

September 29, 1998

MEMORANDUM TO: File

FROM: Ronald B. Eaton, Senior Project Manager Original signed by
Project Directorate I-3
Division of Reactor Projects - I/II

SUBJECT: CORRESPONDENCE FROM GPU NUCLEAR, INC., PROVIDING THE
QUESTIONS ASKED BY THE NRC STAFF AND THE ANSWERS
FROM THE LICENSEE WITH RESPECT TO THEIR SUBMITTAL FOR
APPROVAL OF ALTERNATE 17R INSPECTIONS RELATED TO
GENERIC LETTER 88-01, INTERGRANULAR STRESS CORROSION
CRACKING COMMITMENTS

Please place the attached subject correspondence received on September 21,
1998, in Docket file 50-219.

Docket No. 50-219

Attachment: As stated

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Oyster Creek 17R IGSCC Inspection Scope Deferral Questions

(1) Identify the fit up welds (the last weld that was performed in a piping run) among the welds requested for inspection deferral.

None of the welds in the current 17R scope is a piping run closure weld. In the Isolation Condenser and RWCU systems, the closure weld is at the drywell penetration which was performed in 13R (1992). In the Core Spray system, the closure weld was at the reactor vessel nozzle safe end weld which was made during original construction. The closure weld for the Shutdown Cooling system was the weld on the downstream side of the valve (NU-4-3 is the weld in the 17R scope and is the weld of the Tee to the upstream side of the valve). Lastly, the Recirculation closure weld was the weld upstream of the vessel inlet safe end weld during construction.

(2) Confirm the assumption of the welding process used during initial construction (i.e., shielded metal arc/submerged arc welds vs. gas tungsten arc welds and gas metal-arc welds).

A review of a sample of the weld records showed that all the welds in the sample, both shop- and field-welds, were EB inserts for the root and SMAW fills. Therefore, for conservatism, we assume all the welds were either SAA or SMAW welds.

(3) Provide weld configuration types (i.e. pipe-pipe, pipe-elbow, etc.) and if significantly different thicknesses are present at the weld location also provide the wall thicknesses (based on UT if available).

See attached table for joint configuration and thickness. Most of the thicknesses are based on UT. For a few, we took nominal dimensions from drawings. On joints involving valves and pumps, the weld thickness at the toe of the weld on the fitting side is about the same as that on the pipe side; however, there is a transition to the thicker body of the valve/pump casing (usually about 30° - 45°).

(4) What locations are used for taking oxygen samples?

Recirculation Loops A & B; we primarily use A. Taps are located at the pump suction side.

(5) Was any in-situ ECP tests done (i.e., during the Hydrogen Water Chemistry mini-test)?

There were no in-situ measurements (e.g., recirc line decon flange). Measurements were performed in the autoclave which is tapped off the A Recirc line, pump suction side.

(6) Which Table 1 welds (if any) have recordable UT indications?

See attached table.

(7) Rank the 38 Category D RWCU welds inside containment by susceptibility to IGSCC based on stress, environment, materials, inspection experience, etc.

We have provided all the information we have on these welds. With regard to ranking in terms of susceptibility, we have reached the conclusion that they are all susceptible. However, we also conclude that the industry has no means of predicting initiation of cracking in individual weldments, or even within a particular system. For example, in the

OC Isolation Condenser system piping outside the drywell, we had cracking in about 25% of the about 120 welds. We attempted to correlate the cracking with many known variables (e.g., carbon content, environment, operating stresses, etc. and could draw no statistically valid conclusions with regards to the probability of one weld's developing cracking versus another's. We concluded that this was most likely due to the existence and extent of unknown variables, such as degree of sensitization, amount of residual stress from welding, heat input, starts and stops, etc..

Operating primary stresses (pressure + deadweight) and thermal secondary stresses (without Stress Intensification Factors) for the RWCU welds are listed in Table 1.

Environment

The only difference in environment is the temperature. The RWCU inlet, off the Recirc system (ND-1), temperature is 520°F; the return line (ND-10) temperature is 412°F. Both lines are considered fully protected by HWC.

Materials – Records from the 1960s were reviewed. The base material is Type 316, mostly with a carbon content greater than 0.03%.

Inspection results – No IGSCC has been detected in any RWCU weld. The attached table shows those RWCU welds with recordable indications.

- (8) Review past IHSI application data (e.g., temperature gradients, etc.) for the welds in the 17R inspection scope and confirm application effectiveness and conformity to the process specifications (especially for complex weld joints).

Weld NZ-3-39 was the only Core Spray weld in the 17R scope that had IHSI applied outside the recommended parameters. The deviation was that the actual through-wall temperature differential (ΔT) was 263°C vs. the 275°C required by the procedure. An engineering analysis, including finite element analysis, showed that favorable residual stresses occurred at temperature differentials as low as 208°C. Therefore, it was concluded that the deviation was technically acceptable. A review of recirc weld NG-E-13's records has determined that no Material Non-Conformance Reports (MNCR's) were written against NG-E 13 in 1986. Therefore it is concluded that IHSI was done in accordance with procedure that in turn was in accordance with IHSI guidelines.

