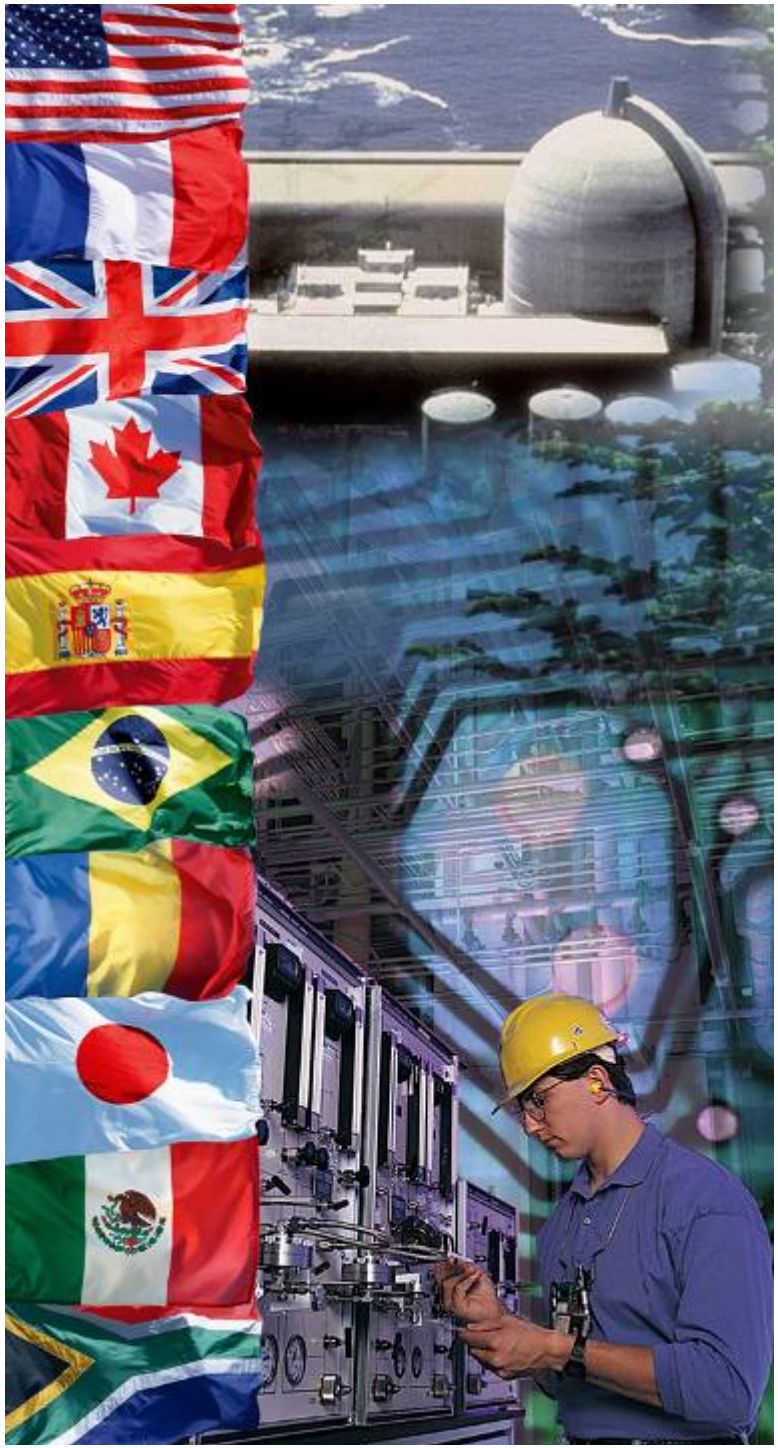
Enclosure 8

Memo from Donald G. Naujock
to Terence L. Chan
Dated August 26, 2008

PDI/NRC Meeting



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Weld Inlay Examination Capability

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Appendix VIII Performance Demonstration

