50-334

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001
August 26, 1997

LICENSEE: Duquesne Light Company

FACILITY: Beaver Valley Power Station, Unit No. 1

SUBJECT: SUMMARY OF AUGUST 5, 1997, MEETING TO DISCUSS UPDATED INFORMATION REGARDING PRESSURIZED THERMAL SHOCK (PTS) EVALUATION

A meeting was held in the Nuclear Regulatory Commission's (NRC) One White Flint North Office in Rockville, Maryland, with Duquesne Light Company (DLC) and NRC staff's representatives to discuss updated information regarding the Beaver Valley Power Station, Unit No. 1 (BVPS-1), reactor pressure vessel PTS evaluation. The licensee had requested this meeting. Enclosure 1 is a list of meeting attendees. Enclosure 2 is a copy of the materials used by DLC during their presentation.

By letter dated August 2, 1996, DLC had submitted updated information relative to the current projected values of the PTS reference temperature for the BVPS-1 reactor pressure vessel limiting material (plate B6903-1). The NRC staff has been reviewing the August 2, 1996, submittal and by letter dated April 28, 1997, sent a request for additional information (RAI) to DLC. Issue 1 of the NRC staff's RAI stated that it was the NRC staff's position that DLC should use 34 °F for the margin term when evaluating the limiting material, rather than 29.1 °F used by DLC in its submittal. DLC responded to the staff's RAI by letter dated June 5, 1997, and requested a meeting to discuss this margin term issue.

DLC used the material in Enclosure 2 in an attempt to show the acceptability of their proposed margin term of 29.1 °F. Although the NRC staff and DLC representatives agreed that the material of the BVPS-1 reactor pressure vessel will meet the screening criteria requirements of 10 CFR 50.61 until expiration of the facility operating license, the NRC staff did not fully agree with DLC's analysis supporting the use of a margin term of 29.1 °F. However, the NRC staff agreed to address each point raised by DLC in their analysis to justify a margin term of 29.1 °F in the staff's safety evaluation (SE) of the August 2, 1996, submittal.

The NRC staff stated that this meeting had provided sufficient information regarding Issue 1. of its April 28, 1997, RAI and therefore, no additional information regarding Issue 1. of the RAI would be required from DLC. The NRC did request and DLC agreed to provide clarifying information regarding the calculated fluence values noted in Issue 3. of the RAI.

NRC FILE CENTER COPY

9709150007 970826
PDR ADOCK 05000334
P PDR

At the conclusion of the meeting, DLC stated that if the NRC staff's SE reflects an RT_{PTS} value of 269.4 °F as calculated using a 34 °F margin term, DLC would request a higher level management meeting before issuance of the SE. The NRC staff will issue its SE and will then, if necessary, hold a meeting with DLC to discuss the contents of the SE.

Donald S. Brinkman

Donald S. Brinkman, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-334

Enclosures: 1. List of Attendees
2. Licensee's Handouts

cc w/encls: See next page

At the conclusion of the meeting, DLC stated that if the NRC staff's SE reflects an RT_{PTS} value of 269.4 °F as calculated using a 34 °F margin term, DLC would request a higher level management meeting before issuance of the SE. The NRC staff will issue its SE and will then, if necessary, hold a meeting with DLC to discuss the contents of the SE.

/s/

Donald S. Brinkman, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-334

Enclosures: 1. List of Attendees
2. Licensee's Handouts

cc w/encls: See next page

DISTRIBUTION All w/Enclosure 1
Hard Copy (*w/Enclosures 1 and 2)
*Docket File
*PUBLIC
*PDI-2 Reading
OGC
ACRS
*PEselgroth, RGN-I
*DBrinkman

E-Mail

SCollins/FMiraglia	KWichman	TLiu
RZimmerman	MMitchell	TMartin
BBoger	BElliot	KKarwoski
JStolz	LLois	BMcCabe
MO'Brien	RSchaaf	JStrosnider

*SEE PREVIOUS CONCURRENCE

OFFICE	PDI-2/PM	PDI-2/LA	EMCB/BC*	PDI-2/D	
NAME	DBrinkman:rb	MO'Brien	JStrosnider	JStolz	
DATE	8/26/97	8/26/97	08/22/97	08/26/97	

OFFICIAL RECORD COPY
DOCUMENT NAME: BV8-5.MTS

50-334

cc:

Jay E. Silberg, Esquire
Shaw, Pittman, Potts & Trowbridge
2300 N Street, NW.
Washington, DC 20037

Director-Safety and Licensing
Department (BV-A)
Duquesne Light Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077

