Duquesne Light Company Beaver Valley Power Station
P.O. Box 4
Shippingport, PA 15077-0004

SUSHIL C. JAIN
Division Vice President
Nuclear Services
Nuclear Power Division

(412) 393-5512
Fax (412) 643-8069

June 5, 1997

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
Response to Second Request for Additional Information
Concerning Reactor Vessel PTS Assessment

Attached is our response to an NRC request for additional information provided by letter dated April 28, 1997, concerning the new reactor vessel pressurized thermal shock (PTS) assessment submitted by our letter dated August 2, 1996, and supplemented by our March 14, 1997, response to the first request for additional information. This response provides information concerning the NRC's position regarding the margin term in the PTS calculation, core barrel support rings that may be shadowing surveillance capsules, and the use of calculated fluence values. The attachment provides each NRC item followed by our response.

Sincerely,

Sushil C. Jain

c: Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. S. Brinkman, Sr. Project Manager

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NRC Question 1:

It is the NRC staff's position that DLC should use 34°F for the margin term when evaluating lower shell plate B-6903-1 rather than the value of 29.1°F used in WCAP-14543. The use of 34°F for this margin term is consistent with the value previously accepted by the staff in DLC's previous PTS evaluation.

Response to NRC Question 1:

The Duquesne Light Company requests a meeting with the management and staff of the NRC to discuss the use of the 34°F margin term and compliance with 10 CFR 50.61. This has been preliminarily discussed with the Beaver Valley NRC Sr. Project Manager. Information regarding NRC Question 1 will be provided following the requested meeting.

NRC Question 2:

Recently, information provided from a French source has indicated that core barrel support rings may be shadowing surveillance capsules and the dosimeters within them, in some RPV surveillance programs. The NRC staff has begun to discuss this issue with Westinghouse. Westinghouse staff members are aware of the NRC staff's concerns that, if these supports are not modeled correctly, this may lead to deviations between measured and calculated neutron fluence values. Assess whether such a problem may exist for the measured and calculated fluence values in the case of BVPS-1 and provide drawings of the reactor vessel internals which show the relative location of the baffle radial support plates (baffle formers), the surveillance specimen capsules, and the dosimeters and Charpy impact specimens within the surveillance capsules.

Response to NRC Question 2:

The design of the Beaver Valley Unit 1 Reactor Vessel internals includes eight former plates spanning the radial distance between the external boundary of the baffle plates and the inner radius of the core barrel. Due to the shape of the perimeter of the reactor core, the radial extent of the former plates varies significantly with azimuthal angle. Therefore, an accurate evaluation of the effect of the presence of these former plates on the neutron environment at surveillance capsule and reactor vessel locations would require three-dimensional transport analysis.

The configuration of the former plates at Beaver Valley Unit 1 is depicted schematically in Figure 1 (attached). Also shown in Figure 1 are the relative locations of materials test specimens and dosimetry sensors within a surveillance capsule with respect to the former plates. From Figure 1, it can be seen that the surveillance capsules are impacted primarily by only former plates C and D. An expanded representation of the materials test specimens and dosimetry sensors relative to these two former plates is provided in Figure 2 (attached). The specific axial dimensions for the former plate elevations, the material test locations, and the dosimetry sensor elevations are listed in Tables 1 through 3, respectively. Relative to Figures 1 and 2, as well as Tables 1 through 3, it should be noted that all dimensions are referenced to the axial midplane of the active core.

From Figure 2, it can be seen that portions of Charpy compartments 4 and 5 lie in line with former plate C; and portions of tensile compartment 1 and WOL compartment 1 lie in line with former plate D. None of the other materials test specimen compartments fall in direct line with the former plates. In the case of the dosimetry sensor sets, only the bottom tips of the copper and nickel wires contained in Charpy compartment 5 lie directly in line with the former plate. The remaining dosimetry sensors, particularly those at the top, middle, and bottom of the surveillance capsule are positioned such that they are minimally influenced by the presence of the former plates.