Table 1
Oyster Creek 17R Scope Inspection History
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System: Closure Head

Weld Number	Weld Config	"T" UP STREAM	"T" DOWN STREAM	SI	11R Insp	12R Insp	13R Insp	14R Insp	15R Insp	Insp Results	16R Insp	17R Insp	17R Cat
MV-5-001	F-T	0.52	0.35	No	No	No	Yes	No	Yes	NRI	No	Yes	D
MV-5-001A	T-R	0.43	0.34	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
MV-5-002	T-R	0.44	0.31	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
NR022-576	N-F	1.64	1.20	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
NR024-576	N-F	1.50	1.56	No	No	No	Yes	No	Yes	NRI	No	Yes	D
NR026-576	N-F	1.16	1.20	No	No	Yes	Yes	No	Yes	NRI/R	No	Yes	D
RHC-HS-002	F-R	0.62	0.48	No	No	No	Yes	No	Yes	NRI	No	Yes	D

System: Core Spray

Weld Number	Weld Config	"T" UP STREAM	"T" DOWN STREAM	SI	11R Insp	12R Insp	13R Insp	14R Insp	Insp Results	15R Insp	Insp Results	16R Insp	17R Insp	17R Cat
NZ-3-039	P-E	0.52	0.52	12R	No	Yes	No	Yes	NRI	No		No	Yes	C
NZ-3-040	E-P	0.50	0.50	12R	Yes	Yes	No	Yes	NRI	No		No	Yes	C
NZ-3-042	P-E	0.50	0.50	12R	Yes	Yes	No	Yes	ISG	No		No	Yes	C
NZ-3-082	V-E	NA	0.48	No	Yes	No	Yes	No		Yes	NRI	No	Yes	D
NZ-3-083	E-P	0.52	0.52	No	Yes	No	Yes	No		Yes	NRI	No	Yes	D
NZ-3-084	P-P	0.52	0.52	12R	No	Yes	No	Yes	NRI	No		No	Yes	C
NZ-3-086	E-P	0.48	0.48	12R	No	Yes	No	Yes	NRI	No		No	Yes	C
NZ-3-088	E-E	0.50	0.52	12R	No	Yes	No	Yes	NRI	No		No	Yes	C

Table 1
Oyster Creek 17R Scope Inspection History
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System: Isolation Condenser

Weld Number	Weld Config	"T" UP STREAM	"T" DOWM STREAM	SI	11R insp	12R Insp	13R Insp	14R insp	15R Insp	Insp Results	16R Insp	17R Insp	17R Cat
NE-2-052	E-P	0.51	0.54	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-053	P-E	0.51	0.55	15R	Yes	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-054	E-P	0.55	0.54	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-054A	P-P	0.54	0.54	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-055	P-E	0.54	0.59	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-056	E-P	0.60	0.54	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-057	P-E	0.54	0.64	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-058	E-P	0.62	0.60	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-058A	P-P	0.56	0.56	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-059	P-E	0.56	0.66	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-060	E-P	0.58	0.55	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-061	P-V	0.54	0.593	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-062	V-P	0.593	0.58	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-063	E-P	0.60	0.60	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-063A	P-B	0.60	NA	15R	Yes	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-116	P-P	0.55	0.60	15R	Yes	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-117	P-E	0.52	0.61	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-118	E-P	0.60	0.60	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-119	P-E	0.56	0.60	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-120	E-P	0.60	0.56	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-2-121	P-E	0.49	0.60	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-122	E-P	0.60	0.54	15R	Yes	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-123	P-P	0.60	0.58	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1
NE-2-124	P-V	0.56	0.64	15R	No	Yes	Yes	No	Yes	NRI	No	Yes	C1
NE-5-201	P-E	0.56	0.64	15R	Yes	No	Yes	No	Yes	NRI	No	Yes	C1
NE-5-209	E-E	0.76	0.92	15R	No	No	Yes	No	Yes		No	Yes	C1

Table 1
Oyster Creek 17R Scope Inspection History
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System: Reactor Water Cleanup

