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Docket No. 50-412

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Mr. J. J. Carey, Vice President
Duquesne Light Company
Nuclear Group
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Dear Mr. Carey:

Subject: Beaver Valley 2 WHIPJET Program - Formal Staff Position and Request for Additional Information (RAI)

On April 10, 1986, we and our consultants met with Duquesne Light Company (DLC) for the third progress meeting on the Beaver Valley 2 WHIPJET Program. At this meeting we presented DLC with positions we have been developing over the course of our review. Based upon the DLC responses at the meeting and the information contained in its draft progress report dated April 10, 1986, we have prepared the request for additional information contained in the enclosure.

The enclosure contains a statement of each of our positions followed by a summary of the information needed to resolve the open items related to these positions. The enclosure also contains additional questions that arose from our review of the draft progress report. We request that DLC respond to this RAI in the revised progress report prior to the next WHIPJET meeting scheduled for May 20, 1986.

The information request effects fewer than 10 respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

/S/

Peter S. Tam, Project Manager
PWR Project Directorate #2
Division of PWR Licensing-A
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: See next page

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ENCLOSURE

POSITIONS AND REQUESTED INFORMATION

1. Subject: Representativeness of plant materials to test materials

Position: a. DLC will verify that the materials in the plant are conservatively represented by the test materials.

b. DLC will catalog the materials available for fabrication into test specimens (ferritic pipe and weld rod). DLC will choose the three heats (pipe and weldment) based on upper and lower bound values of yield and average yield strength. If there is not enough material in a given heat with limiting yield strength (e.g. upper bound value) the matrix of three tests of each heat may be altered in order to use the bounding material, provided the total number of tests is unchanged.

c. DLC will have all the material certifications available for staff review.

d. For the non-nuclear piping in the WHIPJET Program NRC will require that bounding toughness and tensile properties be used in the fracture mechanics analyses to ensure that the evaluation is conservative.

Requested Information: DLC will construct a table of weld and base metal material properties for the nuclear grade piping in the WHIPJET program. The table will also include the vendor and date of purchase of the

piping spool pieces. DLC will expand the table of test materials presented at the April 10, 1986, meeting to include material properties for the weld wire used in the test program.

DLC will discuss the weld fabrication procedures used to fabricate test specimens relative to the procedures used throughout the plant. This discussion should justify that the toughness values of the pipe welds in the WHIPJET Program are not non-conservative relative to the toughness values indicated from the test program.

DLC will propose a method of categorizing material properties for the non-nuclear piping in the WHIPJET Program.

Similarly, DLC will construct tables of austenitic weld and austenitic base metal material properties for piping in the WHIPJET Program. DLC will demonstrate that the austenitic weld and austenitic base metal materials whose fracture properties are quoted from the literature to be used in the WHIPJET Program are representative of the materials in the plant.

2. Subject: Test methods related to development of J-R curves.

Position: a. The staff recommends testing only 6" and 8" pipe rather than including 3" and 4" pipe specimens.

b. DLC will test an uncracked 6" or 8" pipe to verify the assumption that the plastic displacement in the bend tests

are only due to the crack. Span length and other experimental conditions must be the same for cracked and uncracked pipe.

Requested Information: DLC agrees to meet this position as stated. No additional information needed.

3. Subject: PICEP/Leak Detection

Position: a. DLC should define on a system-by-system basis the smallest leak rate that can reasonably be found in a timely manner consistent with their inservice leakage detection method.

b. Unless the licensee provides justification for considering lower leak rate margins, the staff's position is that a factor of 10 must be applied to a. to determine the leakage size crack from PICEP. Item c. contains factors to be considered when providing justification.

c. The staff considers that the following factors contribute to the need for the one order of magnitude safety margin:

1) Computational reliability of PICEP as influenced by parameters such as flaw size and shape and as evidenced comparisons of experimental and analytical results,

2) Uncertainty in stress distributions,

3) Effect of plugging of cracks by corrosion products,

4) Equipment response and human response,

5) Background leakage.

d. Consistent with the position taken in NUREG 1061, Vol. 3, redundancy in leak detection methods will be required. Acceptable methods of achieving redundancy include:

1) mass balance,

2) temperature or humidity monitors,

3) visual inspection,

4) acoustic monitoring, and

5) augmented ISI for ferritic piping.