To date three surveillance capsules (V,U, and W) have been withdrawn from Beaver Valley Unit 1. In Table 4, a summary of the measured specific activity of iron manganese (Fe-54 (n,p) Mn-54) sensors irradiated at five axial elevations within capsules V,U, and W is provided. In Table 4, measurements are provided on an absolute basis as well as relative to the average specific activity for each capsule. It should be noted that the average activity is the quantity used in the surveillance capsule dosimetry evaluations. From Table 4, the standard deviations associated with the average data sets range from 3.5% to 4.7%, a range consistent with the 5% uncertainty assigned to the Fe-54 (n,p) Mn-54 reaction rates used in the capsule dosimetry evaluations. It is evident from the data provided in Table 4 that no significant effects due to the presence of former plates C and D are observable, and therefore, are bounded by the current margin term in the determination of RT_{PTS}.

Table 1
Elevations of Baffle-Barrel Former Plates Relative to the Active Core
for Beaver Valley Unit 1

	Bottom of Plate (in.)	Top of Plate (in.)
Bottom of Active Core	-72.00	-72.00
Former A	-70.04	-67.54
Former B	-36.04	-34.54
Former C	-12.29	-10.79
Active Core Midplane	0.00	0.00
Former D	8.46	9.96
Former E	27.46	28.96
Former F	45.46	46.96
Former G	61.71	63.21
Top of Active Core	72.00	72.00
Former H	76.71	79.21

Table 2
Elevations of Materials Test Specimens Arrays relative to the Active Core Midplane
Beaver Valley Unit 1

	Bottom of Array (in.)	Top of Array (in.)
Charpy 1	-19.60	-17.47
Charpy 2	-17.47	-15.35
Charpy 3	-15.35	-13.22
Charpy 4	-13.22	-11.10
Charpy 5	-11.10	-8.97
Charpy 6	-8.97	-6.85
Charpy 7	-6.85	-4.72
Charpy 8	-4.72	-2.60
Charpy 9	-2.60	-0.47
Dosimeter Block	-0.47	1.05
Charpy 10	1.05	3.17
Charpy 11	3.17	5.30
Tensile 1	5.30	9.55
WOL 1	9.55	11.00
WOL 2	11.00	12.45
WOL 3	12.45	13.90
WOL 4	13.90	15.35
Tensile 2	15.35	19.60

Table 3
Elevations of Dosimeter Locations Relative to the Midplane of the Active Core

	Bottom of Compartment (in.)	Top of Compartment (in.)
Bottom Co	-19.60	-18.54
Bottom Fe	-18.54	-11.10
Bottom/Middle Cu, Ni	-11.10	-10.04
Bottom/Middle Fe	-10.04	-2.60
Middle Cu, Ni	-2.60	-1.54
Middle Fe	-1.54	-0.47
Middle U-238, Np-237	-0.47	5.30
Top/Middle Cu, Ni	5.30	6.36
Top/Middle Fe	6.36	17.48
Top Co	17.48	18.54
Top Fe	18.54	19.60

Table 4
Measured Specific Activity of Iron Dosimeters Included in Internal Surveillance Capsules
Beaver Valley Unit 1

