June 25, 2003

Mr. Khushwant S. Grewal
114 Coopers Kill Road
Deiran, NJ 08075-2008

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNIT NO. 2 (NMP2) - HIGH-PRESSURE CORE SPRAY NOZZLE SAFE-END EXTENSION WELD KC-32 (TAC NO. MB8071)

Dear Mr. Grewal:

By letter dated July 11, 2002, Mr. Stuart A. Richards responded to your letter of April 4, 2002, to Mr. Samuel J. Collins, Director of the Office of Nuclear Reactor Regulation, concerning NMP2. The subject of your concern was regarding a crack at weld KC-32 joining the high-pressure core spray nozzle safe-end to the safe-end extension on the reactor pressure vessel. You had raised similar concerns of weld KC-32 in your previous letter dated March 16, 2000, to which we responded by a letter dated May 5, 2000.

Mr. Richards stated in his July 11, 2002, letter that the Nuclear Regulatory Commission (NRC) staff will evaluate the licensee's response to its request for additional information dated June 5, 2002 (publicly available as Accession No. ML021560298 in the Agencywide Documents Access and Management System, ADAMS). The licensee responded by a letter dated March 6, 2003 (Accession No. ML030770444 in ADAMS).

The NRC staff reviewed the licensee's response. Based on the results of seven ultrasonic examinations performed in the past 12 years, the NRC staff finds that there is reasonable assurance that the mechanical stress improvement process treatment of weld KC-32 is effective in mitigating intergranular stress corrosion cracking, and that NMP2 can continue to be operated safely. Details of the NRC staff's review are set forth in the enclosed safety evaluation. This completes the NRC staff's effort responding to your April 4, 2002, letter.

Sincerely,

/RA/

Peter S. Tam, Senior Project Manger, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc w/encl: See next page

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DISTRIBUTION:

PUBLIC	PDI R/F	R. Laufer	S. Little	P. Tam
C. Holden	B. Platchek, RI	Y. L. Li	W. Koo	

ACCESSION NUMBER: **ML031710515**

OFFICE	PDI-1/PM	PDI-1/LA	EMCB/SC	PDI-1/SC		
NAME	PTam	SLittle	TChan*	RLaufer		
DATE	6/24/03	6/23/03	6/10/03	6/25/03		

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*Safety evaluation transmitted by memo of 6/10/03.

<u>SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION</u>

<u>NINE MILE POINT NUCLEAR STATION, UNIT NO. 2 (NMP2)</u>

<u>DOCKET NO. 50-410</u>

<u>HIGH-PRESSURE CORE SPRAY NOZZLE SAFE-END EXTENSION WELD KC-32</u>

1.0 INTRODUCTION

In a letter dated April 4, 2002, to Mr. S. J. Collins, Director of the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC), Mr. K. S. Grewal raised some concerns regarding a crack at weld KC-32 which joins the high-pressure core spray (HPCS) nozzle safe-end to the safe-end extension on the reactor pressure vessel at NMP2. By letter dated July 11, 2002, the NRC staff informed Mr. Grewal that it has requested additional information from the licensee, NMP2, by a letter dated June 5, 2002. The licensee provided additional information by letter dated March 6, 2003.

2.0 TECHNICAL EVALUATION

Mr. Grewal had raised similar concerns about weld KC-32 in a previous letter dated March 16, 2000 (Accession No. ML003702226 in the Agencywide Document Access and Management System), and the NRC staff responded to that letter on May 5, 2000 (Accession No. ML003713375). In the response, the NRC staff indicated that the concerns would be evidenced by significant changes or by trends in ultrasonic measurements that would indicate a developing problem. The results of ultrasonic measurements performed in the last 12 years, including the latest Refueling Outage (RFO)-8 examination have confirmed that there is no significant change in the flaw size, and therefore, the mechanical stress improvement process (MSIP) treatment is effective in mitigating the intergranular stress corrosion cracking (IGSCC) at weld KC-32.

The concerns raised in Mr. Grewal's letter of April 4, 2002, regarding the evaluation of a crack at weld KC-32, as the NRC staff understands them, are briefly summarized below:

1. The effect of lead shielding weight and pinning/not pinning of constant support hanger on the ultrasonic measurements of crack depth.

2. The effect of the stresses resulting from thermal stratification in the piping on the crack evaluation.

3. The potential relaxation of the beneficial residual stress induced by MSIP due to stresses such as thermal expansion stress, thermal stratification stress, pressure stress and any dynamic stresses.

Enclosure

In its March 6, 2003, response to the NRC staff's request for additional information, the NMP2 licensee reported the results of ultrasonic examination performed at weld KC-32 during the eighth refueling outage RFO-8, April 2002. The Westinghouse "Intraspect" automated system was used in the examination, and the inspection procedures, equipment, and personnel were qualified to the Electric Power Research institute (EPRI) Performance Demonstration Initiative (PDI) standard. The crack size was reported to be 2.7 inches in length and 0.25 inch in depth, which was consistent with that reported in the previous examination performed in RFO-6 (May 1998). The reported crack size is also bounded by the original post-MSIP examination results (3.4 inches in length and 0.35 inch in depth). The results of the RFO-8 examination further confirmed that there is no significant change in the crack size at weld KC-32 after MSIP treatment.

