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RECIP.NAME RECIPIENT AFFILIATION
MURLEY,T. Office of Nuclear Reactor Regulation, Director (Post 870411

SUBJECT: Provides partial response to request for addl info re Generic Ltr 88-01, "NRC Position on IGSCC in BWR ASSP."

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PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101 • 215/770-5151

Harold W. Keiser
Senior Vice President-Nuclear
215/770-4194

AUG 18 1989

Director of Nuclear Reactor Regulation
Attention: Dr. Thomas Murley
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
ADDITIONAL RESPONSE TO GENERIC LETTER 88-01
PLA-3233 FILE R41-1D

Dear Dr. Murley:

The following is our partial response to the request for additional information regarding Generic Letter 88-01, "NRC Position On IGSCC In BWR Austenitic Stainless Steel Piping." The following items are included in our current response:

1. PP&L's position on NRC staff positions including the Susquehanna Specific item no. 1 - Refer to Table I attached.

2. Leak detection - Refer to Table II attached.

Our engineering department is presently formulating our final response for the remaining additional information items. We plan to forward our final response to you by September 30, 1989.

If you have any questions, please contact Mr. J. B. Wesner at (215) 770-7906.

Very truly yours,

H. W. Keiser

Affidavit
Attachments

cc: NRC Document Control Desk (original)
NRC Region I
Mr. G. S. Barber, Sr. Resident Inspector
Mr. M. C. Thadani, NRC Project Manager
Dr. A. Lakner, Viking Systems International

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AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA)
: SS
COUNTY OF LEHIGH)

I, HAROLD W. KEISER, being duly sworn according to law, state that I am Sr. Vice President - Nuclear of Pennsylvania Power & Light Company and that the facts set forth on the attached response to Generic Letter 88-01 are true and correct to the best of my knowledge, information and belief.

H Keiser
Harold W. Keiser
Sr. Vice President - Nuclear

Sworn to and subscribed
before me this 17th day
of August , 1989.

Helen J. Wolfer
Notary Public

NOTARIAL SEAL
Helen J. Wolfer, Notary Public
City of Allentown, Lehigh County, Pa.
My Commission Expires Apr. 4, 1993

rmh/msc200368i

TABLE I

RESPONSES TO NRC STAFF POSITIONS

Staff Position	PP&L RESPONSE: Accept	PP&L RESPONSE: Accept W/Provisions	PP&L RESPONSE: Request Alt.Provisions	PP&L HAS/WILL: Applied in Past	PP&L HAS/WILL: Cons. For Future Use
1. Materials		Yes(1)		Yes(1)	
2. Processes	Yes			Yes(1)	
3. Water Chemistry	Yes				Yes
4. Weld Overlay	Yes				Yes
5. Partial Replacement	Yes				Yes
6. Stress Improvement of Cracked Weldments	Yes				Yes
7. Clamping Devices	Yes				Yes
8. Crack Evaluation & Repair Criteria		Yes(1)(3)			Yes(1)
9. Inspection Method & Personnel	Yes			Yes	
10. Inspection Schedules	Yes			Yes(1)	
11. Sample Expansion	Yes			Yes	
12. Leak Detection		Yes(1)		Yes(1)	
13. Reporting Requirements			Yes(1)(2)	Yes(1)(2)	

(1) Additional explanation is contained in PP&L's original submittal, PLA-3060, dated August 10, 1988.

(2) Additional explanation is contained in PP&L's additional submittal, PLA-3136, dated February 13, 1989.

(3) Response to request for additional information pertaining to Susquehanna Units 1 and 2.

ITEM 1 - INSERVICE INSPECTION AND MITIGATING TREATMENTS

Additional Information Pertaining to Crack Characterization and Repair Criteria.

a) The reasons why an equation is used for non-IHSI welds that gives about 20% lower crack growth rate than that for IHSI welds are as follows:

1. The crack growth equation for non-IHSI welds was taken from data compiled by R. M. Horn and co-workers and presented in EPRI Report NP-4690-SR as Figure 3-4 (copy attached). This report summarizes the methods and bases used by the Task Group for Piping Flaw Evaluation to develop allowable flaw sizes for Section XI, IWB-3640 of the ASME Code. The equation used for the non-IHSI welds represents Curve B-Weld Sensitized Materials, 0.2 ppm Oxygen, in Figure 3-4. This curve gives results about 20% lower than the crack growth rate selected for use by the Staff in NUREG-0313, Revision 2.

2. As noted above, the crack growth equation for Curve B represents weld-sensitized Type 304 stainless steel behavior in 0.2 ppm oxygenated water. We note that this equation differs slightly from that used by the NRC since each equation was based on the engineering judgements of two different organizations, specifically the ASME Code Section XI and the Nuclear Regulatory Commission. In our judgement, we believe that the use of Curve B is justified due to the conservatism in our analysis model for the non-IHSI welds. The primary conservatism in our evaluation for these welds is the assumption of a full 360 degree ID flaw. This assumption becomes very conservative for evaluating finite length flaws with aspect ratios larger than one to ten.

b) The residual stress distribution for welds in pipes with wall thicknesses <1 inch is also based on recommendations of the Task Group on Piping Flaw Evaluation contained in EPRI report NP-4690-SR. (Reference Figures 3-1 and 3-3). The data contained in this report suggest that residual stress differences in various sizes of pipe are due primarily to the increased heat capacity of thicker wall pipe and are only coincidentally associated with diameter. Consequently, a linear distribution is used for thinner wall pipe due to its decreased heat capacity. The linear distribution will provide a conservative representation of residual stress for ID flaws in thin wall pipe. The transition to a non-linear distribution was chosen somewhat arbitrarily at one inch. Both finite element calculations and limited experimental data support these different residual stress distributions.

c) For IHSI welds, no residual stress distribution is used. This is because we believe IHSI will essentially mitigate tensile residual stress conditions at the inside diameter pipe surface. Hence, residual stresses are neglected for these welds including any beneficial compressive residual stresses that may be present after IHSI treatment.

(3) Continued.

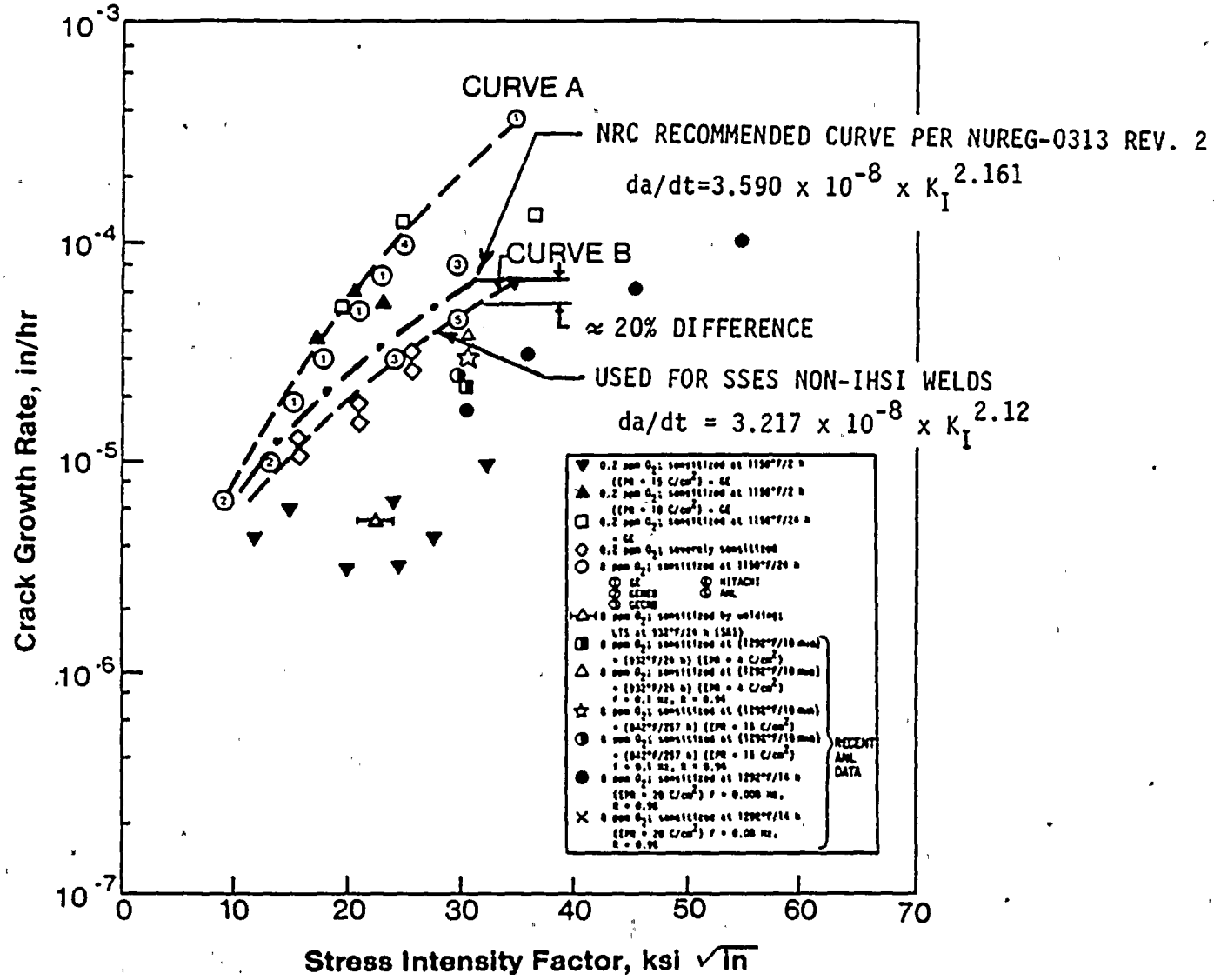


Figure 3-4. Recommended Corrosion Crack Growth Rates, for Austenitic Stainless Steel: Curve A - Furnace Sensitized Material, 0.2 ppm Oxygen; Curve B - Weld Sensitized Material, 0.2 ppm Oxygen

(REFERENCE EPRI NP-4690-SR)

(3) Continued.

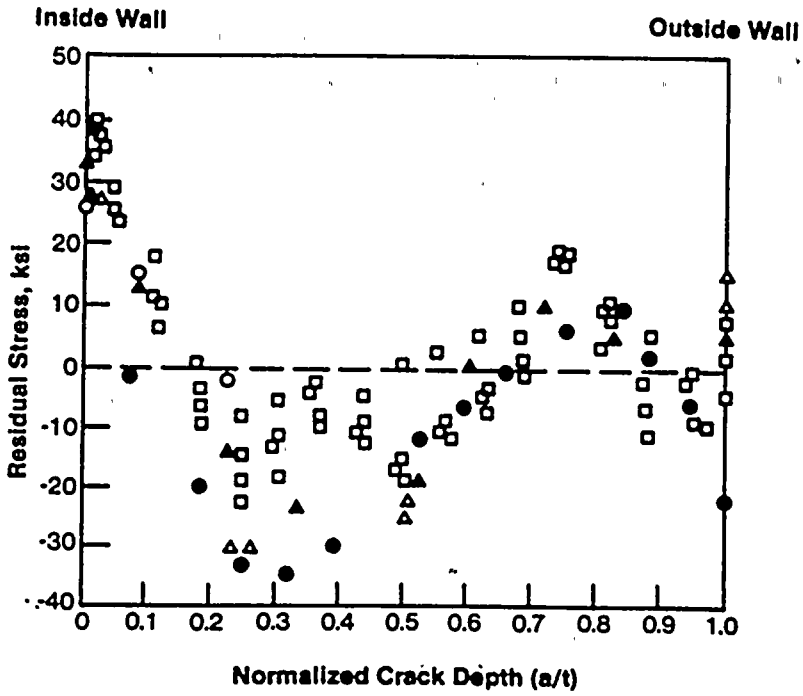
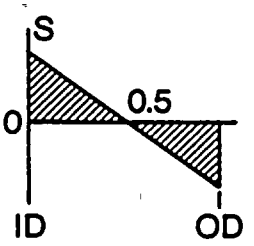
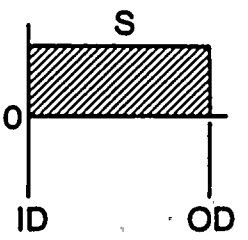
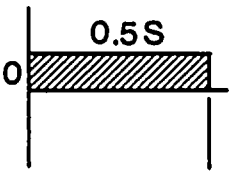


Figure 3-1. Measured Axial Throughwall Residual Stress as a Function of Radial Distance Through the Pipe Wall for Austenitic Stainless Steel Pipe Welds

(REFERENCE EPRI NP-4690-SR)

(3) Continued.

Wall Thickness	Through-Wall Residual Stress [1]	
	Axial	Circumferential [2]
<1 inch		
≥1 inch	See Note 3	

[1] S = 30 ksi

[2] Considerable variation with weld heat input.

[3] $\sigma = \sigma_i [1.0 - 6.91 (a/t) + 8.69 (a/t)^2 - 0.48 (a/t)^3 - 2.03 (a/t)^4]$

σ_i = stress at inner surface (a = 0)

Figure 3-3. Recommended Axial and Circumferential Residual Stress Distributions for Austenitic Stainless Steel Pipe Welds

(REFERENCE EPRI NP-4690-SR)

TABLE II

LICENSEE POSITIONS ON LEAKAGE DETECTION

Position	Already Contained in TS	TS will be Changed to Include	Alternate Position Proposed
1. Conform with Position C of Regulatory Guide 1.45	Yes*		
2. Plant shutdown should be initiated when:			
(a) within any period of 24 hours or less, an increase is indicated in the rate of unidentified leakage in excess of 2gpm, or			Yes(1)
(b) the total unidentified leakage attains a rate of 5 gpm.			Yes(2)
3. Leakage monitored at four hour intervals or less.	Yes		
4. Unidentified leakage includes all except:			
(a) leakage into closed systems, or	Yes		
(b) leakage into the containment atmosphere from sources that are located, do not interfere with monitoring systems, or not from throughwall crack.	Yes		
5. Provisions for shutdown within 24 hours due to inoperable measurement instruments in plants with Category D, E, F and G welds.	Yes		

* The drywell floor drain sump, all drywell drain piping, and all instrumentation used to monitor drywell floor drain sump are qualified to operate following an OBE. The drywell equipment drain tank, drywell equipment drain tank level instrumentation, and drywell floor drain sump pumps are not qualified to operate following an OBE.

Credit will be taken for monitoring unidentified leakage following an OBE thru the use of the drywell floor drain sump level monitoring system. The proper functioning of at least one leakage detection system following an SSE is provided by the design of the air borne radioactivity monitoring system.

ALTERNATE POSITION PROPOSED

(1) POSITION 2.(a)

Our Technical Specifications currently stipulate that the increase in unidentified leakage be limited to 2 GPM within any 4-hour period. Changing the limits to a 2 GPM increase within any 24-hour period is significantly more restrictive and would require a Technical Specification change. We feel that the present Technical Specification is reasonable and achievable with our present leakage detection system. The significant tightening of allowable leakage rate increases would pose a substantial threat to SSES availability with no improvement in our break detection capability.

The Technical Specification also allows 4 hours to identify the source of leakage increase as not service-sensitive, Type 304 or 316 austenitic stainless steel. It is our opinion that 4 hours is a reasonable period for corrective action (e.g. backseating valves) and should not be deleted from the Technical Specifications.

(2) POSITION 2.(b)

Our Technical Specifications limit the total unidentified leakage to 5 GPM which is in agreement with Position 2.(b), however, it also allows 4 hours to reduce the leakage rate before initiating a shutdown. It is our opinion that 4 hours is a reasonable period for corrective action and should not be deleted from the Technical Specifications.