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May 12, 1988

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A4.05
QA

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford 3 SES Unit 3, Docket No. 50-382
<u>1988 Survey and Analysis of Toxic Chemicals and Pipelines</u>

Gentlemen:

Louisiana Power and Light Company is required according to Technical Specifications 6.9.1.9 and 6.9.1.10 to perform a survey and analysis of toxic chemicals and pipelines respectively within the immediate vicinity of Waterford 3.

Provided herewith are the results of this survey and analysis. LP&L has concluded based on the survey and analysis that the chemical detection systems at Waterford 3 provide adequate protection in the unlikely event of a toxic chemical release and that the effects of potential explosive sources are bounded by analyses in the FSAR.

The results of the survey and analysis will be included, as needed, in the next annual update of the FSAR.

Please contact me or Robert J. Murillo, should there be any questions concerning this matter.

Yours very truly,

R.F. Burski

R.F. Burski
Manager
Nuclear Safety & Regulatory Affairs

RFB/RJM/tsy

Enclosures: Reports A & B and Engineering Drawing

cc: E.L. Blake, W.M. Stevenson, J.A. Calvo, D.L. Wigginton, R.D. Martin,
NRC Resident Inspector's Office (W3)

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REPORT A

1988 SURVEY AND ANALYSIS OF TOXIC CHEMICALS STORED, PROCESSED, OR TRANSPORTED IN THE VICINITY OF WATERFORD SES UNIT 3

1. INTRODUCTION

Technical Specification 6.9.1.9 for Waterford SES unit 3 requires LP&L to perform surveys and analyses of major industries in the vicinity of Waterford 3 which could have significant inventories of toxic chemicals onsite to determine impact on safety and to submit the results to the NRC at least once every four years. A report of the results of the last such survey and analysis was transmitted to the NRC by LP&L letter W3P84-2152, dated August 9, 1984. A more detailed description is in the WSES-3 FSAR, Section 2.2.3. This report discusses the survey and analysis of toxic chemical hazards as required by Technical Specification 6.9.1.9. The survey and analysis of toxic chemical hazards from pipelines is discussed in Report B.

2. TOXIC CHEMICAL SURVEYS

2.1 Surveys of Local Industries

2.1.1 Participating facilities

The 1983-84 survey of toxic chemicals in the WSES-3 vicinity identified 15 industrial facilities which stored or processed toxic chemicals within a 5-mile radius of the WSES-3 control room. Regulatory Guide 1.78 specifies that sources more than five miles away need not be considered, since such sources are not likely to pose a hazard to nuclear plants. One industrial facility, E. I. Du Pont De Nemours & Co., was omitted from the 1988 survey since all structures on its property are outside the 5-mile radius.

To determine if there are any other industrial facilities with significant sources of toxic chemicals in the Waterford 3 area, the Emergency Preparedness Centers of the Louisiana Parishes of St. Charles and St. John The Baptist were consulted. The area encompassed by a five-mile circle lies within the boundaries of these two parishes. State law requires all hazardous chemicals stored anywhere in the parish to be reported to the parish emergency preparedness center.

The only industry within the five-mile zone not included in the 1983-84 survey which was listed by St. Charles Parish was Big Three Industries. Earlier correspondence, confirmed by a recent telephone conversation with the plant manager, confirmed that the only hazardous materials were non-toxic gases stored at cryogenic temperatures which were nitrogen, oxygen, and argon. Thus, Big Three Industries was not included in the survey.

One additional facility in St. John The Baptist Parish, the Henry Martin Oil Company, was included in the survey, for a total of 15 survey participants, which are listed in Table 1.

2.1.2 Survey questionnaires

Each participant in the survey was furnished with a questionnaire form requesting all the data listed in FSAR Table 2.2-3a, as well as additional information, such as actual storage or processing temperatures. As in the previous survey, information was requested on the maximum quantity of each chemical shipped by truck, rail, or barge. In addition, data was requested on the routes, directions, and frequencies of shipment for each chemical and shipment made. For the convenience of the respondents and to enable a direct comparison with earlier information, available data from Tables 2.2-3 and 2.2-3a of the FSAR was entered on the forms, with instructions for the respondent to update it as necessary.

