November 18, 2003

Mr. John L. Skolds, Chairman
and Chief Executive Officer
AmerGen Energy Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

SUBJECT: CLINTON POWER STATION, UNIT 1 - CORRECTED REQUEST FOR ADDITIONAL INFORMATION REGARDING ALTERNATE SOURCE TERM SUBMITTAL (TAC NO. MB8365)

Dear Mr. Skolds:

By letter dated October 30, 2003, the staff issued a request for additional information (RAI) regarding your application of April 3, 2003 (RS-03-060) that proposed application of an alternative source term methodology pursuant to Section 50.67, "Accident Source Term" of Title 10 of the *Code of Federal Regulations* (10 CFR). On November 5, 2003, your staff informed us that the RAI included in our letter was inconsistent with previous discussions on this issue.

The enclosure includes the corrected RAI. As stated in our previous letter, the staff is preparing a standard set of questions concerning the standby liquid control system which will be provided to you at a later date.

We apologize for any inconvenience this may have caused.

Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure: Request for Additional Information

cc w/encls: See next page

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Clinton Power Station, Unit 1

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REQUEST FOR ADDITIONAL INFORMATION

APPLICATION OF ALTERNATE SOURCE TERM

CLINTON POWER STATION, UNIT 1

DOCKET NO. 50-461

1. On Page 8 of Attachment 2 to the April 3, 2003, submittal, the last paragraph states that the leakage of air from the feedwater isolation valve (FWIV) would be 10.98 cfm for a 1-hour period until the feedwater piping is filled with water. However, Table 4 on Page 18 of 35, states the leakage as 10.98 cfm for "each of two penetrations" from 21.15 minutes to 1-hour, a period of less than 40 minutes. The table on Page 27 of 35 states that the leakage is 10.98 cfm total. Similar confusion exists over the 2 gpm value after 1-hour. Please clarify the appropriate leakage value, onset, and duration. Please confirm that the analyses were performed using the correct values. If the 21.15 minute leakage onset is correct, please provide the basis for this onset timing.

2. On Page 9 of Attachment 2 to the submittal, the third paragraph states that since a separate dose analysis has been performed for the primary containment purge lines, the leakage from these penetrations no longer need to be considered in determining compliance with the secondary containment bypass leakage or primary containment leakage rate acceptance criteria in the technical specifications. This is also shown on Page 18 in Attachment 5. The staff finds this argument to be technically correct but believes 10 CFR Part 50 Appendix J (e.g., III.B.3) requires the leakage from all pathways subject to testing to be summed. Please provide an explanation of how your proposed protocol will meet the requirements of Appendix J.

3. On Page 10 of Attachment 2 to the submittal, the control room unfiltered leakage is established at 600 cfm. Please provide an explanation of the basis or derivation of this value. Include in your explanation any testing results that confirm the assumed value.

4. On Page 11 of Attachment 2 to the submittal, the second paragraph states that AmerGen has used the Brockmann-Bixler model for main steamline deposition. The discussion and the data in Table 6 are insufficient to support staff confirmation. Please provide the following information.

    a. A single-line sketch of the four main steamlines and the isolation valves. Annotate this sketch to identify each of the control volumes assumed by AmerGen in the deposition model.

    b. A tabulation of all of the parameters input into the Brockmann-Bixler model for each control volume shown in the sketch (and time step) for which AmerGen is crediting deposition. This includes:

- Flow rate
- Gas pressure
- Gas temperature
- Volume
- Inner surface area
- Total pipe bend angle

c. For each of the parameters in 5.b, provide a brief derivation and an explanation why that assumption is adequately conservative for a design-basis calculation. Address changes in parameters over time, e.g., plant cooldown.

