NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
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June 28, 1991

Docket No. 50-423
B13867
Re: ASME Section XI
GL 90-05
10CFR50.55a(g)(6)(i)

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Request for Relief From ASME Section XI

In a letter dated May 31, 1991,(1) Northeast Nuclear Energy Company (NNECO) submitted to the NRC Staff a request for relief from ASME Code Section XI requirements for an interim repair to Pipe 3SWP-030-334-3 at Millstone Unit No. 3. In subsequent telephone conversations, the Staff requested further information on this repair. Attachment 1 to this letter provides the requested information.

Additionally, a leak has been identified in a 30-inch service water supply pipe. The leak has been covered by a soft patch held in place by nylon strapping bands. Consistent with the provisions of Generic Letter 90-05 and 10CFR50.55a(g)(6)(i), NNECO is submitting a request for relief from ASME Code Section XI to make interim repairs to this piping as an alternative to an IWA-7000 replacement. Attachment 2 to this letter provides all details relevant to this request.

The basis for requesting this relief, pursuant to 10CFR50.55a(g)(6)(i), is that the subject leak is located in nonisolable piping, and an outage will be necessary to effect a permanent code repair. A code repair at this time is impractical, and NNECO requests relief from ASME Code Section XI requirements until the next scheduled refueling outage.

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(1) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Modification to Pipe 3SWP-030-334-3--Relief Request From ASME Code Section XI Requirements," dated May 31, 1991.

A047
1/1

Please contact us with any questions.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: E. J. Mroczka
Senior Vice President

BY: C F Sears
C. F. Sears
Vice President

cc: T. T. Martin, Region I Administrator
D. H. Jaffe, NRC Project Manager, Millstone Unit Nos. 1 and 3
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Additional Information to Relief Request
for Pipe 3SWP-030-334-3

June 1991

ATTACHMENT 1

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

A. DESIGN DETAILS

Piping System:

Service Water Return Piping ("B" Train) from the Reactor Plant Component Cooling Water Heat Exchangers

Piping Size and Schedule:

30"

Pipe Nominal Wall Thickness:

0.500" Carbon Steel with 0.100" Copper Nickel Cladding

Pipe Safety Code Class:

Class 3

Pipe Material:

Base Material SA-516, Gr. 70, Cladding Material SB-402, No. 706

Design Pressure:

100 psig (Maximum Normal Operating Pressure = 16 psig, Reference Westinghouse Letter NEU-91-576)

Design/Operating Temperature:

95°F/95°F

Code Minimum Wall Thickness:

.107" with E=.80 Joint Efficiency

B. FLAW CHARACTERIZATION

Flaw Description/Size (i.e. Location, hole size, adjacent wall thickness, single/multiple flaw, total area examined, etc.):

See the attached drawing. The leak from a single 1/4" hole was discovered on May 2, 1991. An 8 by 5 inch area was examined by UT. The grid size was 1 inch square. The hole is located on the extrados of a 90° elbow downstream of a restricting orifice used to maintain backpressure on the system. The hole is 1" below a longitudinal fabrication weld. The area where piping has degraded below nominal wall is approximately 6 inches by 3 inches. The area below minimum wall thickness is approximately 3" long by 1/2" wide, with a minimum thickness of 0.079 inches.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

Examination Method:

Ultrasonic

Flaw Type:

Through-wall

C. ROOT CAUSE INVESTIGATION

Root Cause Description:

Erosion/corrosion due to turbulence created by the restricting orifice upstream of the elbow.

D. DESCRIPTION OF PROPOSED REPAIR

The hole has been covered by a 6" by 5" soft patch (rubber with a metal stiff back plate) held in place by metal bands. This temporary repair is completely reversible. Based on the projected flaw size below, the use of a hard patch (welded to pipe) is being considered. See Section H for details.

E. EVALUATION SUMMARY

Method used (i.e., LEFM, Area Reinforcement, Wall Thinning):

Area Reinforcement ("Branch Reinforcement" Approach) consistent with Section 3.2 of Draft ASME Code Case: "Temporary Corrective Measures for Class 3 Moderate Energy Piping When A Leak Is Found and Repairs/ Replacements Are Impractical", Revision 4. Two exceptions to the Draft Code Case are as follows:

- Section 3.2 specifies a maximum flaw size (circular opening) of less than 5 inches. A flaw size of 10 inches has been postulated, and qualified for structural integrity by detailed engineering calculation.

- Section 3.2 specifies Service Level A, B, C and D loads consistent with the plant design basis shall be considered at the postulated circular opening. Thermal loads have been neglected, as they are considered secondary and self relieving. This position is based on a relatively low design temperature of 95°F; flaw is not crack like, but an elongated circular hole caused by erosion/corrosion; and it is localized, not continuous around the circumference of the pipe.

Estimated Wall Erosion Rate:

To be determined through follow-up NDE on a monthly basis (minimum).

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

Projected Flaw Size:

7 to 10 inch diameter hole (flaw) with temporary corrective measure providing leak mitigating capability.

Period of Time to Permanent Repair/Replacement:

No later than Refueling Outage 4 (RFO4) scheduled for November 1992, or earlier if NDE results so dictate.

Design Loading Conditions Met?

Yes, all normal/upset & faulted conditions have been met with no credit for structural integrity taken for the temporary corrective measure. Thermal loads were neglected as they are considered secondary and self relieving.

System Interaction Evaluation:
(i.e., Flooding, Jet Sprays, loss of flow, etc.)

There is no equipment in the area which would be directly or indirectly damaged by spray based on a recent walkdown. The soft patch provides leak mitigating capability.

Impact to Safe Shutdown Capability?

None as the Service Water in this section of piping has already provided cooling to the Reactor Plant Component Cooling Water Heat Exchanger. With two Service Water trains, isolation of one train upon flooding alarm, use other train for safe shutdown.

F. FLAW MONITORING

Walkdowns:

The soft patch as installed does not currently leak. It will be monitored for leakage. This area is subject to routine operator walkdown every shift. There are typically people in this area much more often than this.

Follow-up NDE:

Monthly (minimum) UT monitoring to track and trend future erosion.

Additional Examinations Required (Based on root cause):

The piping downstream of the four restriction orifices in the two 30" service water return headers are being examined. All others accessible service water piping restricting orifice plates where there is normally full flow will be examined the next 60 days.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

G. AUGMENTED INSPECTION OF AFFECTED SYSTEM

Assessment of over all degradation:

N/A

If additional examinations are required, specify number of inspection locations:

N/A

Description of Areas selected for Augmented inspection:

N/A

H. ADDITIONAL COMMENTS

Currently, a soft patch (completely reversible) has been installed as an interim temporary corrective measure. The soft patch is compromised of sheet rubber (5" by 6") with an aluminum stiffback place held in position by metal bands. The soft patch is credited with leak mitigating capability to limit fluid loss, and is also considered adequate to preclude a catastrophic failure, i.e. a significant loss of fluid from the maximum permissible size circular opening of 5", per Section 3.2 of the Draft ASME Code Case.

Based on current best estimates, the flaw may exceed the 5" maximum circular opening size prior to the next scheduled refueling outage. The pipe section at the flaw location has been evaluated by detailed engineering calculation and found to maintain structural integrity for up to a 10" circular opening. However, the soft patch over a projected 10" circular opening may not be leak tight, and potential flooding is a concern.

