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ACCESSION NBR:8402160148 DOC.DATE: 84/02/10 NOTARIZED: NO DOCKET #  
 FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250  
 50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251  
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 WILLIAMS,J.W. Florida Power & Light Co.  
 RECIP.NAME RECIPIENT AFFILIATION  
 EISENHUT,D.G. Division of Licensing

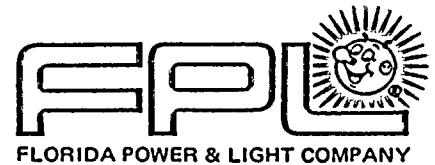
SUBJECT: Forwards pressurized thermal shock reactor vessel matls data summary, per 840119 discussion. Review & concurrence by 840501 requested. Direction of analytical effort will be effected by results of review.

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 TITLE: OR Submittal: Thermal Shock to Reactor Vessel

NOTES:

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LTR  
L-84-31  
February 10, 1984

Office of Nuclear Reactor Regulation  
Attention: Mr. Darrell G. Eisenhut, Director  
Division of Licensing  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Eisenhut:

Re: Turkey Point Units 3 & 4  
Docket Nos. 50-250 & 50-251  
Pressurized Thermal Shock -  
Reactor Vessel Materials Data

The Turkey Point Units 3 & 4 RT<sub>NDT</sub> was established for the purposes of evaluating Pressurized Thermal Shock using material data obtained from the initial weld qualification report and a chemical analysis of a surveillance capsule. In a discussion with your staff on January 19, 1984, we presented a much larger data base of information on the chemical composition of the weld. This additional information was obtained through the use of information previously held as proprietary by the reactor vessel fabricator.

Therefore, please find attached a report summarizing the available data. The evaluation of this data results in our conclusion that the RT<sub>NDT(0)</sub> should be 10<sup>0</sup> F without any standard deviation, Copper content equal to 0.26 wt %, and Nickel content equal to 0.60 wt %. We request your review and concurrence by May 1, 1984. The results of your review are necessary to plan our future PTS efforts. We plan on continuing all efforts regarding flux reduction and improving our ability to quantify the results. However, the direction of our analytical effort will be effected by the results of your review.

Very truly yours,

A handwritten signature in cursive script, appearing to read "J.W. Williams, Jr.", is written over the typed name.

J.W. Williams, Jr.  
Vice President  
Nuclear Energy

JWW/JEM/djc

Attachments

cc: Mr. James P. O'Reilly, Region II  
Mr. Harold F. Reis, Esquire

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PDR ADDCK 05000250  
P PDR



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The reactor vessels at the Turkey Point Units 3 and 4 nuclear power plant of Florida Power and Light (FP&L) were fabricated by Babcock and Wilcox (B&W) for Westinghouse, the nuclear steam supply system designer. The intermediate to lower shell girth welds were made using automatic submerged arc welding using Linde 80 flux (lot No 8445) and Page copper coated weld wire (wire heat No 71249). These welds are identified as SA1101.

The FPL effort to resolve pressurized thermal shock revealed the need to better determine the material properties and chemical analyses of the reactor vessels material at Turkey Point Units 3 & 4. An evaluation has been made to determine the availability of applicable weld metal data. This evaluation has established:

- (1) Test data to establish initial  $RT_{NDT}$  for our critical welds.
- (2) A much larger data base from which to determine chemical composition. Weld SA1101 and weld wire heat 71249 is one of the best defined welds and family of welds in the industry.
- (3) The PTP critical welds are present in the Heavy Section Steel Technology (HSST) program.

The data available is shown below with a discussion of each source of data.

(1)  $RT_{NDT}$  INITIAL ( $RT_{NDT(o)}$ )

