UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 7, 2009

Mr. John T. Carlin
Vice President R.E. Ginna Nuclear Power Plant
R.E. Ginna Nuclear Power Plant, LLC
1503 Lake Road
Ontario, NY 14519

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: SUPPLEMENTAL RESPONSE TO GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS" - R. E. GINNA NUCLEAR POWER PLANT (TAC NO. MC4687)

Dear Mr. Carlin:

By letters dated February 29, 2008 and July 25, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML080710041 and ML082100452), R. E. Ginna Nuclear Power Plant, LLC (the licensee) submitted supplemental responses to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," for the R. E. Ginna Nuclear Power Plant.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittals. The process involved a detailed review by a team of approximately 10 subject matter experts, with a focus on the review areas described in the NRC's "Content Guide for Generic Letter 2004-02 Supplemental Responses" (ADAMS Accession No. ML073110389). Based on these reviews, the staff has determined that additional information is needed in order to conclude there is reasonable assurance that GL 2004-02 has been satisfactorily addressed for Ginna. The enclosed document describes these requests for additional information (RAIs).

The NRC requests that the licensee respond to these RAIs within 90 days of the date of this letter. However, the NRC would like to receive only one response letter for all RAIs. If the licensee concludes that more than 90 days are required to respond to the RAIs, the licensee should request additional time, including a basis for why the extension is needed.

If the licensee concludes, based on its review of the RAIs, that additional corrective actions are needed for GL 2004-02, the licensee should request additional time to complete such corrective actions as needed. Criteria for such extension requests are contained in SECY-06-0078 (ADAMS Accession No. ML053620174), and examples of previous requests and approvals can be found on the NRC's sump performance website, located at: http://www.nrc.gov/reactors/operating/ops-experience/pwr-sump-performance.html.

Any extension request should also include results of contingency planning that will result in near term identification and implementation of any and all modifications needed to fully address GL 2004-02. The NRC strongly suggests that the licensee discuss such plans with the staff before formally transmitting an extension request.

Please contact me at 301-415-1364 if you have any questions.

Sincerely,

Douglas V. Pickett

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-244

Enclosure:
As stated

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R. E. GINNA NUCLEAR POWER PLANT

REQUEST FOR ADDITIONAL INFORMATION

SUPPLEMENTAL RESPONSES TO GENERIC LETTER (GL) 2004-02

1. Please identify the source of the test data used to support the debris size distribution assumed for calcium silicate. Please compare the banding method, jacketing properties, and manufacturing process for the calcium silicate insulation material installed at Ginna versus the material and jacketing system or systems used for destruction testing.

2. Please justify the treatment of the Asbestos insulation debris as though it was Thermo-12 Gold (surrogate) debris by either providing the comparative evaluation, or showing the transport, erosion, and head loss characteristics of the Thermo-12 Gold are conservative with respect to the corresponding characteristics for Asbestos.

3. The supplemental responses did not provide sufficient information for the NRC staff to verify that transport had been adequately evaluated. The licensee should re-submit a transport evaluation in accordance with the revised content guide (ADAMS Accession No. ML073110389). The licensee should refer to previous adequate transport supplemental responses, such as the one provided for Crystal River (ADAMS Accession Number ML080640544). In developing a revised transport response, the licensee should specifically consider the following non-exhaustive list of subject areas:

   a) A description of the assumed behavior of each type of debris during blowdown, washdown, pool fill and recirculation transport.

   b) A washdown discussion describing the spray distribution model with specific focus on the credit taken and basis for retention of debris in upper containment.

   c) For pool fill transport, discussion of any direct transport to the sump strainers, any credit for debris washed into inactive volumes, and the accompanying technical bases.

   d) A description of the deviations and refinements from the staff safety evaluation (SE)-approved transport methodology (SE Section 3.6), with the technical basis for these items.

   e) A statement as to the computational fluid dynamics (CFD) code used for the transport evaluation and a description of specific aspects of the model and assumptions used (e.g., pool height, sump flow and pump configuration, turbulence modeling, number of cells used in the analysis, and the pipe breaks for which simulations were performed).

   f) A listing of the debris transport metrics that were used for all types of debris, including degraded coating chips.

   g) A description of the assumptions and technical basis that support the credit for settling and/or hold-up of fine debris that resulted in a 66% transport percentage.

Enclosure

h) A description of the methodology used to estimate the erosion of fibrous and calcium silicate insulation in the containment pool (and any other insulation types for which erosion was assumed).

i) A statement of the height of the debris interceptors, a description of their modeling in the CFD, a summary of the transport metrics used for debris that is assumed to climb over the interceptors, and a description of the credit that was taken for debris capture at the debris interceptors.

j) A discussion as to why the transport fractions for Temp-Mat are higher than for Thermal Wrap. Presumably, the denser fiberglass (Temp-Mat) would be less transportable for equivalent sizes of debris than the less dense fiberglass (Thermal Wrap). However, the results presented in the supplemental response show the opposite behavior.

4. Please provide verification that the fibrous size distribution used during testing was prototypical or conservative compared to the size distribution predicted by the transport evaluation.