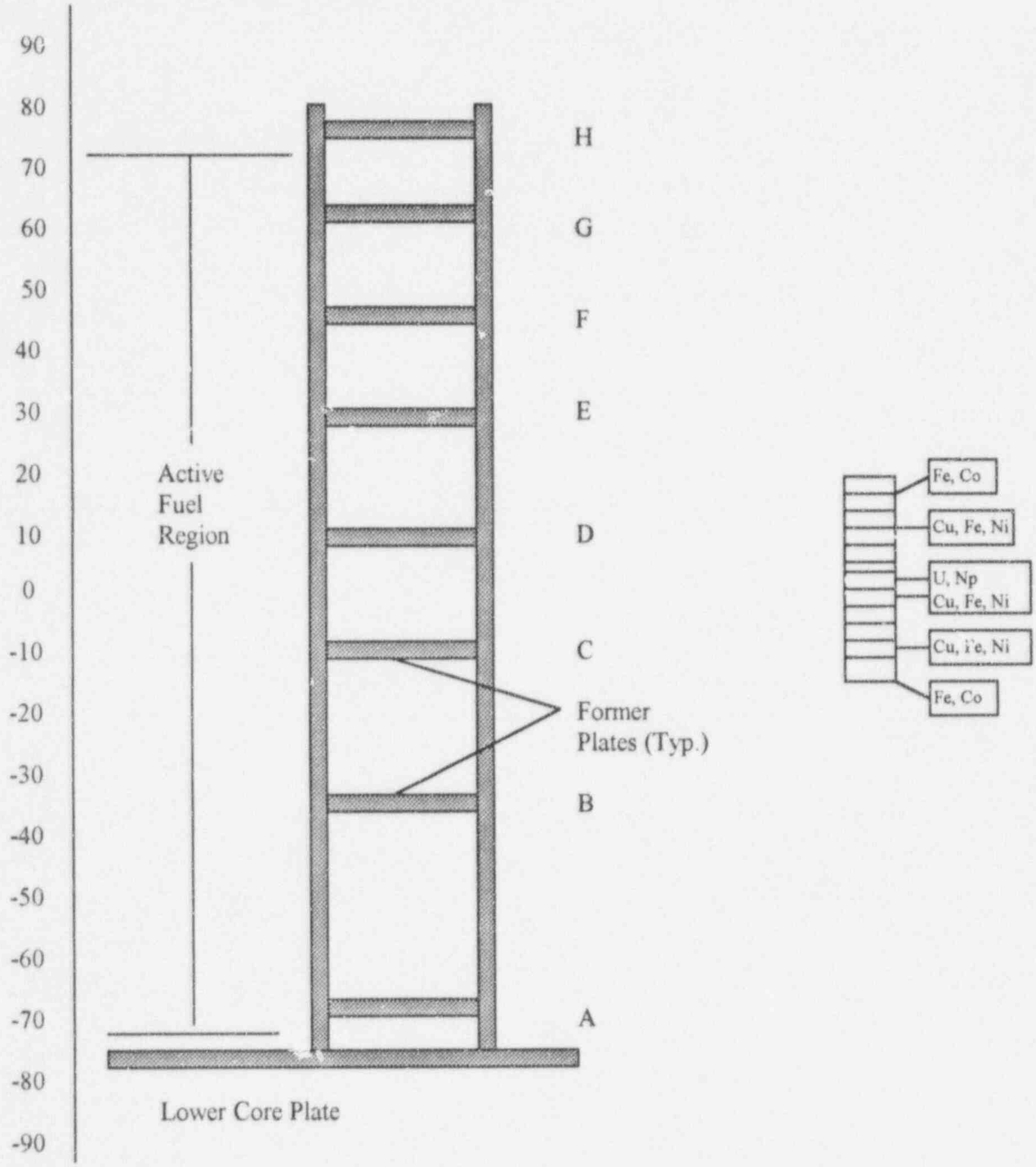
Absolute Measured Specific Activities (dps/gm)

Axial Location	Capsule V	Capsule U	Capsule W
Top	5.84E+05	1.21E+06	1.00E+06
Top-Middle	5.35E+05	1.13E+06	9.00E+05
Middle	5.62E+05	1.22E+06	9.44E+05
Bottom-Middle	5.32E+05	1.16E+06	8.89E+05
Bottom	5.37E+05	1.14E+06	9.19E+05
Average	5.50E+05	1.17E+06	9.30E+05
% Std Deviation	4.1	3.5	4.7

