August 3, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
1400 Opus Place, Suite 500
Downers Grove, IL 60515

SUBJECT: CLINTON POWER STATION, UNIT 1 - GENERIC LETTER 96-06
(TAC NO. M96796)

Dear Mr. Kingsley:

By letter dated October 28, 1996, as supplemented January 28 and July 24, 1997, June 15, 1998, and December 18, 2000, you responded to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." The submittals address the issues of water hammer, two-phase flow, and thermally-induced pressurization of piping penetrating containment for Clinton Power Station.

The Nuclear Regulatory Commission staff has completed its review of your submittals, and finds that your evaluations and corrective actions are acceptable for responding to GL 96-06. Our safety evaluation is enclosed.

Contact me if you have any questions.

Sincerely,

/RA/

Jon B. Hopkins, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure: As stated

cc w/encl: See next page

Oliver D. Kingsley

Clinton Power Station, Unit 1
AmerGen Energy Company, LLC

cc:

John Skolds
Chief Operating Officer
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

William Bohlke
Senior Vice President Nuclear Services
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

John Cotton
Senior Vice President - Operations Support
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

Christopher Crane
Senior Vice President - Mid-West Regional Operating Group
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

Jeffrey Benjamin
Vice President - Licensing and Regulatory Affairs
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

H. Gene Stanley
Operations Vice President
Mid-West Regional Operating Group
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

R. M. Krich
Director-Licensing
Mid-West Regional Operating Group
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

Robert Helfrich
Senior Counsel, Nuclear
Mid-West Regional Operating Group
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

Document Control Desk-Licensing
Exelon Generation Company, LLC
1400 Opus Place, Suite 900
Downers Grove, IL 60515

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, IL 62704

J. M. Heffley
Vice President
Clinton Power Station
RR 3, Box 228
Clinton, IL 61727-9351

M. J. Pacilio
Plant Manager
Clinton Power Station
RR 3, Box 228
Clinton, IL 61727-9351

W. S. Iliff
Regulatory Assurance Manager (Acting)
Clinton Power Station
RR 3, Box 228
Clinton, IL 61727-9351

Oliver D. Kingsley

cc:
Resident Inspector
U.S. Nuclear Regulatory Commission
RR#3, Box 229A
Clinton, IL 61727

R. T. Hill
Licensing Services Manager
General Electric Company
175 Curtner Avenue, M/C 481
San Jose, CA 95125

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Chairman of DeWitt County
c/o County Clerk's Office
DeWitt County Courthouse
Clinton, IL 61727

J. W. Blattner
Project Manager
Sargent & Lundy Engineers
55 East Monroe Street
Chicago, IL 60603

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
1400 Opus Place, Suite 500
Downers Grove, IL 60515

August 3, 2001

SUBJECT: CLINTON POWER STATION, UNIT - GENERIC LETTER 96-06
(TAC NO. M96796)

Dear Mr. Kingsley:

By letter dated October 28, 1996, as supplemented January 28 and July 24, 1997, June 15, 1998, and December 18, 2000, you responded to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." The submittals address the issues of water hammer, two-phase flow, and thermally-induced pressurization of piping penetrating containment for Clinton Power Station.

The Nuclear Regulatory Commission staff has completed its review of your submittals, and finds that your evaluations and corrective actions are acceptable for responding to GL 96-06. Our safety evaluation is enclosed.

Contact me if you have any questions.

Sincerely,
/RA/

Jon B. Hopkins, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure: As stated

cc w/encl: See next page

Distribution:
PUBLIC
PD3/2 r/f
AMendiola
THarris
JHopkins
OGC
ACRS
GGrant, R3

ACCESSION NO.: **ML012120329**

To receive a copy of this document, indicate in the box: "C" = Copy without enclosures **"E"** = Copy with enclosures **"N"** = No copy

OFFICE	PM:LPD3/2		LA:LPD3/2		SC:LPD3/2	
NAME	JHOPKINS		THARRIS		AMENDIOLA	
DATE	08/2/01		08/2/01		08/3/01	

OFFICIAL RECORD COPY

SAFETY EVALUATION OF THE RESPONSE TO GENERIC LETTER 96-06

CLINTON POWER STATION

DOCKET NO. 50-461

1.0 INTRODUCTION

By letter dated October 28, 1996, as supplemented January 28 and July 24, 1997, June 15, 1998, and December 18, 2000, the licensee (AmerGen Energy Company, LLC; previously Illinois Power Company) for Clinton Power Station (CPS) responded to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." The submittals address the issues of water hammer, two-phase flow, and thermally-induced pressurization of piping penetrating containment during postulated design-basis accidents for CPS.

