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

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to NRC Request for Additional Information Regarding Unresolved Safety Issue A-46 (TAC No. M69428)

Attached is the response to the NRC Request for Additional Information dated January 10, 1997, which concerned Unresolved Safety Issue A-46 for Beaver Valley, Unit 1.

If there are any questions concerning this response, please contact Mr. J. Arias at (412) 393-5203.

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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DUQUESNE LIGHT COMPANY
Nuclear Power Division
Beaver Valley Power Station Unit 1

Attachment

Response to Request For Additional Information Regarding Unresolved Safety Issue (USI) A-46 for Beaver Valley Power Station Unit No. 1, NRC letter dated January 10, 1997

The following items are from the January 10, 1997, NRC Request for Additional Information Regarding USI A-46 and refer to the Summary Report for Resolution of USI A-46, submitted to the NRC by Duquesne Light Company (DLC) letter dated January 31, 1996

1. On page 20 of your submittal, you state that "The length of all Hilti Kwik-bolts is known by virtue of controlled procurement." Indicate whether the demand force in an anchor was compared against the bolt strength specified in Generic Implementation Procedure, Revision 2, (GIP-2) Table C.2-1, or the bolt strength corresponding to the actual bolt length from the Hilti catalog. If the Hilti Catalog allowable bolt loads were used, provide the basis for not using the GIP-2 allowable bolt loads.

Response:

The SQUG anchorage calculations used the appropriate GIP-2 allowables for the length of anchor installed.

2. You stated that thirty-one (31) tanks and heat exchangers were reviewed and twenty-seven (27) were outliers, and most of the outliers were caused by anchorage problems. However, you did not state whether you had reviewed the adequacy of the tanks and heat exchangers themselves assuming the anchorage was properly designed and installed. Provide information regarding the adequacy of the tanks and heat exchangers themselves in accordance with the criteria delineated in Chapter 7 of GIP-2.

Response:

The adequacy of Safe Shutdown Equipment List (SSEL) tanks and heat exchangers were evaluated to the requirements of Chapter 7 of the GIP-2 methodology (Refer to Section 6.1 of Summary Report, p.31-32). Per the GIP-2 requirements, only vertical, flat-bottom tanks require tank wall stability analysis (GIP-2, Section 7.1.2). The tank wall analyses for the SSEL vertical flat-bottom tanks (QS-TK-1 and WT-TK-10) were performed as part of their overall GIP-2 evaluation. Note that the majority of the SSEL tanks are not flat-bottomed tanks. As noted in the Summary Report, the buried diesel fuel oil storage tanks are outside of the GIP-2's guidelines, but were previously, successfully analyzed for appropriate loads. The boric acid storage tanks (CH-TK-1A & 1B) are on legs, and were successfully analyzed by EQE, Inc. The 12 air-start tanks (EE-TK-3A/B/C/D/E/F and 4A/B/C/D/E/F) and two (2) nitrogen accumulator tanks (GN-TK-1A & 1B) are gas-filled bottle-type tanks, for which the GIP-2 guidelines of Section 7.4 are applicable. GIP-2, Section 7.4.2, states that it is not necessary to evaluate shell stress, welds, nor shell-to-support welds for such tanks. However, the Seismic Capability Engineers (SCEs) did confirm the existence and apparent adequacy of these welds during their walkdowns. The 19 anchorage outliers resulted from: four (4) air-start tank racks (each

supporting 3 air tanks), two (2) flat-bottom tanks, and three (3) heat exchangers for which embedded nelson studs are closely spaced.

Our SQUG consultant, EQE Inc., is analyzing the flat-bottom tank outliers. The anchorage outlier issues for the other tanks are being resolved through more detailed modeling of the tank-support system, which is expected to result in reduced anchor loads. The interaction outlier issues are being resolved through deflection calculations for the CH-TK-1A & 1B tanks and removal of an abandoned strut. A missing screw on an emergency light near EE-TK-2A will be replaced.

3. Based on the information provided by DLC, it is unclear as to how some equipment was determined to meet the intent of the stated caveat. The following questions pertain to Table 5.2 on meeting the intent of caveats as described in Appendix B of GIP-2.

3.a. For equipment FE-CDL-1A, FE-CDL-1B, PCC-FE-1A, and PCC-FE-1B, you stated that the anchorage calculation is not yet complete but that the anchorage was adequate. State your basis for this conclusion.

Response:

The FE-CDL-1A & 1B and PCC-FE-1A & 1B SSEL items are small, light-weight, wall-mounted, fire protection panels, containing few components. Each panel has four, 3/8" diameter expansion anchors, which were found to be tight and judged to have adequate capacity. This has since been confirmed through anchorage analysis using GIP-2 criteria.

