Entergy

Entergy Nuclear Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

December 3, 2007

GL 2004-02

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

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

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

Dear Sir or Madam:

By letters dated August 25, 2005 (ML052500280), May 12, 2006 (ML061320249) and July 18, 2006 (ML061990310), Nuclear Management Company, LLC (NMC, the former license holder) provided responses to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors." In these letters, NMC described plans for plant modifications that included the installation of new sump passive strainers, installation of new containment spray isolation valves with throttling capability, and the implementation of an alternate buffer during the 2007 fall refueling outage. NMC also described results and further plans to evaluate downstream components using the methodology provided in WCAP-16406-P, "Evaluation of Downstream Sump Debris Effects in Support of [Generic Safety Issue] GSI-191." Further, plans were described to evaluate the Pressurized Water Reactor Owners Group acceptance parameters and the Palisades Nuclear Plant (PNP) specific fuel assembly characteristics, if necessary, for determining the downstream chemical and debris effects on fuel clogging. Additionally, NMC also described plans for evaluating the adequacy of the strainer design and to address chemical effects through use of WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191," and plant-specific strainer testing.

During the PNP 2007 fall refueling outage, Entergy Nuclear Operations, Inc. (ENO), completed the following changes at PNP: 1) the original containment sump screens were replaced by containment sump passive strainer assemblies, 2) the containment trisodium phosphate buffer was replaced with sodium tetraborate, 3) the containment spray valves were replaced with a new design that automatically repositions the valves to throttle positions at initiation of containment sump recirculation, and 4) the mechanical seals and seal coolers

for the high pressure safety injection pumps were replaced. These modifications represent a significant improvement over the previously existing design by providing greatly increased strainer surface areas, reduced potential chemical precipitate, increased net positive suction head margin, and reduced downstream effects.

ENO has not completed actions to fully address potential chemical and downstream effects. Therefore, ENO requests an extension until June 30, 2008, to complete activities needed to achieve compliance with GL 2004-02. The basis for the proposed extension is provided in Enclosure 1. ENO requests approval of this extension request by December 28, 2007.

Summary of Commitments

This letter contains no new commitments, revises one existing commitment, and withdraws one existing commitment.

Commitment made by letter dated August 25, 2005:

1. NMC will implement all corrective actions to resolve GSI-191 prior to plant restart following the Fall 2007 refueling outage at Palisades Nuclear Plant.

Revised commitment:

1. ENO will complete actions to resolve GSI-191 at PNP by June 30, 2008.

Commitment revised by letter dated July 18, 2006:

2. NMC will submit a license amendment request on the safety injection refueling water tank volume no later than September 1, 2006.

It was determined that a license amendment request is not needed. Therefore, this commitment is being withdrawn.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 3, 2007.

Christopher J. Schwarz
Site Vice President
Palisades Nuclear Plant

Enclosure

CC Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ENCLOSURE 1
REQUEST FOR DUE DATE EXTENSION FOR CORRECTIVE ACTIONS REQUIRED
BY GENERIC LETTER 2004-02

1.0 Background

Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," (Reference 1), was issued on September 13, 2004. The GL requested that licensees perform a mechanistic evaluation of the potential for the adverse effects of 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 all postulated accidents for which these systems are required. By letters dated August 25, 2005 (Reference 2), May 12, 2006 (Reference 3), and July 18, 2006 (Reference 4), Nuclear Management Company, LLC (NMC), the former licensee, provided responses to GL 2004-02 for Palisades Nuclear Plant (PNP). In these letters, NMC described plans for plant modifications that included the installation of new sump passive strainers, installation of new containment spray isolation valves with throttling capability, and the implementation of an alternate buffer during the 2007 fall refueling outage. NMC also described results and further plans to evaluate downstream components using the methodology provided in WCAP-16406-P, "Evaluation of Downstream Sump Debris Effects in Support of [Generic Safety Issue] GSI-191." Further, plans were described to evaluate the Pressurized Water Reactor (PWR) Owners Group acceptance parameters and the PNP-specific fuel assembly characteristics, if necessary, for determining the downstream chemical and debris effects on fuel clogging. Additionally, NMC described plans for evaluating the adequacy of the strainer design, and to address chemical effects through use of WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191," and plant-specific strainer testing.

