Consumers Power
POWERING MICHIGAN'S PROGRESS
Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

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U S Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
ADDITIONAL INFORMATION TO SUPPORT CONTINUED OPERATION FOR THE REPAIRED PRESSURIZER INSTRUMENT NOZZLE

Our letter dated April 28, 1995 provided justification for continued operation of the plant beyond 1995 with the repairs made to two of the pressurizer temperature element nozzles. In October 1993, after the temperature element nozzle repairs had initially been performed, operation of the plant had been justified for one cycle of operation.

As a result of NRC reviews, additional information was requested during a conference call held on May 25, 1995. The NRC questions and our responses are contained in Attachment 1 to this letter. Please note that we have paraphrased the NRC questions to be consistent with our understanding of the request as interpreted during the May 25, 1995 conference call and subsequent discussions.

SUMMARY OF COMMITMENTS

This letter contains 3 new commitments as follows:

1. Complete inspections for Primary Water Stress Corrosion Cracking (PWSCC) of the areas to which the mechanical stress improvement process (MSIP) is applied every other refueling outage.

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2. Perform a VT-2 examination of the TE-0101 nozzle at every future refueling outage to identify any leakage from the nozzle.

3. Complete appropriate PWSCC inspections of the pressurizer spray nozzle every other refueling outage.

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CC Administrator, Region III, USNRC
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Attachment

ATTACHMENT 1

CONSUMERS POWER COMPANY
PALISADES PLANT
DOCKET 50-255

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4 Pages

NRC Question 1

On the subject of the mechanical stress improvement process (MSIP), the licensee identifies as an issue, getting NRC approval of the method and inspection interval concurrence. It also states that it is code allowable and cites NUREG 0313. The NRC needs more details concerning MSIP, such as a) how were the components (surge and shutdown cooling nozzles) and not others selected to undergo MSIP, b) What inspection intervals are proposed following application of the MSIP process and why are these intervals acceptable, c) when determining these inspection intervals were the inspection intervals and application criteria in NUREG 0313 considered, and d) are there any relevant ASME Code references to MSIP?

CPCo Response 1

The Mechanical Stress Improvement Process is a process of mechanically squeezing the pipe near the weld location susceptible to PWSCC with use of specially designed clamps and box presses. MSIP replaces the existing tensile residual stresses at the region of the weld root with favorable compressive stresses. Hence MSIP effects a redistribution of the residual stresses near the weld region resulting in a favorable residual stress pattern.

The Alloy 600 Project Plan for Palisades has evolved as project activities have progressed. Section 7.0 of the Project Plan, "Approach to Work," describes the overall goals of the project as originally envisioned by the project team. Some of the goal statements in Section 7.0 of the plan do not necessarily reflect all specific activities that will actually be accomplished by the project. The detailed work scope that evolved during the project work is described in Section 3.0 of the project plan.

One of the goals in Section 7.0 of the plan was to investigate how the process of mechanical stress improvement could be used at Palisades. We initially thought, as described in Section 7.0, that NRC approval might be needed before applying MSIP at Palisades. Our later investigations determined that, since the mechanical stress improvement process (MSIP) was a Code allowable application, NRC approval would not be needed.

a) As a part of the Alloy 600 project literature research, field weld records of various primary system field welds were obtained. The field welds between safe-ends and pipe at the pressurizer and hot leg surge nozzles and the hot leg SDC nozzle were noted to have been reworked during original plant construction. These nozzles connect to large diameter pipes (12" NPS). Moreover, they are subjected to high temperatures of the hot leg and pressurizer, were ranked to be highly susceptible to PWSCC, and were found to have significant consequences on failure. Hence these locations were chosen for the MSIP application.

b & c) The inspection intervals and application criteria in NUREG-0313 were considered. The application of MSIP eliminates the tensile residual stress which is a primary cause for PWSCC. Thus, we believe MSIP mitigates future PWSCC where it is applied. Before applying the MSIP process, we will first perform baseline NDE examinations looking for evidence of PWSCC. MSIP will be applied and then a follow-up NDE PWSCC examination will be performed. Based on this process, we believe that inspection results that show no PWSCC might indicate that future PWSCC inspections of these locations may not be necessary. We will, however, commit to follow-up inspections for those areas to which the mechanical stress improvement process is applied every other refueling outage.

d) MSIP is not a repair, replacement, or modification and is not specifically addressed by the Code (ASME Section XI of the B&PV Code). The stress improvement achieved by MSIP is not very different from other established stress improvement techniques (IHSI, weld overlay etc.). Typically, the residual stresses due to welding are not considered for stress analysis of piping or associated components. Application of MSIP only results in a very small plastic deformation of the pipe wall. Since MSIP only alters the residual stress distribution near the weld region, it does not affect the existing code stress analyses for the piping or the nozzle to which it is applied. Hence, MSIP is considered to be Code allowable. To our knowledge, no relevant ASME Code references to MSIP exist.

<u>NRC Question 2</u>

One of the calculations provided shows that a service life of 7.5 years was predicted for the repaired temperature elements. After the 1995 inspection of the repaired temperature elements, future inspections are stated as to be determined. Are there any provisions to inspect given the predicted lifetime.