3.b. Transmitters FT-CH-124, FT-CH-127, and FT-CH-130 were mounted to block walls with expansion anchors. You stated that you performed analyses for these anchors and found them acceptable. Provide the criteria that you used for expansion anchors embedded in block walls and submit anchorage calculations for these three transmitters.

Response:

The allowables for the expansion anchors in concrete block walls (CBW) are based upon testing results provided by Bechtel Engineering for a utility group resolving NRC Bulletin (IEB) 80-11 issues. The testing had been performed at other plants on standard (construction & material) block walls. The allowables used were derived from this data. Calculation No. 52233-C-019 used these allowables for the solid block CBWs supporting FT-CH-124, FT-CH-127 and FT-CH-130 and includes them as Attachment B of the calculation, provided as Enclosure 1.

3.C. For BAT-BKR-1, -2, -3, -4 and BAT-CHG-1, -2, -3, -4 provide a calculation for each type of equipment to demonstrate the seismic adequacy of these cabinets.

Response:

GIP-2 guidelines do not require the analysis of enclosures such as BAT-BKR-1, -2,-3, -4 and BAT-CHG-1, -2, -3, -4 beyond that intended to demonstrate anchorage adequacy. Satisfying the equipment class caveats assures that the plant equipment under consideration is comparable to the equipment in the SQUG database, which performed satisfactorily in large seismic events. This comparison of component features is fundamental to the SQUG SSEL equipment evaluation process, which requires inspection and reviews for anchorage, interaction, and contactors. The SCEs visually assessed the internal load path to establish that framing, connections and wall panels appeared to be of conventional construction, and adequate for the mass involved. Many of these types of enclosures have successfully undergone original procurement vibratory testing, although of a different type than would currently be performed. Often these original, multiple, single-directional, single frequency, tests had lengthy durations that severely exercised the equipment. Additional information on battery chargers from the Supplemental Database Information furnished by EQE International is provided by Enclosure 2.

The anchorage analyses for these cabinets are being provided by Enclosure 3 (Calculation No. 52233-C-004) and Enclosure 4 (Calculation No. 52233-C-017). Also included is the technical evaluation document TER-9294 (Enclosure 5) and Calculation 8700-DSC-6545-1 (Enclosure 6), which relate to the addition of a steel angle and Hilti anchors to BAT-CHG-2. These documents supported a repair effort for the anchorage of BAT-CHG-2, and used the existing site Hilti allowables in effect for modifications (GIP-2 Part I, Section 2.3.5). The allowables were established by a site testing program.

3.D. For valves FCV-RC-455C1, C2, D1, and D2, discuss how these valves are equivalent in ruggedness to the check valves with regard to design adequacy during a seismic event.

Response:

The FCV-RC-455C1, C2, D1 and D2 valves are flow control valves that are equivalent to check valves in that they are simple, self-actuating, and have no apparent seismic vulnerabilities. They have no external controller or operator, and allow full flow in one direction, and metered flow in the opposite direction. This is accomplished by way of a moveable, spring-loaded, internal disc which is positioned by the fluid flow alone. Its position with flow in one direction allows full flow, while reversing flow direction moves the disk to a position that diverts the fluid past an adjustable rod. The rod's presence in the fluid stream restricts flow. The rod's degree of insertion is adjustable, and it has an external adjustment knob which is held securely by a thumb-latch pawl. The patented device is produced by ASCO, and is described in the catalogue cut provided by Enclosure 7. Based upon the valve's simple design as a hybrid manual valve/check valve, and field observation of its rugged construction, the check valve equivalence is considered appropriate.

3.e. For flow indicators FI-CH-122A, 124, 127, 130, and 150, FI-FW-100A/B/C, level recorders FR-MS-478, 488, and 498, LI-FN-474, 475, 476, 484, 485, and 486, discuss in detail how these components were qualified by the "rule of the box."

Response:

Equipment Class 20, GIP-2 page B.20-2, states that indicators and recorders are included with the Instrumentation and Control Panels and Cabinets. They are typical of the equipment which was found to perform properly following large seismic events. The above devices were inspected in the field for attachment integrity, wire slack and interaction.

In accordance with Class 20 Caveat 3, the Westinghouse strip chart recorders were given additional review. Although they possessed the compression-type mounting brackets considered to be adequate by the GIP-2, a review of their existing qualification and installation documentation indicated that they were intended to have rear support. This deficiency was documented by plant Problem Report 1-95-605. Testing of the existing configuration to plant demand levels (including GIP-2 amplification of 7.0), showed the recorders to be seismically capable in the as-found condition. This result confirmed the guidance given by the GIP-2.