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Weld Inlay Examination Capability

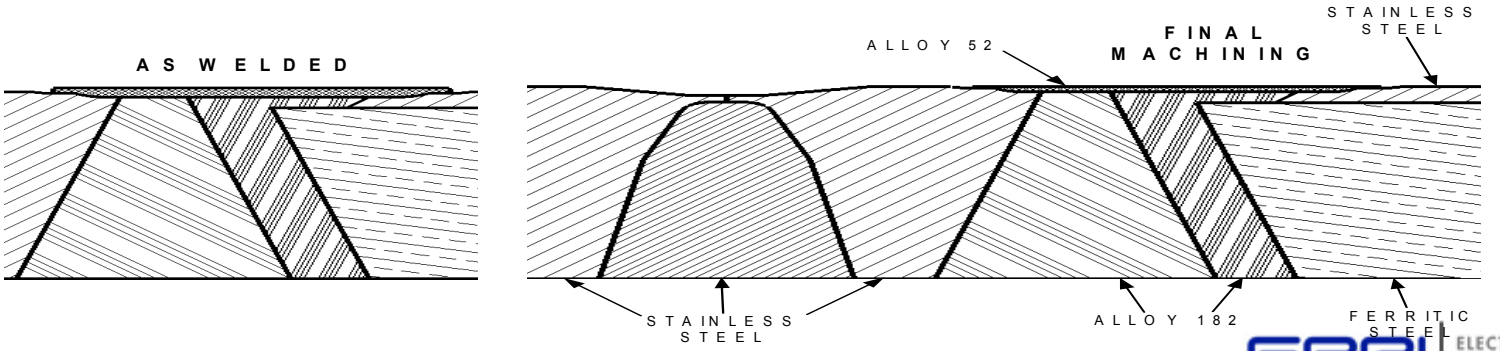
Summary

- The mitigation of PWR main loop nickel based dissimilar welds using a weld inlay process is under investigation
- Inlays are likely to be the an effective mitigation approach where access from the outside is not available
- The capability of inside surface examination techniques to establish that the dissimilar metal weld is defect free during and after mitigation repair is key to the acceptance of this mitigation process

Weld Inlay Examination Capability

Project Description

- Purpose of this project is to
  - Provide documented evidence that the inlay repair/mitigation approach can be effectively examined using existing inside surface qualified examination procedures (No further qualifications required)