5. Please provide details of the debris addition procedures used. Please include a description of fibrous concentration during debris addition, the debris addition location, and the method of adding fibrous debris to the test tank. Please provide verification that the debris introduction processes did not result in non-prototypical settling, agglomeration, or deposition of debris.

6. If the test(s) allowed near-field settling, please provide a comparison of the flows predicted around the strainer in the plant versus the flows present in the test flume. Please show that the test velocities and turbulence levels were prototypical or conservative compared to the plant. If the test(s) allowed settling, please provide the amount (percentage by type) of debris that settled in the test tank.

7. If agitation was utilized to prevent debris settling, please discuss the methods by which the strainer debris bed was not non-conservatively disturbed by the agitation and that non-prototypical transport did not result.

8. Please provide the test termination criteria and the methodology by which the final head loss values were extrapolated to the emergency core cooling system (ECCS) mission time or some predicted steady state value. Please include enough test data to allow the extrapolation results to be verified.

9. Please provide information that verifies that the thin bed testing was conducted in a manner that would result in prototypical or conservative head loss values. Please see the "Revised Review Guidance for Strainer Head Loss and Vortexing (ADAMS Accession No. ML080230038). The second supplemental response indicated that small amounts of fibrous debris were added to the test followed by small amounts of particulate. However, the intent of thin bed testing is to determine if the limiting particulate load, combined with gradually increasing amounts of fiber, will result in greater head losses than the full debris load. In addition, the staff believes that it is most

conservative to ensure that fine (easily suspendable) fibers are used in thin bed testing until the amount of fine fiber predicted to reach the strainer has been added to the test flume.

10. Please provide flow rates used during testing.

11. Please provide information that verifies that the amounts of debris added to the test flume were scaled correctly.

12. Please provide information that shows that pressure-related phenomena (e.g., boreholes or channeling) did not occur during testing. A description of flow sweeps conducted following testing that show a head loss change is approximately proportional to flow change is acceptable for this purpose.

13. Please provide any conservatisms that were used during the strainer final head loss testing.

14. Please provide the methodology used for calculation of clean strainer head loss.

15. Please provide the following information as discussed in Enclosure 3 to a letter from the NRC to the Nuclear Energy Institute dated March 28, 2008 (ADAMS Accession No. ML080380214). Specifically, please provide the information requested by item 16.d. on page 20 (termination criteria) and items 17.d.i. and 17.d.ii. on page 21 (test pressure drop curve and an explanation of any extrapolation of data).

16. Please provide a basis for the assertion that strainer submergence is greater than debris bed head loss. The strainer head loss, as determined by testing, appears to exceed the strainer submergence of 7 inches. Please provide a flashing evaluation considering the calculated head loss value for debris and the clean strainer.

17. Please clarify the basis for determining the limiting pump flow rates used in the net positive suction head (NPSH) calculation. How were these pump and sump flow rates determined? Are the assumed pump flows 1) "runout" (pump tested maximum) flow values, 2) preset maximum flow values, or 3) manually controlled flow rates? If runout flow values are not used, how is the flow controlled so as not to exceed the value assumed in the NPSH calculation?

18. Please provide the methodology for determining pump suction and other flow-related head losses. Please provide the assumptions and bases for the application of this methodology.

19. Please provide information that illustrates why there is a difference in the NPSH margin results for the case where "B" residual heat removal (RHR) pump is operating with a suction line failure ("Suction Line Fails to Open" case) and the case where the "B" RHR pump is operating with a failure of Train A ("Train A Failure" case).

20. Please provide the NPSH margin results for the hot-leg injection case wherein two safety injection (SI) pumps are operated in series with a single RHR pump for a sump flow rate

of 2200 gpm. This configuration is described at the top of page 50 in the supplemental response dated February 29, 2008.

21. Please provide the methodology for determining $NPSH_R$ (NPSH required) for the ECCS and containment spray system pumps.

22. Please provide the basis for concluding that the refueling cavity drain(s) would not become blocked with debris. Please identify the potential types and characteristics of debris that could reach these drains. In particular, could large pieces of debris be blown into the upper containment by pipe breaks occurring in the lower containment, and subsequently drop into the cavity? In the case that partial/total blockage of the drains might occur, do water hold-up calculations used in the computation of NPSH margin account for the lost (held-up) water resulting from debris blockage?

23. Please provide the basis for concluding that the ratio of refueling cavity area to basement floor area is conservative for determining how much water will drain into the cavity. For example, is it possible that spray drainage landing on other surfaces at or above the elevation of the refueling cavity, but not directly over the refueling cavity, may drain into the refueling cavity?

24. What is the volume of water assumed to be held up in the refueling cavity whether blocked, partially blocked or open?

25. Please provide information that supports crediting the accumulator volume for calculating minimum sump level for all break scenarios, including small-break loss-of-coolant accidents (LOCAs), as applicable. If accumulator volume should not be credited for specific break scenarios, please provide an updated assessment of NPSH margin and the likelihood and effect of air entrainment from vortexing.

