained

These mitigative measures are already in place and minimize the risk of degraded ECCS and CSS functions during the extension period.

3.3 Generic Letter 2004-02 Basis for Continued Operation

In addition to the mitigative measures identified above, the basis for continued operation provided by GL 2004-02 includes a number of factors that remain applicable to the ANO units during the period of the proposed extension. The NRC staff provided a justification for continued operation in GL 2004-02 of PWRs through December 31, 2007.

Attachment 2

OCAN110701

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	
Replace TSP containment buffer with NaTB and additional insulation modifications for ANO-2	X		Spring 2008 (2R19 restart)
Complete analysis and sodium-hydroxide concentration change for ANO-1	X		Spring 2008
Update licensing basis for both ANO units		X	60 days after completion of 2R19