<u>CPCo Response 2</u>

Analyses performed to evaluate the TE nozzle repairs of 1993 show that there is no short term safety concern. The fracture mechanics analysis completed for Palisades Alloy 600 components (Attachment 3 to our April 24, 1995 letter to the NRC) shows that, using the most limiting conditions, the pressurizer temperature element nozzles can be expected to remain in service for about 7.5 years. During the 1995 refueling outage a VT-2 and some baseline inspections of the TE-0101 nozzle, and a VT-2 of the TE-0102 nozzle will be performed. The major focus of this Alloy 600 Project is to establish the baseline status of the Alloy 600 components with respect to PWSCC. With the results of the inspections from this 1995 refueling outage, we will further evaluate the need for future inspections, mitigation, repair or replacement. Regardless of the outcome of our reviews, we plan to perform a VT-2 examination of the TE-0101 nozzle at every future refueling outage to identify any leakage from the nozzle in a timely fashion. TE-0101 has been selected for future inspections as it has the more severe operating environment of the two temperature elements (TE-0101 and TE-0102) that were repaired during the 1993 refueling outage.

NRC Question 3

For the pressurizer spray nozzle, the licensee recommends regular NDE. If no flaws are detected during 1995, the next inspection will be performed after two operating cycles. What are the inspection plans after that time.

CPCo Response 3

The Alloy 600 project is planning to perform a bare metal VT-2 and an internal video inspection of the spray nozzle safe-end to pipe weld during the 1995 refueling outage to confirm that no weld rework was performed during original installation of the nozzle. Information concerning weld rework and condition of the spray nozzle safe-end discovered during this refueling outage will be used to evaluate the need for future inspections, repair and/or replacement of the spray nozzle safe-end.

Based on analysis results to date for a worst case scenario, we have shown that assuming a worst case temperature of 640°F, the pressurizer spray nozzle safe-end has an estimated service life of 5.36 years. Future PWSCC inspection intervals of every other refueling outage will be sufficient to assure the long-term, safe operation of the pressurizer spray nozzle.

NRC Question 4

Did the licensee consider microstructure (variations within heats) in its susceptibility determinations. Inter and intra heat variability can be quite diverse as seen at St. Lucie during steam generator tube plug inspections.

CPCo Response 4

CPCo did not consider the effects of material microstructure in the PWSCC susceptibility determination. Adequate information on microstructure of the existing heat of components was not available for inclusion in the susceptibility evaluation. Established parameters influencing PWSCC were considered in developing the susceptibility rankings for Palisades Alloy 600 components (Project Plan — page 19, 1st paragraph).

NRC Question 5

On page 27 of the project plan under the section entitled PCS Loops, the Licensee stated that fracture mechanics analyses are being performed for all PCS loop penetrations and nozzles safe-ends. Were fracture mechanics analysis completed and were they performed for the primary system RTD nozzles?

CPCo Response 5

Fracture mechanics analyses have been completed for all PCS loop penetrations. Attachment 3 to our April 24, 1995 letter to the NRC contained a non-proprietary version of the fracture mechanics analysis entitled, "FM Assessment of Palisades Alloy 600 Components." A representative hot leg and cold leg RTD nozzle were analyzed. Section 5.0 of the report (page 25) details the material properties of the hot and cold leg RTD nozzles. Table 6 (page 29) provides a summary of the time to failure for an initial flaw depth of 0.010" for both the hot and cold leg RTD nozzles, and figures 15, 20, 29 and 34 of the report provide a representation of time to failure for axial and circumferential flaws.

Section 3.6.2 (page 38) of the Alloy 600 project plan stated that we were planning an internal eddy current test (ECT) examination of the hot leg RTD nozzles if the water level in the hot legs was drained below the elevation of the PCS RTD penetrations and if the ECT inspection tooling was qualified and available. We will not be completing internal ECT examination of the hot leg RTD penetrations because qualification of ECT inspection tooling could not be completed in time for the refueling outage.

NRC Question 6

Section 3.0 of the Alloy 600 Project Plan "Inspection Acceptance Criteria and Contingency Planning" under the heading for the reactor vessel head (page 27), states that NUREG/CR-6245 flaw acceptance criteria will be used for indications characterized by ECT and sized by UT examinations. Based on the licensee's questions concerning acceptance criteria for ICI nozzles is this acceptance criteria still being proposed for use?

CPCo Response 6

No. A more appropriate acceptance criteria to use for the Palisades reactor vessel head penetrations is that approved by the NRC for the Point Beach Nuclear Plant, Unit 1, as described in the NRC's March 9, 1994 letter to Wisconsin Electric Power Company. The letter acknowledges acceptance criteria for both axial and circumferential cracks and also identifies associated reporting criteria when cracking is identified. Palisades plans to use the acceptance criteria described in the March 9, 1994 letter to Wisconsin Electric Power Company for evaluating PWSCC cracking in the reactor vessel head penetrations. It is our understanding that the NRC will confirm by letter that use of this acceptance criteria at Palisades will be acceptable.