Information Notice (IN) 2005-26, "Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment," (Reference 5) was issued to inform licensees that recent research results indicate 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 transported to a preexisting fiber bed on the sump screen. IN 2005-26 was applicable to PNP because TSP was used as the buffering agent, and there are calcium sources within containment, including containment concrete and two forms of calcium silicate: 1) pipe insulation and 2) Marinite® fiber board. NMC responded to IN 2005-26 on November 30, 2005 (Reference 6). NMC concluded that compensatory actions already implemented as a

result of NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," (Reference 7) were still appropriate, and two additional compensatory measures were being evaluated. These were: 1) isolating or removing TSP for one cycle, and 2) permanently sequestering calcium silicate. Since that time, Entergy Nuclear Operations, Inc., (ENO) replaced TSP with an alternate buffer, sodium tetraborate, during the 2007 fall refueling outage, which eliminates the calcium phosphate precipitate concern.

Additionally, during the PNP 2007 fall refueling outage: 1) the original containment sump screens were replaced by containment sump passive strainer assemblies, 2) the CSS valves were replaced with a new design that automatically repositions the valves to throttle positions at initiation of containment sump recirculation, and 3) the mechanical seals and seal coolers for the high pressure safety injection (HPSI) pumps were replaced. These modifications represent a significant improvement over the previously existing design by providing greatly increased strainer surface areas, increased net positive suction head (NPSH) margin, and reduced downstream effects. These modifications are more fully described in Section 3.2, Mitigative Measures. The evaluations of the adequacy of the strainer design to handle the predicted post-LOCA debris and chemical loads have continued in accordance with Reference 8 with justifiable refinements. Additional time is needed to complete testing and analysis for PNP as described in Section 2.0, Reason for the Request for Extension.

2.0 Reason for the Request for Extension

ENO has installed passive containment sump strainer assemblies for segregating post-LOCA generated debris from the containment sump envelope. The strainer assemblies are sized for the bounding debris load generated following a large break LOCA. ENO has not yet resolved chemical effects for PNP. ENO is in the process of refining debris transport by using Computational Fluid Dynamic (CFD) modeling. The CFD results will be used as input to subsequent strainer testing. WCAP-16530-NP and strainer testing will be used to address chemical effects for PNP.

ENO's strategy for resolution of GL 2004-02 includes completing an 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. Additionally, ENO needs to revise its analysis of downstream components to include the recently revised WCAP-16406-P, for pump wear.

These analyses are currently scheduled to be completed during the first quarter 2008. Strainer testing is scheduled during the second quarter 2008. ENO is requesting an extension to June 30, 2008, in order to complete these activities.

3.0 Technical Basis for Proposed Extension

ENO considers that the conditions at PNP meet the criteria identified in SECY-06-0078, "Status of Resolution of GSI-191, Assessment of Debris Accumulation on PWR Sump Performance," (Reference 9), 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.

These criteria are met as described below. The remaining actions are not related to a refueling outage. However, the criteria should be applicable to PNP because the intent of an acceptable extension is met.

3.1 Plant Specific Technical/Experimental Plan

In References 2, 3, and 4, NMC submitted descriptions of the actions to be taken to address GL 2004-02. The key actions are summarized below.

(1) Completed Actions

(a) Debris generation, debris transport, and downstream effects calculations and evaluations.

(b) Strainer debris head loss testing.

(c) Strainer bypass testing.

(d) Installation of sump passive strainers.

(e) Replacement of CSS isolation valves.

(f) Replacement of high pressure safety injection pumps seals and seal coolers.