Weld Inlay Examination Capability

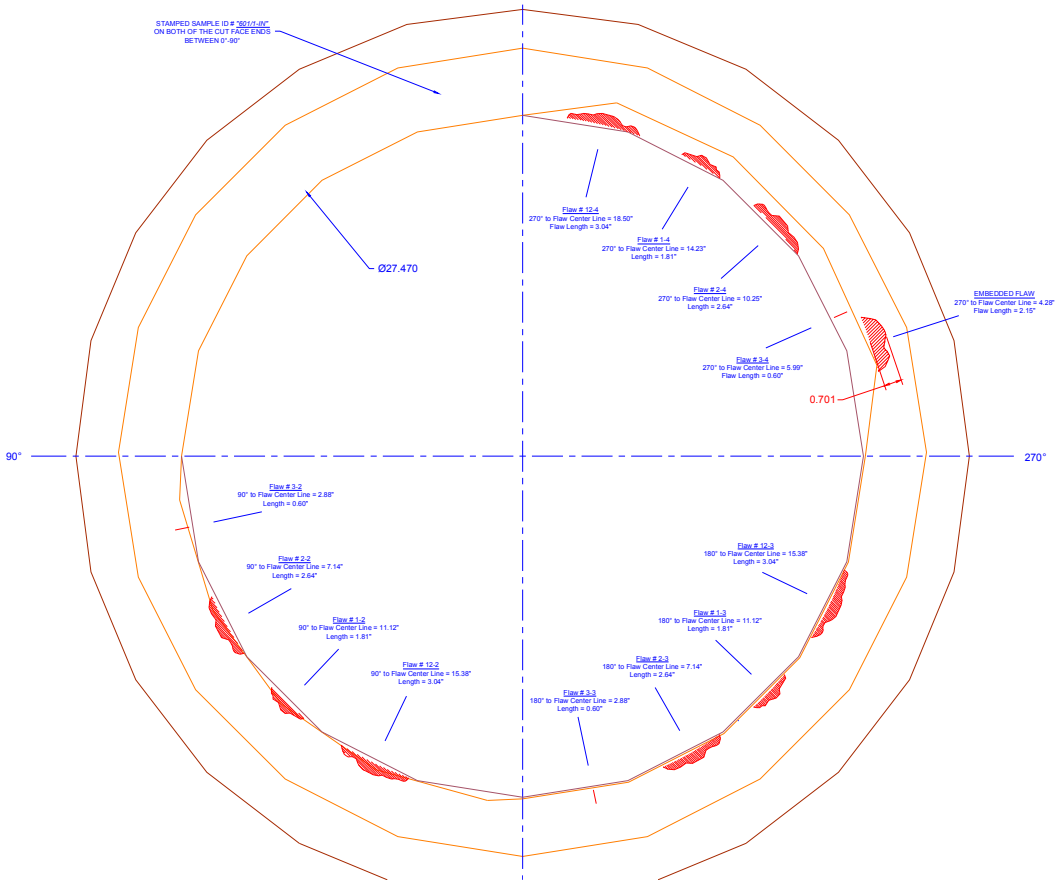
Background

- Appendix VIII currently states that the qualification requirements for Structural weld inlay (corrosion resistant clad) austenitic as being in course of preparation
- Supplement 10 and CC-695 presently exclude welds with Corrosion Resistant Cladding (CRC)

Weld Inlay Examination Capability

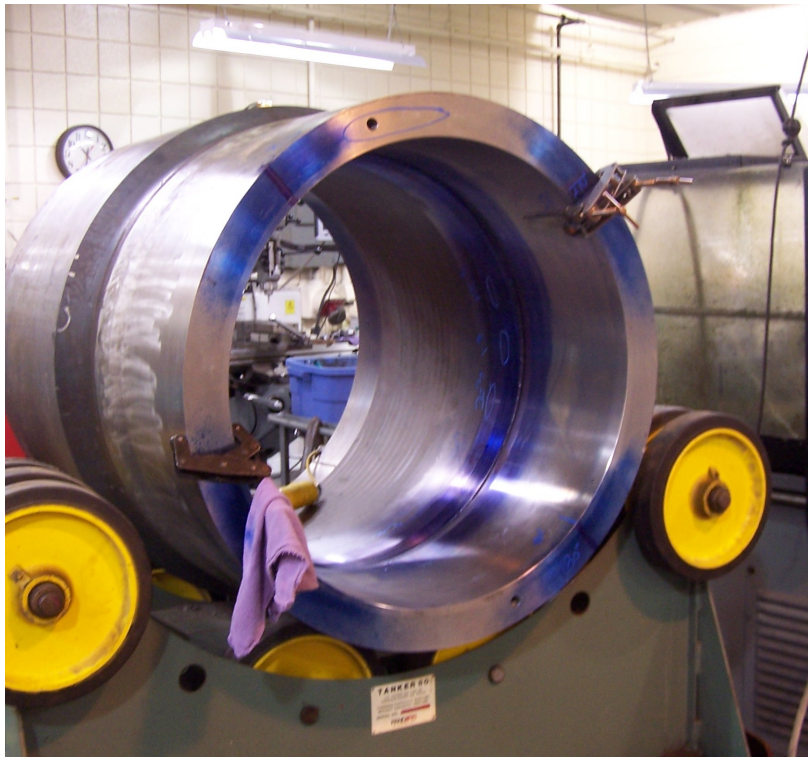
- **Tasks & Deliverables**
  - PDI Equivalency Testing
    - Design and fabrication of a representative RCS mockup for PDI equivalency testing (Complete)
    - Perform equivalency testing on the RCS mockup with existing PDI UT procedures and personnel (Complete)
    - Witness of equivalency testing and document results (Complete)
    - Develop technical basis including relief request
      - *First Quarter 2008 (Complete) "Ultrasonic Equivalency Testing of Weld Inlaid Components" Report # 1016543 published 4/2008 working with one utility on the development of their relief request*