In addition, facilities near the Waterford 3 site or those whose sites covered an extensive area, were furnished copies of topographical maps including the areas of their sites, and were asked to indicate on the maps the actual location of each storage tank.

2.1.3 Survey results

The facilities producing or storing toxic chemicals within a five mile radius of Waterford 3 are shown in Table One. All of the facilities responded to the survey by providing sufficient information to enable a determination of control room habitability in the event of a toxic chemical release accident. Responses included completed questionnaire forms or other data forms. Storage locations were indicated on topographical maps or plot plans.

The survey results indicate that, with few exceptions, the types and quantities of significant sources of toxic chemicals have either remained the same or have been reduced or eliminated since the last survey, four years ago. The one new respondent, Henry Martin Oil, stores an inventory of 10,000 gallons of gasoline, at a distance of over three miles from WSES-3, not a significant hazard at that distance. Agrico Chemicals reported a new source of 37% hydrochloric acid which was included in the toxic chemical safety analysis.

The Union Carbide Industrial Chemicals plant initially elected not to complete the questionnaire. Instead, Union Carbide furnished copies of the Tier Two Emergency and Hazardous Chemical Inventory report, which complies with the Louisiana Right-to-Know Law as well as with the Federal Title III Superfund Amendments and Reauthorization Act. This report lists hazardous materials, often by a trade name rather than a chemical name. For those materials which could not be readily identified, Material Safety Data Sheets were obtained from the St. Charles Parish Emergency Preparedness Center or from Union Carbide. In response to a subsequent request, Union Carbide supplied data on shipment modes and frequencies, as well as detailed information on those chemicals which required detailed analyses.

2.2 Union Pacific Railroad

The tracks of the Union Pacific Railroad, formerly the Missouri Pacific, pass within approximately 0.45 mile of the Waterford 3 control room. Toxic chemicals transported over these tracks were included in the survey. In 1983, the railroad had been asked to list shipments of toxic chemicals, chosen from a list of about 100 such chemicals, which were transported in the vicinity during the previous year. That data was tabulated and appears in Table 2.2-3b of the current FSAR.

A simpler and a more thorough method of updating the 1983 railroad information was utilized. The Standard Transportation Commodity Code (STCC) Tariff, published by the various regional railroad associations, assigns a seven-digit number, called the STCC code, to each commodity. All hazardous cargo has a STCC code beginning with the number 49. Thus, a list of all 49 series commodities includes all toxic chemicals, in addition to many other materials. The Railroad then prepared a log of all hazardous freight passing between Edgard Station, which is about 5.6 miles north-west of WSES-3, and Dufresne, which is six miles to the southeast. This log, which includes all traffic on this track within five miles of the plant, lists 266 separate commodities. For each commodity, the number of cars passing over this portion of the track in 1987 and the average lading of each car are listed.

3. STATIONARY AND TRANSIENT TOXIC CHEMICAL ANALYSES

3.1 The TOXCHM Computer Program

The hazards to the control room operators posed by postulated chemical release accidents in the WSES-3 vicinity were evaluated using the latest versions of the TOXCHM computer program. This program, which is based on a model described in NUREG-0570 [1], was originally written by the NRC staff to evaluate the impact of a chemical release accident on a nuclear power plant. The model predicts toxic gas concentrations at the control room fresh air intake duct as well as inside the control room following an accident. This model, which was enhanced and expanded, has been converted to an interactive program for the IBM-PC and compatible micro-computers.

3.1.1 Meteorological parameters

A file of meteorological data, including the 49 combinations of stability class and wind speed listed in FSAR Tables 2.3-126 to -132, was constructed for use by TOXCHM. The highest wind speed range listed in the Tables 2.3-126 to -132 has a zero frequency for all classes and was therefore omitted. Summer temperatures were assumed for the sake of conservatism, since the impact of a hypothetical chemical release accident under given conditions of stability class and wind speed increases with temperature. Stability classes E - G were assumed to occur primarily at night. For these cases, the average ambient night time temperature for the summer months, June through August, was calculated by taking the average of the mean temperatures and the mean minimum temperatures for each of these months, using the data in FSAR Table 2.3-33. Since stability classes A - D may occur in the daytime, average daytime temperatures were calculated for those cases by substituting mean maximum for mean minimum temperatures in the process described above. Ground temperatures were assumed to be 10 °C higher than the air temperatures, as in the original NRC TOXCHM program. Night time ground temperatures were assumed to be the same as the ambient air temperatures. The selection of temperatures is conservative, since temperatures for only the summer months were coupled with the annual average joint frequencies.

