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US NUCLEAR REGULATORY COMMISSION
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Ladies and Gentlemen:

DOCKETS 50-266 AND 50-301
GENERIC LETTER 96-06, 120-DAY RESPONSE
ASSURANCE OF EQUIPMENT OPERABILITY AND
CONTAINMENT INTEGRITY DURING DESIGN BASIS ACCIDENT CONDITIONS
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Generic Letter 96-06 requests licensees to perform evaluations and take actions if necessary to ensure that containment cooling water systems and other water-filled piping sections inside containment remain operable during design basis accident (DBA) conditions. This Generic Letter identified concerns for potential waterhammer and two-phase flow in containment cooling systems under certain postulated post-DBA conditions. Also identified was a concern for overpressurization of isolated fluid systems due to containment heatup post-accident. Our letter VPNPD-96-090, dated October 30, 1996, provided our 30-day response to the Generic Letter.

Herein, we provide the required 120-day response to describe the basis for continued operability of PBNP Units 1 and 2 with respect to the stated conditions. This summary report states the actions taken in response to the Generic Letter requested actions, and the conclusions reached relative to susceptibility for waterhammer and two-phase flow in the containment air cooler cooling water system and overpressurization of piping that penetrates containment. This summary report also states the basis for continued operability of affected systems and components as applicable, and corrective actions that were implemented or planned to be implemented.

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Waterhammer and Two-Phase Flow

As discussed in our 30-day response, we have previously evaluated the response of the containment fan coolers (CFCs) and the Service Water (SW) cooling system with respect to the waterhammer and two-phase flow transients described in the Generic Letter. Our 30-day response described the basis for continued operability of PBNP Units 1 and 2 with respect to the stated conditions. Those conclusions remain valid, as clarified below.

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Subsequent to our 30-day response, we evaluated the postulated transient of SW System boiling as a de facto "change to the facility". In accordance with the provisions of 10 CFR 50.59, we determined that the potential for SW boiling during the transient is an unreviewed safety question (USQ). *We plan to request a license amendment pursuant to 10 CFR 50.90 which will incorporate the transient into the licensing basis.* In the interim, the report submitted in our 30-day response provides the basis for Unit 1 and Unit 2 operability and describes our plan to restore the system to comply with the design basis. Based on the extensive scope of required analyses and design, our plans for system restoration extend to the next scheduled Unit 2 outage (U2R23).

Also, we have reviewed the validity of our 30-day response with respect to recent changes in the post-accident containment temperature and pressure profile. Our previous analyses were based on the containment profile described in the FSAR. However, Unit 2 steam generator replacement resulted in a new containment profile exhibiting a peak pressure/temperature that is 0.75 psi and 2°F higher than the FSAR values. We evaluated the potential effects on the peak waterhammer loads previously provided and the potential effects on the restoration of the CFC to heat-removal service following the voiding transient.

Our existing analysis demonstrates that the peak pressures associated with condensation-induced waterhammer are bounded by the peak pressures associated with the "refill" waterhammer. The refill waterhammer event provides the maximum loads used in the limiting stress analysis. We believe that a more adverse containment environment will even further reduce the probability for condensation-induced waterhammer. Therefore, the assumption that the refill waterhammer event is bounding is still a valid conclusion with the revised containment pressure and temperature profile.

Effect on the condensation-induced waterhammer analysis: A higher containment pressure/temperature profile would result in a higher steam-generation rate and, accordingly, a higher Froude number in the 8" service water return lines from the CFCs. Based on the principles described in FAI/96-75 (an attachment to our September 9, 1996 submittal VPNPD-96-065), the potential for condensation-induced waterhammer is further reduced as the Froude number increases. Therefore, a higher containment pressure/temperature profile would reduce condensation-induced waterhammer loads.

Effect on the refill waterhammer analysis: A higher pressure/temperature profile would result in a larger void in the return lines during the postulated transient. If the PBNP configuration were not already postulated to be subject to the maximum refill velocity, it could be postulated that the larger void could result in a higher refill velocity and a larger waterhammer load. However, this scenario has been bounded by the conservative assumptions that form the basis for our refill waterhammer analysis. For conservatism, the refill waterhammer loads are already based on the steady-state terminal velocity with 6 SW pumps running. This is the largest refill rate that is physically possible in the PBNP SW system, regardless of void size. Also, for conservatism, the refill waterhammer is assumed to occur at the throttle valve rather than at the middle of the return line. Therefore, no credit is taken for compliant surface column rejoining. Based on the above, the magnitude of the calculated refill waterhammer loads will bound the loads that may be generated with the higher containment temperature/pressure profile.

Effect on the CFC function restoration: A higher pressure/temperature profile was evaluated to ensure that the restoration of the CFC heat removal function would not be delayed beyond design basis requirements. Based on the FSAR profile, our previous analysis concluded that adequate flow would be restored to the CFCs within 36 seconds. Based on the sensitivity of the original analysis, it is our judgment that the restoration of CFC heat removal would not be delayed significantly by the small increase in the containment P/T profile, and in any case, the 60-second FSAR response requirement would not be exceeded.