Commissioner Roy M. Smith
West Virginia Department of Labor
Building 3, Room 319
Capitol Complex
Charleston, WVA 25305

Director, Utilities Department
Public Utilities Commission
180 East Broad Street
Columbus, OH 43266-0573

Director, Pennsylvania Emergency
Management Agency
Post Office Box 3321
Harrisburg, PA 17105-3321

Ohio EPA-DERR
ATTN: Zack A. Clayton
Post Office Box 1049
Columbus, OH 43266-0149

Dr. Judith Johnsrud
National Energy Committee
Sierra Club
433 Orlando Avenue
State College, PA 16803

Duquesne Light Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077
ATTN: R. L. Grand, Division Vice
President, Nuclear Operations Group
and Plant Manager (BV-SOSB-7)

Bureau of Radiation Protection
Pennsylvania Department of
Environmental Resources
ATTN: Michael P. Murphy
Post Office Box 2063
Harrisburg, PA 17120

Mayor of the Borrough of
Shippingport
Post Office Box 3
Shippingport, PA 15077

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Resident Inspector
U.S. Nuclear Regulatory Commission
Post Office Box 298
Shippingport, PA 15077

Duquesne Light Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077
ATTN: S. C. Jain, Vice President
Nuclear Services (BV-A)

J. E. Cross
President-Generation Group
Duquesne Light Company
Beaver Valley Power Station
PO Box 4
Shippingport, PA 15077

MEETING ATTENDEES

UPDATED INFORMATION REGARDING PRESSURIZED THERMAL SHOCK EVALUATION

BEAVER VALLEY POWER STATION, UNIT NO. 1

AUGUST 5, 1997

NAME	ORGANIZATION
D. Brinkman	NRC/NRR
T. Liu	NRC/NRR
K. Wichman	NRC/NRR
M. Mitchell	NRC/NRR
B. Elliot	NRC/NRR
L. Lois	NRC/NRR
R. Schaaf	NRC/NRR
K. Karwoski	NRC/NRR
S. Sovick	DLC
D. Weakland	DLC
G. Kammerdeiner	DLC
J. Arias	DLC
S. Jain	DLC
W. Server	ATI Consulting
L. Connor	DSA Inc.
N. Chapman	Bechtel
J. Perock	Westinghouse
S. Anderson	Westinghouse
E. Terek	Westinghouse
M. Murphy	Pennsylvania DEP

ENCLOSURE 1

Meeting Scope

- Purpose of discussions
- Review of 10CFR50.61 Requirements
- Treatment of Beaver Valley Unit 1 Surveillance Data
- Compliance to Regulation
- Resolution of Concerns

ENCLOSURE 2

Historical Overview

- 12/16/91 - Beaver Valley identifies Plate B6903-1 will exceed Screening Criteria prior to End of License Life
- 4/20/93 - NRC Safety Evaluation concludes the Unit 1 surveillance capsule data non-credible and recommended revisiting Margin term when the improved Industry generic database is prepared and analyzed
- 6/93 - Low Low Leakage Loading Pattern (L4P) Flux Reduction Program implemented
- 2/96 - Hafnium Power Suppression Assemblies added for additional flux reduction in the Unit 1 Vessel

Historical Overview (Continued)

- 8/2/96 - BVPS Unit 1 RT_{PTS} re-evaluation submitted to the NRC containing both -
  - (c)(1) evaluation, non-credible surveillance data due to scatter and $\therefore$ $RT_{PTS} = 241.9^{o}F$
  - (c)(3) evaluation, using additional information to improve the RT_{PTS} accuracy based upon current industry surveillance database, $RT_{PTS} = 264.5^{o}F$
- 4/28/97- NRC RAI recommends the use of $34^{o}F$ for the Margin term rather than the $29.1^{o}F$ value used in the (c)(3) evaluation

Meeting Purpose

- Show Beaver Valley Unit 1 Submittal is in compliance with 10CFR50.61
- Show the application of a 34°F Margin term to our surveillance data is inappropriate
- Show that our surveillance data is credible with the appropriate Margin term
- Show that Beaver Valley Unit 1 is pro-actively and conservatively managing the PTS issue

10CFR50.61(b)

Fracture Toughness Requirements for Protection
Against Pressurized Thermal Shock Events

- Accepted Projected RT_{PTS} for Vessel Materials at EOL Fluence
- Assessment of RT_{PTS} to be done in accordance with (c)(1) of 10CFR50.61, except as provided in (c)(2) and (c)(3)
- Screening Criteria is 270°F for Plates
- Flux Reduction to remain below 270°F
- Analysis to Evaluate if Screening Criteria cannot be met

10CFR50.61(c)

