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 50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316  
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SUBJECT: Informs of action taken in response to Action Items 2 & 3 of  
 Bulletin 88-008, "Thermal Stresses in Piping Connected...."

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AEP:NRC:1069A

Donald C. Cook Nuclear Plant Units 1 and 2  
Docket Nos. 50-315 and 50-316  
License Nos. DPR-58 and DPR-74  
NRC BULLETIN NO. 88-08: ACTION ITEM STATUS

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Attn: T. E. Murley

August 8, 1989

Dear Dr. Murley:

The purpose of this letter is to describe the actions taken to date in response to Action Items 2 and 3 of NRC Bulletin No 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems," and to provide the actions planned and schedule for completion of the bulletin response for the Donald C. Cook Nuclear Plant. Action Item 2 requested nondestructive examination of any unisolable sections of piping connected to the reactor coolant system that may have been subjected to excessive thermal stresses to provide assurance that there are no existing flaws. Action Item 3 requested planning and implementing a program to provide continuing assurance that unisolable sections of all piping connected to the reactor coolant system will not be subjected to combined cyclic and static thermal and other stresses that could cause fatigue failure during the remaining life of the unit.

Our prior response to NRC Bulletin No. 88-08, AEP:NRC:1069 dated September 29, 1988, identified the following piping sections as having the potential for being subjected to high-cycle thermal stress caused by leaking valves:

- o One 3" alternate charging line to loop 1 cold leg
- o One 2" auxiliary pressurizer spray line
- o Four 1 1/2" high-pressure emergency core cooling system (ECCS) injection lines (one injection line to each cold leg)

These lines were initially considered susceptible to thermal fatigue loading based on the potential for upstream valve leakage.

Westinghouse Electric Corporation was contracted to further evaluate the susceptibility of the alternate charging line and the auxiliary pressurizer spray line to excessive thermal fatigue stresses. The evaluation determined that the auxiliary pressurizer spray line is not exposed to thermal cycling. However, in the course of developing our final response to the bulletin and upon further review of the Westinghouse evaluation, it was determined that an operating condition may not have been adequately addressed. The unusual condition of low leakage from the auxiliary pressurizer spray line without fully developed turbulent flow from the normal spray valves needs to be further evaluated.

The initial evaluation that the auxiliary pressurizer spray line is not exposed to thermal cycling was based on the following:

- o The principal cyclic mechanism identified at Farley 2 which led to fatigue failure was turbulent flow from the reactor coolant system (RCS) at the intersecting ECCS nozzle. Turbulent flow is not continuously present in the auxiliary pressurizer spray line at Cook Nuclear Plant. The normal pressurizer spray line joins the auxiliary spray line at a potential high stress point and passes flow only when the normal spray valves are open. These valves are in the closed position the majority of the operating cycle. Only a minimum flow of 1 to 5 gpm from the normal spray bypass valves is continuously present and this flow is injected upstream of the tee. Without turbulent flow, any existing thermal stratification remains stable and no cyclic fatigue loadings are imposed on the auxiliary pressurizer spray line. When the normal pressurizer spray valves are opened, full mixing is accomplished at the intersection with the auxiliary pressurizer spray line. Actual temperature data on another Westinghouse plant indicated that any leakage will be mixed with the normal spray flow eliminating the thermal stratification at the high stress points.
- o The probability of valve leakage causing significant thermal gradients in the auxiliary pressurizer spray line is of a lesser magnitude compared to the Farley 2 ECCS line. The leakage at Farley 2 was at a constant temperature of approximately 120-150°F since it originated directly from the discharge of the charging pumps. Significant thermal gradients were introduced independently of leakage flow rate as colder water was continuously injected into the RCS. Conversely, for Cook Nuclear Plant, the colder water that may be introduced

in the auxiliary pressurizer spray line is from the regenerative heat exchanger at a temperature of approximately 490°F. Most leakage flow rates would therefore not deliver fluid sufficiently cold to cause significant thermal gradients. This is due to the proximity of the upstream valve to the normal and auxiliary pressurizer spray line intersection, approximately 48 ft. A flow rate of 0.2 gpm or less would have to be present to introduce thermal gradients of any significance. However, without the presence of a cyclic mechanism (turbulent flow), the resulting thermal stratification would remain stable and not introduce fatigue loadings.

- o Current industry data for Westinghouse plants and fluid flow calculations performed by Westinghouse indicate that there is no thermal cycling in the auxiliary pressurizer spray system. No fatigue failures have been experienced in this system on Westinghouse plants.

Based on the above, the auxiliary pressurizer spray line at the Donald C. Cook Nuclear Plant has an overall minimum potential for thermal fatigue failure.