The NRC staff has reviewed the licensee's March 6, 2003, response. The licensee's response is summarized and discussed below:

(1) The licensee stated that, with the exception of the 1992 inspection, the spring hanger near weld KC-32 was not pinned during the installation of the lead shielding and performance of the ultrasonic testing (UT) inspections. The weight of shielding lead placed on the HPCS piping during UT inspection cannot be determined with certainty; however, similar amounts have been used during the various examinations. The HPCS piping has been analytically qualified for a shielding lead weight of 90 lbs/ft applied to the piping and in line valves from the reactor pressure vessel nozzle to 4 feet upstream of containment isolation valve 2CSH*AOV108 (a total shielding weight of approximately 2,200 lbs). Administrative controls are used to ensure that the weight of shielding lead installed does not exceed the analytically qualified weight.

The results of the licensee's calculations showed that the resulting compressive (deadweight) stresses at the nozzle-to-pipe connection due to the application of shielding lead (in the amount discussed above) are 1,155 psi with the spring hanger pinned and 1,395 psi with the spring hanger unpinned. The results also showed that the difference in the deadweight stress due to the shielding lead with the spring hanger pinned versus unpinned is small. Since the compressive stresses resulting from the shielding lead is small, the NRC staff agrees with the licensee's conclusion that it will not have a significant effect on the ability of ultrasonic examination to detect and size the flaw.

(2) The licensee stated that HPCS system design criteria did not anticipate or require that thermal stratification be considered. Thermal stratification is caused by cold water flowing at the bottom of the pipe while the top of the pipe is exposed to hot temperature. The licensee's analysis confirmed that the differential water temperature between the top and bottom of the piping adjoining the reactor pressure vessel nozzle is small (a few degrees). The NRC staff finds that the licensee's response is reasonable. Based on the available information, the NRC staff agrees with the licensee's conclusion that the thermal stratification stresses need not be considered in the HPCS design criteria and evaluation.

(3) The licensee calculated the stress from the normal/upset load combination in accordance with the American Society of Mechanical Engineers Boiler and Pressure

Vessel Code (ASME Code), Section III requirements. The normal/upset load combination includes pressure, deadweight, and earthquake inertia loads, with the spring hanger unpinned. The calculated stress is 9,642 psi, which is well below the Code allowable of 30,000 psi (1.5 S_m). Therefore, the NRC staff believes that the potential relaxation of the beneficial residual stress at weld KC-32 is not going to be significant. The NRC staff's assessment is also supported by the results of ultrasonic examinations showing that the crack size has been stabilized by the MSIP treatment.

Mr. Grewal's letter stated that the maximum fatigue usage factor for Emergency Core Cooling Systems is limited to 0.1 instead of 1.0. The licensee stated in its response that, in accordance with the ASME Code, Section III, Division 1, Subsection NB, the design basis cumulative usage factor (CUF) limit for the HPCS piping and nozzle is 1.0. The NRC staff is not aware of any other design basis that would require the CUF limit for the HPCS systems to be 0.1.

Mr. Grewal also commented that Generic Letter (GL) 88-01 does not take into account the reliability requirements of the HPCS system. GL 88-01 is an NRC issuance advising the industry regarding NRC's position on IGSCC in boiling-water reactor austenitic stainless steel piping, and does not provide guidelines on other requirements pertaining to system reliability. As discussed above, the requirement of the CUF limit for the HPCS piping and nozzle is provided in ASME Code, Section III.

3.0 CONCLUSION

In summary, based on available information and the results of seven ultrasonic examinations performed in the past 12 years, the NRC staff finds that there is reasonable assurance that the MSIP treatment of weld KC-32 is effective in mitigating IGSCC, and that NMP2 can continue to be operated safely.

Principal Contributors: Y. L. Li
W. Koo

Date: June 25, 2003

Nine Mile Point Nuclear Station
Unit No. 2

cc:

Regional Administrator, Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Resident Inspector
Nine Mile Point Nuclear Station
P.O. Box 126
Lycoming, NY 13093

Mr. John V. Vinquist, MATS Inc.
P.O. Box 63
Lycoming, NY 13093

Supervisor
Town of Scriba
Route 8, Box 382
Oswego, NY 13126

Mr. Paul D. Eddy
Electric Division
NYS Department of Public Service
Agency Building 3
Empire State Plaza
Albany, NY 12223

Charles Donaldson, Esquire
Assistant Attorney General
New York Department of Law
120 Broadway
New York, NY 10271

C. Adrienne Rhodes
Chairman and Executive Director
State Consumer Protection Board
5 Empire State Plaza, Suite 2101
Albany, NY 12223-1556

Mark J. Wetterhahn, Esquire
Winston & Strawn
1400 L Street, NW.
Washington, DC 20005-3502

Mr. Michael J. Wallace
President
Nine Mile Point Nuclear Station, LLC
c/o Constellation Energy Group
750 East Pratt Street
Baltimore, MD 21201-2437

James M. Petro, Jr., Esquire
Counsel
Constellation Power Source, Inc.
111 Market Place
Suite 500
Baltimore, MD 21202

Mr. William M. Flynn, President
New York State Energy, Research,
and Development Authority
17 Columbia Circle
Albany, NY 12203-6399

Mr. John T. Conway
Site Vice President
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093