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August 22, 1984

United States Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. George W. Knighton, Chief
Licensing Branch 3
Office of Nuclear Reactor Regulation

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
Containment Systems Branch Open Items

Gentlemen:

This letter forwards responses to draft SER open items provided by the Containment Systems Branch (CSB). This draft SER material, which was officially transmitted from the NRC to Duquesne Light Company on June, 8, 1984, contains Open Items 166 through 171.

Informal response to all of these open items were transmitted to you on August 17, 1984. All six of the CSB draft SER open items have been addressed.

DUQUESNE LIGHT COMPANY

By E. J. Woolever
E. J. Woolever
Vice President

JJS/wjs
Attachment

cc: Ms. M. Ley, Project Manager (w/a)
Mr. E. A. Licitra, Project Manager (w/a)
Mr. G. Walton, NRC Resident Inspector (w/a)

SUBSCRIBED AND SWORN TO BEFORE ME THIS
21st DAY OF August, 1984.
Anita Elaine Reiter
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

B001
/1

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On this 21st day of August, 1984, before me, a Notary Public in and for said Commonwealth and County, personally appeared E. J. Woolever, who being duly sworn, deposed and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge.

Anita Elaine Reiter
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

JJS/wjs
NR/NRC/CSB/OI
Attachment

bcc: J. J. Carey (w/o attachment)
G. I. Rifendifer "
W. T. Wardzinski "
E. J. Woolever "
R. E. Dougher "
C. E. Ewing "
T. D. Jones "
J. H. Latshaw "
T. P. Noonan "
J. A. Rocco "
R. J. Swiderski "
G. L. Beatty "
E. T. Eilmann "
K. M. Holcomb "
J. Lee, Esq. "
R. E. Martin "
S. L. Pernick, Jr. "
T. J. Zoglmann "
D. E. Burke (CEI) "
R. G. Schuerger (CEI) "
W. T. Keller (NUTEC) "
B. M. Miller (2) (OEC) "
J. Silberg (SPPT) "
C. R. Bishop "
E. F. Kurtz, Jr. (w/attachment)
H. M. Siegel "
R. W. Fedin "
D. Chamberlain (S&W) "
P. RaySircar (S&W)(6) "(3)
T. J. Lex (W) "
S. Phillips (W) "
NCD File "

Draft SER Open Item No. 166

The staff is unable to conclude on the acceptability of the applicant's containment depressurization analysis at this time because the applicant has not stated the barometric pressure used in the analysis. The applicant will be required to discuss and justify the barometric pressure for the plant site. This matter will remain an open item pending the receipt of additional information.

Response:

The plant site barometric pressure used in the BVPS-2 containment depressurization analysis is 14.36 psia. This pressure was obtained by averaging monthly average values for the two-year period of January 1963 to December 1964 from climatological data for Greater Pittsburgh Airport (U.S. Dept. of Commerce, Weather Bureau 1963-1964 Local Climatological Data, Pittsburgh, Pennsylvania, Greater Pittsburgh Airport). The monthly average pressures, which are based on hourly readings, were adjusted from the applicable elevation of the measurements to plant grade (735 ft/msl) using hydrostatic approximation along with monthly average temperatures.

FSAR Section 6.2.1.1 will be revised in Amendment 8 to state the use of the average barometric pressure (14.36 psia) in the containment transient analysis.

Draft SER Open Item No. 167a

The staff's review of the applicant's containment response analysis has included the postulated reactor coolant system and the secondary system pipe breaks, initial conditions, input parameters, and assumptions. However, the methodology used to calculate the mass and energy release rate data for the LOCA and MSLB accident has not been reviewed due to a lack of information (see Section 6.2.ol.3 and 6.2.1.4 of the SER). Therefore, the staff cannot conclude on the acceptability of the applicant's analysis at this time. This will be an open item until further information is provided by the applicant regarding the calculation of the mass and energy release data.

Response:

The methodology used to calculate the mass and energy release rate data for the LOCA and MSLB accident are described in Sections 6.2.1.3 and 6.2.1.4, respectively. As stated in the response to Question 480.7, Amendment 5, the methodology used to calculate the mass and energy release data for the LOCA accident is described in letter NS-TMA-2075 from T. M. Anderson, Westinghouse to J. F. Stolz, NRC, dated April 25, 1979. Westinghouse has responded to the NRC staff's request for additional information (letter from C. Thomas, NRC, to E. Rahe, Westinghouse, dated February 22, 1983) by NS-#PR-2948, dated August 14, 1984.