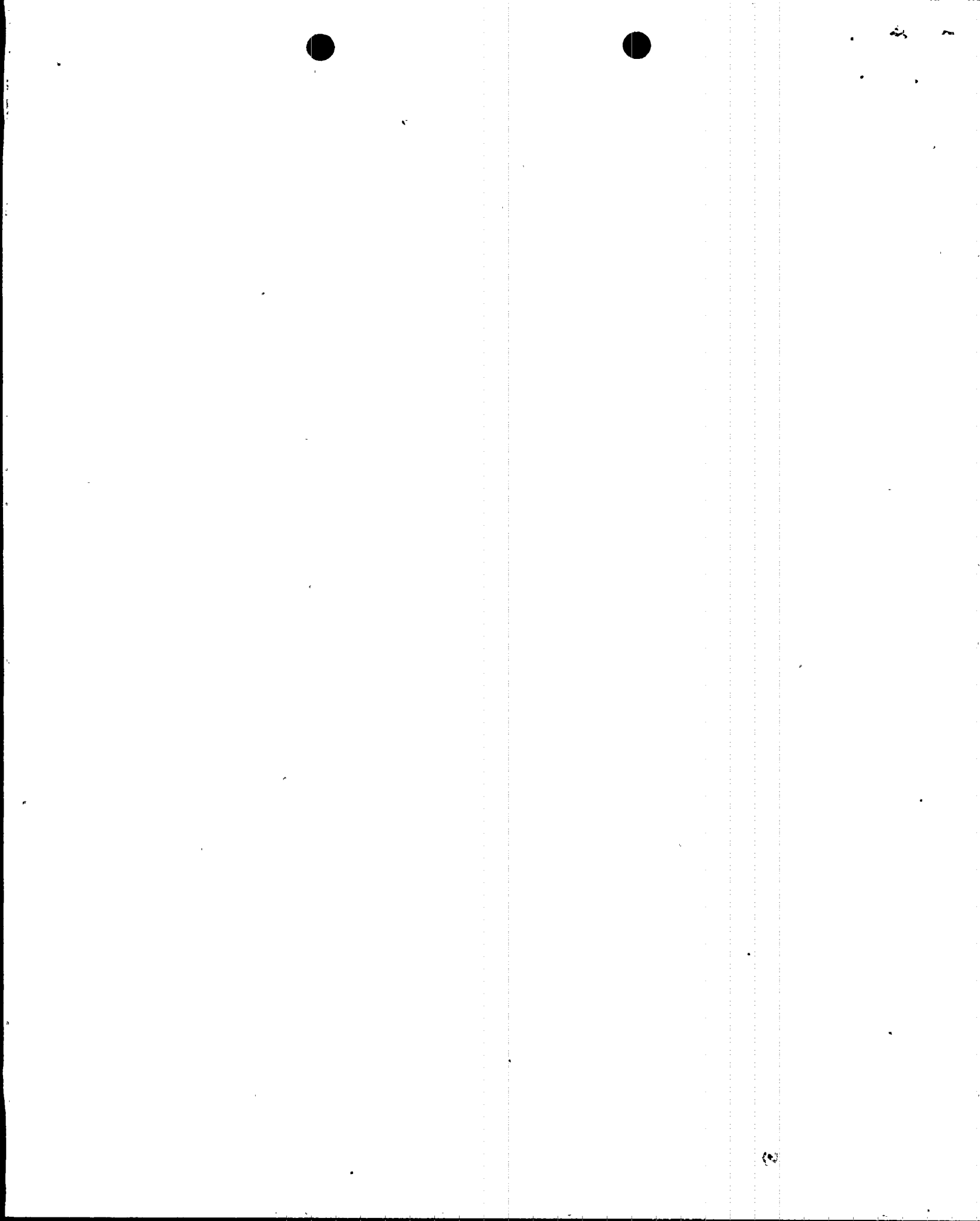
As noted in appendix E of SECY 82-465, values of initial  $RT_{NDT}$  measured according to ASME Code rules are not generally available for the welds in question. For Linde 80 flux welds, the mean value of  $0^{\circ}F$  with a deviation of  $17^{\circ}F$  was used in Pressurized Thermal Shock (PTS) calculations.

EPRI Report NP-373<sup>1</sup> characterizes SA1101. Both dropweight and charpy tests were performed and show a dropweight NDTT of  $-60^{\circ}F$  with a charpy Cv50 of  $70^{\circ}F$ . Using ASME Code rules, which require using the higher of NDTT and Tcv50- $60^{\circ}F$ , the initial  $RT_{NDT(o)} = 10^{\circ}F$ .

The use of  $10^{\circ}F$  with elimination of the  $17^{\circ}F$  deviation, yield equivalent results in PTS calculations.

(2) Copper and Nickel Chemistry

The major source of copper and nickel chemistry has typically been the original weld qualification (WQ) test report. There has been some question as to the validity of these values, and since these values are only based on one analysis, it has become practice to analyze surveillance specimens. Appendix P of SECY 82-465 uses 0.32% Copper and 0.57% Nickel for PTP. These values are based on five analyses performed by Westinghouse on broken charpy specimens in 1977.<sup>2</sup>



EPRI NP-373 supplies nine additional weld analyses for a production SA1101 weld. These analyses are also additionally supported by microprobe analysis data. Babcock and Wilcox contracted with the Westinghouse Owners Group to supply all the proprietary information which B&W had on the welds in the B&W owners group program.<sup>3</sup> This included 26 analyses on weld No SA 1769 which is a Page wire heat 71249 surveillance weld and also identified SA 1229 as a Page wire heat 71249 weld. The number of analyses performed on SA 1229 is not published, so we assumed it is just one analysis and verified its validity by its reference in SECY 82-465 as the Oconee 1 girth weld.