Calculation Methodology for RT_{PTS}

- Provides Equations and Procedures for Calculating RT_{PTS} at EOL Fluence in (c)(1)
- Directs Evaluation of Surveillance Data in Accordance with (c)(2)
- Directs that any Information that would improve the Accuracy of the RT_{PTS} be reported to the Director, NRR as per (c)(3)

10CFR50.61(c)(1)

Equations Used

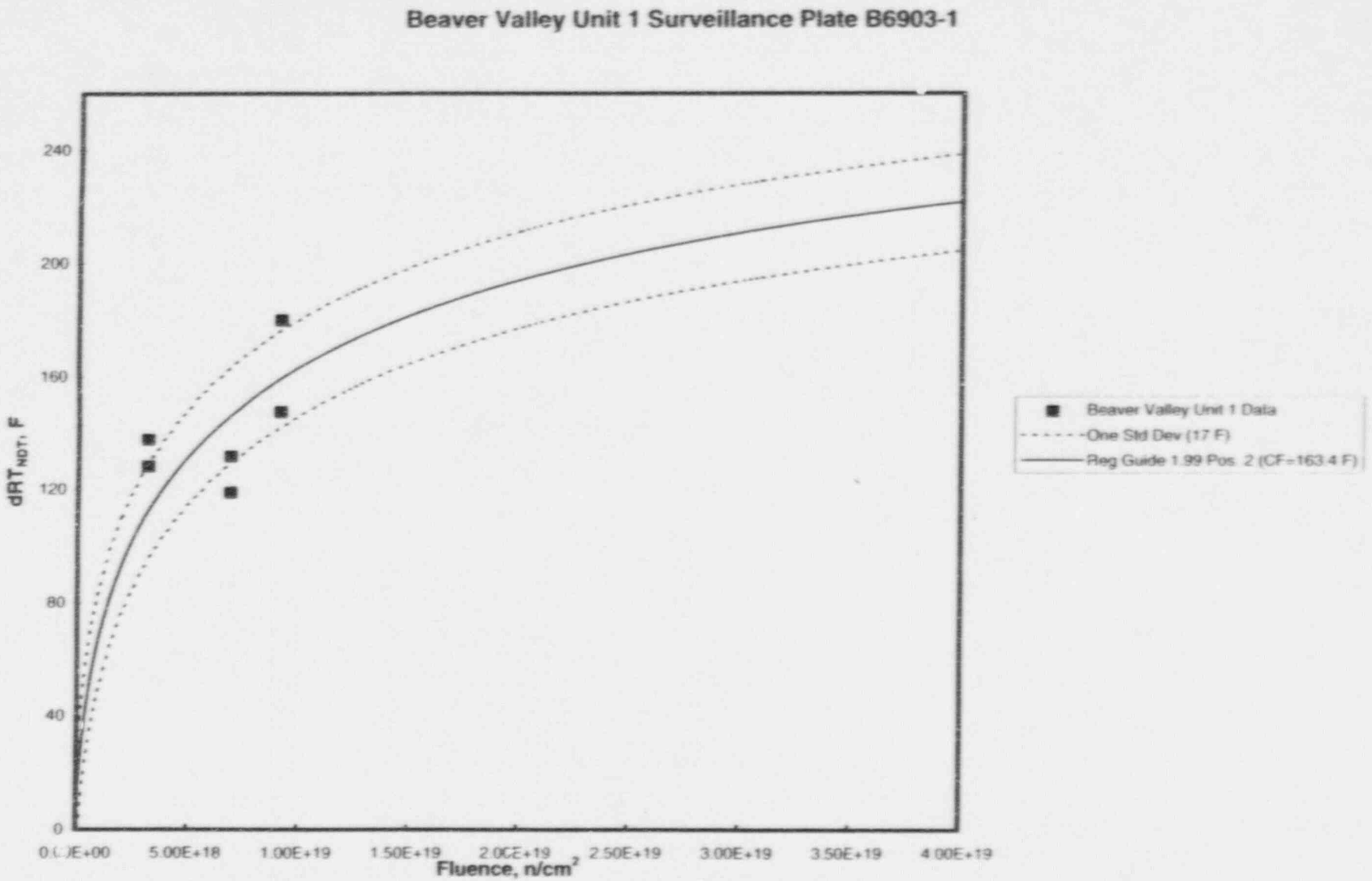
- EQ 1: $RT_{NDT} = RT_{NDT(U)} + M + \Delta RT_{NDT}$
- EQ 2: $M = 2\sqrt{\sigma_U^2 + \sigma_\Delta^2}$
- EQ 3: $\Delta RT_{NDT} = (CF)f^{(0.28-0.10 \log f)}$
- EQ 4: $RT_{PTS} = RT_{NDT(U)} + M + \Delta RT_{PTS}$