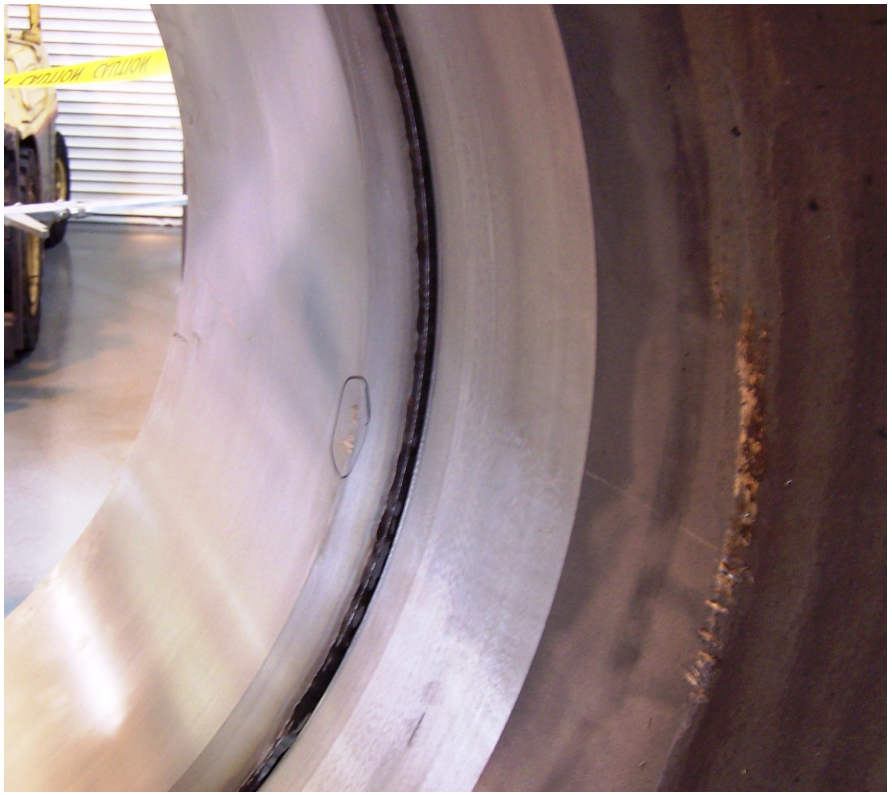
Inlay Specimen



END VIEW LOOKING TO
THE CARBON NOZZLE

Inlay Specimen





Weld Inlay Examination Capability

Status

- PWROG has funded project lead by AREVA to evaluate and develop technology
  - Westinghouse also part of team
    - Kick off meeting held March 19th through 21st
  - AREVA and WESDYNE have collected data on mock-up
  - All data analyzed and results evaluated
  - All flaws detected and sized within acceptable sizing tolerances

Comparison Data

WESDYNE INTERNATIONAL

PLANT: PDI Supplement 2 10 Demonstration
PROCEDURE: PDI -ISI-254-SE Rev. 2
COMPONENT: Actual Flaw size to UT results of 601 block and Inlay Block
ANALYST:

Indication No.	Actuals		601 Sizing		Inlay Sizing			
	Length	T/W	Length	T/W	Ind. No.	Length	T/W	COMMENTS
1	1.80"	0.339"	1.875"	0.37"	1-Q2	1.75"	0.37"	
2	2.63"	0.350"	2.75"	0.39"	2-Q2	2.75"	0.34"	
3	* 0.60" ** 0.50"	0.374"	0.40"	0.44"	3-Q2	0.64"	0.40"	
12	3.05"	0.815"	3.25"	0.79"	12-Q2	3.00"	0.81"	
embed	2.23"	0.70"						
					1-Q3	1.75"	0.42"	
					2-Q3	2.375"	0.33"	
					3-Q3	0.64"	0.37"	
					12-Q3	2.875"	0.81"	
					1-Q4	1.625"	0.36"	
					2-Q4	2.625"	0.37"	
					3-Q4	0.72"	0.27"	
					12-Q4	3.125"	0.77"	
					embed	2.25"	0.71"	

* 601 Block
** Inlay Block

Comparison Data

Flaw Detection and Length Sizing Results for Inlay Mockup and Mockup 601-1 Comparisons

Measurements from the Nozzle Side					Measurements from the Safe-end Side				
Measured Flaw Start Position (deg.)	Measured Flaw End Position (deg.)	Measured Flaw Length (in.)	Measured Flaw Length (deg.)	Length Variance (in.)	Measured Flaw Start Position (deg.)	Measured Flaw End Position (deg.)	Measured Flaw Length (in.)	Measured Flaw Length (deg.)	Length Variance (in.)
-22.14	-10.20	3.02	11.94	0.39	-22.02	-11.12	2.76	10.90	0.13
-2.77	4.03	1.72	6.80	-0.08	-3.34	4.18	1.90	7.52	0.10
12.26	24.79	3.17	12.53	0.12	11.82	24.15	3.12	12.33	0.07
116.82	128.22	2.74	11.40	0.11	117.18	127.81	2.55	10.63	-0.08
135.38	142.42	1.69	7.04	-0.11	136.42	142.67	1.50	6.25	-0.30
150.90	163.50	3.02	12.60	-0.03	149.97	163.27	3.19	13.30	0.14
207.44	218.07	2.55	10.63	-0.08	207.01	218.46	2.75	11.45	0.12
225.36	232.82	1.79	7.46	-0.01	225.73	233.01	1.75	7.28	-0.05
240.27	253.72	3.23	13.45	0.18	239.99	253.40	3.22	13.41	0.17
310.00	320.97	2.63	10.97	0.00	309.66	321.10	2.75	11.44	0.12
328.49	335.09	1.58	6.60	-0.22	328.48	334.61	1.47	6.13	-0.33
342.86	355.37	3.00	12.51	-0.05	343.32	356.04	3.05	12.72	0.00
283.83	293.72	2.37	9.89	0.22	286.95	295.20	1.98	8.25	-0.17

Negative Beam Direction Measurements					Positive Beam Direction Measurements				
Measured Flaw Start Position (in.)	Measured Flaw End Position (in.)	Measured Flaw Length (in.)	Measured Flaw Length (deg.)	Length Variance (in.)	Measured Flaw Start Position (in.)	Measured Flaw End Position (in.)	Measured Flaw Length (in.)	Measured Flaw Length (deg.)	Length Variance (in.)
-0.42	-0.94	0.52	0.00	-0.08	-0.64	-0.99	0.35	0.00	-0.25
ND	ND				0.01	0.41	0.40	0.00	-0.20
-0.32	0.18	0.50	0.00	-0.10	-0.28	0.22	0.50	0.00	-0.10
ND	ND				0.01	0.56	0.55	0.00	-0.05
-0.59	-1.14	0.55	0.00	-0.05	-0.54	-1.15	0.61	0.00	0.01
-0.42	0.07	0.49	0.00	-0.11	-0.43	0.11	0.54	0.00	-0.06
-0.48	0.09	0.57	0.00	-0.03	-0.43	0.06	0.49	0.00	-0.11
ND	ND				-0.19	0.46	0.65	0.00	0.05