3.f. For flow indicator FI-CH-122, provide the basis for concluding that the collapse of a lighting fixture located above this equipment will not adversely affect its function.

Response:

This comment apparently relates to FT-CH-122 (not FI-CH-122), since an interaction caveat intent condition (Table 5.2, p 2, of the Summary Report) involving a light fixture, was identified for FT-CH-122. The description in Table 5.2, "By engineering judgment the collapse of a lighting fixture located above this equipment will not adversely affect its function," does imply the possibility that a collapse could occur. The Screening Evaluation Work Sheet (SEWS) for FT-CH-122 was reviewed and states, "LIGHT FIXTURE OVERHEAD (O.K. BY ENGR. JUDGMENT)." Discussion with the SCEs has confirmed that the SEWS note meant that the engineers did not consider the collapse of the fixture to be likely. The SCEs saw no significant risk in that the light fixture clearly appeared to be secure, which is a valid GIP-2 approach.

3.g. For motor-operated valves MOV-106A and 114A, provide the basis for concluding that the failure of the 1-inch steel pipe above the valves will not damage the valves.

Response:

This comment relates to MOV-RW-106A and 114A, since the Caveat Intent Table 5.2, p. 4, makes reference to these valves having a 1" diameter pipe passing over them. The pipe was noted by the SCEs during the walkdown, but judged not to be a significant risk. The SEWS states that the piping is rod-hung which indicates that the pipe would not be safety-related, but would be seismically supported in this area of the plant. The SEWS also identifies an intervening

(lower) pipe which would intercept the subject pipe if it would fail. Discussion with the SCEs indicates that they took note of the pipe because it was in proximity to the MOVs and must be considered. However, in their judgment, even if the 1" pipe were to fall and reach the MOVs, no soft targets exist that would incapacitate the valves. This conclusion is consistent with the guidance of GIP-2, Sections 4.5 and D.2.1, which discuss such piping interactions.

3.h. Discuss how the solenoid-operated valves SOV-MS-lOlA, B, and C were qualified by the "rule of box" with panels PNL-MS-lOlA, B and C, respectively.

Response:

PNL-MS-101A, B & C meet the criteria for, and were evaluated under, Equipment Class 18, "Instruments on Racks." This class includes the pneumatic devices found on the rack and specifically includes solenoid valves. Individual components included in an equipment class were inspected by the SCEs for the presence of fasteners, adequate connection slack, and interaction. The rack-mounted solenoid valves SOV-MS-101A, B & C satisfied applicable criteria and were properly included with the panels.

3.i. For solenoid-operated valves SOV-RC-455C1, C2, D1 and D2, the clearance from the valve housing is approximately 1/16 inch to the adjacent PCV-RC-455C valve actuator. Provide additional information to demonstrate that the SOVs and the valve actuator would not respond out of phase and impact each other during an earthquake, as described in the Bounding Spectrum Caveat 3 of Appendix B to GIP-2.

Response:

These SOVs are rigidly mounted by a steel plate directly to the yoke of the referenced AOV (PCV-RC-455C). The SOVs are small and do not have sufficient mass to deflect the steel plate to close the 1/16" gap. Also, it is not considered to be credible that the yoke will deflect to close the gap, since the plate and the attached SOVs are moving with the yoke. Therefore, the entire assembly will move in phase as one. The Summary Report Table 5.2 repeats what the SEWS states: "They will move in-phase and not interact." The SCE conservatively noted the 1/16" clearance and judged that interaction was not a problem. Additional information on AOVs from the Supplemental Database Information furnished by EQE International, is provided in Enclosure 2.

3.j. Provide an analysis or a calculation to demonstrate the seismic adequacy of the cast-iron valve yokes for valves TV-MS-111A, B, and C.

Response:

The AOVs TV-MS-111A, B & C were reported as having cast iron yokes, but are not a failure concern, based upon Equipment Class 7, Caveat 3. This caveat specifically references piston-operated and safety relief valve types as concerns when cast iron valve yokes are present. The concern does not extend to air-operated valves. The Senior Seismic Review and Advisory Panel

(SSRAP) Report, p. 87, gives the same explicit guidance. The AOV's air/opposing spring actuator design imposes less severe, slower-acting, loads on the yoke than the referenced valve types and MOVs. The mass of an AOV operator is also generally much less than an MOV's operator, and it exerts no torque in combination with tensile loads. Additional information on AOVs from the Supplemental Database Information furnished by EQE International; is provided in Enclosure 2.

3.k. For control room air intake vent damper VS-D-40-1F, provide the basis for the statement that poor weld quality is judged to be structurally adequate.