10CFR50.61(c)(2)(i)

Surveillance Data Credibility Criteria

- Beaver Valley meets (c)(2)(i) criteria for
  - Materials in the Surveillance Capsules must be those which are controlling materials
  - Scatter in Charpy energy verses Temperature must allow determination of 30 ft-lb. temperature unambiguously
  - Irradiation Temperature of Charpy Specimens must be $\pm$ 25°F of Vessel Wall
- Scatter in Surveillance Data for ΔRT_{NDT} values must be less than 17°F for Base Metal

Beaver Valley Unit 1 Surveillance Data



10CFR50.61(c)(2)(i)

Surveillance Data Credibility

- Beaver Valley Surveillance Data has a maximum scatter of 27.5°F
- If surveillance data is not credible, then the generic values in 10CFR50.61(c)(1) are to be used with a 34°F Margin term

RT_{PTS} Based Upon (c)(1) Criteria

- RT_{PTS} = 27°F+ 34°F+ 180.9°F = 241.9°F
  - $RT_{NDT(U)}$ is 27°F a measured value
  - EOL Fluence (f) = 2.82 10^{19} n/cm^2
  - CF from Table 2 of 10CFR50.61 for Plate B6903-1 with Cu=0.20 wt% and Ni=0.54 wt% is 141.8
  - ΔRT_{PTS} = 180.9°F Reference Equation 3
  - Margin (M) = 34°F Reference Equation 2
- Submitted on August 2, 1996

RT_{PTS} Based Upon (c)(2) Criteria

Assumes Surveillance Data meets Criteria

- RT_{PTS} = 27°F+ 17°F+ 208.4°F = 252.4°F
  Margin (M) = 17°F per EQ. and 10CFR50.61(c)(2)(iii)
  - $RT_{NDT(U)}$ is 27°F a measured value
  - EOL Fluence (f) = 2.82 10^{19} n/cm^2
  - CF is determined in accordance with Equation 5 of 10CFR50.61 using the results of each surveillance capsule. CF = 163.4
  - ΔRT_{PTS} = 208.4°F Reference Equation 3
- RT_{PTS} = 27°F+ 34°F+ 208.4°F = 269.4°F
  Margin (M) = 34°F suggested by NRC

RT_{PTS} Based Upon (c)(2) Criteria

Assumes Credible Surveillance Data

- The Margin of 34°F suggested by the NRC staff over states the scatter and is not in conformance with 10CFR50.61(c)(2)(iii) for credible surveillance data
- Neither evaluation presents an accurate assessment of RT_{PTS} for Beaver Valley Unit 1
- Nor are they compliant to the regulations

Information to Improve Accuracy of RT_{PTS} for Beaver Valley

- 10CFR50.61(c)(3) states that "Any information that is believed to improve the accuracy of the RT_{PTS} value significantly must be reported to the Director, Office of Nuclear Reactor Regulation."
- Reflects the guidance identified in the Federal Register, Vol. 59, No. 191, page 50514 dated October 4th, 1994