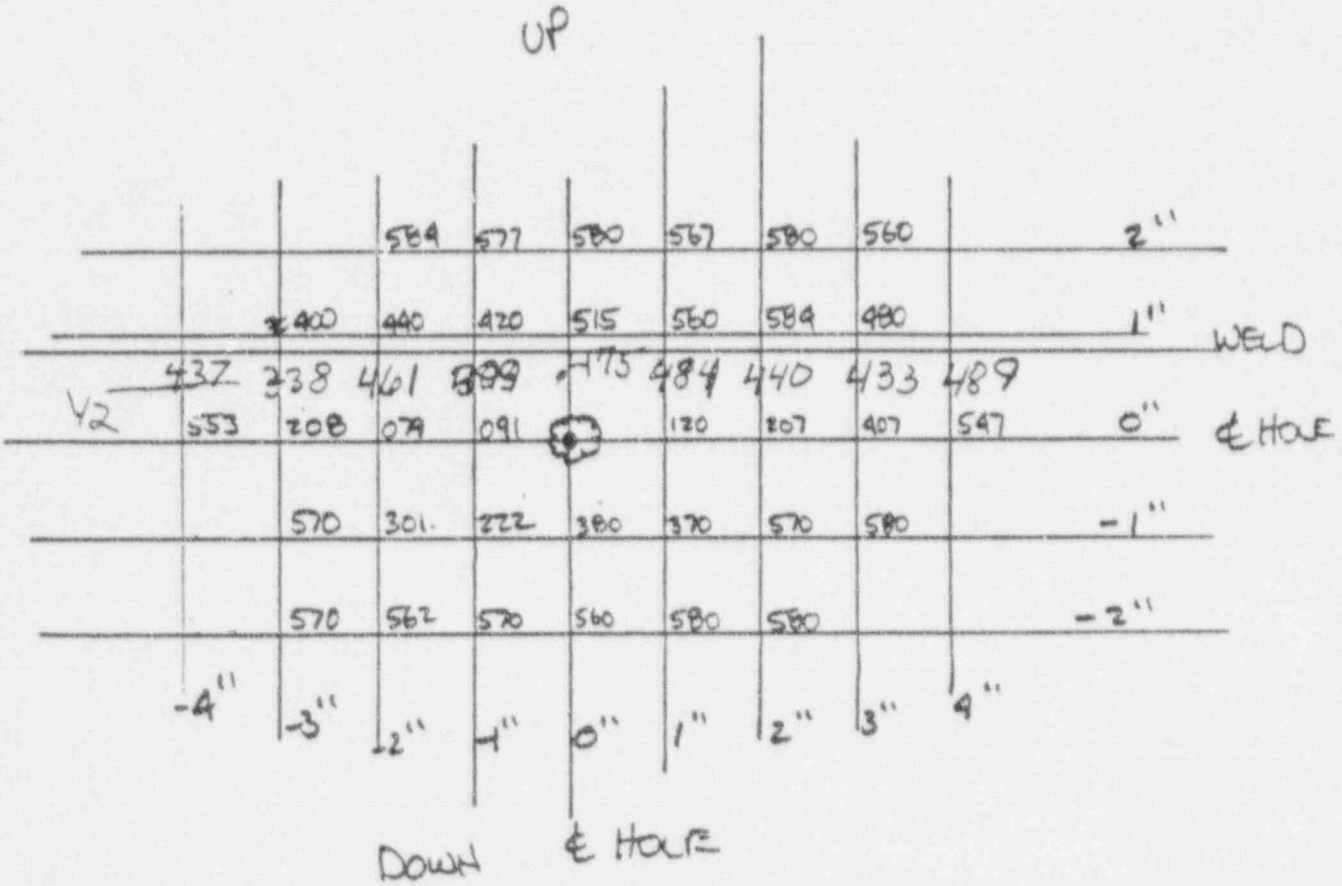
The use of a engineered hard patch (welded to pipe) as a temporary corrective measure is being considered. This hard patch would be installed for pressure/fluid loss only, and is not necessary to demonstrate the structural integrity of the piping. In accordance with Generic Letter 90-05, it is understood that NRC acceptance of the "welded patch" temporary repair will be required prior to its implementation. A separate relief request will be filed accordingly.

Concluding Remarks

Considering the low line pressure (≈ 16 psig), plant experience with soft patches, specified operator walkdowns for monitoring leaks, NDE for determining erosion rate and flaw re-evaluation if the situation requires it, the proposed soft patch provides adequate interim assurance for system availability and avoids a plant shutdown for repair.

UT MAP - HOLE ON
3 SWP 030 33903

NCR 391-293



① READINGS AT WELD BOUNCED AROUND. WELD TO LEFT SIDE OF HOLE APPEARS TO HAVE SOME MATERIAL LOSS BUT AVERAGED AROUND 0.400"
② ALL OTHER READINGS WERE REPEATABLE
③ HOLE ≈ 1/4" DIA.