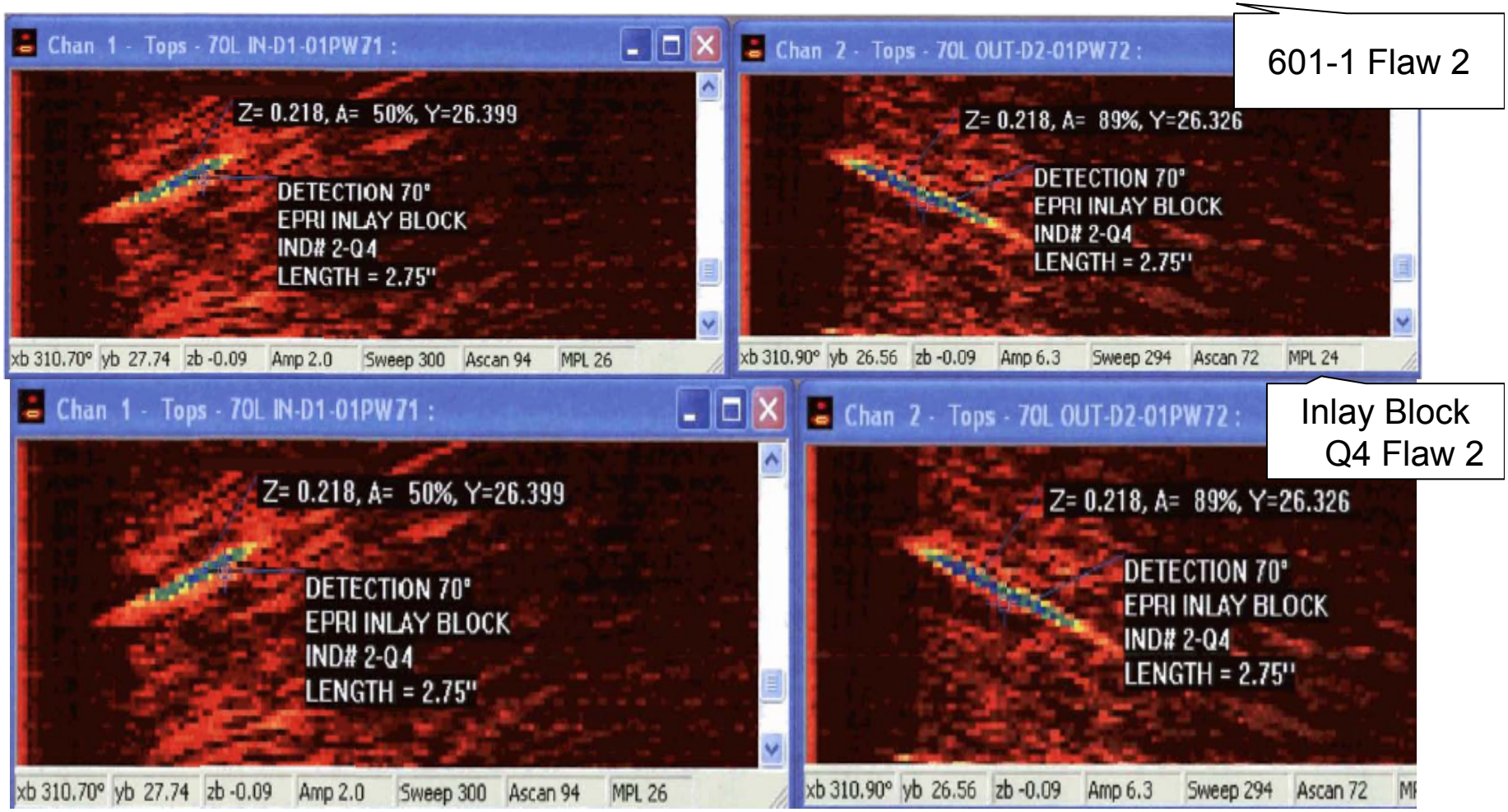
Comparison Data

Flaw Depth Sizing Results for Inlay Mockup and Mockup 601-1 Comparisons

Circumferential Flaws										UT Measurement	
Mockup	Quadrant Start (deg.)	Flaw #	Reference Location (deg.)	Actual Flaw Length (in.)	Actual Flaw Length (deg.)	Actual Center Position (deg.)	Actual Flaw Start Position (deg.)	Actual Flaw End Position (deg.)	Actual Flaw Depth (in.)	**Measured Flaw Depth (in.)**	**Depth Variance (in.)**
601-1	N/A	2	343.40	2.63	10.40	343.40	338.20	348.60	0.350	**0.290**	-0.060
		1	0.00	1.80	7.10	0.00	-3.55	3.55	0.339	**0.390**	0.051
		12	17.80	3.05	12.10	17.80	11.75	23.85	0.815	**0.823**	0.008
Inlay	90	2-2	29.80	2.63	11.00	119.80	114.30	125.30	0.350	**0.355**	0.005
		1-2	46.40	1.80	7.50	136.40	132.65	140.15	0.339	**0.405**	0.066
		12-2	64.20	3.05	12.70	154.20	147.85	160.55	0.815	**0.850**	0.035
	180	2-3	29.80	2.63	11.00	209.80	204.30	215.30	0.350	**0.349**	-0.001
		1-3	46.40	1.80	7.50	226.40	222.65	230.15	0.339	**0.306**	-0.033
		12-3	64.20	3.05	12.70	244.20	237.85	250.55	0.815	**0.844**	0.029
	270	2-4	42.60	2.63	11.00	312.60	307.10	318.10	0.350	**0.343**	-0.007
		1-4	59.20	1.80	7.50	329.20	325.45	332.95	0.339	**0.319**	-0.020
		12-4	77.00	3.05	12.70	347.00	340.65	353.35	0.815	**0.876**	0.061
		Embedded	17.00	2.15	9.00	287.00	283.40	292.40	0.701	**0.728**	0.027

Axial Flaws										UT Measurement	
Mockup	Quadrant Start (deg.)	Flaw #	Reference Location (deg.)	Actual Flaw Length (in.)	Beam Angle (deg.)	Actual Center Position (deg.)	Actual Flaw Start Position (deg.)	Actual Flaw End Position (deg.)	Actual Flaw Depth (in.)	**Measured Flaw Depth (in.)**	**Depth Variance (in.)**