Southwest Research performed three retest for FP&L on charpy specimens of surveillance weld 1094.<sup>4</sup> SA1101 appears in the HSST program. Copper content is reported but it is not clear how many analyses were performed but, since both a mean and a range of values are reported, we assume at least two analyses were performed since the mean is the average of the given range.<sup>5</sup>

WCAP7636<sup>6</sup> and WCAP7660<sup>7</sup> are the surveillance programs for PTP 3 and 4 and supply two analyses. WCAP8743<sup>8</sup> is the surveillance program for Point Beach Unit 1 and supplies one copper analysis for SA1101, the Point Beach circumferential weld.

The Barberton WQ reports test reports of 71249 materials identified (SA1101, SA1094, SA1229) represent three analyses. The weld qualification for SA1769 has no specific copper concentration shown but does have a value listed as "other" which probably is copper. This is presented for information only.

Zion Unit 2 is an SA1769 girth weld and is reported in SECY 82-465. We add this for verification and information but is not considered an individual analysis. Ginna Unit 1 also has an upper girth weld of SA1101. Their analysis is also shown for verification and information but is not considered an individual analysis.

B&W considers SA1101 to be a category 1 weld<sup>3</sup> which is defined as a weld for which several sources of actual reactor vessel weldments were available for multiple chemical analyses. We refer you to BAW 1799 for a more complete description of the statistical techniques used to establish the confidence levels B&W proposes.

Table 1 gives a summary of all the analyses considered including Cu and Ni concentration, number of analyses, weld identification, and the source of each data point. The copper represents 51 analyses which have a mean of 0.26% with a standard deviation of 0.04%. The nickel represents 41 analyses which have a mean of 0.60% with a standard deviation of 0.04%. The four analyses from table one which are presented for information, generally fall within these data but are not part of them.



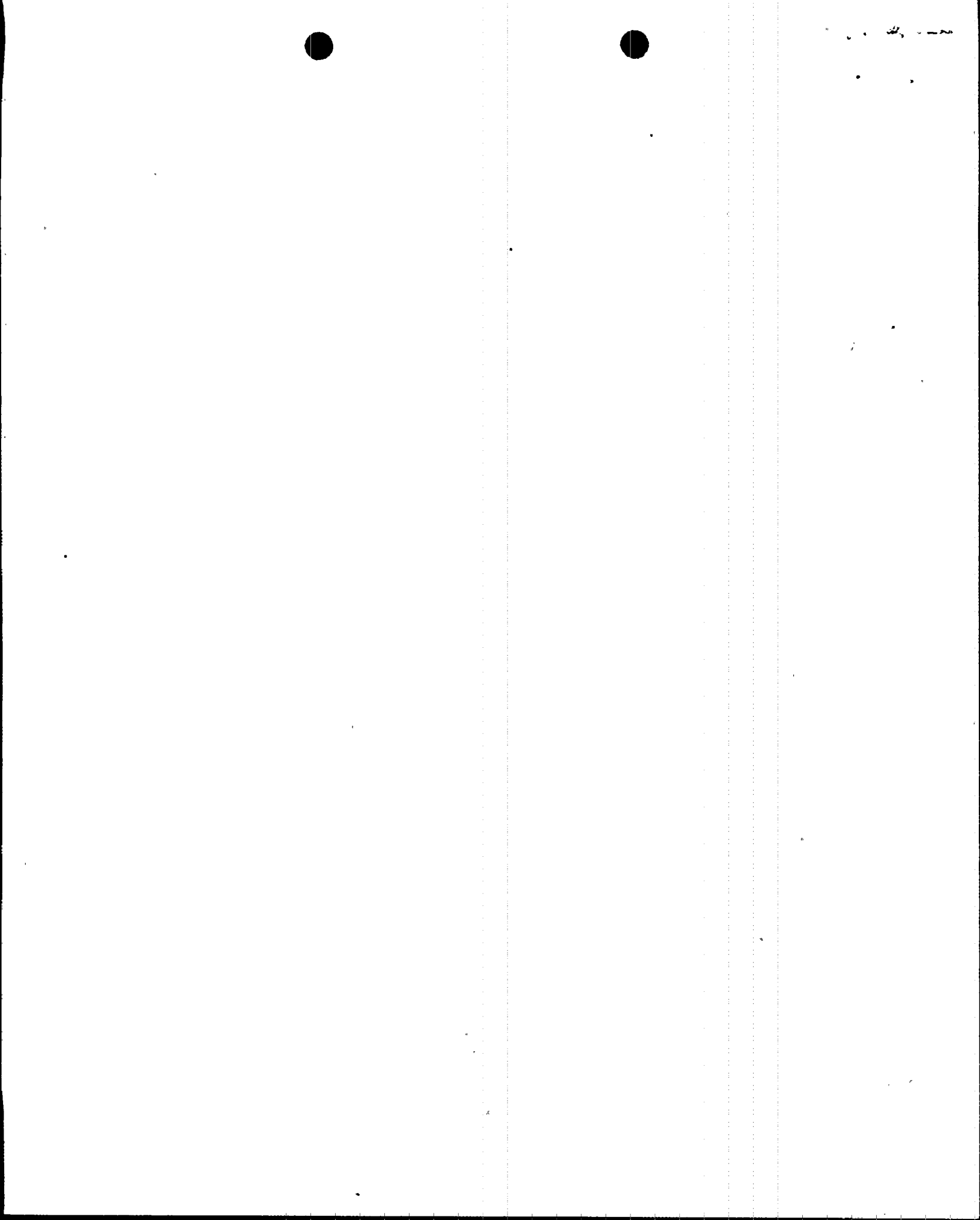
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### SUMMARY OF MATERIAL DATA