Draft SER Open Item No. 167b

The mass and energy release rate data used in the sub-compartment analyses were calculated using the SATAN-VI computer progr (WCAP-8306). The acceptability of using the SATAN-VI for this purpose is currently under separate staff review. This matter will remain an open item until such time that pending staff information needs under the Westinghosue Topical Report Review are satisfied.

Response:

The following is the references for the SATAN program used to calculate the sub-compartment mass and energy release rates for BVPS-2:

Shepard, R. M.; Massie, H. W.; Mark, R. H.; and Docherty, P. J., Westinghouse Mass and Energy Release Data for Containment Design, WCAP-8264-P-A, June 1975 (Proprietary), WCAP-8312A, Revision 2, August 1975 (Non-Proprietary).

Section 6.2.1.2 will be accordingly revised to clarify that the SATAN-V version has been employed in the mass and energy release calculations used in the sub-compartment analyses. Refer to the following page change (page 6.2-19) which will be incorporated in a future amendment.

The description of, and justification for, the subsonic and sonic flow model and the degree of entrainment used in the vent flow calculations are given in Section 6.2.1.2.3.2.

In those situations, however, where the component is most vulnerable to a loading induced by the rupture of a pipe not immediately adjacent to the component or where the worst loading results from an overturning moment created by loads away from the break, the Moody choked flow correlation (Moody 1965), with a discharge coefficient of 1.0, is used to yield corresponding high values of flow.

The vent loss coefficients used in the subcompartment analyses depend on the geometry of the particular vent. The values of the total loss coefficients for both forward and reverse flow directions are simply the sum of the head losses for the separate parts of the system. These head losses consist of the following:

1. Contraction and expansion losses are determined as a function of the ratio of the upstream and/or downstream cross-sectional area to the cross-sectional area of the vent.

2. Bend losses resistance is determined by the angle and length of the bend and the hydraulic diameter of the vent.

3. Friction losses, although generally very small are calculated as an fl/d term.

4. Form losses are due to objects in the flow path such as grating, and are calculated based on the methods by Idel'chik (1966).

The previous list of losses are defined specifically by Idel'chik. The values of the loss coefficients used in the subcompartment analyses are given in Section 6.2.1.2.3.3.

The RCS mass and energy release rates are provided by the NSSS vendor for each break. The release rates are computed by the SATAN Program (Bordelon 1974b). The initial BVPS-2 operating conditions are selected to yield the maximum calculated blowdown.

6.2.1.2.3.1 Break Type Definitions and Areas

Two types of breaks are used to analyze containment subcompartments. The first type is a guillotine break, which results in complete pipe separation. A guillotine break which results in a break flow area of two pipe cross sections is called a DER. In some subcompartments, pipe restraints limit the displacement of two broken ends of the pipe so that the break flow area is less than two pipe cross-sectional areas. This type of break is called an LDR. The second type of break is a longitudinal split which is equivalent to a hole in the pipe.

Draft SER Open Item No. 167c

The method used by the applicant to compute the mass and energy release rates from reactor coolant pipe breaks for the containment functional analyses is described in a reference Westinghouse letter that is currently under staff review. At this time, we are not in a position to conclude on the acceptability of the blowdown methodology. This matter will remain an open item pending the completion of the staff's review.

Response:

Further NRC review is required. Refer to parts a and b of this open item.

Draft SER Open Item No. 167d

The applicant has computed the mass and energy release rates for postulated main steam line breaks using the MARVEL Computer Code (WCAP-8843, 1977). However, the mass and energy release data for the MSLB analysis were not documented in the FSAR. The staff has requested this information for review and to facilitate the staff's confirmatory analysis. This matter will remain an open item pending the receipt of additional information.

Response:

As stated in the response to Question 480.8, Amenement 6, this data has been provided under separate cover. This is also indicated in Tables 6.2-47 through 6.2-49, Amendment 5. The letter which transmitted this information is 2NRC-3-097 from E. J. Woolever to G. W. Knighton, dated December 5, 1983.

Draft SER Open Item No. 168a

The design basis values of the differential pressure loads on the reactor vessel cavity, steam generator cubicles, and the pressurizer cubicle are not documented in the FSAR. This will be an open item pending the receipt of additional information from the applicant.