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Attachment 2

Millstone Nuclear Power Station, Unit No. 3

Request for Relief From
ASME Code Section XI Requirements

June 1991

ATTACHMENT 2

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

A. DESIGN DETAILS

Piping System:

Service Water Supply Piping ("B" Train) from "B" and "D" Service Water Pumps in the Intake Structure

Piping Size and Schedule:

30"

Pipe Nominal Wall Thickness:

0.500" Carbon Steel with 0.100" Copper Nickel Cladding

Pipe Safety Code Class:

Class 3

Pipe Material:

Base Material SA-516, Gr. 70; Cladding Material SB-402, No. 706

Design Pressure:

100 psig (Maximum Normal Operating Pressure = 54 psig, Ref. Test Procedure IST-3-91-007)

Design/Operating Temperature:

75°F/75°F

Code Minimum Wall Thickness:

0.107" with E=0.80 Joint Efficiency

B. FLAW CHARACTERIZATION

Flaw Description/Size (i.e. Location, hole size, adjacent wall thickness, single/multiple flaw, total area examined, etc.):

See the attached drawing. The leak from a single 1/8" hole was discovered on June 6, 1991. An area approximately 1 square foot was examined by UT, including portions of an adjacent slip-on flange. As no degradation was found outside the immediate vicinity of the leak hole, a grid was not used, just the average pipe wall thickness for the areas shown.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

The hole is located adjacent (at the "toe of the weld") to the flanged connection between a long straight run of pipe and an elbow. The hole is on the elbow side of the flange connection with flow coming from the straight run of pipe and entering the elbow. There is no sign of degradation of the pipe wall excluding the through-wall hole, but it must be noted that the UT examination does not "see" the pipe under the slip-on flange. Past experience has shown that most likely the pipe under the flange is degraded to some degree. The thickness readings of the flange in the immediate area indicate the flange has not been affected.

Examination Method:

Ultrasonic

Flaw Type:

Through-wall

C. **ROOT CAUSE INVESTIGATION**

Root Cause Description:

Not known at this time. Two possible root causes are postulated.

Past inspections of large bore Service Water piping has shown sulfide attack in the areas adjacent to flange faces (heat affected zone caused by the installation of the slip-on flange). The literature on the subject is mixed as to the rate at which this attack takes place and the severity of the attack. Inspections to date have not indicated that this attack is occurring at a rate to cause short term (6 to 12 months) concern. As the flange joint is downstream of a long straight run of pipe, and there are no causes of flow disturbance upstream of the leak, sulfide attack has to be considered.

The leak is at the "toe" of the slip-on flange weld (also a heat affected zone caused by the installation of the slip-on flange), where a small flaw or holiday in the copper-nickel cladding during construction could have gone undetected. Localized erosion/corrosion of the cladding in time would expose the carbon steel base metal to service water, i.e. sea water. Once sea water came in contact with the carbon steel base metal, a through-wall leak would follow.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

D. DESCRIPTION OF PROPOSED REPAIR

The hole has been covered by an approximately 4" by 8" soft patch (rubber with a contoured wooden block) held in place by nylon strapping bands (circumferentially around pipe) and a clamp to hold the patch against the backside of the flange. This temporary repair is completely reversible. Based on the projected flaw size below, the use of a hard patch (welded to pipe/flange) is being considered. See Section H for details.

E. EVALUATION SUMMARY

Method used (i.e., LEFM, Area Reinforcement, Wall Thinning):

Area Reinforcement ("Branch Reinforcement" Approach) consistent with Section 3.2 of Draft ASME Code Case: "Temporary Corrective Measures For Class 3 Moderate Energy Piping When A Leak Is Found And Repairs/Replacements Are Impractical", Revision 4. Two exceptions to the Draft Code Case are as follows:

- Section 3.2 limits the maximum flaw size (circular opening) to less than 5 inches. For the present evaluation, a flaw size of 10 inches has been postulated, and qualified for structural integrity by detailed engineering calculation.

