Dominion Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, Virginia 23060
Web Address: www.dom.com

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DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
SUPPLEMENTAL INFORMATION REGARDING WELD OVERLAY REPAIR RELATED TO RELIEF REQUEST IR-2-39, REVISION 1, USE OF A WELD OVERLAY AND ASSOCIATED ALTERNATIVE REPAIR TECHNIQUES

This letter provides supplemental information for request IR-2-39, submitted by Dominion Nuclear Connecticut, Inc. (DNC) letter, dated October 19, 2005. Attachments 1, 2, and 3 provide information that has been requested in an NRC teleconference on October 18, 2005. Additional information requested by the NRC was transmitted under Westinghouse Project Letter No. LTR-NRC-05-61 issued to the NRC on October 19, 2005.

Should you have any questions regarding this submittal, please contact Mr. Paul R. Willoughby at (804) 273-3572.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments (3)

(1) Volumetric Examinations Associated with Request IR-2-39
(2) Chemical Analyses of Incremental Milling of Weldment
(3) Weld Overlay Design Information

Commitments made in this letter: None.

cc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Mr. G. F. Wunder
Project Manager Millstone Unit No. 3
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8B1A
Rockville, MD 20852-2738

Mr. S. M. Schneider
NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT 1

VOLUMETRIC EXAMINATIONS ASSOCIATED WITH REQUEST IR-2-39 PRESSURIZER SPRAY NOZZLE

MILLSTONE POWER STATION UNIT 3
DOMINION NUCLEAR CONNECTICUT, INC.

VOLUMETRIC EXAMINATIONS ASSOCIATED WITH REQUEST IR-2-39 PRESSURIZER SPRAY NOZZLE

Radiographic examination of the pressurizer spray nozzle to safe end weld 03-X-5641-E-T identified the following two indications:

- 2.5 inch long linear indication located approximately 1/8" from the carbon steel to butter interface
- 1.25 inch long linear indication located approximately 1/8" from the carbon steel to butter interface

A supplemental ultrasonic examination was performed with smaller search units capable of maintaining improved contact in the area of interest. The smaller search units were not focused to sufficient depth to determine if the indications were inside surface connected. The results of this supplemental examination revealed 2 indications that were plotted to a location that correlated with the indications detected by radiography.

Due to the surface condition of the weld, it was not possible to fully characterize the location and through wall extent of the indications. DNC proceeded to machine and flapper wheel prepare the nozzle to improve the surface condition to an acceptable level that would allow full characterization of the indications.

WESDYNE automated ultrasonic procedure WDI-STD-119A Revision 1, which utilizes the AMDATA/Intraspect I/UX automated system, was then used to fully characterize the indications. The procedure, personnel and equipment have been fully qualified for detection and sizing through the PDI program.

The results of the automated examination revealed the presence of 3 reportable indications (2 circumferential and 1 axial).

Indication 1 – Description

The first circumferential indication was evaluated to be non-crack like and most likely due to lack of fusion located at the interface between the inconel weld and the nozzle butter. The indication appears to start at or near the inside surface. The indication is reported to have a maximum measured depth of 0.208" (~24%). The indication is reported to be intermittent for most of the full circumference (16.4" of 18.8") but more prevalent (stronger amplitude and more measurable through-wall extent) in the areas of the indications reported by radiography.

Indication 1 – Characterization and Conclusion:

This indication exhibits characteristics typical of lack of fusion. This conclusion is based on the following key attributes:

1) The indication plots to the fusion zone of the inconel weld and butter material;

2) The echo dynamic pattern observed from this flaw is smooth and no evidence of branching or multifaceted tip signals were detected;

3) The B and B-Prime (D-Scan) views indicate that the flaw does not vary in depth for the entire length of the scan. This uniform response pattern is not indicative of stress corrosion cracking;

4) The C-Scan image shows that the flaw is extremely straight and its axial position does not vary along the entire length of the scan. This consistent response is also not indicative of stress corrosion cracking.

The indication appears to be connected or in very close proximity to the inside surface. However, due to the inherent limitations of the ultrasonic techniques being used, it is impossible to determine if it is actually open to the inside surface.

Indication 2 – Description:

The second circumferential indication reported using the automated ultrasonic data was at the interface between the inconel weld and the stainless steel safe-end. The indication was characterized as being non-crack like and typical of lack-of-fusion. The indication was measured to be 0.219" (~24%) in depth and 7.7" long. The indication was reported to be located at or near the inside surface.

Indication 2 – Characterization and Conclusion:

This indication exhibited similar ultrasonic responses as indication 1, but was located on the fusion line between the weld and the safe-end. This indication also appears connected or in very close proximity to the inside surface.

Indication 3 – Description:

The third indication that was reported using the automated ultrasonic data is an axial indication that originates at the inside surface and is located wholly in the nozzle weld butter region. This indication was measured to be 0.214" (~24%) in depth and 0.25" long. The indication was recorded using the qualified probe in both the clockwise and counterclockwise circumferential scans.

Indication 3 – Characterization and Conclusion:

This indication appears to be a planar flaw that is wholly contained in the nozzle buttering material. The ultrasonic data shows it is connected or in very close proximity to the inside surface of the component. This indication can be seen on several adjacent scan lines from 2 directions, but it is much more prevalent from the counterclockwise direction. Similar indications can be seen in other areas around the weld, but could not be confirmed from the other direction and can only be observed on one scan line with very small echo dynamic responses. Because of its location and confirmation from the opposite scanning direction, this indication is conservatively evaluated as a planar flaw. However, it is also quite possible that the indication is associated with a small welding defect or inclusion located in the butter material.