Weld Number	Weld Config	"T" UP STREAM	"T" DOWM STREAM	Sustained Stress (P + DW) ksi	Thermal (w/o SIF) ksi	SI	11R Insp	12R Insp	13R Insp	14R Insp	15R Insp	Insp Results	16R Insp	17R Insp	17R Cat
ND-1-001	B-P	0.48	0.42	6.8	10.1	No	Yes	No	Yes	No	Yes	NRI/ISG	No	Yes	D
ND-1-003	P-E	0.45	0.50	2.7	8.6	No	Yes	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-004	E-P	0.50	0.55	2.9	8.6	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-1-004A	P-V	0.42	0.40	5.1	6.2	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-004B	V-P	0.40	0.44	2.5	3.4	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-1-004C	P-P	0.42	0.42	4.9	10.1	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-005	P-E	0.46	0.52	4.8	17.7	No	Yes	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-006	E-V	0.44	NA	4.5	18.6	No	Yes	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-007	V-P	NA	0.40	4.5	13.4	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-1-008	P-E	0.42	0.45	4.5	4.4	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-009	E-P	0.47	0.42	4.1	1.8	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-010	P-E	0.42	0.44	4.5	13.7	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-1-011	E-P	0.49	0.43	4.8	17.9	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-012	P-E	0.43	0.49	4.8	18.1	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-013	E-P	0.48	0.42	4.8	15.1	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-1-020	P-E	0.42	0.46	6.4	5.6	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-021	E-P	0.45	0.43	5.9	7.1	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-023	P-T	0.44	0.44	9.7	8.4	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-024	T-P	0.44	0.46	4.2	8.3	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-027	T-P	0.39	0.45	9.7	8.4	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-027A	P-P	0.48	0.42	6.5	4.7	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-028	P-E	0.42	0.52	7.4	6.4	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-1-029	E-V	0.50	NA	7.8	6.6	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-10-001	P-B	0.52	0.55	5.5	11.1	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-10-002	E-P	0.53	0.58	1.3	12.6	No	No	Yes	Yes	No	Yes	NRI/ISG	No	Yes	D
ND-10-003	E-E	0.50	0.48	1.2	12.9	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-10-004	V-E	NA	0.48	1.3	10.9	No	No	No	Yes	No	Yes	NRI	No	Yes	D
ND-10-005	P-V	0.50	0.51	0.8	5.8	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D
ND-10-006	P-P	0.45	0.45	0.5	3.0	No	No	Yes	Yes	No	Yes	NRI	No	Yes	D

Table 1
Oyster Creek 17R Scope Inspection History

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Weld Number	Weld Config	"I" UP STREAM	"I" DOWM STREAM	Sustained Stress (P + DW) ksi	Thermal (w/o SIF) ksi	SI	11R Insp	12R Insp	13R Insp	14R Insp	15R Insp	16R Insp	17R Insp	17R Cat
ND-10-007	E-P	0.52	0.42	0.4	16.9	No	Yes	No	Yes	No	Yes	No	Yes	D
ND-10-008	V-E	0.50	0.55	0.3	15.7	No	Yes	No	Yes	No	Yes	No	Yes	D
ND-10-009	P-V	0.43	0.50	0.2	7.6	No	Yes	No	Yes	No	Yes	No	Yes	D
ND-10-010	E-P	0.48	0.45	0.3	11.2	No	Yes	No	Yes	No	Yes	No	Yes	D
ND-10-011	P-E	0.50	0.55	0.3	12.2	No	No	Yes	Yes	No	Yes	No	Yes	D
ND-10-017	E-P	0.46	0.42	5.2	8.5	No	No	No	Yes	No	Yes	No	Yes	D
ND-10-018	P-E	0.40	0.45	5.1	8.1	No	No	No	Yes	No	Yes	No	Yes	D
ND-10-020	V-P	NA	0.40	4.9	6.8	No	No	No	Yes	No	Yes	No	Yes	D
ND-2-009	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-010	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-011	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-012	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-013	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-014	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-015	P-P					No	No	No	No	No	No	No	Yes	G
ND-2-016	P-E					No	No	No	No	No	No	No	Yes	G
ND-2-017	P-E					No	No	No	No	No	No	No	Yes	G

System: Recirculation

Weld Number	Weld Config	"I" UP STREAM	"I" DOWM STREAM	SI	11R Insp	12R Insp	13R Insp	14R Insp	15R Insp	16R Insp	17R Insp	17R Cat
NG-D-011R1	Pump-E	1.25	1.05	11R	Yes	Yes	Yes	No	Yes	No	Yes	E
NG-D-018	P-P	1.06	1.14	11R	Yes	Yes	Yes	Yes	Yes	Yes	Yes	F
NG-E-013	Pump-E	1.25	1.25	11R	Yes	Yes	No	No	No	No	Yes	C

Table 1
 Oyster Creek 17R Scope Inspection History
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System: Shutdown Cooling

Weld Number	Weld Config	"T" UP STREAM	"T" DOWN STREAM	SI	11R Insp	12R Insp	13R Insp	14R Insp	15R Insp	Insp Results	16R Insp	17R Insp	17R Cat
NU-4-001	B-T	NA	1.10	15R	No	Yes	Yes	No	Yes	NRI/ISG	No	Yes	C1
NU-4-002	V-T	0.75	0.64	No	No	No	Yes	No	Yes	NRI/ISG	No	Yes	D
NU-4-003	T-V	0.78	0.75	15R	No	No	Yes	No	Yes	NRI	No	Yes	C1

E = Elbow
 T = Tee
 P = Pipe
 V = Valve
 B = Branch Connection
 F = Flange
 N = Nozzle

NRI = No recordable Indications
 ISG = Inside surface geometry
 R = Root condition
 NA = Not Available (due to joint configuration)