d. Since the crediting of main steamline deposition effectively establishes the main steam piping as a fission product mitigation system, the staff expects the piping to meet the requirements of an engineered safety feature system, including seismic and single-failure considerations. Your submittal does not appear to address a single-failure of one of the main steam isolation valve (MSIVs). Such a failure could change the control volume parameters that are input to the deposition model. Previous implementations of main steam deposition have been found acceptable only if the licensee had modeled a limiting single-failure. Please explain why AmerGen feels that such a limiting failure need not be considered.

e. Please confirm that the main steam piping and isolation valves that establish the control volumes for the modeling of deposition were designed and constructed to maintain integrity in the event of the safe shutdown basis earthquake for Clinton. If the design-basis for the piping and components does not include integrity during earthquakes, please provide an explanation of how the Clinton design satisfies the prerequisites of the staff-approved NEDC-31858P-A, “BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems.” If piping systems and components at Clinton were previously found by the staff to be seismically rugged using the methodology of this Boiling Water Reactor Owners Group report, please provide a specific reference to the staff’s approval.

f. On page 24 of 30 in Table 2, you state that your submittal is in compliance with Paragraph 6.3 of Appendix A to regulatory guide (RG) 1.183, and reference the RADTRAD Brockman-Bixler approach apparently as establishing that conformance. However, Paragraph 6.3 of RG 1.183 states that the model should be based on well-mixed volumes, but other models such as slug flow may be used if justified. The Brockman-Bixler model is a slug-flow model. This paragraph did not endorse RADTRAD as an acceptable approach. RG 1.183 states that main steamline deposition will be considered on a case-by-case basis. The staff documented its evaluation of the first application of main steam-line deposition credit in an alternate source term in Appendix A of the staff report: AEB-98-03, "Assessment of the Radiological Consequences for the Perry Pilot Plant Application using the Revised (NUREG-1465) Source Term." The methodology of this report, which can be found online in ADAMS at ML011230531, was used by at least two additional licensees. The staff did accept one application of plug flow in which the licensee has committed to maintaining a seismically rugged drain path from the 3rd MSIV to and through the condenser. This safety evaluation is on ADAMS at ML011660142. Please provide a justification for your proposed modeling approach or re-perform the analyses.

5. Provide the corresponding information requested in Item 5 for the containment purge penetrations.

6. Section 4.3 of Attachment 2 to the submittal addresses the main steamline break accident analysis. AmerGen has proposed a transport model that is based on thermo-hydraulic rather than the meteorological processes addressed in regulatory guidance. AmerGen's approach appears to maximize the volume of the assumed hemisphere which minimizes its concentration, exposing the control room intake to a lower concentration for a longer period. The description in the submittal doesn't provide sufficient information for the staff to conclude that this is an adequately conservative approach. Please provide the following information:

   a. Whether AmerGen performed a sensitivity analysis to determine if the maximum hemisphere volume yields the highest control room intake? Did AmerGen consider heat losses during expansion that could reduce the size of the expanded hemisphere?

   b. The pressure and temperature of the steam at the point of release (prior to expansion to atmospheric pressure and temperature).

   c. A clarification of whether "atmospheric pressure and temperature" is to be interpreted as 14.7 psia and the associated saturation temperature. If another temperature or pressure is assumed, please identify the values and their bases.

   d. The assumption regarding control room intake during the puff transit. For example, a particular flow rate for the duration of the hemisphere movement.

7. Section 4.3 of Attachment 2 to the submittal also states that the meteorological dispersion model of RG 1.5 is used for offsite doses. The methodology of RG 1.5 requires the release rate to be expressed in terms of release rate. Please explain how the release quantity for an instantaneous release has been converted to a release rate.

8. Section 4.3 of Attachment 2 to the submittal provides three bullet items related to establishing the magnitude of the release activity. Please explain the relationship of the second and third bullet items as they apply to the statement in the first bullet that the activity in the steam cloud is based on the total mass of water released from the break, not just that which flashes to steam. These last two bullets appear to conflict with the first of the three bullets and the break discharge mass entry in Table 8.

