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October 28, 1999
1940-99-20583

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington DC 20555

Dear Sir:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Generic Letter 95-07
Response to Second Request for Additional Information

By letter dated September 13, 1999, the USNRC provided three additional questions to be included in the Oyster Creek Nuclear Generating Station response to Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety Related Power Operated Gate Valves". Attached to this cover is the Oyster Creek response to these questions.

If any additional information or assistance is required, please contact Mr. John Rogers of my staff at 609.971.4893.

Very truly yours,

Michael B Roche

Michael B. Roche
Vice President and Director
Oyster Creek

MBR/JJR
cc: Administrator, Region I
NRC Project Manager
Senior Resident Inspector

A056

Attachment I

GPUN Response to Second RAI

NRC Question 1:

The September 5, 1996, submittal states that a calculation was used to demonstrate that the isolation condenser return valves, V-14-34 and V-14-35, would operate during pressure-locking conditions when reactor pressure is greater than 500 psig. The valves are cycled during plant cooldown at approximately 500 psig reactor pressure. A modified industry gate valve thrust equation was used to calculate the thrust required to open these double disk gate valves during pressure-locking conditions.

The NRC staff approved the use of a modified industry gate valve thrust equation (double disk area) to calculate the thrust required to open double disk gate valves during pressure-locking conditions. The double disk gate valve pressure locking thrust prediction methodology and the testing used to validate the methodology are described in NUREG/CR-661 1, 'Results of Pressure Locking and Thermal Binding Tests of Gate Valves.' Test data demonstrated that the results of the double disk gate valve pressure locking thrust prediction methodology trended with the pressure locking test results but generally underestimated the thrust required to open a pressure locked valve. The NRC staff considers sizing and setting the valve actuator to deliver the thrust determined from the double disk gate valve pressure locking thrust prediction methodology to be acceptable long-term corrective action for GL 95-07 provided that the margin between calculated pressure locking thrust and actuator capability exceeds 40 percent. This large margin is needed to account for valve degradation, diagnostic equipment accuracy and the additional thrust that was required to open the test valve.

Discuss the margin between actuator capability and the thrust required to overcome pressure locking for V-14-34 and V-14-35 using GL 89-10 program valve and stem factors.

GPUN Response to Question 1:

The results of GPUN calculation C-1302-211-E540-125 demonstrated that in order to meet the NRC mandated 40% design margin for long term acceptability, the operating procedures would need to be changed to cycle the valves at reactor pressures of 650 psig and 300 psig during reactor cooldown evolutions. The procedure revisions have been issued.

At the above pressures, assuming a design valve factor of 0.61 (low temperature) and a design unwedging stem friction coefficient of 0.17, the margin between required and available thrust was greater than 40%. The actual stem friction coefficient is shown by static testing, to remain well below 0.17. (The recorded data from the most recent testing indicated an actual unwedging friction coefficient of 0.06 and 0.13.)

In letter 6730-96-2241, GPUN, Inc. to NRC dated September 5, 1996, GPUN stated that the Isolation Condenser System (ICS) was credited in the Oyster Creek High Energy Line Break (HELB) analysis. It further went on to state that the pressure to consider for pressure locking following an ICS line break, after ICS initiation, was 660 psig, when in fact, the valves are not susceptible to pressure locking during this accident scenario. This is because when the valves open to initiate the ICS, the pressure in the bonnet equalizes with that upstream and downstream. Therefore, a pressure differential will not exist for this accident scenario. In that same letter, GPUN reported that the analysis results for reactor overpressure at the time of the reactor isolation for the Main Steam Line Break was 590 psia. These results were based on a ten second delay in the Main Steam Isolation Valve (MSIV) isolation, in addition to the ten second MSIV stroke time. The ten second delay is overly conservative. Within the same calculation is the reactor response for a five second delay in the MSIV isolation. The five second delay response remains conservative. The results of this analysis show that at the time the reactor is isolated, reactor dome pressure is 667 psig. This pressure is above the reactor pressure at which potential pressure locking could occur on ICS valves V-14-34 and V-14-35. Finally, also discussed in the same letter, was the reactor response to a Reactor Water Cleanup RWCU system HELB. Since that time, Oyster Creek has installed a safety grade isolation signal for RWCU HELBs . The results of the current analysis show that at the time the reactor is isolated following a RWCU HELB, the reactor dome pressure is 932 psig, which is well above the reactor pressure at which potential pressure locking could occur on ICS valves V-14-34 and 35.

Also, as both the required and available thrusts are calculated based on design parameters, it is inappropriate and unnecessary to apply additional margins for test equipment uncertainty.

NRC Question 2:

In Attachment 1 to GL 95-07, the NRC staff requested that licensees include consideration of the potential for gate valves to undergo pressure locking or thermal binding during surveillance testing.

During workshops on GL 95-07 in each Region, the NRC staff stated that, if closing a safety-related power-operated gate valve for test or surveillance defeats the capability of the safety system or train, the licensee should perform one of the following within the scope of GL 95-07:

1. Verify that the valve is not susceptible to pressure locking or thermal binding while closed,

2. Follow plant technical specifications for the train/system while the valve is closed,

3. Demonstrate that the actuator has sufficient capacity to overcome these phenomena, or

4. Make appropriate hardware and/or procedural modifications to prevent pressure locking and thermal binding.

The staff stated that normally open, safety-related power-operated gate valves, which are closed for surveillance but must return to the open position, would be evaluated within the scope of GL 95-07.

