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May 30, 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
FSAR Site Analysis Questions

Gentlemen:

Attached to this letter are our responses to the Site Analysis Branch questions (311.5-311.8) forwarded to Duquesne Light Company in your letter dated April 18, 1984. Also attached is the scaled topographical map requested in Question 311.5. It is DLC's intention to include these responses in the next FSAR amendment.

DUQUESNE LIGHT COMPANY

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

TJZ/wjs
Attachment

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Question 211.5 (Section 2.2.2)

Please provide a scaled topographical map which shows the exact routing of the Mobil Oil pipeline southeast of the Beaver Valley site. It appears that the pipeline, as indicated on the U.S.G.S. topographical map "Hookstown, PA," (published in 1954 and photo revised in 1979), could have a break releasing gasoline into the Peggs Run. Peggs Run flows through the plant exclusion area between the bridge and the cooling towers. Figure 2.2-3 (Amendment No. 3) does not show the relationship between Peggs Run and the Mobil Oil Company pipeline offsite.

Response:

The scaled topographical map will be provided under separate cover.

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Question 311.6 (Section 2.2.3) 1.11

Provide an analysis of a postulated rupture of the relocated Mobil Oil pipeline involving a small leak (of the order of a few gallons per hour) that goes undetected. The break should address at least two break locations. First, assume a break at the closest location of the pipeline to the Unit No. 2 diesel generator building. Second, assume a break at a point on the hillside above Peggs Run. Calculate both the thermal flux from burning gasoline and the peak reflected overpressure in the event of ignition of a gasoline vapor cloud for each of the above postulated breaks. 1.12 1.13 1.14 1.15 1.16 1.17 1.18

Response: 1.19

The Mobil Oil pipeline is buried approximately 8 feet below the grade level. In accordance with 49 CFR, Section 195.412, the pipeline route is patrolled at intervals of every 2 weeks by the pipeline owner/operator. The mission of the patrol crew is to detect any visible damage or leaks in the pipeline. The patrol crew is not equipped to detect subsurface leaks in the pipeline that are not visible at the grade level. A small subsurface leak of a few gallons per hour does not possess sufficient driving force associated with it to cause well-up of gasoline to the surface. 1.21 1.22 1.23 1.24 1.25 1.26 1.27

The slow leak also implies that a [therefore] significant portion [in the form of a puddle] is lost by subsurface diffusion and evaporation and it cannot collect. Since a small leak cannot flow as a liquid stream, the gasoline cannot enter Pegg's Run. A small leak, at all locations in the vicinity of BVPS-2 is, therefore, incapable of causing the formation of a gasoline vapor cloud. 1.28 1.30 1.31 1.32

A discharge of few gallons (assume 2 gallons per hour) of gasoline is not even required to be reported to the U.S. Department of Transportation (DOT) since it is not a safety hazard. A 2 gallon per hour leak is equivalent to approximately 1 barrel per day. The DOT requires that leaks over 50 barrels per day or more be reported. 1.33 1.34 1.35 1.36

Even if small leaks were considered a safety hazard to BVPS-2, their consequences are far less in magnitude than discussed in the response to Question 311.7. Therefore, a small leak with undetected discharge of a few gallons per hour of gasoline from the pipeline does not constitute a safety hazard to the BVPS-2 structures. 1.37 1.38 1.39 1.40

NRC Letter: April 18, 1984 1.8

Question 311.7 (Section 2.2.3) 1.11

Provide an similar analysis of a complete double-ended rupture at the locations listed in Question 311.6. Indicate the quantity of gasoline released prior to isolation valve closures. 1.12 1.13

Response: 1.14

A complete double-ended rupture of the pipeline is postulated to occur at: (1) the closest location of the pipeline to a BVPS-2 safety-related structure (diesel generator building), and (2) a location on the hillside above Peggs Run. A double-ended rupture in the vicinity of BVPS-2 will release a maximum of 23,380 gallons of gasoline prior to and after the pumping is stopped. This quantity of gasoline forms the basis of the rupture analysis for both locations. 1.15 1.16 1.17 1.19

1. Double-ended rupture at closest location of the pipeline to the BVPS-2 diesel generator building: 1.21

   The closest distance of the pipeline to the BVPS-2 diesel generator building is approximately 950 feet. The maximum 23,380 gallons of gasoline spilled will be spread over an area of 31,741 sq. ft. Approximately 1,562 lbs of gasoline will vaporize to form a combustible vaport cloud. Since the gasoline vapor-air mixture is unconfined, the combustion of the vapor cloud will be characterized by a subsonic flame front propagation and small pressure changes. The combustion of this gasoline vapor cloud has two effects on the diesel generator building impose an incident pressure and a thermal flux. 1.23 1.24 1.25 1.26 1.27 1.28 1.29