Key Points

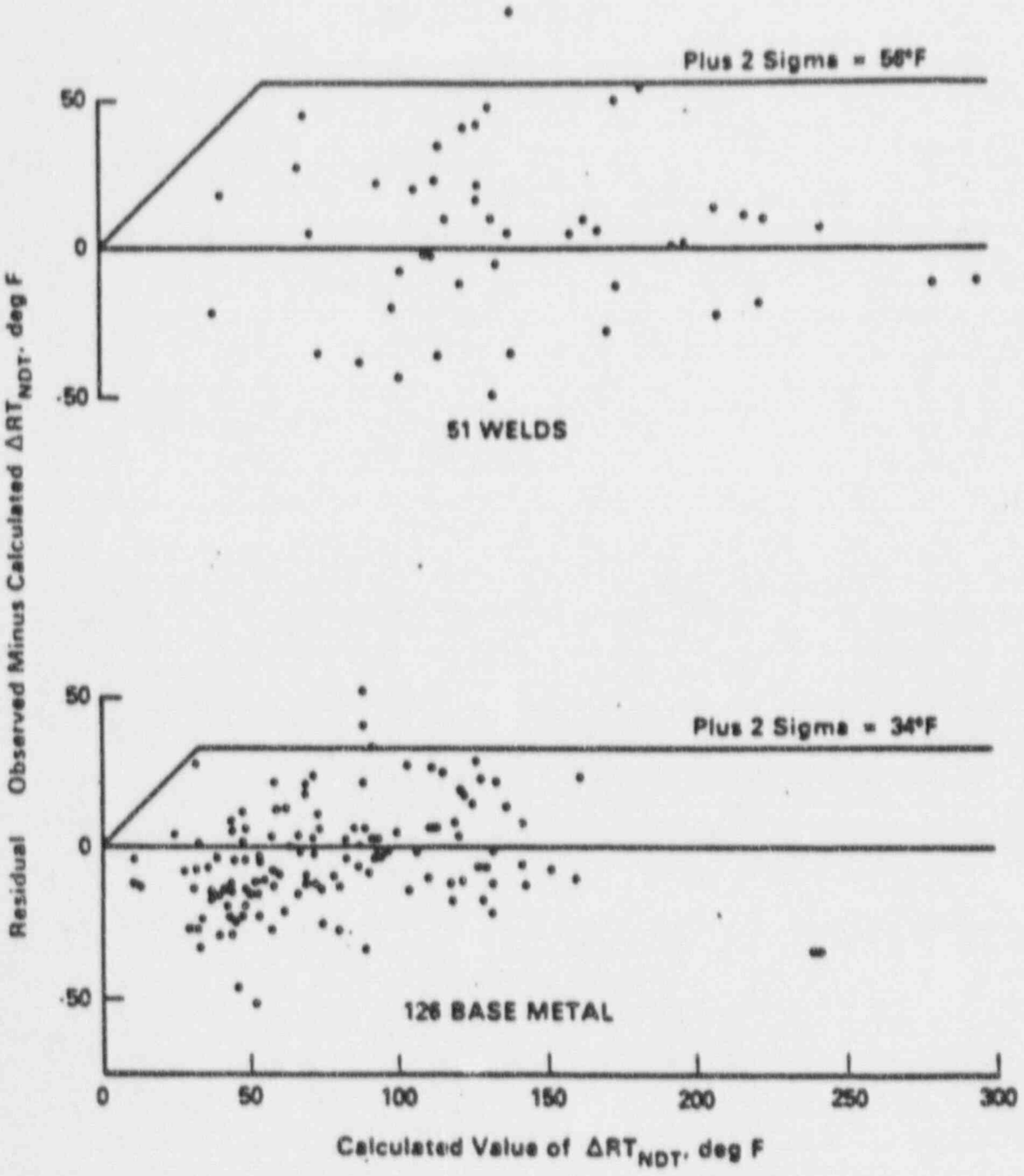
Federal Register Guidance of October 4, 1994

- 'Evaluations of current surveillance data have indicated that the standard deviation of the differences between predicted and measured shifts in RT_{NDT}...are higher than the margin values used in the PTS rule..., particularly for plate materials.'
- 'The NRC staff considered amending the PTS rule to incorporate the revised margin terms and the over-estimation bias, but decided against such an amendment due to the small number of plants that would be affected...'

Key Points

Federal Register Guidance of October 4, 1994

- 'The number of plants which would have their RT_{PTS} values change "significantly" by such a change to the margin terms is not large; the impact of the revised margin terms on those plants is being addressed through other regulatory mechanisms.'
- Duquesne Light Company believes that 10CFR50.61(c)(3) is the regulatory mechanism for plants, such as Beaver Valley.



