March 12, 1998

Mr. Joseph V. Sipek
Director - Licensing
Clinton Power Station
P.O. Box 678
Mail Code V920
Clinton, IL 61727

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE GL 96-06 RESPONSE FOR THE CLINTON POWER STATION, UNIT 1 (TAC NO. M96796)

Dear Mr. Sipek:

Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996, included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to water hammer and two-phase flow conditions. You provided your assessment for the Clinton Power Station in letters dated January 28, and July 24, 1997. In order to complete our review of your resolution of the water hammer and two-phase flow issues, we require additional information as discussed in the enclosure. We request that you provide this information by June 15, 1998.

Your resolution of the thermal pressurization issue is continuing to be reviewed by the NRC staff. If necessary, a separate request for additional information will be sent to you for that issue.

Contact me if you have any questions.

Sincerely,

Original signed by:

Jon B. Hopkins, Senior Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure: Request for Additional Information

cc w/encl: See next page

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DATE	3/12/98		3/12/98	

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

March 12, 1998

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Division of Reactor Projects III/IV
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REQUEST FOR ADDITIONAL INFORMATION FOR RESOLUTION OF

GL 96-06 ISSUES AT THE CLINTON POWER STATION

(TAC NO. M96796)

Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996, included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to water hammer and two-phase flow conditions. Illinois Power Company (the licensee) provided its assessment for the Clinton Power Station in letters dated January 28, and July 24, 1997. In order to adequately assess the licensee's resolution of the water hammer and two-phase flow issues, the following additional information is requested:

1. If a methodology other than that discussed in NUREG/CR-5220, "Diagnosis of Condensation-Induced Water Hammer," was used in evaluating the effects of water hammer, describe this alternate methodology in detail. Also, explain why this methodology is applicable and gives conservative results for the Clinton unit (typically accomplished through rigorous plant-specific modeling, testing, and analysis).

2. For both the water hammer and two-phase flow analyses, provide the following information:

   a. Identify any computer codes that were used in the water hammer and two-phase flow analyses and describe the methods used to bench mark the codes for the specific loading conditions involved (see Standard Review Plan Section 3.9.1).

   b. Describe and justify all assumptions and input parameters (including those used in any computer codes) such as amplifications due to fluid structure interaction, cushioning, speed of sound, force reductions, and mesh sizes, and explain why the values selected give conservative results. Also, provide justification for omitting any effects that may be relevant to the analysis (e.g., fluid structure interaction, flow induced vibration, erosion).

   c. Provide a detailed description of the "worst case" scenarios for water hammer and two-phase flow, taking into consideration the complete range of event possibilities, time of system alignment, system configurations, and parameters. For example, all water hammer types and water slug scenarios should be considered, as well as temperatures, pressures, flow rates, load combinations, and potential component failures. Additional examples include:

      - the effects of void fraction on flow balance and heat transfer;
      - the consequences of steam formation, transport and accumulation;
      - cavitation, resonance, and fatigue effects; and
      - erosion considerations.

Licensees may find NUREG/CR-6031, "Cavitation Guide for Control Valves," helpful in addressing some aspects of the two-phase flow analyses.

d. Confirm that the analyses included a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact performance of the cooling water system, and confirm that the FMEA is documented and available for review, or explain why a complete and fully documented FMEA was not performed.

e. Explain and justify all uses of "engineering judgment."

3. Determine the uncertainty in the water hammer and two-phase flow analyses, explain how the uncertainty was determined, and how it was accounted for in the analyses to assure conservative results for the Clinton Power Station.

4. Confirm that the water hammer and two-phase flow loading conditions do not exceed any design specifications or recommended service conditions for the piping system and components, including those stated by equipment vendors; and confirm that the system integrity will be maintained.

5. Provide a simplified diagram of the system, showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions.