Enclosure 1

VERMONT YANKEE
IGSCC MEETING

OCTOBER 21, 1983
1:00 PM

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PDR ADOCK 05000271
P PDR

VERMONT YANKEE I&E BULLETIN 83-02
UT INSPECTION SEQUENCE

I. Basic 83-02 Inspection

- Chose 25 welds by stress rule index

  13-12" joints
  12-22" or 28" joints

- Indications in 7 small bore
  8 large bore

II. Expanded Sample

- Chose 19 additional joints by:

  1. Stress rule index - high susceptibility
  2. Review of construction records to determine most heavily repaired joints
  3. Review of joints with abnormal configurations

  11-small bore
  8- large bore

- Indications in 8 small bore
  3 large bore

  Indications in large bore were short and shallow

- Conservative flaw evaluations per IWB-3640 resulted in factors of 2.5-4.0 on $\frac{\text{ALLOWABLE FLAW DEPTH}}{\text{UT FLAW DEPTH}}$

III. Inspected Remaining 12" Joints

IV. Enhance Drywell Leakage Monitoring

NOTE: Prior to inspections performed a decontomination which has been shown to enhance crack detection capability.
"Nine Mile Point 1 Pipe Crack Task Force Report"

SUMMARY OF INSPECTION PROGRAM

SMALL BORE - 12" RISER PIPING

- 100% UT INSPECTION

LARGE BORE - 22" & 28" PIPING

- HIGH SUSCEPTIBILITY WELDS (29) WERE COVERED BY EITHER:
  1. UT INSPECTION (16) OR
  2. LEAK TAPE (7) OR
  3. INSPECTION OF IDENTICAL JOINT IN OPPOSITE LOOP E.G. JOINT 28-38 IN LOOP A WAS INSPECTED; 28-14 WAS NOT.(10)

- JOINTS WITH EXTENSIVE CONSTRUCTION WELD REPAIR WERE DETERMINED AND INSPECTED

- IN GENERAL, INDICATIONS IN LARGE BORE PIPING WERE SHALLOW INDICATIONS OF FINITE LENGTH CONSISTENT WITH TYPICAL IGSCC IN LARGE BORE PIPING.

EVALUATION OF UT FINDINGS

- DECON ENHANCED DETECTION CAPABILITY
- UNLESS ABSOLUTELY CERTAIN THAT INDICATION WAS GEOMETRY IT WAS CLASSIFIED AS IGSCC
- SECOND SAMPLE OF LARGE BORE UT INSPECTIONS SHOWED LOWER SIGNAL AND LOWER PERCENTAGE OF FLAWED JOINTS
- SIMILARITY CONSIDERATIONS AND DELIBERATE SELECTION OF HIGH SUSCEPTIBILITY JOINTS MEANS THAT WE HAVE VERY THOROUGH ASSESSMENT OF PLANT WELD STATUS

SUMMARY

TOTAL JOINTS (22", 28", 12")		95
NON-SUSCEPTIBLE BY SOLUTION HEAT TREATMENT	-10	
NON-SUSCEPTIBLE BY SRI <1.08	-11	
TOTAL NON-SUSCEPTIBLE		21
REMAINDER		74
UT INSPECTED	-56	
LEAK TAPE INSTALLED	-(7)	
LARGE DIAMETER JOINTS COVERED BY SIMILARITY	-10	
JOINTS BETWEEN LOOP CROSSOVER VALVES WHICH ARE CLOSED	-2	
TOTAL COVERED		68
REMAINDER		6

OF REMAINING SIX

LEAK TAPE ON TWO
SRI < 1.3; C < .059

- 92% OF ALL JOINTS WERE EVALUATED

- NO FURTHER INSPECTIONS PERFORMED SINCE REMAINING JOINTS HAVE:

1. LOWER SUSCEPTIBILITY C <.059; SRI <1.3
2. FEWER REPAIRS
3. BASICALLY STANDARD JOINT DESIGNS
4. MORE PREDICTABLE RESIDUAL STRESS PATTERNS
5. FLAW EVALUATION FACTORS AT LEAST AS HIGH AS INSPECTED JOINTS
6. EVALUATION BY METHODS STATED ABOVE

- SAFETY EVALUATION REPORT -

- VERMONT YANKEE INSPECTION COMPLIES WITH I & E BULLETIN 83-02

- CONCURRED THAT WELDS MOST LIKELY TO CRACK WERE SELECTED FOR INSPECTION

- INDEPENDENT NRC STAFF CALCULATIONS VERIFIED THAT VERMONT YANKEE'S EVALUATION OF CRACK GROWTH IN LARGE BORE WELDS, AND OVERLAYS OF SMALL BORE INDICATIONS PROVIDED ADEQUATE ASSURANCE THAT CODE SAFETY MARGINS WOULD BE MAINTAINED DURING NEXT CYCLE OF OPERATION

- RECOGNIZED UNCERTAINTY IN UT DEPTH SIZING AND IMPOSED ENHANCED LEAK MONITORING REQUIREMENTS ON UNIDENTIFIED DRYWELL LEAKAGE TO COVER THIS UNCERTAINTY.

SMALL BORE PIPING - RESULTS

- PERFORMED 100% INSPECTION OF RISER WELDS
- OVERLAYED ALL JOINTS WITH INDICATIONS (22 OVERLAYS)
- TWENTY-ONE OUT OF TWENTY-TWO OVERLAYS QUALIFY AS STRUCTURAL OVERLAYS I.E. ENOUGH WELD METAL FOR FULL STRUCTURAL INTEGRITY REGARDLESS OF FLAW DEPTH.
- ONE OVERLAY (JOINT 32, RISER TO ELBOW) DOES NOT HAVE ENOUGH WELD DEPOSIT FOR FULL STRUCTURAL INTEGRITY. OVERLAY AVERAGES .15 INCHES.
- THE WELD OVERLAY THICKNESS PLUS ABOUT 20% OF THE ORIGINAL WALL WOULD PROVIDE FULL STRUCTURAL INTEGRITY
- AN 80% T_{WALL} FLAW, 360^{o} AROUND CIRCUMFERENCE COULD BE TOLERATED AT JOINT 32
- OVERLAYS DESIGNED FOR FIVE YEARS IN ACCORDANCE WITH ASME SECTION III SUBSECTION NB.

LARGE BORE - 22" & 28"

I. INSPECTED 20 LARGE BORE JOINTS

- PERFORMED FLAWED PIPE ANALYSIS ON 12 LARGE BORE JOINTS
  - ALL FLAWS WERE ANALY ZED AS 360° INDICATIONS
  - CONSERVATIVE WELD RESIDUAL STRESS DISTRIBUTIONS ASSUMED
  - UPPER BOUND IGSCC FLAW GROWTH CURVE (EPRI NP-2472 & EPRI 2423-LD)

- RESULTS INDICATED FACTORS OF 2.5-4 ON ALLOWABLE FLAW DEPTH TO 'UT' CALLED DEPTH

II. FLAWS REEVALUATED USING UNCRACKED LIGAMENT CRITERIA

- NINE JOINTS CONTAIN FLAWS 20% OF CIRCUMFERENCE OR LESS IN LENGTH

- FOR NINE JOINTS, REEVALUATION USING REMAINING UNCRACKED LIGAMENT SHOWS THAT A THRU-WALL FLAW OF THE LENGTHS DETECTED COULD BE TOLERATED AND NOT REDUCE CODE SAFETY MARGIN TO PLASTIC COLLAPSE. (CODE FACTOR = 2.77)

- THREE JOINTS WERE CHARACTERIZED AS CONTAINING LONG FLAWS IN ORIGINAL SUBMITTAL

JOINT	LENGTH
1A	38"
2	360° (INTERMITTENT)
9A	360° (INTERMITTENT)

WELD 1A

DISPOSITION: IGSCC, 38" LONG ON ELBOW SIDE OF WELD.

PRESERVICE: NO INDICATIONS > 10% DAC

1974 - GEOMETRIC INDICATIONS TO 100% DAC

1976 - GEOMETRIC INDICATIONS TO 45% DAC 360° AROUND WELD

1983 - INDICATIONS 40 TO 80% DAC ON INITIAL SCANS
- EVALUATION SCANS PLOT VERY CLOSE TO OR IN ROOT WITH CHARACTERISTIC SIGNAL
- CONTINUIOUS LENGTHS OF 38" AND 9" CALLED
- SIZED AT 10 TO 15% TWD
- RADIOGRAPH 4/6/83 DID NOT CONFIRM GEOMETRY

CONCLUSION: IGSCC CALLED

HOWEVER THE CONDITION IN 1983 IS STABLE AND CONSISTENT WITH CONDITIONS IN 1974

WELD No.2

DISPOSITION: IGSCC INTERIMITTENT 360° AROUND PIPE

PRESERVICE: NO INDICATIONS > 10% DAC

1976 - NO RECORDABLE INDICATIONS

1983 - INDICATIONS 360° AROUND AT 20 TO 65% OF DAC

- ALL INITIALLY RECORDED INDICATIONS EVALUATED AS GEOMETRY
- EVALUATION SCAN NOTED VERY LOW AMPLITUDE IGSCC CHARACTERISTIC SIGNAL
- LENGTH NOTED AS SHORT AND INTERMITTENT, OFTEN INDISTINGUISHABLE FROM ROOT SIGNAL
- MAXIMUM T.W.D. PLACED AT ≤10%
- RADIOGRAPH CONFIRMED POOT LOCATION

CONCLUSION: IGSCC FLAWS INTERMITTENT OVER 360° CIRCUMFERENCE AT VERY LOW AMPLITUDE (5-15% DAC)

WELD No. 9A

DISPOSITION: IGSCC INTERMITTENT 360° AROUND WELD

PRESERVICE - NO INDICATIONS >10% DAC

1976 - NO RECORDABLE INDICATIONS

1983 - INITIAL SCANS PLOT AS GEOMETRY
- SIGNAL CHARACTERISTIC IS IGSCC-LIKE
- SIZED AT 10% TWD

CONCLUSION: IGSCC FLAWS, INTERMITTENT 360° AROUND PIPE
IGSCC CONSERVATIVELY CALLED.

(NOTE: PIPE WAS AT 7-9 R/HR CONTACT DURING EXAMINATION)

FURTHER EVALUATION OF WELDS 1A AND 2

- RADIOGRAPHS TAKEN IN APRIL, ~~1987~~ 1983 TO AID INTERPRETATION OF INDICATIONS

- ONE FILM AT TYPICAL INDICATION SITE PER WELD

- ORIGINAL UNENHANCED FILMS READ IN APRIL SHOWED NO INDICATIONS BUT NO CONFIRMATORY GEOMETRY

- FILMS (CONST. & CONFIRMATORY) LATER COMPUTER ENHANCED * AS FOLLOWS:

WELD 1A - NO INDICATIONS OF IGSCC IN CIRCUMFERENTIAL DIRECTION

WELD 2 - SHORT AXIAL FLAWS AT LONGITUDINAL WELD
- NO INDICATIONS OF IGSCC IN CIRCUMFERENTIAL DIRECTION

* R.T. TECHNIQUE UTILIZED (Co 60) LIMITS ENHANCEMENT LOWER BOUND TO $\geq$.200"

JOINT 1A

- FINITE LENGTH FLAW - 38 INCHES LONG

- FLAW ORIGINALLY ANALYIZED AS A 360° FLAW - ALLOWABLE BEGINNING OF FUEL CYCLE DEPTH = 34% T WALL.

- FLAW REEVALUATED, CONSIDERING CROSS SECTIONAL AREA REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY FOR ALL DESIGN LOADS. A MULTIPLIER OF THREE PUT ON SEISMIC STRESS FOR CONSERVATISM. RESULTS INDICATE A FLAW OF APPROXIMATELY 60% T WALL FOR 38 INCHES COULD BE TOLERATED.

- VERY LOW APPLIED STRESS - 10,2000 PSI = 0.55M BASED ON ACTUAL MATERIAL CERTIFICATION.

- FLAWS OF THIS MAGNITUDE HAVE NOT BEEN OBSERVED TO DATE IN ANY PLANT NOR WOULD BE EXPECTED IN LARGE DIAMETER PIPING.

JOINTS 2 & 9A

- FLAWS WERE "UT CALLED" 10% DEEP AND 360° AROUND PIPE INTERMITTANTLY.

- UT RESULTS ARE MORE RELIABLE FOR THESE TWO JOINTS - VERY LOW LEVEL SIGNAL - 10% DEPTH CONSERVATIVELY CALLED. SIGNAL DEFINITELY LOWER THAN THAT FROM FLAWS CALLED 20%.

- ORIGINAL FLAW EVALUATION INDICATED THAT A 40% DEEP, FULL CIRCUMFERENTIAL FLAW IS ACCEPTABLE AT THE BEGINNING OF THE FUEL CYCLE. (FACTOR OF 4 ON UT DEPTH SIZING)

- THESE TWO JOINTS HAVE VERY LOW APPLIED STRESS 11,000 PSI WITH A MULTIPLIER OF 3 ON SEISMIC. (ABOUT $0.52S_M$)

- AN END OF FUEL CYCLE FLAW OF 63% T_{WALL} IS ACCEPTABLE FOR THIS LOW STRESS LEVEL.

- LONG SHALLOW FLAW IS CHARACTERISTIC IGSCC IN LARGE BORE PIPING DUE TO FAIRLY UNIFORM RESIDUAL STRESS PATTERN.

- THESE TYPES OF FLAWS WILL RUN INTO THE COMPRESSIVE STRESS FIELD AT ABOUT 20% T_{WALL} AND SHOULD NOT CONTINUE MUCH BEYOND.

TABLE II

ENCLOSURE C

RESULTS
FLAW EVALUATION
LARGE DIAMETER PIPING(1)

PIPE	WELD	(2) A	L	A/T (% TWD)	A/T_{ALLOW} BØC	END OF CYCLE FLAW DEPTH (% TWD)	A/T_{ALLOW} EØC	ACTION	$L/2\pi R$
28"	64	.19"	4"	.1-.15	.55	.21	.75	NO REPAIR REQUIRED FOR ONE OPERATION CYCLE.	.05
28"	1A	.19"	38"	.15	.34	.21	.68		.47
28"	2	.13"	360°	.1	.41	.21	.63		1.0
28"	9A	.13"	360°	.1	.43	.21	.63		1.0
28"	65A	.19"	9.5"	.15	.41	.21	.75		.12
28"	15A	.19"	11"	.15	.41	.21	.75		.14
28"	58	.19"	17.5"	.15	.44	.21	.75		.22
28"	59	.19"	3"	.15	.44	.21	.75		.04
22"	16B	.1"	4.5"	.1	.35	.13	.75		.07
22"	36B	.1"	12.0"	.1	.29	.13	.75		.19
22"	30B	.15"	4.5"	.15	.48	.17	.75		.07
24"	RHR-31 Weld 1	.09"	4.0"	.07	.50	.1	.75		<.07

(1) An explanation of the associated conservatisms of this table are provided in Enclosure D.
(2) For explanation of symbols see Sheet 2.

PROPOSED JULY 1984 EXAMINATION SCOPE

12" RISER WELDS	-	EXAMINE 6* OF 18, WELDS NOT REPAIRED IN 1983
	-	4** WELD OVERLAYS
22" WELD	-	2* ADDITIONAL SWEEP-O-LETS
	-	2* END CAPS (ONE NEW)
	-	2* NEW WELDS AT CROSSOVER
28" WELD	-	ALL (3) WELDS WITH IND. >20% OF CIRCUMFERENCE
	-	3** SELECTED WELDS WITH INDICATIONS
	-	6* WELDS NOT PREVIOUSLY EXAMINED
	-	6* RHR WELDS NOT PREVIOUSLY EXAMINED

TOTAL 34 WELDS

* SAMPLE SIZE TO BE INCREASED IN ACCORDANCE WITH IWB 2430 IF INDICATIONS ARE FOUND.

** ALL WELDS OF THIS TYPE IF SIGNIFICANTS CHANGES ARE NOTED

EXAMINER AVAILABILITY

In accordance with present schedules two likely ISI vendors have no scheduled outages in 1984 prior to July.

- Each vendor estimated 25-30 qualified Level II examiners

- Based upon 1983 post-decon radiation levels this number will be adequate for full exam scope.

QUALIFICATION OF EXAMINERS

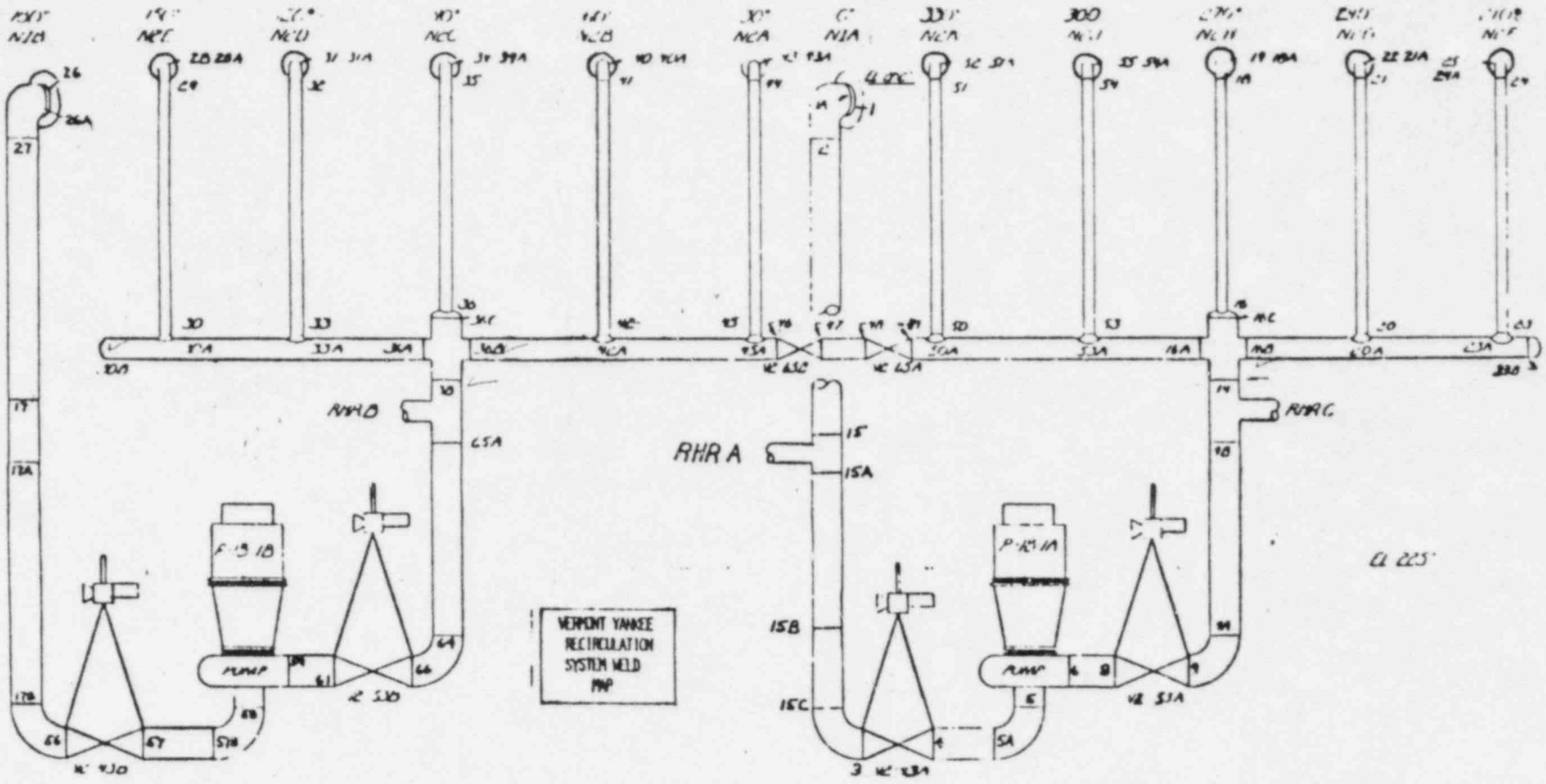
JULY 1984 OUTAGE

LEVEL II AND III EXAMINERS

- BASIC QUALIFICATION TO SNT-TC-1A
- ADDITIONAL QUALIFICATION TO E.P.R.I. I.G.S.C.C. TRAINING COURSE OR EQUIVALENT
- FLAW SIZING TO BE AS PER E.P.R.I. WORKSHOP ON PLANAR FLAW SIZING

LEVEL I EXAMINERS

- BASIC QUALIFICATION TO SNT-TC-1A
- ADDITIONAL PROCEDURAL TRAINING PER YANKEE ATOMIC ELECTRIC COMPANY
- DIRECT SUPERVISION BY QUALIFIED LEVEL II OR III


RHR A
RHR C
MERRIMENT YANKEE
RECIRCULATION
SYSTEM WELD
MAP
DRYWELL
CONTAINMENT

- SUMMARY OF IGSCC ACTIONS AT VERMONT YANKEE -

- INSPECTED 100% OF 12 INCH INLET RISER WELDS
- OVERLAYS ACCEPTABLE AS FULL STRUCTURAL OVERLAYS
- INSPECTED 30% OF LARGE BORE RECIRC & RHR WELDS
- CONSERVATIVE FLAW EVALUATIONS UTILIZED TO SHOW ACCEPTABILITY
- INSPECTED HEAVILY REPAIRED WELDS
- INSPECTED HIGHLY STRESSED JOINTS
- INSPECTIONS ESTABLISHED CONDITION FOR 90% OF SUSCEPTIBLE LARGE BORE RECIRC WELDS BASED ON SIMILARITY CONSIDERATIONS
- UNADDRESSED LARGE BORE RECIRC & RHR WELDS HAVE CARBON CONTENT $\leq 0.059\%$
- BYPASS LINE REPLACED IN 1976 WITH CAST 304
- CORE SPRAY REPLACED UP TO FIRST ISOLATION VALVE IN 1977 WITH 316 LOW CARBON
- RWCU REPLACED IN 1980 WITH 316 LOW CARBON
- ENHANCED DRYWELL LEAK MONITORING

- VERMONT YANKEE FUTURE PLANS -

- NEXT REFUELING OUTAGE IS PLANNED FOR JULY 1984
- INSPECT PREVIOUSLY UNINSPECTED WELDS USING 83-02 SAMPLING CRITERIA
- EXPAND SAMPLE SIZE PER 83-02 REQUIREMENTS
- REINSPECT SELECTED WELDS FROM 1983 INSPECTION SAMPLE
- REPAIR INDICATIONS BASED ON FLAWED PIPE ANALYSIS METHODS; IF A SUITABLE DEPTH SIZING PROCEDURE IS NOT AVAILABLE ASSUME INDICATIONS ARE THROUGH-WALL
- INSPECTORS (LEVEL II AND III) WILL BE QUALIFIED PER 83-02 REQUIREMENTS
- SUFFICIENT PERSONNEL WILL BE AVAILABLE FOR JULY 1984 OUTAGE
- REPLACEMENT PLANNED FOR 1985 REFUELING OUTAGE