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AUTH.NAME AUTHOR AFFILIATION
CURTIS,N.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
YOUNGBLOOD,B.J. Licensing Branch 1

SUBJECT: Forwards responses to NRc concerns on transportation incidents in vicinity of facilities.

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NORMAN W. CURTIS
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March 27, 1981

Mr. B.J. Youngblood
Licensing Branch 1
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Susquehanna Steam Electric Station
Transportation Information
ER100450 File 841-2
PLA-694

Docket Nos. 50-387 and 50-388

Dear Mr. Youngblood:

Attached are copies of responses to your concerns on transportation incidents in the vicinity of Susquehanna.

Very truly yours,

N.W. Curtis
Vice president-Engineering and construction-Nuclear

cc: R.M. Stark

bcc: N.W. Curtis
W.E. Barberich
B.A. Snapp
C.T. Coddington
R.J. Shovlin

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Question 2

In order to determine if Class I structures at the Susquehanna SES must be designed to withstand the impact of fuel truck accidents on the township roads adjacent to the site the potential risk is compared to a probability of occurrence of 1×10^{-7} per year[1]. This determination requires information on the frequency of fuel deliveries on these roads per year, the probability of truck accidents, the probability of explosion per accident, the pressure generated by an explosion and its impact on Class I structures.

PP&L contacted the local fuel oil and propane distributors to determine the frequency of fuel deliveries made on the township roads adjacent to the Susquehanna SES. It was determined that during the heating season that there was a maximum of 9 fuel oil and 9 liquid propane deliveries per month on T438, of 2 fuel oil deliveries per month on T419 and of 6 fuel oil deliveries per month on T486. PP&L assumed that these maximum monthly deliveries continued over a six month heating season. With this assumption, there are 54 fuel oil and liquid propane deliveries per year on T438, 12 fuel oil deliveries per month on T419 and 36 fuel oil deliveries per month on T456.

According to a study done for the Maritime Administration[2] the accident frequency of tank truck accidents resulting in a spill is approximately 2.7×10^{-8}/per mile of road traveled per year.

The Susquehanna SES is located in Tornado Region I and its Class I structures are designed to withstand a dynamic wind pressure of 2.3 psi. In section 2.2.3.1.2 of the SSES-FSAR, the overpressure resulting from the explosion of a 10,000 gallon propane tank truck was evaluated using the method described in Regulatory Guide 1.9.1[3]. This overpressure was extended to estimate the distance at which 1 psi would be felt as a result of this accident. The resulting distance is approximately 3,300 feet. A similar analysis was performed for the potential overpressure resulting from a fuel oil explosion both within the tank of the tank truck and from the spreading spill of fuel from a ruptured tank both of these analysis resulting in far lesser explosions than resulting from the propane explosion.

The probability of an explosion resulting from tank truck spill of flammable liquid is 0.0113, based upon a study of accident reports done by the U.S. Department of Transportation[4]. During a period July 1973 to December 1975, there were 442 spills of flammable liquids from tank trucks of which 5 resulted in explosions. It should be noted that these statistics should be quite reliable because since July, 1973, federal law has required the reporting of all unintensional spills of hazardous materials. These incident reports also included classification according to the results of the spills.

The accident probabilities for these township roads are as follows:

1) T419, adjacent to the site on the north.

Trips/year	x	accident probability/mi/yr	x	explosion probability	=	Probability/mi/yr
1.2×10^{1}		2.7×10^{-8}		1.13×10^{-2}		3.7×10^{-9}

2) T438, adjacent to the site on the west.

Trips/year	x	accident probability/mi/yr	x	explosion probability	=	Probability/mi/yr
1.08×10^{2}		2.7×10^{-8}		1.13×10^{-2}		3.30×10^{-8}

3) T456, adjacent to the site on the south.

Trips/year	x	accident probability/mi/yr	x	explosion probability	=	Probability/mi/yr.
3.6×10^{1}		2.7×10^{-8}		1.13×10^{-2}		1.1×10^{-8}

The length of road along which a tank truck explosion could impact a Class I structure was determined based upon the distance from which a 10,000 gallon propane explosion overpressure would be decayed to 1 PSI at a Class I structure. The 1 PSI overpressure distance is approximately 3,400 feet. This is a conservative distance to be utilized for its effect for several reasons including a propane explosion was used for both fuel oil and propane tank explosions, the Class I structures are designed to withstand a 2.3 psi overpressure so a 1 PSI overpressure would have little or no impact on Class I structures and the calculation of the explosive overpressure is conservative. The closest Class I structure to each of the roads is approximately 500 feet, 1,800 feet and 1,430 feet from T419, T438, and T456, respectively. The distances along these roads from a 1 PSI or more would be felt at a Class I structure are approximately 6,000 feet (1.2 miles), 3,200 feet (0.6 miles), and 3,940 feet (0.76 mi.), along T419, T438, and T456, respectively.

The overall probability of a Susquehanna Class I structure being affected by a fuel truck accident along the neighboring township roads are as follows:

	Probability fuel truck & explosion/mi/yr	x	Length of Road to 1 PSI (miles)	=	Probability/year
T419	3.7×10^{-9}		1.2		4.4×10^{-9}
T438	3.3×10^{-8}		0.6		2.0×10^{-8}
T456	1.1×10^{-8}		0.76		8.4×10^{-9}

All of the probabilities of fuel truck impacting any Class I from an accident along the neighboring township roads are for less probable than 1×10^{-7} per year and therefore in PP&L's judgement, these risks are acceptable.

(1) "Evaluation of Accidents," Standard Review Plan, Section 2.2.3, NUREG 75/087.