Response:

The weld on damper VS-D-40-1F lacks cleaning or grinding for improved appearance, and consequently presents a rough profile. The SCEs noted this, but considered the amount of weld and the light loading imposed by the damper, in the conclusion that the weld was structurally sufficient. Enclosure 8 provides documentation of an independent inspection of the weld by the Supervisor of Materials and Standards which confirmed the SCE's judgment.

4. In Table 5-3, it appears that the brief discussion and resolution of the outliers do not provide adequate information in characterizing the deficiencies and for evaluating acceptability of the proposed or implemented modifications. This observation is applicable to over 200 caveats listed in Table 5.3. It is expected that, as GIP-2 specifies, the deficiencies and modifications have been thoroughly documented to allow an independent review. Provide documentation regarding the resolution of the outliers for equipment BAT-1, FCV-RC-455C1, FR-MS-478, HCV-CH-389, INV-VITBUS-1, PCV-RC-456, PNL-AMSAC, PNL-PR-HTR-A, RK-VS-E567, TRANS-1-8-N1, TV-CH-200A, VS-AD-9, VS-AFD-5, VS-D-4-8A, VS-F-57A, and WR-P-1A.

Response:

The summary report outlier descriptions, Table 5.3, were made as complete and concise as space permitted. Expanded descriptions were included on pages 21 through 25 of the report. Many of the outliers resulted from strict and conservative application of the GIP-2 guidelines. Numerous fixes included "further analysis," which is intended to indicate that conventional analysis for pipe stress, deflection, or natural frequency would be performed. The Summary Report also made reference to specific qualification records, previous modification records, or details of simple fixes when these were known.

DLC does intend to make use of the experience database being maintained by EPRI (see SSER-2, I.3.0), when it can be justified. The current GIP-2 limit often resulted from the simple fact that certain sizes of equipment happened not to be used in the plants visited during the collection process. Since the issuance of GIP-2, many more earthquake site visits have been made by SQUG using the same assessment procedures. These visits have expanded the experience data base to include more equipment that has been shown to be seismically rugged. This information will be submitted to the NRC for review and approval if it is used.

Enclosure 9 provides the Outlier Seismic Verification Sheet (OSVS) forms for the equipment items specifically addressed above, and additional information for this equipment is also provided below.

a. BAT-1: As stated in Table 5.3, the batteries are heavier than the GIP-2 caveat limit - 600 lbs vs. 450 lbs. The batteries are seismically qualified, nuclear-grade, replacement, double cell units manufactured by Exide (most recently Yuasa-Exide). The battery support racks were analyzed and modified in 1987 to accept the Exide batteries as replacements for the original Gould units. The current battery cells were installed in 1996, and are the same EXIDE model with an improved, qualified, post design. All other aspects of BAT-1 and BAT-2 were satisfactory per the GIP-2 (interaction, anchorage). Based upon the current qualification documentation these outliers are considered closed. Additional information on battery chargers from the Supplemental Database Information furnished by EQE International is provided by Enclosure 2.

b. FCV-RC-455C1: This valve is mounted on 1/2" diameter copper air supply line, and appears to be satisfactorily supported because of its small size. As discussed in Item 3.d, above, the valve is a hybrid manual-check valve. Its overall length is 3 11/32" and height is 2 13/16". The valve is an outlier because Equipment Class 07 does not include line sizes smaller than 1" (Caveat 4), and the concern that valves with extended operators on small lines may overstress the piping. The valve's eccentricity of 2 13/16" does not justify such a concern. However, since the caveat does allow resolution by way of pipe stress evaluation, the copper tubing for FCV-RC-455C1, C2, D1, & D2 will be analyzed.

c. FR-MS-478: This recorder was included in the group of strip chart recorders discussed in Item 3.e (FR-MS-478, 488, and 498), as being included (rule-of-box) with the control room control panels and cabinets, but not being supported as described in their original qualification documentation (see Enclosure 9, Benchboard OSVS). However, unlike the recorders lacking rear support, this recorder is on top of the Benchboard and is fully supported throughout its length. Since this differs from the rear support configuration, it was also considered an outlier. The testing that was done for DLC, showed that the recorders were qualified as cantilevers (typical for recorders), which clearly envelopes the full-length support configuration. Consequently, FR-MS-478, 488 & 498 outliers are considered closed.

d. HCV-CH-389: This valve was considered an outlier because:

- it is mounted on a 3/4" diameter line, whereas the GIP-2 Equipment Class 07, Caveat 4, does not include valves on lines smaller than 1" diameter. The caveat states that this is a concern due to the effects an extended operator may have on the adjacent line stress level. Analysis of pipe stress is the intended resolution.