#### Action Items 2 and 3 - Descriptions of Action Taken

Action Item 2: The potential high stress points for the ECCS and alternate charging lines identified as part of this bulletin's review were nondestructively examined during the Unit 2 1988 steam generator repair outage and the Unit 1 1989 refueling outage. Satisfactory volumetric examination results were obtained showing no evidence of thermal fatigue cracking.

The high stress points for the Unit 2 auxiliary pressurizer spray lines were also volumetrically examined. Examinations were performed on the originally identified 2" portion of line as well as on a 4" portion of line. The addition of the 4" line to the NDE scope was required due to the redefining of the potential high stress points. For the Unit 1 high stress points, only one of the two areas identified on the 4" line was examined. The weld at the intersecting tee could not be examined due to the presence of a pipe support. The decision not to examine this weld was based on the original Westinghouse evaluation which concluded that the auxiliary spray line was not susceptible to thermal fatigue stresses. This decision was made during our recently completed refueling outage, prior to identifying the potential operating condition noted above. Satisfactory volumetric examination results were obtained for all welds/bends that were examined.

Action Item 3: The long-term assurance program for the ECCS, alternate charging and auxiliary pressurizer spray lines is as follows:

- o 1 1/2" ECCS lines - like Farley 2 and Tihange, these lines may be subjected to cyclic thermal stresses if a manual block valve in the boron injection tank (BIT) bypass line leaks. The higher pressure from the charging pump discharge would force flow by this valve into the RCS. To further isolate this flow path, a design change, RFC-DC-12-3011, was implemented during the aforementioned outages. The design change installed two normally sealed closed manual globe valves (SI-220 and SI-218) in series in the BIT bypass line.  
  
A telltale connection and a manual globe valve (SI-219) between the two valves were also installed to ascertain the leakage integrity of the upstream valve. Operating procedures 1-, 2-OHP-4030.STP.035, "Controlled Valve Position Logging," provide the administrative control to ensure the proper valve position for these valves. Leak monitoring by opening the telltale valve will be performed at least on a quarterly basis per OHI-5030, "Preventative Maintenance."
- o 3" alternate charging line - this flow path was normally isolated by an air-operated globe valve, QRV-61, during power operation. It was proposed to normally operate with the valve fully open to eliminate the potential for thermal stresses caused by leakage past QRV-61. Operation of the charging system with two open parallel lines was reviewed by the plant and various engineering sections, as well as by the NSSS supplier, Westinghouse. System operation in this manner was determined to be acceptable. Operating procedures 1-, 2-OHP-0421.003.001, "Operation of Letdown, Charging and Seal Water System," were revised to incorporate this change. Both the normal and alternate charging valves QRV-62 and QRV-61, respectively, are fail open valves thus ensuring flow through the lines during operation.
- o 4" auxiliary spray line - as previously identified, this line has a minimal potential for fatigue failure; however, a particular operating condition requires further evaluation. We are continuing our review of this condition and will finalize our response on the auxiliary spray line within 90 days from the date of this submittal. Our response will include the results of the evaluation and any long term assurance program if required.

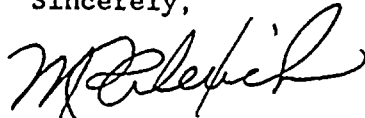
Dr. T. E. Murley

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AEP:NRC:1069A

This letter is being submitted under oath pursuant to the provisions of Section 182a, Atomic Energy Act of 1954, as amended.

Sincerely,



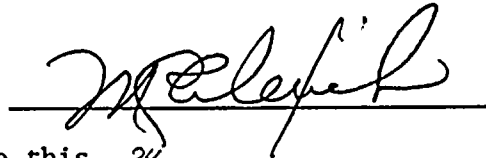
M. P. Alexich  
Vice President

ldp

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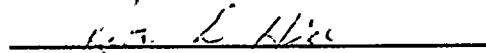
STATE OF OHIO)  
COUNTY OF FRANKLIN

Milton P. Alexich, being duly sworn, deposes and says that he is the Vice President of licensee Indiana Michigan Power Company, that he has read the forgoing Completion Information associated with Bulletin No. 88-08: Thermal Stresses in Piping Connected to Reactor Coolant Systems and knows the contents thereof; and that said contents are true to the best of his knowledge and belief.



Subscribed and sworn to before me this 24

day of \_\_\_\_\_, 1987.

  
NOTARY PUBLIC  
RITA D. HILL  
NOTARY PUBLIC, STATE OF OHIO  
MY COMMISSION EXPIRES 6-28-90