Reg Guide 1.99, Rev. 2 Basis

126 Data Points for Plate

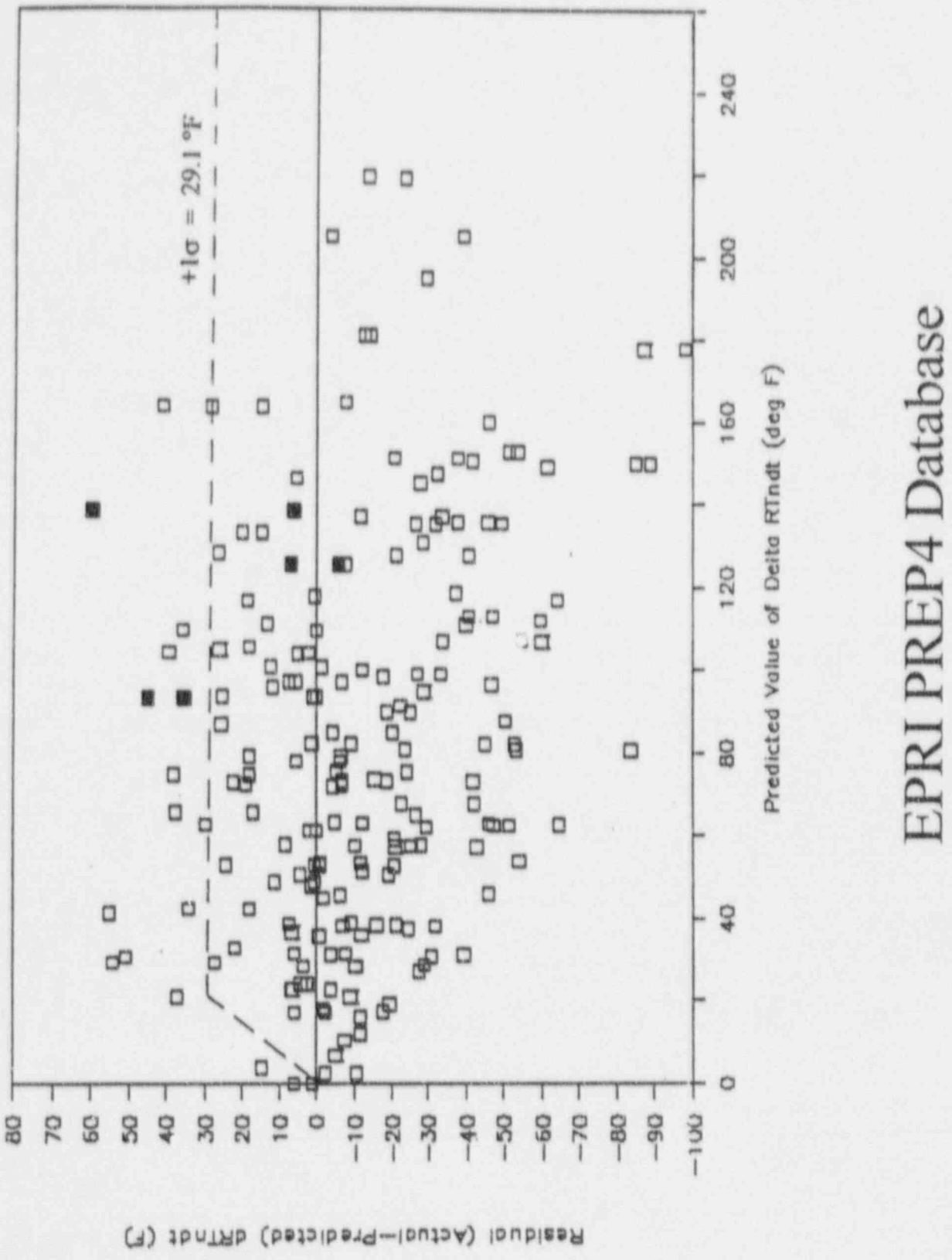
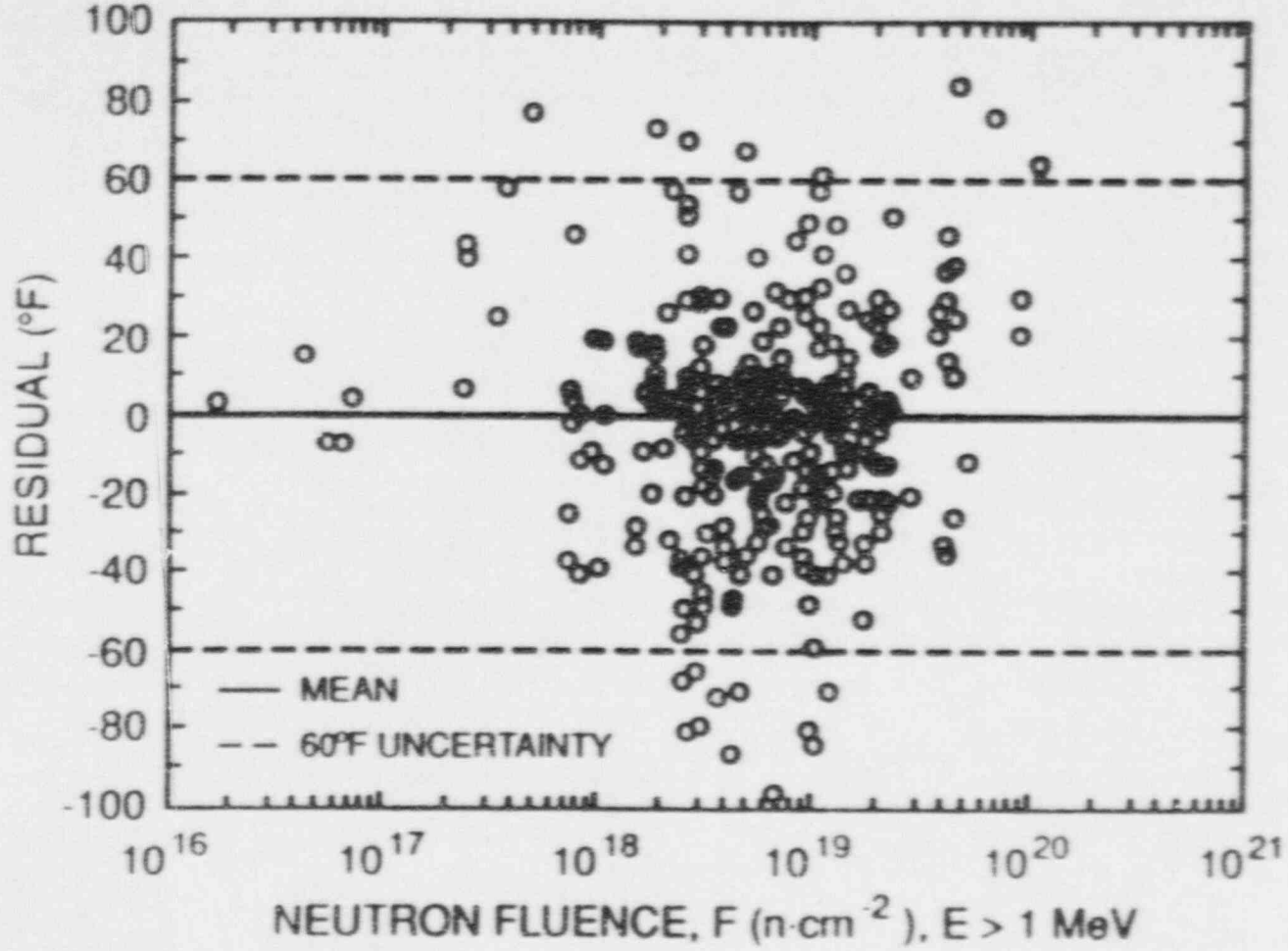