Relative Specific Activities

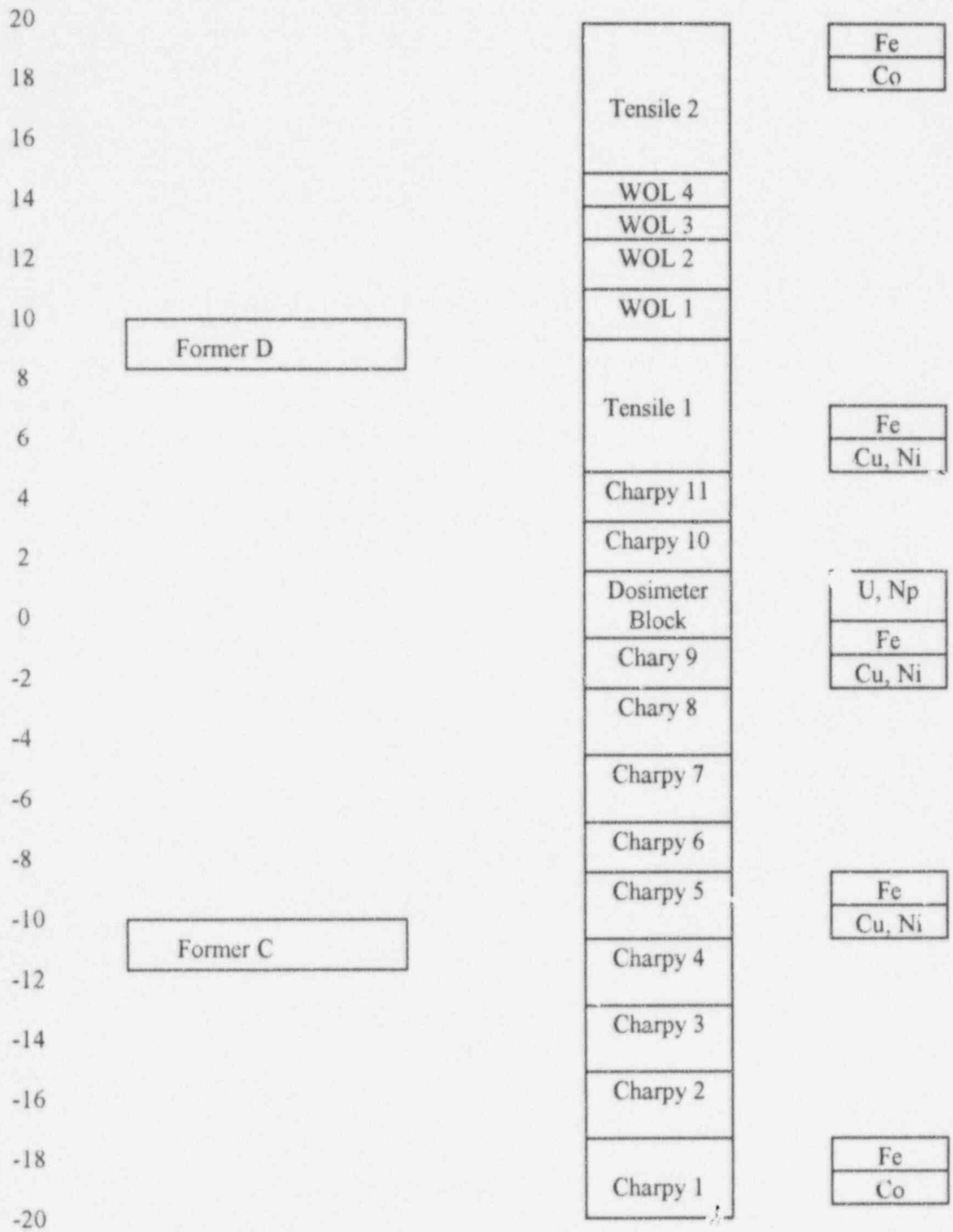
Axial Location	Capsule V	Capsule U	Capsule W
Top	1.06	1.03	1.08
Top-Middle	0.97	0.97	0.97
Middle	1.02	1.04	1.02
Bottom-Middle	0.97	0.99	0.96
Bottom	0.98	0.97	0.99
Average	1.00	1.00	1.00
% Std Deviation	4.1	3.5	4.7