26. Please list the design inputs used for the strainer structural loads considered (such as live load, thermal, seismic, differential pressure, hydrodynamic, LOCA, loads imposed by debris etc), the design strength of structural materials, and actual damping used for the analysis.

27. Please list the actual load combinations evaluated in the structural analysis of the sump strainer assembly.

28. Please indicate the edition/revision of the American Institute of Steel Construction and American Society of Mechanical Engineers Section III Codes and the Regulatory Guides used in the structural analysis.

29. Please indicate the components for which the equivalent static analysis was used and the components for which the dynamic analysis was used, and if any structural analysis software was used.

30. A calculation (Reference i) is listed in the list of references for Section 3.k in the supplemental response which may contain the structural qualification results and design margins for various components of the sump strainer structural assembly. However, none of the actual information was summarized or provided. Please provide a summary

of this information. This summary should include interaction ratios and/or design margins for the structural components (structural members, plates, welds, concrete anchorages, and bolted connections, as applicable) of the strainer assembly that demonstrate existing margins between actual stress (force) and allowable stress (force) or other acceptance criteria for the different structural components of the strainer assembly for the load combinations considered.

31. The leak-before-break (LBB) concept, which was NRC-approved for Ginna for the main coolant loop piping under LOCA (see Updated Final Safety Analysis Report Sections 3.6.1.3.2.13 and 5.4.11.1.2), was appropriately credited in the sump structural analysis as the rationale for not considering the dynamic effects of a break in this particular piping (submittal Section 3.k.1, page 72). However, the supplemental response did not specifically state that the sump was outside the zone of influence of the three pipe breaks postulated in Section 3.e.2 and Figure 3.e.2.1 (page 40) of the supplemental response. Considering this, please provide the following information regarding consideration of possible dynamic effects associated with high-energy line breaks in the sump structural analysis: (a) please examine the above stated break locations relative to the location of the sump and confirm/justify if these postulated breaks would or would not impose dynamic pipe break effects on the sump strainer assembly; and (b) please examine and confirm if there are or are not breaks of any other piping (e.g. safety injection, containment spray lines etc.) for which application of the leak-before-break concept may not have been approved but which may impose dynamic pipe break effects on the strainer assembly. If there are any such cases, please justify why the dynamic pipe break effects of such piping were not considered in the sump structural analysis.

32. The supplemental response for Section 3.k is silent with regard to backflushing. Please indicate whether a back-flushing strategy was credited for Ginna. If credited, please provide a summary statement regarding the sump strainer structural analysis considering reverse flow, as requested in the fourth bullet of the guidance for Section 3.k in the Revised Content Guide for GL 2004-02.

33. Please confirm that the downstream effects components and systems evaluation performed for Ginna used the guidance in WCAP-16406-P, Revision 1 and the NRC safety evaluation of WCAP-16406-P, Revision 1.

34. The February 29, 2008, supplemental response discusses the assumptions for post-LOCA pH in the sump pool but did not provide the pH values for the containment spray. The corrosion rate of aluminum exposed to initial containment spray containing injected sodium hydroxide will be higher due to the increased pH before an equilibrium pH is reached in the sump. Please provide the containment spray pH values used as input for the WCAP-16530-NP chemical spreadsheet from the time that sodium hydroxide is injected into the containment spray until an equilibrium pH value is reached.

35. The February 29, 2008, supplemental response indicated that aluminum corrosion inhibition by silica leached from various sources was stated to not have been taken into account. However, the 71.3 kg of sodium aluminum silicate tested in February 2008, appears to be consistent with a silica refinement value shown in Table 3.o.1 in the February 29, 2008, supplemental response. Please clarify if aluminum corrosion

inhibition by silica was credited. If silica inhibition credit was used to reduce the amount of aluminum containing precipitate, please address the following: (a) the types and amounts of plant debris assumed to provide the source of silicates, (b) the dissolved silicate concentration assumed to inhibit aluminum corrosion and the time assumed to reach that silicate concentration, (c) for cases where silicate inhibition was credited, discuss whether other breaks that produce less calcium silicate were considered to ensure that these breaks did not produce a more challenging head loss test by having a greater amount of chemical precipitate, and (d) how much the amount of chemical precipitates in the head loss test was reduced by silicate inhibition.

36. The February 29, 2008, supplemental response stated that licensee analysis of the Control Components, Incorporated (CCI) precipitate generation methodology concluded that approximately four times the precipitate that was expected per WCAP-16530-NP formed in the test loop. Therefore, the chemical effects testing was considered flawed and additional testing was performed. Please describe the analysis that was performed and the basis for concluding that four times the predicted amount of chemical precipitate formed in the CCI test loop. In addition, please describe why the precipitate that formed in the test loop was not representative of what could form in the sump pool following a LOCA.

37. Please indicate what aspects of the plant's licensing basis has changed and/or what new information will be added and considered to be part of the plant's licensing basis. Please provide a schedule for establishing a revised licensing basis.

Please contact me at 301-415-1364 if you have any questions.

Sincerely,

/RA/
Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-244

Enclosure:
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