(g) Replacement of trisodium phosphate buffer with sodium tetraborate.

(h) Generic chemical effects strainer test protocol developed by strainer vendor (Performance Contracting, Inc).

(2) Actions in Progress

(a) CFD and tests inputs for subsequent chemical effects strainer testing.

(3) Planned Actions

(a) Reevaluate downstream effects to incorporate WCAP-16406-P, Revision 1, scheduled for completion in first quarter of 2008.

(b) Complete an analysis of the downstream effects on the fuel per WCAP-16793-P scheduled for completion in first quarter of 2008.

(c) Follow results of PCI strainer testing for other plants that occur before PNP testing for application of appropriate lessons learned to PNP strainer testing.

(d) Complete chemical effects strainer testing by June 30, 2008.

(e) Strainer final test report inclusive of chemical effects scheduled for completion 30 days following test completion.

(f) Complete design and license bases updates, and provide final update to GL 2004-02 supplemental response 60 days following completion of strainer final test report.

The strainer vendor test schedule has been delayed for all clients. This delayed the strainer testing previously scheduled for PNP from the first quarter of 2008 to the second quarter of 2008. Though the final strainer test report may not be complete by June 30, 2008, the test data is expected to be sufficient to validate that PNP has resolved GSI-191 by June 30, 2008. Final plant documentation updates would be performed before or concurrent with development of the final GL 2004-02 supplemental response update. ENO plans to monitor strainer vendor testing results for other plants in order to apply lessons learned to PNP strainer testing. Such monitoring would also: 1) assure the schedule for PNP testing is being maintained, 2) provide assurance that the overall resolution strategy remains valid, and 3) provide confidence that subsequent PNP testing will be successful.

3.2 Mitigative Measures

ENO 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 2007 fall refueling outage, the original containment sump screens (approximately 52 ft^2) were replaced. The replacement strainers are a modular design and have a surface area of approximately 3500 ft^2. The previous sump screens consisted of 0.047" diameter wire on 0.125" square center spacing. The new strainers consist of 0.045" diameter hole perforated plate. 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) Installation of replacement containment spray valves

During the 2007 fall refueling outage, the containment spray valves were replaced with a new design that automatically repositions to a throttle position, at initiation of containment sump recirculation. This new design gains NPSH margin, which provided allowance for the additional head loss due to the new passive strainers.

(3) Implementation of a new buffer

During the 2007 fall refueling outage, the previously existing containment trisodium phosphate buffer was replaced with sodium tetraborate. This eliminates the potential calcium phosphate chemical effects concern.

(4) Replacement of high pressure safety injection pump seals and seal coolers

During the 2007 refueling outage, the mechanical seal system for the HPSI pumps was replaced with a mechanical seal system that is not susceptible to post-LOCA debris-induced failure. This ensures that the HPSI pumps are capable of performing their safety-related design function during their required mission time of 30 days under post-LOCA conditions.

(5) Implementation of mitigative measures in response to NRC Bulletin 2003-01

In addition to the plant modifications described above, current mitigative measures in response to NRC Bulletin 2003-01 are in place and continue to be in effect. The responses to Bulletin 2003-01 are documented in References 10, 11 and 12, and include implementation of compensatory measures including candidate operator actions, as described in WCAP-16204, "Evaluation of Potential ERG [Emergency Response Guideline] and EPG [Emergency Procedure Guideline] Changes to Address NRC Bulletin 2003-01 Recommendations." By letter dated August 14, 2003 (Reference 13), the NRC provided notification that the 60-day response actions for compensatory measures that have been, or will be, implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions, are considered complete for PNP.

These measures include:

(a) Training the licensed operators on sump clogging.

(b) Revising plant off normal procedure (ONP) to lower entry conditions from Technical Specification value of one gallon per minute (gpm) unidentified leakage to 0.15 gpm unidentified leakage. The reactor trip value in the ONP was lowered from 20 gpm to 10 gpm unidentified leakage.