(2) Arthur D. Little, Inc., "A Model Economic and Safety Analysis of the Transportation of Hazardous Substances in Bulk," report prepared for the U.S. Department of Commerce, Maritime Administration, Office of Domestic Shipping, Washington, D.C., Report No. COM-74-11271, 1974.

(3) "Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plant Sites," Directorate of Regulatory Standards, U.S. Nuclear Regulatory Commission, Regulatory Guide, 1.91, January, 1975.

(4) "Hazardous Materials Incident Reports Form DOT F5800.1, July, 1973, to December, 1975," U.S. Department of Transportation, Materials Transportation Bureau, Office of Hazardous Materials Operations, Washington, D.C.

QUESTION 3

In order to determine if the reactor control room for the Susquehanna SES is designed to meet a postulated hazardous/toxic chemical release[1], an analysis of truck accidents within a radius of five miles of the station was undertaken. U.S. Route 11 is the only major highway within the five-mile radius of the station. Both Interstates 80 and 81 are located outside this five-mile radius and were not considered in this analysis. It was assumed that an occurrence of 1.0×10^{-7} per year was an acceptable risk[2]. The determination requires information on the frequency of hazardous shipments per year along U.S. Route 11, the accident probability per mile per year, reportable hazardous/toxic chemical discharge(s) per year, and the safe distance to the reactor control room.

In a review of both state and federal highway accident statistics, it was impossible to determine the number of shipments traversing U.S. Route 11 in the vicinity of the Susquehanna SES. In addition, most of the non-local traffic use the interstate system (I-80 and I-81) rather than U.S. Route 11. Therefore, to quantify the transportation data along U.S. Route 11, PP&L surveyed in person essentially all manufacturing industries (approximately 60) along the U.S. Route 11 corridor between the Interstate 80 interchange near Lime Ridge, Pa. and the crossing of the Susquehanna River at West Pittston, Pa. This survey included industries within a one-half mile radius on either side of the highway.

Each of the industries in the surveyed area was questioned as to their use of hazardous and toxic materials, the types, amounts, mode of transport, frequency and route. Of the sixty industries there were seven that used hazardous materials and six of these firms knew that transport of their materials was not along U.S. 11 within the five-mile radius. The seventh firm received one shipment per month (12 per year) of hazardous materials but was unaware of the route.

According to a study performed by Brobst[3], the accident frequency of trucks carrying hazardous material resulting in a spill is approximately 1.7×10^{-6} per mile of road traveled per year. In addition the reportable hazardous/toxic chemical discharge per year is 9.3×10^{-3}. The accident probabilities for U.S. Route 11 are as follows:

$$\frac{\text{Trips/year}}{1.2 \times 10^{1}} \times \frac{\text{Accident Probability/mi/yr}}{1.7 \times 10^{-6}} \times \frac{\text{Reportable Hazardous Discharge/year}}{9.3 \times 10^{-3}}$$

$$= \frac{\text{Probability/mi/yr}}{1.9 \times 10^{-7}}$$

Shipments of hazardous materials per month from this one firm include 4-6 barrels of naphtha UM and P grades and 4-6 barrels in total of xylene, toluene or Stoddards Solvent. A naphtha spill was not evaluated because it is a solid and is not an inhalation hazard[5]. Xylene, toluene and Stoddards Solvent have comparable toxicities [5]. However, since the toxicity level of xylene is listed in Reg. Guide 1.78[1] it was used as the critical substance in this analysis. This approximate weight for each shipment of hazardous materials is approximately 5000 pounds.

In Pennsylvania, the vehicle weight limit for large semi-trailer trucks is 72,000 pounds. The approximate truck weight is 40,000 pounds and the maximum weight of hazardous materials would be 32,000 pounds. This weight is used in the calculations for hazardous materials instead of the estimated weight of 5,000 pounds. Under the worst case meteorological conditions (Pasquill F-Stability) using Tables C-1 and C-2 of Reg. Guide 1.78[1], the number of pounds of hazardous materials that require consideration in accident analysis of a type B control room at the Susquehanna SES, at a distance of 0.3 to 0.5 miles is 2,300 equivalent pounds of a hazardous material. From the data provided from these tables for xylene, the equivalent weight calculated was 1,000 pounds. Since the control room is a greater distance than 0.3 miles from U.S. Route 11, hazardous chemical accidents need not be considered.

The overall probability of the hazardous/toxic truck accident along U.S. Route 11 affecting the reactor control room is:

$$\frac{\text{Probability/mi/yr}}{1.9 \times 10^{-7}} \times \frac{\text{Distance to Reactor Control Room}^{(1)}}{0.3} = \frac{\text{Probability/yr}}{5.7 \times 10^{-8}}$$

The probability of a truck accident along U.S. Route 11, containing hazardous materials, affecting the reactor control room is less probable than 1.0×10^{-7} per year, therefore in accordance with Reg. Guide 1.91[2], these risk estimates are acceptable.

REFERENCES

(1) "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," Directorate of Regulatory Standards, U.S. Nuclear Regulatory Commission, Regulatory Guide, 1.78, June, 1974.

(2) "Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plant Sites," Directorate of Regulatory Standards, U.S. Nuclear Regulatory Commission, Regulatory Guide, 1.91, Rev. 1, February, 1978.

(3) Brobst, W.A., "Transportation accidents: How probable?", Nuclear News, May 1973, pp. 48-54.

(4) Rawls, R.L., "Chemical transport - coping with disasters," Chem. & Engr. News, November 24, 1980.

(5) "Dangerous Properties of Industrial Materials," N.I. Sax Editor, 5th Edition, 1979.