FIGURE 6-30 Calculated (Actual - Predicted) Scatter in Base Metal Data



Plot of PR-EDB

Reference "power Reactor Embrittlement Data Base (PR-EDB)
Uses in Evaluating Radiation Embrittlement of Reactor Vessel"
by F.B.K. Kam, F.W. Stallman and J.A. Wang
Presented at Aging Research Conference, March 24-27, 1992
Published in NuReg/CP-0122, Volume 1 dated September, 1992

Information to Improve Accuracy of RT_{PTS}

- The evaluation of current surveillance data has been incorporated into the analysis for the determination of an appropriate Margin term
- Based upon current industry data the new Margin term would equal 29.1°F as submitted August 2, 1996
- This is compliant to 10CFR50.61(c)(3) and the guidance provided in the October 4, 1994 Federal Register

RT_{PTS} Based Upon (c)(3)

Using the Additional Information to Improve the Accuracy of RT_{PTS}

- Beaver Valley Data would now fall within 1σ (29.1°F) of the best-fit prediction
- Using the credibility basis of 10CFR50.61(c)(2) of having the scatter of plant specific ΔRT_{NDT} values be within the 1σ value established for industry data
- Beaver Valley Surveillance Capsule data can be considered 'credible' and RT_{PTS} be determined using 10CFR50.61 Equations and a new Margin term of 29.1°F in lieu of the old 17°F term

Beaver Valley Unit 1 - Base Metal (TL & LT)