Requested Information: a. DLC will develop information relative to the Duane Arnold data to demonstrate the effects of system cooldown on the flow rate predictions of PICEP.

b. DLC will evaluate the leak rate from the observed flaw in Duane Arnold using stress report inputs. DLC will demonstrate that the predicted leak rate from PICEP for the Duane Arnold flaw based on the Duane Arnold stress report is consistent with the experience at Duane Arnold.

c. At the May 20, 1986, meeting DLC will discuss their planned methods for complying with position 3.d. on redundancy.

Specifically, DLC should address (1) how leak rate limits will be implemented into plant operation, (2) what actions are required of operators when leaks are observed, and (3) where administrative controls for these activities will be documented.

4. Subject: Susceptibility to corrosion and fatigue

Position: DLC will demonstrate by reference to service experience that the piping systems in the WHIPJET Program are not susceptible to corrosion or fatigue. DLC should document the sources of their conclusions. DLC should also specify the thresholds for corrodants and temperature in the austenitic materials review for corrosion screening.

Requested Information: DLC will expand the discussion on susceptibility to flow stratification induced fatigue to include the reactor coolant system and the residual heat removal system.

NUREGs 0679 and 0691 indicate that there has been service experience of both corrosion and fatigue cracking in the CVCS. DLC should specifically address this concern as it relates to Beaver Valley 2.

5. Subject: Fatigue crack growth analysis

Position: a. DLC will perform as realistic analysis as possible using service level A and B loads. The aspect ratio for the crack in the fatigue evaluation should be 6. The aspect ratio will remain constant throughout the analysis.

Unless otherwise justified the maximum allowable flaw depth is the smaller of

1) 60% of the wall thickness, or

2) the depth at which the plastic zone is equal to the remaining ligament.

b. The length of the fatigue crack must be less than both:

1) the length of the instability thru-wall at $\sqrt{2}$ (N+SSE)

2) 1/2 (instability thru-wall flaw at (N+SSE)).

Comment: DLC indicated that they no longer intend to do ASME Code Section III Class 1 fatigue analysis for Code Class 2 and 3 systems. Rather they will perform Section XI fatigue crack growth analyses for all break locations in the program. This is acceptable to the staff.

Requested Information: a. DLC will indicate whether they will meet this position. DLC will develop additional information to justify the da/dn relationship on page 1 of Section V of the April 10, 1986, progress report.

b. DLC will provide a step-by-step discussion of their procedure for performing fatigue crack growth analysis including a description of the methods used to calculate membrane and bending stress and the associated stress intensity factors.

6. Subject: Ferritic Pipe Behavior Below the Upper Shelf Energy (USE) Temperature

Position: DLC will determine whether there are any ferritic piping systems in the program that will be below USE temperatures when failure from postulated loading (such as SSE) could result in a safety concern. If this is possible, DLC will have to use appropriate fracture mechanics methods and material properties.

Requested Information: DLC indicated in the April 10, 1986, meeting that the piping systems in the WHIPJET Program will always be greater than 200°F when called upon for service. DLC will provide information to confirm that the USE for the SA106GrB piping and the welds in that piping is greater than 200°F.

7. Subject: Positive Displacement Pumps

Position: DLC will determine the systems still in the WHIPJET Program that have positive displacement pumps and will indicate for those pumps how vibration fatigue has been minimized to acceptable levels.

Requested Information: This position is satisfactorily addressed in Section IV.D.2 of the April 10, 1986, progress report.

8. Subject: Fracture Mechanics Computer Program Validation

Requested Information: DLC will describe the methods used to validate the fracture mechanics computer codes intended to be used in the WHIPJET Program.