This evaluation is FPL's materials plant specific analysis for PTP 3/4. We propose to use  $RT_{NDT(o)} = 10^{\circ}F$  without the  $17^{\circ}F$  standard deviation, 0.26% Copper and 0.60% Nickel for future screening criteria calculations. In addition, both HSST and EPRI NP-373 fracture mechanics data derived from this study will be used as plant specific in any future fracture mechanics evaluations.

FPL has installed ex-vessel dosimetry in the form of foils and wires around the Turkey Point Unit 3 vessel and is planning to install similar dosimetry around the Turkey Point Unit 4 vessel at the next available opportunity to better define flux variations as part of our plant specific evaluations.



## REFERENCES

- 1 W.A. Van der Sluys, et al., An Investigation of Mechanical Properties and Chemistry Within a Thide Mn-Mo-Ni Submerged Arc Weldment, EPRI NP-373, Electric Power Research Institute, Palo Alto, California, February 1977
- 2 Supplement to FP&L., L-77-113, Weld Metal Copper Data, R.E. Uhrig to George Lear, June 27, 1977
- 3 B&W 177-FA Reactor Vessel Beltline Weld Chemistry Study, BAW 1799, Babcock and Wilcox, Lynchburg, Virginia, July 1983
- 4 FP&L L-77-113, Fracture Toughness Requirements, R.E. Uhrig to George Lear, April 11, 1977
- 5 R.G. Berggren, Irradiation Effects, Presented to Vessel Integrity Review Group, June 2, 1981
- 6 S.E. Yanichco, FP&L Co. Turkey Point Unit 3 Reactor Vessel Radiation Surveillance Program, WCAP 7656, Westinghouse Electric Corp., Pittsburgh, PA, May 1971
- 7 S.E. Yanichco, FP&L Co. Turkey Point Unit 4 Reactor Vessel Radiation Surveillance Program, WCAP 7660, Westinghouse Electric Corp., Pittsburgh PA, May 1971
- 8 Point Beach Unit 1 Reactor Vessel Radiation Surveillance Program, WCAP 8743, Westinghouse Electric Corp., Pittsburgh, PA



BARBERTON WQ	** BAW 1799 EPRI 373	WCAP 7636 PTP3	W RETEST	HSST	PT BEACH 1 WCAP'S 8743/7513	WCAP 7660 PTP4	RETEST SWRI	BARBERTON WQ	BAW 1799	BARBERTON WQ	*** ZION 2 SECY 82465	*** OCONEE SECY 82-465	*** FROM RGE GINNA	*** BARBERTON WQ
% CU 0.21	0.18	0.31	0.33	0.21	0.21	0.30	0.29	0.23	0.285	0.20	0.26	0.26	0.21	0.19*
% NI 0.57	0.54	0.57	N/A	N/A	0.57	0.60	N/A	0.55	0.63	0.57	0.61	0.61	0.57	0.66
WELD ID SA1101	SA1101	SA1101	SA1101	SA1101	SA1101	SA1094	SA1094	SA1094	SA1769	SA1229	SA1769	SA1229	SA1101	SA1769
NUMBER OF OBSER- VATIONS	1	9	1	5	2	1	1	3	1	26	1	1	1	1

\* Presented as "other" on WQ & assumed to be CU.

\*\* There are 10 microprobe analyses which support these data, but are not used in this data base. Refer to EPRI-NP373 for details.

\*\*\* These analyses are shown for information. They are not part of the data base, but support it.