Figure 1
Schematic Showing Relative Locations of Baffle-Barrel Formers
Material Specimen Stackups and Dosimetry Locations
Beaver Valley Unit 1



Note: Distances are from Core Midplane in inches

Figure 2
Schematic Showing Material Specimen Stackups and Dosimetry Locations
Within a Surveillance Capsule
Beaver Valley Unit 1



Note: Distances are from the Core Midplane in inches

NRC Question 3:

The NRC Staff has established the position of not accepting adjustments to calculated neutron fluence values based on the use of dosimetry data and the FERRET code (for reference, see the staff's safety evaluation on the PTS reassessment for Palisades, December 20, 1996). Perform DLC's PTS reassessment based on calculated fluence values for determining:

(1) surveillance capsule fluences,
(2) the chemistry factor from BVPS-1 surveillance results, and
(3) the EOL fluences of the RPV plates and welds.

Recognize that the NRC staff expects that this reevaluation will include any changes which result from DLC's investigation into the need to address the core baffle radial support plates raised in #2 above. If remodeling and recalculation is necessary, the staff requests that DLC submit a schedule for resolution of this issue within 30 days of receipt of this letter.

Response to NRC Question 3:

The PTS evaluation provided in the August 6, 1996, Beaver Valley Unit 1 submittal was performed using best-estimate fluence values for both capsule and vessel evaluations. However, to provide a point of comparison, a re-evaluation of the RT_{ndt} based on the use of calculated fluence and measured charpy shift has been performed for the limiting lower shell plate material, which is bounding for the other materials and welds within the Reactor Vessel.

From the fluence evaluations provided in WCAP-14554, "Beaver Valley Unit No. 1 Fluence Re-Evaluation," S. L. Anderson, June 1996, the following calculated and best-estimate fluence values were reported for the three surveillance capsules withdrawn from the reactor to date.

Capsule	Irradiation Time [efps]	Calculated Fluence [n/cm^2]	Best-Estimate Fluence [n/cm^2]
V	3.66E+07	3.40E+18	3.16E+18
U	1.13E+08	6.88E+18	6.91E+18
W	1.87E+08	1.06E+19	9.15E+18

The best-estimate fluence values and the measured RT_{ndt} shift data from the capsule evaluation resulted in a plant specific chemistry factor for the lower shell plate material of 163.4. This value was provided in the August 1996 submittal.

A re-evaluation of the chemistry factor using the calculated capsule fluence along with the measured shift data results in a reduced chemistry factor value (CF = 159.9).

Based on the use of a chemistry factor of CF = 159.9, an initial RT_{ndt} of 27°F and using a conservative margin of 34°F, results in the PTS screening criterion of 270°F being reached at a fluence of 3.22E+19 n/cm^2. Based on the calculated maximum vessel fluence for the Beaver Valley Unit 1 lower shell plate at EOL (27.1 EFPY) of ~2.92E+19 n/cm^2, it can be seen that the screening criteria value of RT_{ndt} will not be reached within the 27.1 EFPY operating lifetime of the unit.

Therefore, the use of calculated fluence values versus the best-estimate values contained in our August 6, 1996, submittal does not impact the conclusions reached in the current Unit 1 PTS assessment. Based on the above, the need for PTS reassessment is not considered necessary.

Additionally, as was noted in the response to Question #2, the effects of the shadowing by the former plates is very small and within the standard calculational error expected for reaction rates associated with dosimetry and fluence evaluations. Therefore, no adjustments need to be added to the above calculated fluence values.