- Section 3.2 specifies Service Level A, B, C, and D loads consistent with the plant design basis shall be considered at the postulated circular opening. For the present evaluation, the thermal loads have been neglected as they are considered secondary and self relieving. This position is based on a relatively low design temperature of 75°F; flaw is not crack like, but a through-wall circular hole caused by erosion/corrosion; and it is localized, not continuous around the circumference of the pipe.

Estimated Wall Erosion Rate:

To be determined through follow-up NDE on a monthly basis (minimum).

Projected Flaw Size:

7 to 10 inch diameter hole (flaw) with temporary corrective measure providing leak mitigating capability.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

Period of Time to Permanent Repair/Replacement:

No later than Refueling Outage 4 (RFO4) scheduled for November 1992, or earlier if NDE results so dictate.

Design Loading Conditions Met?:

Yes, all Normal/Upset and Faulted conditions have been met with no credit taken for structural integrity of the temporary corrective measure. Thermal loads were neglected as they are considered secondary and self relieving.

System Interaction Evaluation (i.e., Flooding, Jet Sprays, loss of flow, etc.):

Based on a recent walkdown, there is no equipment in the area which would be directly or indirectly damaged by spray from the leak. Flooding in the area can be tolerated. Flooding results in safety related valves in the Service Water Access Enclosure failing in a safe position. This failure would result in the chlorination capability of the Service Water System being lost, which does not affect the system's ability to perform it's safety function. The soft patch provides leak mitigating capability.

Impact to Safe Shutdown Capability?

The leak is in the main supply line (B-Header) and a loss of fluid is a concern as both service water headers are required for normal plant operation. However, if the temporary corrective measure should fail catastrophically, i.e. fall off, safe shutdown capability is not impacted. Only one service water header is required for safe shutdown, that is, isolate one train upon loss of fluid, and use the second train for safe shutdown.

F. FLAW MONITORING

Walkdowns:

The soft patch as installed does not currently leak. Visual monitoring for leakage will be done monthly during follow-up UT examinations, or whenever plant personnel enter the area.

Flooding of this area is determined by means of a level switch set at approximately 2" above floor level, which is currently monitored once a day. This is being revised to once a shift.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

Follow-up NDE:

Monthly (minimum) UT monitoring to track and trend future erosion.

Additional Examinations Required (Based on root cause):

The basis for root cause is not known at this time, and the implantation of a specific UT/NDE program for similar flange joints is impractical. However, monitoring for general leakage, i.e. noting of water on the floor or around pipe joints is a routing part of plant operations.

G. AUGMENTED INSPECTION OF AFFECTED SYSTEM

Assessment of over all degradation:

N/A

If additional examinations are required, specify number of inspection locations:

N/A

Description of Areas selected for Augmented inspection:

N/A

H. ADDITIONAL COMMENTS

Currently, a soft patch (completely reversible) has been installed as an interim temporary corrective measure. The soft patch is comprised of sheet rubber approximately 4" by 8" with a contoured wooden block held in place by nylon strapping bands (circumferentially around pipe) and a clamp to hold the patch against the backside of the flange. The soft patch is credited with leak mitigating capability to limit fluid loss, and is also considered adequate to preclude a catastrophic failure, i.e. a significant loss of fluid for up to the maximum permissible circular opening size of 5", per Section 3.2 of the Draft ASME Code Case.