- it is outside of the bounds of Caveat 5, Figures B.7-1 & 2, operator height-to-pipe diameter, because the experience database does not presently contain 3/4" line

mounts. Review of plant records indicates that the valve is a Westinghouse valve which was designed for a 3.0g horizontal and 2.0g vertical acceleration (E-Spec. 676270), which satisfies the GIP-2's 3g analytical check. This aspect of the outlier is, therefore, considered closed.

e. INV-VITBUS-1: This equipment was considered an outlier because its width at 55 1/2" exceeded the Equipment Class 16 equipment description limit of 40". However, this equipment was installed in 1990 under our design change control program, which included seismic qualification to IEEE-344-75 requirements. All other aspects of the equipment were satisfactory (anchorage, interaction), and this outlier is considered to be closed.

f. PCV-RC-456: This valve was considered an outlier because:

- it is outside of the bounds of Equipment Class 07, Caveat 5, because the experience data base does not presently contain valves of this size. Review of plant records indicates that the valve is a Westinghouse valve which was designed for a 3.0g horizontal and 2.0g vertical acceleration (E-Spec. 676270), which satisfies the GIP-2's 3g analytical check. This aspect of the outlier is considered closed.

- it has a minimal clearance between an air line and an adjacent support component. While the tubing in question is a relatively sturdy section consisting of a tee and adjacent fittings, DLC intends to resolve the outlier by rerouting the tubing.

Note: The second outlier issue was inadvertently omitted from Table 5.3 of the Summary Report. This outlier issue was documented on the OSVS (refer to the copy provided in Enclosure 9). In addition, two (2) concerns for PCV-RC-455D were also inadvertently omitted from Table 5.3. These issues were: (1) the actuator flange edge is 1/16" to 3/4" clear of a spring hanger rod/can; and (2) a 1" diameter stainless steel line has limited flexibility. The OSVS on file identified these two issues, and is the formal documentation of the outlier status for this valve. The deficiencies in the Summary Report were identified during the preparation of this response. DLC will include the closure of these outlier issues in the Completion Report.

g. PNL-AMSAC: This panel was made an outlier because it contains programmable controllers, which must be evaluated separately. DLC intends to use the new experience based equipment class guidance issued in draft form June 19, 1996. Based upon DLC review of the criteria, no problems are anticipated with its use. Anchorage and interaction were all satisfactory. The panel will be walked down again to verify that the equipment class guidance is met. The new equipment class guidelines are proprietary to EPRI, and will be made available to the NRC through SQUG.

h. PNL-PR-HTR-A: This panel was considered an outlier because its size (64"h x 44 1/2"w x 10"d) exceeds that which is currently included in the SQUG experience data base for Equipment Class 14, Distribution Panels (40"x40"x12"). It is a wall-mounted, sturdy,

nearly empty distribution panel. While the OSVS refers to a qualification record, this panel and the B, D & E panels are candidates for use of an expanded equipment class search within the experience database. Justification for use of such data will be submitted to the NRC for review and approval. It should also be noted that Equipment Class 14 includes free-standing switch boards of 90" height, 20"- 40" width, 20"-40" depth, which would have much greater flexibility and yet were found to function well.

i. RK-VS-E567: This panel was considered an outlier because:

- it had two (2) rigid conduits connecting it to an adjacent panel, which the SCEs felt resulted in undesirable interaction. The conduits have been replaced with flex conduits, and this aspect of the outlier is considered closed.

- the clearance between the panel and an adjacent pipe support is tight. No essential relays or contactors reside in the panel. The pipe support will be modified to resolve this outlier.

- the 5/8" diameter copper air tubing is supported within the panel, but not for some distance outside of the panel. A clamp will be added at the panel face to resolve this outlier.

j. TRANS-1-8-N1: As explained in the Summary Report, four (4) transformers were made outliers because of the need to determine whether the coils' lack of top bracing (Equipment Class 04, Caveat 4) results in overstresses in their supports. An analysis was performed which confirmed that the coils were adequately supported and that the base was adequate to resist weak-way bending. These transformers will be reinspected to confirm the drawing details used in the analysis.

k. TV-CH-200A: This valve is an outlier because:

- it is outside of the current experience data base, as defined by GIP-2 Equipment Class 07, Figures B.7-1 & 2. The valve was manufactured by Masoneilan for Westinghouse who retains the purchase order files. Westinghouse typically specified 3g/2g valve designs, as previously noted. DLC intents to obtain the original qualification documentation which will satisfy the GIP-2 option of a 3g yoke check.