2.0 EVALUATION

CPS does not rely on containment coolers to mitigate the consequences of any design-basis accident. However, operation of the drywell cooling system (VP) and supplemental drywell cooling system (WO) may occur following a loss-of-coolant accident (LOCA) or main steamline break (MSLB). Steam formation within the piping or cooling coils of the VP and WO systems that could produce waterhammer during system draining or actuation is unlikely. The systems are pressurized so that following loss of pumping power, the systems will not drain and will remain water solid. The VP system contains a compression tank located in the auxiliary building that is normally pressurized to 35 psig. The WO system contains a compression tank located outside containment that is normally pressurized to 75 psig.

Since the VP and WO systems are not safety related, they contain isolation valves outside containment that will isolate the systems following a LOCA or MSLB. The licensee has evaluated the possibility of steam formation within the isolated systems resulting from elevated containment temperatures during an accident. The VP system is protected from overpressure by relief valves set at 140 psig. These valves might open following an accident to relieve pressure caused by thermal expansion of the enclosed water. The minimum expected reset pressure is 125 psig. Both these pressures are above the pressure at which steam can form at the maximum calculated accident drywell temperature of 330 ^{o}F. The WO system is equipped with a relief valve that opens at 250 psig. Steam formation within these closed systems following a LOCA or MSLB is unlikely. Therefore, system operability problems associated with two-phase flow are not of concern.

Since steam cannot form in the VP or WO systems by system draining following loss of pumping power or by internal boiling following a LOCA or MSLB, the occurrence of a waterhammer within these systems is unlikely. Nevertheless, the licensee has evaluated the consequences of a postulated waterhammer if an unexpected steam bubble did form.

Following an evaluation of the piping layouts for both systems, the most vulnerable location was determined to be within the VP system which has an air cooling unit that is fed by an eight-inch line close to the inboard containment isolation valve. If a steam void were to form at this location, a waterhammer could occur from column closure if pumped cooling flow were reestablished. The licensee evaluated the maximum pressure pulse that could occur at this location assuming a return to full flow conditions. This calculation used a conservative formulation in which no credit was taken for steam or air entrainment in reducing the sonic velocity in the water or in cushioning the impact. The result was used to calculate loadings on system piping and penetrations. The loadings were found to remain below maximum allowable.

Based on the forgoing considerations, the Nuclear Regulatory Commission staff concludes that the occurrence of a waterhammer event, such as will affect plant safety as described in GL 96-06, is highly unlikely at CPS. Even if waterhammer did occur, loadings would be below maximum allowable.

In the submittal dated January 28, 1997, the licensee summarized its review of fluid systems that are susceptible to overpressurization due to thermal expansion of internal fluid. The licensee identified 21 containment penetrations which were potentially susceptible to thermally-induced pressurization. The licensee determined that all of these penetrations would be operable prior to plant startup (the plant was shutdown at the time). In the July 24, 1997, submittal, the licensee identified another penetration which was susceptible to thermally-induced pressurization. It was also determined to be operable. For these 22 penetrations, the licensee provided the following information. For four of the penetrations, the licensee revised operational procedures to prevent isolation of multiple valves simultaneously, during surveillance testing, thereby eliminating the possibility of pressurization. For three of the penetrations, the licensee determined that they were not required for normal or post-LOCA operation, and drained the piping. For five of the penetrations, the licensee added air chambers to the piping to provide a compressible volume of air to accommodate thermal expansion of water. For three of the penetrations, holes were drilled in the inboard-side disks of the inboard containment isolation valves (CIVs) to relieve the fluid between the CIVs, when it expands. For seven of the penetrations, the licensee determined that the current CIV leakage was sufficient to prevent overpressurization. To eliminate the need to monitor and re-analyze the CIV leakage, the licensee determined that these seven penetrations would be modified. In the December 18, 2000, submittal, the licensee provided a description of the modifications and analysis for these seven penetrations. The licensee modified two of these penetrations by installing relief valves on the piping to prevent overpressure. For two of the penetrations, the licensee determined that the isolation valves are air-operated globe valves such that fluid overpressure is relieved as it lifts the valve disks against the valve spring force and operating air pressure. For two of these penetrations, the licensee drilled holes in the inboard CIVs to relieve overpressure. For one penetration, the licensee performed a structural analysis using the methodology provided in Appendix F of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code and determined that the penetrations were acceptable without any modification. The staff reviewed the information provided and finds that the licensee's evaluations and corrective actions for the identified 22 penetrations are reasonable and acceptable.

3.0 CONCLUSION

The staff reviewed the licensee's responses to GL 96-06 and finds that the evaluations and corrective actions performed by the licensee adequately address the GL 96-06 issues of two-phase flow, water hammer, and thermally-induced pressurization of piping runs penetrating containment for CPS. Therefore, TAC No. M96796 is closed.

Principal contributors: G. Hammer
W. Jensen