3.1.2 Joint frequency table

A file containing the annual joint frequencies for the 49 combinations of wind speed and stability class was constructed, using the data in FSAR Tables 2.3-126 to -132. The frequencies for each of the 16 compass directions were normalized to 1. Thus, each value represents the probability of the joint occurrence of that particular wind speed and stability class, assuming the wind is in the given sector.

3.1.3 Response Time of Broad Range Toxic Gas Detector System

A commonly used equation for the response of an electronic instrument, such as the Broad Range Toxic Gas Detection System (BRTGDS), to a step-function increase of the quantity being measured, such as concentration, is:

$$t = t_d - t_o \ln(1 - y/x) \text{ , where} \qquad (1)$$

t = time after start of exposure to concentration x

t_d = delay time of detector (includes transit time of sample)

t_o = characteristic time constant of detector

y = concentration registered by the detector

x = actual (constant) concentration

This equation cannot readily be used to calculate the detector's response to the varying toxic gas concentration that would usually occur following a chemical release accident. However, this function is a solution of the following differential equation:

$$dy = \frac{(x - y)dt}{t_o} \text{ ,}$$

for the special case x = constant, $y(t_d) = 0$. The latter equation is approximated by:

$$y_2 = y_1 + \left(\frac{(x_1 + x_2)}{2} - y_1\right)\frac{(t_2 - t_1)}{t_o}\text{, where}$$

y_1 = the concentration registered by the detector at time t_1
y_2 = the concentration registered by the detector at time t_2
x_1 = the actual concentration at time t_1
x_2 = the actual concentration at time t_2
t_2 = time step immediately following t_1

This equation is embedded in the modified TOXCHM program, called TOXCHMN2.

The constants t_d and t_o were determined by a statistical analysis of performance test data acquired from the vendor, HNU Systems, Inc., on the detectors which are now installed at WSES-3. A fit of the performance test data to equation 1, above, produces values of 4.06 and 6.84 seconds for t_d and t_o, respectively, for the slower of the two instruments. The HNU tests were performed with an instrument pump flow of 6 liters/minute. However, the pump flow is currently adjusted to 3 l/m, which, according to the HNU Instruction Manual, doubles the response time. The values of 13.0 and 13.7 seconds are determined for t_d and t_o, respectively when the transit time through the sampling tube is added to the newly calculated delay time.

3.2 Analyses of Stationary Sources

3.2.1 Chemicals other than chlorine and ammonia

The analyses of postulated accidents involving stationary sources were performed in accordance with the guidance of RG 1.78. First, the distance and direction of the WSES-3 control room from the source were determined from information furnished by the respondent or, in the absence of this data, from Figure 2.2-1 of the FSAR, confirmed by reference to the latest U.S. Geological Survey maps of the area.

If the chemical is detectable by the BRTGD system, the detector threshold, the effective duct travel time, (the travel time in the intake duct between the sampling port and the isolation valve minus the isolation valve closure time), the delay time, and the detector time constant were entered into the TOXCHMN2 program. The BRTGDS is calibrated in terms of acrolein, set to alarm and isolate at a threshold equal to 3 ppm of acrolein, which is equivalent to 1 ppm of isobutylene, the normal reference standard. The threshold concentrations for other gases detected by the BRTGDS were calculated by taking the measured sensitivity of the detectors to the gas in question relative to isobutylene and dividing this value into 1 ppm. For gases that are detectable, but for which sensitivity data was not available, it was conservatively assumed that the sensitivity was 1% that of isobutylene, (the lowest sensitivity listed for these detectors), resulting in a threshold of 100 ppm.