- the valve yoke is connected directly by a support to a wall; the pipe is also supported about seven (7) feet distant to the same wall. The arrangement generally satisfies Caveat 7 regarding such supports being near to one another and attached to the same wall, but the yoke will be checked for seismic inertial and operation loads.

l. VS-AD-9: As noted in the Summary Report, this damper was made an outlier because no GIP-2 equipment class existed to use in evaluating its seismic capacity. This is true of all of the 51 dampers included in the SSEL and outlier list, Table 5.3. The dampers were walked down to inspect for interaction or obvious deficiencies, and Maintenance Work Requests

(MWR) were written accordingly. SQUG has issued new equipment class guidelines for dampers (dated June 19, 1996), and these guidelines will be used to resolve the damper outliers. A review of the criteria and selected dampers indicates that there should not be issues encountered beyond those already identified. The SQUG damper criteria is proprietary to EPRI, and will be made available to the NRC through SQUG.

m. VS-AFD-5: This damper was identified as an outlier due to not having GIP-2 guidance for dampers, and because the damper's drive rod rubs a conduit as the rod moves. A conduit clamp was also missing, which has since been installed. The conduit will be relocated to resolve this outlier.

n. VS-D-4-8A: As noted in the Summary Report, this damper was made an outlier because:

- no GIP-2 equipment class existed to use in evaluating its seismic capacity. This is true of all of the 51 dampers included in the SSEL and outlier list, Table 5.3. SQUG has issued new equipment class guidelines for dampers (dated June 19, 1996), and these guidelines will be used to resolve the damper outliers. A review of the criteria and selected dampers indicates that there should not be issues encountered beyond those already identified. The SQUG damper criteria is proprietary to EPRI, and will be made available to the NRC through SQUG.

- the dampers were walked down to inspect for interaction or obvious deficiencies. This damper had a pipe, which carries water to an air conditioning unit, located 5"- 6" from it. The pipe run is long, straight, and rod-hung. This means that while it can swing to some degree, its low response frequency will likely minimize acceleration, and impact would be low. Discussion with the SCEs indicated that damage potential appeared to be low. However, the pipe will be analyzed to estimate seismic-induced deflection versus the 5"- 6" clearance.

o. VS-F-57A: This fan is wall mounted in the Intake Structure, inside the pump cubicle, near the underside of the roof slab. The ARS for this structure is for the floor slab elevation, not the ceiling. The fan is an outlier since comparison to the Bounding Spectrum (BS) could not be performed. No other concerns exist for the fan. DLC intends to research our records further to determine what ARS level was used at this building elevation in order to establish a basis for comparison to the Bounding Spectrum.

p. WR-P-1A: This pump was made an outlier because:

- the submerged seismic support had not been inspected by SCEs. The "B" unit has since been inspected, including wall anchor tightness checks; the "A" & "C" supports will be inspected when the bays are drained and cleaned.

- the 3% damping instructure response spectrum (IRS) exceeded the 1.5BS curve. However, the 5% damping 1.5BS curve was used, which is excessively conservative.

The 1.5BS at 3% damping does bound the 3% damping IRS, so that this part of the outlier is resolved.

- its discharge column exceeds the Equipment Class 06, Caveat 2, cantilevered length limit of 20 ft. below the pump's base flange. The limit results from not having longer pump columns represented in the experience data base. The WR-P-1A pump column's length is 60 ft. overall, with the bottom 17 ft cantilevered below the last seismic support. A review of the experience data base identifies only one occurrence of failure, which was a pump column directly supported by earth (not in a bay). The earth shifted, permanently deforming the column and causing the shaft bearings to fail. Such permanent deformation is not credible for WR-P-1A, B or C. Furthermore, a seismic analysis of the pump does exist which determines its column's response frequency to be 0.975 Hz. (low), without water damping effects. The resulting acceleration level would be 0.55g, although the analysis conservatively used 1.54g horizontal and 1.03g vertical peak spectral acceleration (PSAs). All stress levels were elastic and acceptable, but no specific check of bearing loading was included. A simplified check of bearing loading and impeller deflection will be made.

5. Section 5.3.1.5 of the reference report states that the BVPS-1 air supply system is not seismically qualified for functionality. The resolution provided in Table 5.3.1.5 shows that there are seven air-operated valves (i.e., FCV-CH-122, FCV-FW-103A and B, HCV-MS-104, PCV-MS-101A, B and C) that require operator actions for use in the SQUG safe shutdown. Clarify how these operator actions could be performed within the allowable time frame and in a hazardous or unfamiliar environment.

Response:

Regarding timely and credible (non-hazardous) operator action to control AOVs that suffer the loss of air supply, the seven (7) AOVs which require operator action are located in three (3) separate plant locations. Procedures exist to either perform the manual operation or use alternate (qualified) means to accomplish the desired control. DLC believes that several operators can easily position the valves as required in a timely fashion using the existing procedures. Regarding adverse plant conditions affecting the operators' performance:

- Portable lighting is available if normal and emergency lighting is disabled by the earthquake.