Response:

The design basis values of the differential pressure loads across the walls for the reactor vessel cavity, steam generator cubicles, and the pressurizer cubicle will be provided in September 1984.

Draft SER Open Item No. 168b

The applicant has not provided in the FSAR an analysis of the forces and moments on the reactor vessel due to the differential pressure across the vessel caused by a reactor coolant system pipe break within the reactor cavity. This matter will be an open item pending the receipt of additional information from the applicant.

Response:

Analysis of the forces and moments on the reactor vessel due to the differential pressure accross the vessel for a reactor coolant system (RCS) pipe break within the reactor cavity are described in section 5.4.14.3.1.1. Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (Revision 3) calls for information on the RCS component supports to be provided in Section 5.4.14.

Draft SER Open Item No. 169a

The applicant should further justify the acceptability of 50 percent blockage assumption by specifying the types (and quantity of each type) of insulation used within the Beaver Valley 2 containment and discussing the susceptibility of the insulation becoming dislodged by virtue of its proximity to high energy line piping.

Response:

The BVPS-2 sump design basis of 50% blockage is based on Regulatory Guide 1.82 which indicates that it is a conservative assumption.

As indicated in the response to Question 480.26, draft NUREG-0897 and several other NUREG/CR's conclude that 50% blockage is conservative except for plants having large quantities of fibrous insulation. BVPS-2 has a minimal amount of such insulation.

The responses to Questions 480.2 and 730.1 also address insulation used within the containment. The letter response notes that in the ulikely event of a postulated pipe break, only insulation in the immediate vicinity of the break would be susceptable to becoming dislodged.

Draft SER Open Item No. 169b

The applicant has conducted containment sump model testing at the Alden Research Laboratory but has not reported the results to the staff. The staff has learned, however, that the sump model used differs from the sump design shown in the FSAR. The staff has requested the applicant to provide the results of the Alden sump tests and discuss the significance of the results relative to the performance of the as-built, Beaver Valley 2 sump. This information has not been received. This matter will remain an open item pending the receipt of the Alden test report and an accompanying discussion of the applicability of the results to the as-built Beaver Valley 2 sump.

Response:

The Alden Research Laboratory sump model accurately represents the as-built, BVPS-2 sump, and the test results are completely applicable to its performance. It is a 1:3 scale model of the same design.

Results of the model testing were summarized and discussed in the responses to questions 480.2, 480.25, 440.35, and 730.1. Some of these staff questions requested information on the tests but they did not request the test report and the information submitted was considered to be sufficient. A copy of the Alden test report is enclosed.

The model testing has resulted in several modifications to improve the performance of the as-built sump. The pump inlets have been lowered to improve NPSH margin and several layers of grating have been added over the pump inlets to serve as vortex breakers.

Draft SER Open Item No. 169c

There are several issues in Regulatory Guide 1.82 which the applicant has not adequately addressed, and for which additional information is needed before the staff can conclude on the acceptability of the sump design. In considering the location of the sump within the containment, the applicant should discuss the potential for whipping pipes, high velocity jets of water or steam, or direct streams of water (which may contain entrained debris) to adversely affect the integrity or performance of the sump protective screen assembly. The applicant should also address the acceptability of the water velocity at the fine mesh screen, based on one-half of the available free area to account for blockage. The acceptability of the materials used in the construction of the sump screen assembly, and the inservice inspection requirements for the sump components, as well as the provisions made to facilitate such inspections, should also be addressed.

Response:

The sump screens have been evaluated for those high energy line break effects which require the screen to perform a safety-related function. Using the pipe break design criteria, which consider pipe whip and jet impingement as described in Section 3.6.2, the evaluations show that the sump protective screen assembly would not be adversely affected.

For long term operation at maximum safeguards conditions, the average flow velocity of the sump screen is 0.31 fps based on 50 percent blockage of the screen area. The Alden test report concludes that velocities in the containment are low enough so that reflective metallic type insulation (the type used on most piping in the containment; refer to part 3c of the response to Question 480.2) will settle on the containment floor and will not be carried to the racks. This meets the intent of Regulatory Guide 1.82.

Sump materials have been selected to minimize corrosion. The coarse and fine screens are stainless steel, the trash bars are galvanized grating, and, the main frame members are painted carbon steel. The containment sump will be inspected at least every 18 months. A maintenance surveillance procedure will be employed to verify that the containment sump is free of debris and the sump screens are not damaged in accordance with BVPS-2 Technical Specifications Paragraph 4.5.2 (refer to the responses for Questions 480.2 and 440.35).