   The incident pressure imposed on the diesel generator building is 0.6 psi, which is equivalent to 2.4 psi reflected pressure. The thermal flux "seen" by the diesel generator building is 2,950 watts/m^2. The calculated value of thermal flux can be compared with the 1,000-1,250 watts/m^2 peak solar flux measured for Albuquerque, New Mexico. The thermal flux generated by gasoline vapor fire/explosion will be short in duration. Therefore, the calculated thermal flux is not a safety hazard to the diesel generator building. 1.30 1.32 1.33 1.34 1.35 1.36

2. Double-ended rupture on the hillside above Peggs Run: 1.38

   A double-ended rupture of the pipeline on the hillside above Peggs Run will release a maximum of 23,380 gallons of gasoline. The terrain topography relative to the location of the pipeline favors the drainage of gasoline directly into Peggs Run. The nearest safety-related structure is the BVPS-2 diesel generator building, located approximately 1,600 feet away from the location. If a gasoline vapor cloud combustion is postulated in this area, the severity of effects (incident pressure and thermal flux) on the BVPS-2 diesel generator building will be far less than that discussed in Question 311.7.1. The run-off of gasoline into the 1.40 1.42 1.44 1.46 1.47 1.48

Peggs Run culvert and accumulation of vapor at the exit end of Peggs Run also present a potential explosion hazard. Therefore, two other cases resulting from this pipeline rupture scenario were considered in the analysis: (1) explosion of gasoline vapor inside the 1,800 feet long section of the Peggs Run culvert and, (2) a vapor cloud explosion at the exit end of the Peggs Run culvert.

Approximately 1,800 feet of Peggs Run flow is through a 15-feet diameter culvert. The culvert is equipped with manhole covers for servicing. These manhole covers could become missiles in the event of a gasoline vapor explosion within the Peggs Run culvert. This accident scenario was investigated in detail.

The "run-up" distance for gasoline vapor detonation is approximately 100 feet. Since gasoline vapor is postulated to be confined in a 1,800 foot long culvert, a detonation was postulated to occur within the Peggs Run culvert. The result shows that the maximum impact range for a manhole cover missile is approximately 70 feet. The nearest safety-related structure (the BVPS-2 diesel generator building) is approximately 600 feet from the nearest manhole. Thus, manhole cover missiles generated by a gasoline vapor explosion within the Peggs Run culvert are not a safety concern.

Peggs Run flows into the Ohio River. A double-ended rupture of the pipeline on the hillside above Peggs Run will result in gasoline eventually draining into the Ohio River. The gasoline vapor could accumulate within the Peggs Run culvert as well as at the exit end of Peggs Run. Therefore, a gasoline vapor explosion at the exit end of Peggs Run was postulated to occur, although formation of a combustible mixture is less likely than within the culvert. The results of this analysis show that the incident pressure imposed on the diesel generator building is 0.7 psi, which is equivalent to 2.8 psi reflected pressure. The thermal flux imposed on the diesel generator building is 2,704 watts/m^2. Again, tne calculated thermal flux can be compared with the 1,000-1,250 watts/m^2 peak solar flux measured for Albuquerque, New Mexico. As noted previously, the thermal flux generated by a gasoline vapor fire/explosion will be short in duration. Therefore, the calculated thermal flux is not a safety hazard to the diesel generator building.

Finally, certain conservatisms in the analysis of the pipeline rupture scenarios should be noted. In all calculations, the effects of pressure and thermal flux were assumed to be transmitted along the straight line of sight to the target (the diesel generator building). In reality, the effects of incident pressure and thermal fluxes would be considerably attenuated by the favorable terrain topographic features of the BVPS-2 site. For example, the effects of pressure and thermal flux is reduced for a gasoline explosion at both sites discussed earlier. When an explosion is centered at the nearest site to the diesel generator building, the elevated Route 168 platform blocks the direct line of sight. Similarly, when the explosion is centered at the exit end of the Peggs Run culvert, the depth of the Peggs Run ravine blocks the direct line of sight.

Furthermore, the calculation does not take credit for loss of gasoline through ground absorption or loss due to runoff.

Thus, the results presented are based on highly conservative assumptions. The rupture of the pipeline in the vicinity of the BVPS-2 site is, therefore, not a safety hazard to the plant structures.

Question 311.8 (Section 2.2.3)

The FSAR indicates that only gasoline, kerosene, and heating oil are being transported through the Mobil Oil pipeline. Indicate what provisions have been made to prevent liquified petroleum gas from being transported in this pipeline through the Beaver Valley exclusion area.

Response:

Mr. Ancel Bell of the Mobil Pipeline Company (Mobil Pipeline Company 1984) confirmed that the Mobil Pipeline Company has no plans to put this line into LPG service.

Reference:

Mobil Oil Pipeline Company 1984, letter from Bell A. D.
Mobil Oil Pipeline Company to Washabaugh, R. J.
Duquesne Light Company, dated May 14, 1984

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