- Concrete block walls were evaluated per the requirements of IEB 80-11, and also by review of Information Notice 87-67 concerns. Modifications to CBWs were made for IEB 80-11 as necessary to assure structural integrity. Actions included removal of significant load-inducing equipment and pipe supports, and the addition of bracing to several walls. The IEB 80-11 program and results were submitted for NRC review. Subsequent modifications to CBWs have been evaluated and strictly limited.

- Large scale, seismically-induced, structural failures are not credible for a nuclear power plant. Neither are fires and flooding natural consequences of a seismic event for a nuclear power plant.

DLC believes that significant changes in plant environment will not occur, and consequently, operators will have adequate access to the areas required for their actions.

DLC will evaluate the addition of an SSEL use (SQUG) shutdown scenario into operators' simulator training program upon receiving final NRC approval of the SSEL.

6. Section 8 of the reference report states that "the unresolved outliers will be prioritized as to their safety significance and scope. If modifications are required, the implementation of modification and replacements will be scheduled during one of the next three BVPS-1 refueling outages." Discuss how the unresolved outliers will be ranked considering their safety significance and scope. Provide the results of the prioritization analysis, an actual schedule for completion of the outlier resolution and an assessment of the impact on plant safety in consideration of the proposed schedule for resolution.

Response:

A basic premise of the USI A-46 review effort is that it is not the sole means of confirming seismic adequacy; nor is nonconformance with SQUG criteria proof of seismic inadequacy. Where a specific license commitment or safety standard was significantly compromised, the nonconformances were evaluated and appropriately dispositioned. The remaining outliers were each reviewed to confirm the probable resolution approach provided in Table 5.3 of the Summary Report. No additional safety or license issues were found at that time. This review was not a formal analysis since, as noted above, no safety degradation is assumed due to SQUG nonconformance.

Many of the minor fixes were entered into the plant's Maintenance Work Request system and will be resolved as equipment and/or manpower becomes available. The damper outliers resulted from a lack of SQUG guidelines, but had still been walked down for interaction, and will be resolved by application of new SQUG guidelines. Several anchorage edge distance issues require additional torque testing during the next Beaver Valley Unit 1 refueling outage (1R12 scheduled to begin in September 1997), to establish that sufficient margin exists. Lastly, some issues such as relay qualification to current testing standards (9 relay types) present several options, including testing to current standards, justification of existing testing data, or replacement. DLC is presently evaluating these options, with resolution expected by the end of the Thirteenth Refueling Outage (1R13) which is currently scheduled to end in May 1999.

7. In reference to Sections 2.2.1.5 and 2.3 of Attachment 2 to the reference report, the essential relays in the fire protection systems that are neither seismically qualified, nor included in the Seismic Qualification Utility Group (SQUG) data base are listed in Table 2.1-1, as "FIRE PROT. - NO QTR." The report mentioned that these relays/contactors may be qualified by using a data base other than the SQUG data base. If so, identify the

data base and the nature and the extent of the deviation from the GIP-2, and provide justification that the data base is acceptable for such applications.

Response:

Our reference to another qualification data base was to the EQE International data on fire protection systems and their response in earthquakes. EQE does extensive business with insurance carriers on the damage potential of earthquakes, which includes substantial data on what failures fire protection systems experience. DLC intends to qualify essential fire protection contactors through testing, except in cases where experience data can legitimately supplant or supplement testing. If these outliers are resolved through a means other than conventional testing, the basis for the resolution will be submitted to the NRC for review and approval.

8. In Section 2.2, the bad actor relays Westinghouse COM-5, and SG relays and General Electric HGA relays used at BVPS-1 are identified as outliers because of low seismic ruggedness chatter (in accordance with GIP-2 guidance). The section indicated that these relays are used as normally open contacts and, therefore, their seismic capacities exceed the demand level of relays used in that configuration. Provide the seismic qualification data for these relays to demonstrate that these relays have seismic capacity exceeding the seismic demand.

Response:

The Westinghouse SG and COM-5 relays, and General Electric HGA relays, were automatically identified as outliers due to their inclusion in Appendix E of EPRI publication NP-7148-SL. The "Acceptance Criteria," p.3-16 of NP-7148-SL, states that Appendix E relays require a case-specific justification, which per Section 3.7, Item 1, p.3-17, requires more realistic analysis. GIP-2 Section 6.6, Outliers, p. 6-24, repeats this guidance as "Refine the seismic screening requirements and or analysis." Consequently, a consideration of the contact configurations that led to low ruggedness is a first refinement. In the case of the Westinghouse SG, NP-7148-SL, pgs. 6-3 & B-8, or Volume 2, p.4-7, the normally open contacts have an acceptable (and appreciable) capacity of 9.0g PSA/5.4g ZPA. This is precisely the basis for acceptance of our SG relays, which will experience a demand of 2.304g PSA/0.936g ZPA in their application at Beaver Valley.