9. In Table 4 of Attachment 2 to the submittal, the emergency core cooling system (ECCS) water component of the FWIV leak rate is reduced at 24 hours. It appears that this assumption is predicated on the RG 1.183 assumption that containment leakage may be reduced by 50 percent at 24 hours. As the staff understands the Clinton design, the ECCS water is a forced flow intended to seal the penetration. The staff believes that the

pressure associated with this forced flow is that of the ECCS pump discharge pressure, less system pressure drops, and is independent of the containment pressure. Please explain the basis for your assumed reduction at 24 hours.

10. In Table 4 of Attachment 2 to the submittal, the ECCS system leakage flash fraction is set at 1.36 percent. Entry 5.5 in Attachment 5 indicates that the value of 1.36 percent is the current design-basis value derived from ORNL-TM-2412. However, the third paragraph on Page 9 in Attachment 2 states that the ECCS system leakage is a new release path for Clinton Power Station analyzed to comply with RG 1.183. Thus, it would appear that there is no current licensing basis for the flash fraction.

    Paragraph 5.5 of Appendix A of RG 1.183 states that the flash fraction should be assumed to be 10 percent, unless a smaller value can be justified on the actual sump pH history and area ventilation rates. Please explain why ORNL-TM-2412 is an acceptable alternative to the guidance in RG 1.183.

11. In Table 5 of Attachment 2 to the submittal, the control room volume is set at 324,000 cubic feet. Final safety analysis report 6.4.2.1 states that the volume is 405,134 cubic feet. Please resolve this discrepancy.

12. In Table 5 of Attachment 2 to the submittal, the last table entry refers to inleakage control necessary to maintain constant iodine protection factor (IPF). Please explain how these data are being used to show compliance with control room habitability requirements. Were these two expressions used to establish the 650 cfm filtered and 600 cfm unfiltered inleakage rates shown in Table 5? If these expressions were used as part of the basis for the inleakage rates, please provide the following information:

    a. The derivation of the numeric constants in the two expressions.

    b. An explanation of how these expressions were verified and validated.

    c. An explanation of how AmerGen resolved the IPF caveat provided in Footnote 15 on Page 1.183-18 of RG 1.183 in finding (as expressed in Table 1 of Attachment 5 of the submittal) that the AmerGen submittal conformed with Paragraph 4.2.3 of RG 1.183.

13. On Page 5 of Attachment 2 to the submittal, the last bullet states that AmerGen developed new offsite and control room atmospheric dispersion factors. Please provide the following information needed for staff confirmation of these values:

    a. The information, including the joint frequency data file, that was input into the PAVAN code to generate χ/Q values. An electronic copy or a paper copy of the PAVAN input file(s) would be an acceptable approach to providing these data.

    b. The information, including the meteorological data files, that were used as input into the ACRON96 code to generate χ/Q values for the control room. The meteorological data files should be submitted on electronic media in the format readable by the ARCON96 code. For the remaining data, tabular data or paper copies of the ARCON96 input files would be an acceptable approach to submitting this information.

14. The licensee stated in its submittal, as part of the loss-of-coolant accident (LOCA) suppression pool pH evaluation, that 4246 pounds of sodium pentaborate is delivered to the suppression pool to ensure that the particulate iodine deposited in the suppression pool following a LOCA does not re-evolve and become airborne as elemental iodine. The staff is interested in the details of the analysis used for calculating the buffering effect of the standby liquid control system sodium pentaborate solution on the suppression pool pH. Of special interest to the staff are:

    a. Formation of nitric acid in the containment.

    b. Generation of hydrochloric acid from radiolysis of the containment cables.

    c. Amounts of Hydriodic Acid and Cesium Hydroxide release from the damaged fuel after a LOCA.

15. In order to complete its evaluation, the staff needs to appraise the general assumptions and methodologies used by the licensee to prove that the suppression pool pH will be maintained above 7 throughout the duration of the accident. Please describe the procedure utilized, including sample calculations, for calculating pH of the suppression pool water during the 30 day period after a LOCA.