Examined volume:

As-found condition:

In the as-found condition, prior to surface preparation (machining & flapping), 50% coverage was attainable, 100% coverage for axially orientated indications and 0% coverage for circumferentially orientated indications.

Post-preparation condition:

In the post-preparation condition, after machining and flapping, 100% coverage was attained from the safe end side (towards the nozzle) with full coverage of the weld and nozzle butter, and approximately 90% coverage was attained from the nozzle side (towards the safe end), the 10% area not covered is the upper region of the weld and safe end. This is based upon the PDI procedure requiring 100% of the volume to be examined versus the bottom 1/3t required by ASME Section XI.

Inservice Examination Requirements:

As described in Section 5.0 of the Request IR-2-39, Revision 1, dated October 19, 2005, the inservice examination requirements for this weld overlay repair will be in accordance with Nonmandatory Appendix Q, and will consist of adding the installed weld overlay repair to the Millstone Power Station Unit 3 ISI plan per Subarticle Q-4300 for at least one inservice examination to be completed within the next 2 refueling cycles.

ATTACHMENT 2

CHEMICAL ANALYSES OF INCREMENTAL MILLING OF WELDMENT

MILLSTONE POWER STATION UNIT 3
DOMINION NUCLEAR CONNECTICUT, INC.

The data shown below has been previously developed from a representative coupon welded by PCI, which was forwarded to EPRI for chemical analysis. The following are results of this EPRI chemical analysis. The data supports the current overlay design, which specifies a single sacrificial layer that is not credited in the structural analysis of the overlay.

Chemical Analyses (wt. %)

Weldment Incremental Milling Results
For Orbital -52 Filler / Quadrant

	Alloy 52	2nd Layer			1st Layer				HAZ		
Element / Quadrant	SFA 5.14 ER NiCrFe-7	0.22 in.	0.17 in.	0.12 in.	0.07 in.	0.05 in.	0.03 in.	0.01 in.	0.01 in.	0.03 in.	Base Metal
Chromium 45°		29.46	29.66	29.29	27.52	27.25	27.63	26.97	0.17	0.13	
Chromium 135°		29.09	29.46	29.11	26.64	27.07	27.11	26.69	0.16	0.14	
Chromium 225°		29.23	28.94	29.03	27.26	27.00	27.21	27.21	11.56	0.15	
Chromium 315°		29.54	29.57	29.29	27.20	27.19	27.62	24.47	0.37	0.14	
Avg.% Cr	28.0 to 31.5	29.33	29.41	29.18	27.16	27.13	27.39	26.34	3.06	0.14	0.13

NOTE: This data is representative of the alloy 52 weld overlay repair deposited on the Millstone Unit 3 Pressurizer Spray Nozzle. Subsequent layers will have %Cr equal to or greater than the 2nd layer.

ATTACHMENT 3

WELD OVERLAY DESIGN INFORMATION

MILLSTONE POWER STATION UNIT 3
DOMINION NUCLEAR CONNECTICUT, INC.

WELD OVERLAY DESIGN INFORMATION

Proprietary information transmitted under the Westinghouse Project Letter No. LTR-NRC-05-61, issued October 19, 2005, to the NRC provides a weld overlay design drawing and typical nozzle details that are associated with the repairs described in request IR-2-39.

To avoid stress risers, the weld material is extended and tapered across the pipe and nozzle side. The end slope is required to be no steeper than 45 degrees to minimize stress concentration. Therefore, the length of the actual weld overlay exceeds the minimum length required by ASME Code Case N-504-2 and Section XI Appendix Q for load redistribution and inspection purposes. It is important to note that inspection requirements are a controlling factor in the weld overlay repair design. Based on the current Westinghouse inspection techniques, the radius of curvature at any geometric transition must be approximately 4 inches to ensure proper operation of the current inspection probe. The length of the weld overlay must be sufficient for inspection of an area that is ½ inch beyond the required repair length and the outer 25% of the original wall thickness. The design must consider the minimum inspection angle of 30º and the required inspection area. It should be noted that the length of the weld overlay was extended and blended into the low alloy steel nozzle outer diameter taper to permit UT inspection of the adjacent stainless steel weld and minimize stress concentration on the nozzle outer diameter. Since the outside diameter of the nozzle is larger than that of the safe end, the weld overlay thickness on the safe end is increased to allow a smooth transition surface for UT inspection. Therefore, the final weld overlay length and thickness after taking into consideration the UT inspection requirements will exceed the length required for a full structural weld overlay repair in accordance with the ASME Code Case N-504-2 and Section XI Appendix Q.

The minimum weld overlay design thickness that is required to meet structural requirements is shown in the proprietary weld overlay design drawing that was transmitted to the NRC in Westinghouse letter LTR-NRC-05-61, dated October 19, 2005. Weld deposits are added to facilitate volumetric examination. The minimum weld overlay thickness for the spray nozzle repair is 0.33 inch with an additional layer required to account for dilution. Additional weld passes or a larger weld overlay thickness will not invalidate the original design. The cross-hash sections shown in the proprietary drawing transmitted by Westinghouse indicate the structural component of the weld overlay repair. The gray area represents weld deposits that are added to facilitate volumetric examination.