Draft SER Open Item No. 170

The applicant has not discussed in sufficient detail the performance characteristics of the actual post-accident hydrogen monitoring system to be installed. Therefore, this will remain an open item pending the receipt of additional information.

Response:

Description of the Post-Accident Hydrogen Monitoring System

the hydrogen analyzer system is designed for continuous operation for the life of the plant. The analyzers operate on electro-chemistry principles. Accuracy is $\pm$ 1% of range. During all normal plant operations and abnormal transients, the hydrogen analyzers are capable of being started at any time by the control room operator. On a loss-of-coolant-accident (LOCA), and the subsequent receipt of a safety-injection signal, the analyzers will automatically begin to sample the containment atmosphere. The containment sample lines are run from the top of the crane wall. In addition to sampling the containment, the analyzers are capable of sampling the suction and discharge lines of the hydrogen recombiners making it possible to monitor recombination efficiency. Control room indicators are provided for displaying the H_2 concentration currently being sampled. Indicating lights mounted next to the indicators identify for the operator which sample source is being monitored. An isolated recorder is also on the main control board to provide trend indication for the H_2 concentration.

Description of Analyzer

Hardware Description

The analyzer consists of two units: a floor standing cabinet mounted in the safeguards area for sample withdrawal, analysis, and subsequent return of sample to containment; and a wall-mounted control panel located in the service building. Controls available to an operator stationed at the remote control panel include:

1) Analyzer off/on/standby switch
2) H_2 concentration and the sample indication
3) Sample pressure and temperature indication
4) Sample source selection/including the capability to scan through the sample sources at an interval determined by the operator (The indicator and recorder mounted on the main control board will indicate at all times which sample source is being monitored.)
5) Alarms for H_2 concentration Hi and Hi-Hi and the various system troubles
6) Calibration controls
7) Keyboards for diagnostic work associated with any maintenance or verification of information

Description of Operation

The analyzer units may be started by any of three methods:

1) Locally at the remote control panel
2) Remotely via a switch mounted on the main control board
3) Remotely via the initiation of a safety-injection signal

Method two or three will override any current analyzer command and immediately cause the analyzer to recalibrate itself, and then to begin sampling the containment atmosphere. The analyzer will not begin to sample the H_2 recombiner suction or discharge lines until an operator manually changes the source sequence at the local remote control panel.

The indicator located on the remote control panel and the main control board receive Class 1E signals from the analyzer. The recorder mounted on the main control board receives an isolated non-Class 1E signal from the analyzer (Train A only).

Analyzers Performance Characteristics

Although the H_2 analyzer is a post-accident monitoring system, the electronics will be "powered-up" during normal plant operations to maintain the system clock which controls the automatic calibrations every 90 days. At LOCA onset, the sample system is automatically powered for continuous operation. Calibration periods are reduced to 30 days at this time.

The sample transport system, in particular the hydrogen sensor assembly, is configured to accept the full containment sample flow at all times. The specific configuration is not sensitive to flow rate, two phase flow, or full liquid flow. In no instance will sensor operation be adversely affected, nor will the ultimate hydrogen concentration measurement accuracy vary as a result of sample flow variations providing a representative gas sample is present during the sample cycle.

The performance criteria are identified as follows:

1) 0-10% $\pm$ 0.1% for the main control board indicators
2) 0-30% $\pm$ 0.3% for the remote control panel indicator
3) 90% response to a step change in less than 120 seconds

Draft SER Open Item No. 171

The staff has reviewed the containment leakage testing program contained in the FSAR and in the response to NRC questions, and finds them acceptable with the following exception. The applicant proposes to exclude certain valves from Type C testing (including the safety injection system penetrations and recirculaton spray system penetrations). The justification for excluding penetrations from Type C testing will be evaluated in conjunction with the staff review of the facility Technical Specifications.

Response:

By letter dated March 22, 1983 from Peter S. Tam, Project Manager, Operating Reactors Branch No. 1, Division of Licensing, to J. J. Carey, Vice President, Duquesne Light Company, Amendment No. 65 to the BVPS-1 License changed the Technical Specifications to waive the need for Type-C testing these valves. The NRC safety evaluation enclosed with the March 22, 1983 letter provides the bases for acceptability. DLC considers the same bases to be applicable to BVPS-2.