Therefore, the results described in our 30-day response are still valid for the revised containment pressure/temperature profile and continue to provide the basis for Unit 1 and Unit 2 operability.

Thermally-Induced Overpressurization

The design of each containment penetration was reviewed to identify any water-filled piping sections inside containment that may be susceptible to thermally-induced overpressurization following an accident. Configurations were eliminated from consideration if they were gas or steam filled, protected by a relief valve, vented by forward flow through a check valve, not fully isolated to trap fluid, or if they contained a fluid at a temperature higher than the expected containment temperature post-accident. Based on these criteria, the following containment penetrations were identified as susceptible to overpressure:

P-11 Reactor Coolant Pump Seal Water Return Line (Unit 1 & 2)
P-12a Containment DI Water Supply (Unit 1 & 2)
P-30c Pressurizer Relief Tank Makeup Water (Unit 1 & 2)
P-32c Auxiliary Charging Line (Unit 1 & 2)
P-53-1 Unit 1 Containment HVAC Condensate Return Line
P-53-2 Unit 2 Containment HVAC Condensate Return Line

To verify the accuracy of the original review, we re-reviewed the design of all containment penetrations and identified the following containment penetrations that may also be susceptible to overpressure:

P-28b RCS Sample Line (Pressurizer Liquid Sample) (Unit 1 & 2)
P-32b Safety Injection Test Line (Unit 1 & 2)

We have assessed the operability of each penetration, and determined that each is operable. Any identified operability concerns have been and continue to be addressed commensurate with the guidance of GL 91-18. The basis for this operability assessment is as follows:

Penetration P-11

This line is normally open during power operation; transporting coolant from the reactor coolant pump seal water return to the chemical and volume control system. Automatic containment isolation of this

line is provided by a fail-closed air-operated valve inside containment (CV-313A) and a motor-operated valve outside containment (CV-313).

Unit 1. An engineering calculation was prepared to demonstrate operability of Unit 1 with the recent addition of 2 inches of calcium-silicate insulation to the piping inside containment. Pursuant to Generic Letter 91-18, we have reviewed the operability of the existing condition. Since the bodies of the isolation valves are thicker and inherently stronger than the piping, the piping is the weak link in the isolated section. Operability evaluations have determined that the stresses on the associated piping and supports may exceed code allowables, but operability will be assured based on the interim operability criteria (based on ASME Section III Appendix F values). These criteria permit operation in this condition for an interim period only. *During the Spring 1997 Unit 1 refueling outage, we plan to install pressure relief protection or effect other changes to ensure the piping complies with allowable values.*

Unit 2. Based on the similarity of Unit 1 and Unit 2 configurations, we expect that Unit 2 stresses during the postulated transient would also exceed code allowable values. *Therefore, we plan to modify the operation/design of the seal return lines prior to Unit 2 startup from the present refueling outage (U2R22). These changes will ensure the piping complies with code allowable values.*

Penetration P-12a

This line is a normally isolated section that can be opened to transport demineralized (DI) water into containment when required. This line is not normally in-use during power operation. Normally-closed manual valves inside and outside containment perform the containment isolation function.

Unit 1. Recently, this section of piping was opened and drained of approximately 3 gallons of water from the drain line. *Routine draining is being performed to ensure that there will be no water in the piping to pressurize in the post-accident environment. Prior to startup of Unit 1 from the Spring 1997 Refueling Outage, the Unit 1 containment integrity checklist will be revised to ensure that the Unit 1 piping is drained and the DI water supply is adequately isolated from the isolated piping section. In the long term, a modification is planned to add more valves and a drain on the supply side of the containment isolation valves to better isolate the containment piping from the water supply, and thereby ensuring the piping remains empty.*

Unit 2. *Prior to startup of Unit 2 from the present refueling outage, the Unit 2 containment integrity checklist will be revised to ensure that the Unit 2 piping is drained and the DI water supply is adequately isolated from the isolated piping section.* This action will effectively remove the demineralized water hose station from service. *In the long term, a modification is planned to add more valves and a drain on the supply side of the containment isolation valves to better isolate the containment piping from the water supply, and thereby ensuring the piping remains empty.*

Based on these actions which ensure adequate drainage, Penetration 12a is operable for Unit 1 and 2.

Penetration P-28b

This line is a normally isolated section that may be opened to draw a sample from the pressurizer liquid space, when required (normally weekly). Automatic containment isolation of this line is provided by a normally-closed fail-closed air-operated valve inside containment (SC-953) and a similar valve outside containment (RC-966B).