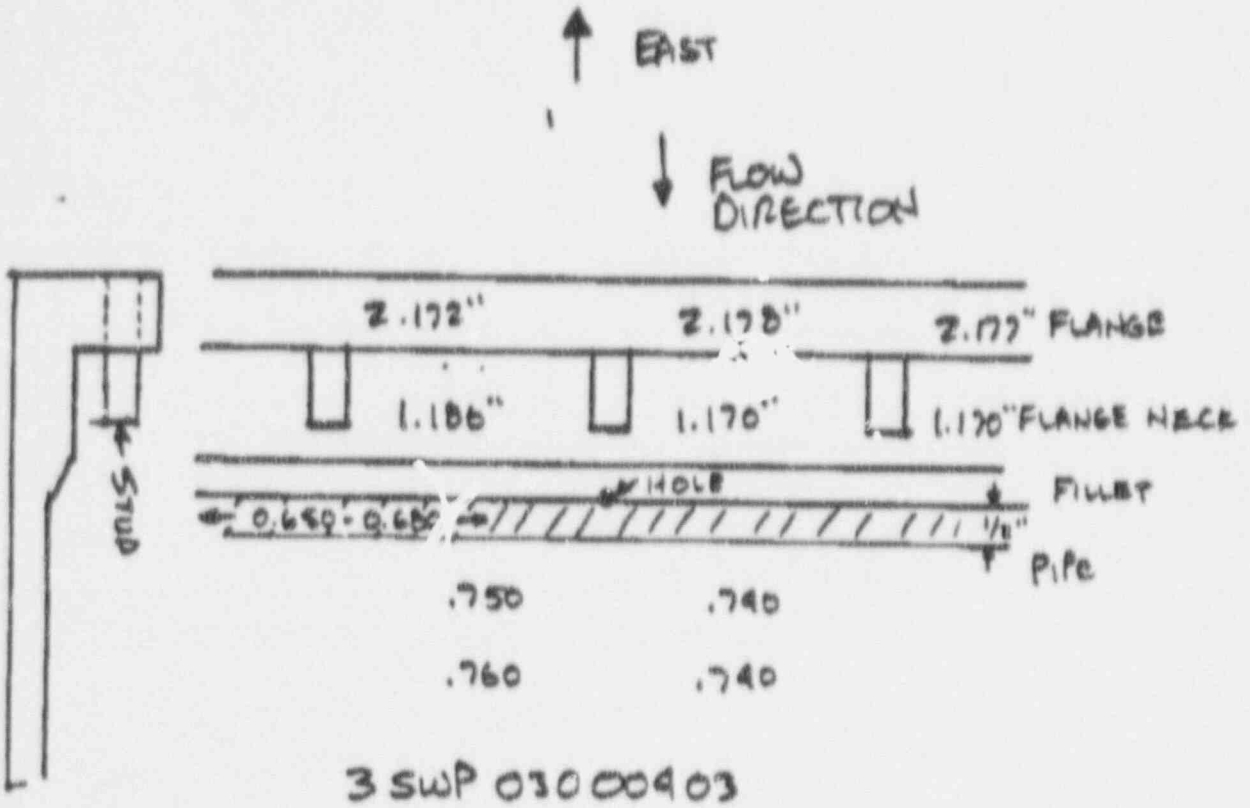
Based on current best estimates, the flaw may exceed the 5 inch maximum circular opening size prior to the next scheduled refueling outage. The pipe section at the flaw location has been evaluated by detailed engineering calculation and found to maintain structural integrity for up to a 10 inch circular opening. However, the soft patch over a projected 10" circular opening may not be leak tight, and potential flooding/fluid loss is a concern.

DETAILS PERTAINING TO RELIEF FROM ASME SECTION XI REQUIREMENTS

The use of a engineered hard patch (welded to pipe/flange) as a temporary corrective measure is being considered. This hard patch would be installed for pressure/fluid loss only, and is not credited in demonstrating the structural integrity of the pipe. In accordance with Generic Letter 90-05, it is understood that NRC acceptance of the "welded patch" temporary repair will be required prior to its implementation. A separate relief request will be filed accordingly.

CONCLUDING REMARKS

Considering the plants experience with soft patches, specified operator walkdowns for monitoring leaks, NDE for determining erosion rate and flaw re-evaluation if the situation requires it, the proposed soft patch provides adequate interim assurance for system availability and avoids a plant shutdown for repair.



3 SWP 030 00403

UT DATA BY
RICH FULLER
JOHN PINTO
6/7/91

NOTE - FOR AREA 1/2" FROM TOE OF WELD AN AREA ALL AROUND THE PIPE WAS STEPPED DOWN FROM ≈ 0.750" TO 0.650 - 0.680". STEP WAS VERY PRONOUNCED.