601-1	N/A	3	325.6	0.6	60L	325.6	325.6	325.6	0.374	**0.460**	0.086
Inlay	90	3-2	12	0.6	60L	102	102	102	0.374	**0.332**	-0.042
	180	3-3	12	0.6	60L	192	192	192	0.374	**0.322**	-0.052
	270	3-4	24.8	0.6	60L	294.8	294.8	294.8	0.374	**0.472**	0.098

Comparison Data



General Observations

- Small increase in noise level noted
  - Increased as inlay material thickness increased
  - More evident in circumferential scanning direction
- No effect on detection and sizing of flaws

Future Work

- At least one utility is evaluating the use of an onlay technique for small diameter ~12.0” Core Flood nozzles
  - B&W design only
- EPRI is working with utility in the design and fabrication of a mock-up to evaluate the effect of the onlay on the previously qualified inside surface techniques (Similar to the inlay work described in this presentation)

Conclusions

- Based on this evaluation the following conclusions can be reached;
  - The application of weld inlays utilizing the processes described have a minimal effect on qualified inside surface examination procedures capability to detect and accurately size flaws
    - No changes to equipment
    - No changes to techniques
    - No change to analysis processes
  - No additional qualifications are required to address examination of dissimilar metal welds inlaid using this process
  - Appendix VIII, Supplement 10 can be revised to include inlays in its scope for inside surface examinations
  - Additional work underway to evaluate onlay configurations