Likewise, the COM-5 has a single low-ruggedness component, the ITH or ICS-L. EPRI publication NP-7147-SL, Volume 2, Addendum 1, p. 2-2 and Table 2-2, p. 2-6, indicates the ITH, which is present in our COM-5's, experienced no contact chatter for a 3g PSA level (1.2g ZPA). This bounds the expected seismic demand of 2.434g PSA/0.891g ZPA at Beaver Valley. It is also noted that the Time Dial adjustment noted for the tests without high frequency, is said to have had no effect, p. 2-8, top, so that the 3g level is a fundamental capacity level.

The HGA (DC) relay has a substantial seismic capacity in the non-operating/NO configuration (8.8g PSA/3.52g ZPA); NP-7147-SL, p.B-19. This exceeds the expected seismic demand of 2.434g PSA/0.891g ZPA of this configuration.

As described above, the process by which the bad actor relays are classified as outliers, but subject to more detailed review, is consistent with GIP-2 guidance. The more detailed review identified the fact that certain contact configurations have sufficient capacity for our essential applications.

9. Referring to the in-structure response spectra provided in your 120-day response to the NRC's request in Supplement No. I to Generic Letter 87-02, dated May 22, 1992, provide the following information:

9.a. Identify structure(s) that have in-structure response spectra (5 percent critical damping) for elevations within 40 feet above the effective grade, which are higher in amplitude than 1.5 times the SQUG bounding spectrum.

Response:

Beaver Valley does not have any 5% in-structure response spectra (IRS) that exceed 1.5 times the SQUG bounding spectrum (BS).

9.b. With respect to the comparison of equipment seismic capacity and seismic demand, indicate which method in Table 4-1 of GIP-2 was used to evaluate the seismic adequacy for equipment installed on the corresponding floors in the structure(s) identified in Item (a) above. If you have elected to use method A in Table 4-1 of GIP-2, provide a technical Justification for not using the in-structure response spectra provided in your 120-day response. It appears that some USI A-46 licensees are making an incorrect comparison between their plant's safe shutdown earthquake (SSE) ground motion response spectrum and the SQUG bounding spectrum. The SSE ground motion response spectrum for most nuclear power plants is defined at the plant foundation level. The SQUG bounding spectrum is defined at the free-field ground surface. For plants located at deep soil or rock sites, there may not be a significant difference between the ground motion amplitudes at the foundation level and those at the ground surface. However, for sites where a structure is founded on shallow soil, the amplification of the ground motion from the foundation level to the ground surface may be significant.

Response:

DLC used only the Table 4-1, Method B.1, approach; not Method A.

9.c. For the structure(s) identified in Item (a) above, provide the in-structure response spectra designated according to the height above the effective grade. If the in-structure response spectra identified in the 120-day response to Supplement No. 1 to Generic Letter 87-02 were not used, provide the response spectra that were actually used to verify the seismic adequacy of equipment within the structures identified in Item (a) above. Also, provide a comparison of these spectra to 1.5 times the bounding spectrum.

Response:

As stated in the response to 9.a, above, no structures have IRS greater than 1.5BS.

NOTE: Enclosure 10 provides relay work-up sheets for which editorial corrections were made. These sheets were included as Appendix G to the Summary Report.

List of Enclosures

1. Calculation No. 52233-C-019, "Anchorage Evaluation for Various Instruments," 194 pages.
2. Supplemental Database Information furnished by EQE International - Battery Chargers, AOV's, Batteries, 4 pages.
3. Calculation No. 52233-C-004, "GE Switchgear Anchorage Evaluation," 40 pages.
4. Calculation No. 52233-C-017, "Battery Chargers & Inverters Anchorage Evaluation," 49 pages.
5. TER 9294, Rev. 0 & Add 1, Evaluation of substitute anchorage for BAT-CHG-2, 9 pages.
6. Calculation No. 8700-DSC-6545, "Anchorage Evaluation for BAT-CHG-2," 20 pages.
7. VTI 8700-06.046-5, Catalogue data for ASCO Adjustable Flow Control Valve. 2 pages.
8. Memo on VS-D-40-F Welds, 1 page.
9. OSVS Forms, 16 pages.
10. Relay Work Sheets Errata, 11 pages.

ENCLOSURE 1