(c) A procedure to provide specific direction for injecting water into the primary coolant system from an alternate water source.

(d) Enhancements to improve containment drainage paths.

(e) Steps to refill the safety injection and refueling water tank following recirculation.

(f) More aggressive cooldown and depressurization following a small break LOCA.

(g) Guidance on symptoms and identification of containment sump blockage.

(h) Contingency actions in response to containment sump blockage, loss of suction, and cavitation.

(i) Securing one containment spray pump before recirculation alignment.

(6) In addition to the above:

(a) Programmatic controls ensure that materials that are introduced to containment are identified and evaluated to determine if they could affect sump performance or lead to downstream equipment degradation.

(b) Programmatic controls ensure that configuration control of insulation and coatings inside containment are maintained.

(c) Containment cleanliness is assured by procedural controls that apply to containment entries, and prior to exiting mode 5 during plant startup.

3.3 Generic Letter 2004-02 Basis for Continued Operation

The NRC staff provided a justification for continued operation (JCO) (as discussed in Reference 1), for pressurized water reactors through December 31, 2007. The following elements of the JCO would remain applicable to PNP during the proposed extension period. These provide additional assurance that the ECCS can perform its safety function in the event of a LOCA.

(1) Switchover to recirculation from the sump during a large break LOCA would not occur until 20 to 30 minutes after accident initiation, allowing time for much of the debris to settle in other places within containment.

(2) The probability of the initiating event (i.e., large and intermediate-break LOCAs) is extremely low.

(3) The NPSH analysis for the ECCS and CSS pumps do not credit containment overpressure.

Based on the applicability of these elements of the JCO, the completed modifications and other mitigative measures in place to reduce risk, the actions in progress, and planned actions for evaluation and testing, ENO concludes that an extension of the completion date for GL 2004-02 until June 30, 2008, is justified.

4.0 References

1. NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004 (ML042360586)

2. NMC letter, "Nuclear Management Company Response to Generic Letter 2004-02, 'Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors,' for Palisades Nuclear Plant," dated August 25, 2005 (ML052500280)

3. NMC letter, "Generic Safety Issue 191 Project Update for Palisades Nuclear Plant," dated May 12, 2006 (ML061320249)

4. NMC letter, "Nuclear Management Company Updated Response to Generic Letter 2004-02, 'Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors,' for Palisades Nuclear Plant," dated July 18, 2005 (ML061990310)

5. Information Notice 2005-26, "Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment," dated September 16, 2005 (ML052570220), and Information Notice 2005-26, Supplement 1, dated January 20, 2006 (ML060170102)

6. NMC letter, "Response to Information Notice 2005-26, 'Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment,' for Palisades Nuclear Plant," dated November 30, 2005 (ML053340462)

7. NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," June 9, 2003 (ML031600259)

8. Nuclear Energy Institute (NEI) 04-07, Volume 1, "Pressurized Water Reactor Sump Performance Methodology, (ML041550332), and NEI 04-07, Volume 2, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to NRC Generic Letter 2004-02," Revision 0, dated December 2004 (ML043280007)

9. SECY-06-0078, from L. A. Reyes, NRC Executive Director for Operations, to NRC Commissioners, "Status of Resolution of GSI-191, Assessment of [Effect of] Debris Accumulation on PWR [Pressurized Water Reactor] Sump Performance," dated March 31, 2006 (ML053620174)

10. NMC letter, "Palisades, 60 Day Response to Bulletin 2003-01: Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated August 5, 2003 (ML032250084)

11. NMC letter, "Palisades Nuclear Power Plant, Supplement to 60-Day Response to Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at pressurized-Water Reactors," dated May 17, 2004 (ML041410026)

12. NMC letter, "Revision of Commitment from Supplement to Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated December 15, 2005 (ML053490051)

13. NRC letter, "Palisades Plant – Response to NRC Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated August 14, 2003 (ML032230019)