CVGRAPH 4.0, Printed at 17:36:29 on 12-12-1995

Page 1

Evaluation of Curve 1

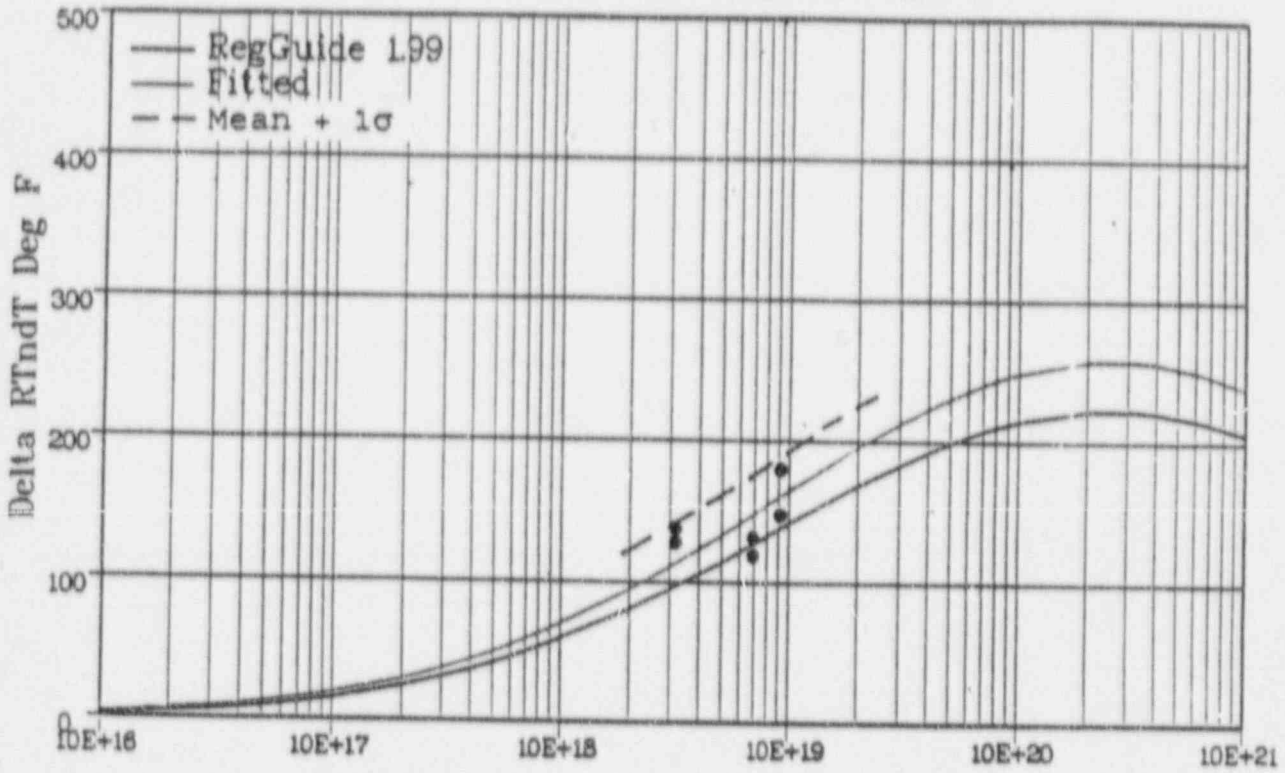
Metal Type is a PLATE and is computed as Base Metal. The Material ID is SA533B and Heat Number is C8317-1

Chemical Content is as follows

Copper = .2 wt%
Nickel = .54 wt%
Phosphorous = 0 wt%
Silicon = 0 wt%

The Chemistry Factor 141.8 F is found by the Reg. Guide 1.99 Revision 2 Method

The Chemistry Factor Fitted to the actual Input Data is 163.4241 F.



Delta RTndT vs. Fluence Data

Capsule	Fluence	Input Delta RTndT	Computed Delta RTndT	Differential
UT	6.9E+18	131.7	146.41	-14.71
VT	3.16E+18	137.8	111.73	26.06
WT	9.15E+18	179.9	159.35	20.54
UL	6.9E+18	118.9	146.41	-27.51
VL	3.16E+18	128.2	111.73	16.46
WL	9.15E+18	147.8	159.35	-11.55

SUM of RESIDUALS = 9.27

FIGURE 6-32 Calculated Best-Fit Trend from Beaver Valley Unit 1 Base Metal Surveillance Data

RT_{PTS} Based Upon (c)(3)

Using the Additional Information to Improve the Accuracy of RT_{PTS}

- RT_{PTS} = 27°F+ 29.1°F+ 208.4°F = 264.5°F
  - $RT_{NDT(U)}$ is 27°F a measured value
  - EOL Fluence (f) = 2.82 10^{19} n/cm^2
  - CF is determined in accordance with Equation 5 of 10CFR50.61 using the results of each surveillance capsule. CF = 163.4
  - ΔRT_{PTS} = 208.4°F Reference Equation 3
  - Margin (M) = 29.1°F

Conclusions

- The Duquesne Light Company submittal, dated August 2, 1996, is in compliance with 10CFR50.61.
- The additional information is significant, in that it conservatively represents the irradiation embrittlement of the Beaver Valley Unit 1 Vessel.
- Beaver Valley continues to pro-actively manage the irradiation embrittlement concern and conservatively applied the new information.
  - L4P Flux Reduction Core Loading
  - Hafnium Power Suppression Assemblies
  - All Reasonable Flux Reduction Actions Have Been Taken
  - Applied Additional Information to Improve Accuracy of RT_{PTS}

Resolution of Concerns

- Completion of the review of the August 2, 1996 submittal which provided a 10CFR50.61(c)(1) evaluation
- Completion of the review of supplied additional information in accordance with 10CFR50.61(c)(3)
- Identify the other regulatory means for addressing this concern that was noted in the October 4, 1994 Federal Register