Unit 1. An engineering calculation was prepared to determine the potential stresses on the isolated piping section and demonstrate Unit 1 operability at those stresses. Since the bodies of the isolation valves are thicker and inherently stronger than the piping, the piping was considered the weak link in the isolated section. The pressure in the piping/tubing was calculated to reach 8430 psig during the postulated transient. However, the outside isolation valve is expected to lift at 7100 psig. At this pressure, the tubing would develop stresses of approximately 23,350 psi. This stress exceeds code allowables, but operability will be assured based on the interim operability criteria (based on ASME Section III Appendix F values). These criteria permit operation in this condition for an interim period only. *During the Spring 1997 Unit 1 refueling outage, we plan to install pressure relief protection or effect other changes to ensure the piping complies with code allowable values.*

Unit 2. Our engineering evaluation concluded that the potential stresses on Unit 2 are bounded by the Unit 1 configuration. Therefore, we have concluded that the Unit 2 stresses during the postulated transient would exceed code allowable values, but operability will be assured based on the interim operability criteria (based on ASME Section III Appendix F values). *Therefore, we plan to install pressure relief protection or effect other changes to restore the pressurizer liquid space sample piping to code compliance. Based on the long lead time for the procurement of the appropriate relief valves and the significant impact to the containment leakage testing program, we plan to defer this modification to the next scheduled Unit 2 refueling outage (U2R23). These changes will ensure the piping complies with code allowable values.*

Penetration P-30c

This line is normally-isolated during power operation, but may be opened for limited periods when reactor makeup water to the pressurizer relief tank or reactor coolant pump seal system is required. When in use, check valves inside containment prevent reverse-flow and ensure the flow direction is into containment. Automatic containment isolation of this line is provided by a single check valve inside containment (RC-529) and a fail-closed air-operated valve outside containment (RC-508). Any coolant trapped in the penetration (between RC-529 and RC-508) will relieve through the check valve RC-529 to the reactor coolant system if any of the three downstream isolation valves will lift off their seat. Those isolation valves are normally-closed fail-closed air-operated diaphragm valves. (Refer to PBNP FSAR Figure 5.2-30c.)

Units 1 & 2. The diaphragm valves are currently rated to lift between 85 psig and 200 psig. Even at the original rated pressure of 200 psig, the valves would self-relieve well within piping code allowable values. Based on the relief function of the isolation valves, Penetration 30c is operable for Unit 1 and 2.

Penetration P-32b

This line is a normally-isolated section that may be opened to recirculate safety injection pump discharge inside containment back to the refueling water storage tank outside containment. This line is not normally in-use during power operation. Normally-closed manual valves (SI-879A and B) inside and outside containment perform the containment isolation function.

Unit 1 & 2. In the post-accident environment, calculations concluded that the fluid trapped in the isolated section could pressurize the pipe to 2585 psig, which would exceed the design pressure of 1745 psig. Further calculations showed that the piping stresses would remain within the code allowable values at this pressure. Per valve specifications, isolation valves are designed for a working pressure (3280 psig at 300°F) that exceeds the calculated maximum pressure. Based on the analytical evidence that the calculated pressure will not exceed the prescribed capabilities of the pipe and isolation valves, Penetration P-32b is operable for Units 1 and 2.

Penetration P-32c

This line is normally-isolated during power operation, but may be opened under abnormal conditions when auxiliary charging is required. When in use, a check valve inside containment prevents reverse-flow and ensures the flow direction is into containment. Automatic containment isolation of this line is provided by a normally-closed fail-closed air-operated valve inside containment (CV-1296). The chemical and volume control system constitutes the containment barrier outside containment (as a closed system). Any coolant trapped in the penetration (between CV-1296 and the closed system) will relieve through CV-1296 and into the RCS if CV-1296 lifts as designed. (Refer to PBNP FSAR Figure 5.2-32c.)

Units 1 & 2. Valve CV-1296 is a dual-function valve that provides both isolation and relief capabilities. Although design documents describe a capability of the valve to lift at a differential pressure of 200 psig, an engineering evaluation considered that the actual differential to lift the valve could approach 1100 psig. Using the more conservative lift differential, the calculated total hoop stress of 14,500 psi (based on the design pressure of 2580 psig plus 1100 psig) is below the piping code allowables, and the increase in the longitudinal pressure stress of 1900 psi due to relieving at 1100 psi pressure differential is below code allowables. Therefore, no compensatory action was required for this penetration. Based on the relief capability of CV-1296, Penetration 32c is operable for Unit 1 and 2.

Penetration P-53-1 (Unit 1) and P-53-2 (Unit 2)

This line is a normally-isolated section that transports condensate from the containment heating and ventilation system to the condensate system outside containment. This line is not normally in-use during power operation. Normally-closed manual valves inside and outside containment perform the containment isolation function.

Unit 1. This piping was drained and the volume of water was measured to be less than the piping volume. Therefore, it was concluded that this piping is not water solid during plant operation, and will not be water solid in the future. *This piping is scheduled to be cut and capped during the Spring 1997 Unit 1 Outage.*

Unit 2. This line is similar to that described for Unit 1, above. *This piping is scheduled to be cut and capped during the present Unit 2 Outage (U2R22).*

Based on the experience that this section of pipe is not water-filled during plant operation, Penetrations 53-1 and 53-2 are operable.

We would be pleased to answer any questions regarding the above information.

Sincerely,

Q. L. Reimer for

Douglas F. Johnson
Manager-Regulatory Services
and Licensing

GDJ\

cc: NRC Resident Inspector
NRC Regional Administrator, Region III

Subscribed and sworn to before me
this 28th day of January, 1997

Jacqueline Gorecki
Notary Public, State of Wisconsin

My Commission expires 10/26/2000