Section 3.1.4 of your May 9, 1996, submittal states that potential accident conditions occurring during testing are not considered pressure locking and thermal binding concerns since the probability of an accident during a short time of testing is very low. This conflicts with Section 3.2.3 of the submittal which states that normally open valves that are closed for testing, that have a safety function to re-open, were evaluated for pressure locking and thermal binding. During a telephone conversation conducted on June 14, 1999, you stated that Section 3.2.3 of the submittal was applicable. Verify that this is correct.

GPUN Response to Question 2:

GPUN has verified that normally open valves with an open safety function were reviewed for pressure locking considerations if the valve is closed for testing, maintenance, or operational purposes and the system is not declared inoperable while the valve was closed.

NRC Question 3:

During a telephone conversation conducted on June 14, 1999, you stated that the containment spray recirculation valves, V-21-13 and 17, are susceptible to thermal induced pressure locking and that you are using a hub analysis pressure locking thrust prediction methodology to demonstrate that the valves will operate during pressure-locking conditions.

On April 9, 1997, a public meeting was conducted to discuss the Commonwealth Edison (ComEd) and Entergy Operations, Inc. (EOI) pressure 'locking thrust prediction methodologies presented in GL 95-07 submittals. The minutes of the public meeting were issued on April 25, 1997, and placed in the Public Document Room (PDR) (Accession No. 9707300022). The ComEd and EOI methodologies that predict the thrust required to open pressure locked flexible-wedge gate valves, validation testing of the analytical method, enhancements to the ComEd pressure locking methodology, and pressure locking tests sponsored by the NRC conducted by Idaho National Engineering and Environmental Laboratory were discussed during the meeting. The minutes of this public meeting indicate the type of information requested by the NRC in order to review and approve pressure locking thrust prediction methodologies.

The NRC staff has reviewed the ComEd pressure locking thrust prediction method and concluded that its acceptable long-term corrective action provided the recommended margins, diagnostic equipment accuracy requirements and methodology limitations are incorporated into the pressure-locking calculations. In a letter to the NRC dated May 4, 1999, EOI stated that they have recently revised their pressure locking thrust prediction methodology. The NRC is reviewing the EOI pressure locking thrust prediction methodology. ComEd and EOI validated their pressure locking thrust prediction methodologies with test programs.

The NRC has also accepted the modified industry gate valve thrust equation (double disk area) described in NUREG/CR-6611 as acceptable long-term corrective action to demonstrate that flexible wedge gate valves will operate during pressure-locking conditions. Test data presented in NUREG/CR-6611 demonstrates that the results of this methodology conservatively predicts the thrust required for flexible wedge gate valves to operate during pressure-locking conditions.

In order for the NRC to review your hub analysis pressure locking thrust prediction methodology, please provide the following information:

a. Provide the test procedure/results that validated the methodology. Include any information that will help evaluate if your valves are similar to test valves as applicable.

b. Results from pressure locking testing sponsored by the NRC performed by Idaho National Engineering and Environmental Laboratory on a double disk and a flexible wedge gate valve have been placed in the PDR (NUREG/CR-661 1). Please discuss if your pressure locking thrust prediction methodology accurately predicted the results of these pressure locking tests.

Discuss the recommended margin between actuator capability and the calculated thrust value when using your pressure locking prediction methodology, any limitations associated with the use of your methodology and any diagnostic test equipment accuracy requirements. Commonwealth Edison Company provided this type of information to the NRC in a letter dated May 29, 1998. This letter is in the PDR (Accession No. 9806040184).

GPUN Response to Question 3:

The Containment Spray recirculation valves V-21-13 and V-21-17 are susceptible to hydraulically induced pressure locking and not thermally induced pressure locking as stated in this RAI. The valves are located downstream of the Containment Spray Heat Exchangers and, therefore, the temperature of the water does not heat up appreciably (more than a few degrees). Therefore, any water trapped in the bonnet of the valve while it is closed (during the brief periods of spraying the drywell) will not heat up.

The calculation used to show adequate MOV capability to overcome the hydraulically induced pressure locking has been changed to use the Kalsi Generalized Methodology as described in the Kalsi proprietary report No. 1968C (reference GPUN calculation C-1302-241-E310-097, Rev 0). This methodology enhances the ComEd methodology by accounting for valve body flexibility. The methodology was validated against both the ComEd test data and the INEEL test data and was shown to accurately predict the required unwedging thrust for all test valves. The maximum difference between the methodology results and test data was found to be 14.3% using the closed form equations for valve body flexibility determination. Test equipment accuracy is appropriately accounted for in the development of the allowable closing thrust such that adequate MOV unwedging capability is assured. The subject valves are six inch, 150 psig pressure class bolted bonnet flex wedge gate valves with an oval body neck. The methodology is applicable to wedge gate valves. The GPUN calculation included a simplifying assumption that equated the non-circular body neck to the circular body neck in order to determine the valve body flexibility using the Kalsi generalized equations. Prior to restart from 18R, GPUN will perform either: 1) a finite element analysis to validate the valve body flexibility assumption, or 2) a diagnostic test of the valve under conditions similar to the postulated pressure locking conditions.