Accidents under all the conditions listed in the meteorological data file for the given wind direction were then modeled. For each case, (if any), that the calculated concentration in the control room exceeded the IDLH, (Immediately Dangerous to Life or Health), level for that chemical by the time the control room operators are assumed to don breathing apparatus, (two minutes after the alarm or after odor detection, whichever comes first), the program extracts the frequency from the normalized joint frequency table for the given compass direction. The control room was considered to be adequately protected in the event of the accident occurring under 95 percentile meteorological conditions, as specified by RG 1.78, if the sum of these frequencies for the postulated accident did not exceed 5%.

3.2.2 Ammonia

Waterford 3 is equipped with dedicated ammonia detectors, with an alarm and trip setpoint of 50 ppm and a response time not to exceed 20 seconds. The operation of these detectors was conservatively and simply modeled as initiating both alarm and isolation 20 seconds after the concentration in the control room fresh air intake reached 50 ppm. Except for this modification, the analyses of the ammonia sources were performed in the same manner as those of other toxic chemicals.

3.2.3 Chlorine

Stationary sources of chlorine were analyzed by the methods specified in RG 1.95, rather than by the methodology previously described. It was ascertained that each chlorine source fell within the limits of Table 1 of Regulatory Guide 1.95.

3.3 Analyses of Data from Union Carbide Industrial Chemicals

3.3.1 Screening tests based on Regulatory Guide 1.78

The Tier Two Emergency and Hazardous Chemical Inventory report prepared by the Union Carbide Industrial Chemicals Division list 242 hazardous chemicals. This list was screened to eliminate those chemicals not capable of posing a hazard to the WSES-3 control room. The first step was to eliminate all chemicals which were solid at ambient temperatures or which had vapor pressures less than 10 torr (mm Hg) at 100 °F.

The second screening test was to eliminate toxic materials on the basis of RG 1.78, Table C-2. Instead of listing the quantity of a given chemical in the largest storage container, the Tier Two report lists the total maximum quantity stored on site in very broad ranges (e.g., 100 to 1,000 lbs, 10,000 to 100,000, etc.) It was conservatively assumed that the largest possible quantity, the upper limit of the indicated range, was stored in a single container. The toxicity of the chemical was then compared, either on the basis of the IDLH value, if listed, the lowest toxic threshold concentration listed by Sax [3], or information in the Material Safety Data Sheet. The toxicity limit was estimated by one of the methods described in NUREG/CR-1741 [4] when toxicity data was not incorporated in the foregoing documents.

The WSES-3 control room satisfies the requirements for Type B for those chemicals which can be detected by the BRTGD system, and for Type C for those chemicals which cannot be detected by the BRTGDS. Part of the Union Carbide plant site is at a distance of 1 - 2 miles from WSES-3, while part is at a distance of 2 - 3 miles. For the purpose of this screening, it was conservatively assumed that all the sources were between 1 and 2 miles away.

Since the worst 5 percentile meteorology for the Waterford site corresponds most closely to a Pasquill stability class G, the amounts in Table C-2 were multiplied by 0.4. The minimum quantity of each chemical that required consideration, according to RG 1.78, was then determined and compared to the maximum amount stored.

3.3.2 Analyses using TOXCHM

For each material that was not eliminated by the above two screening tests, an analysis was performed using the TOXCHM program, as described above. It was conservatively assumed that the tank was located at the nearest location shown on the Union Carbide plot plan, 1.5 miles ESE of the WSES-3 control room, that the maximum quantity on site was stored in a single tank, and that the tank was not diked. If, under these highly conservative assumptions, the chemical was shown not to pose a hazard, as defined previously, it was not considered further.

For chemicals which were not eliminated by the three screening tests above, detailed information, such as that furnished by other survey respondents, was obtained from Union Carbide. These remaining chemicals were then analyzed as discussed in Section 3.2.

3.4 Transient Sources

3.4.1 Data on Transient Sources

Data on shipments of toxic chemicals in the WSES-3 by truck, ship, or barge was obtained from respondents of the survey of local industries. There is only one highway near enough to WSES-3 for a spill of a truck-load of a toxic chemical to pose a hazard to the control room. This highway is Louisiana route 18, which is a local road and does not carry through truck traffic. Therefore, only shipments to or from facilities in the immediate vicinity (i.e., the respondents to the survey) would normally travel on this road.

3.4.2 Analyses of Transient Sources

Transient sources of chemicals transported by truck, barge, or rail in the WSES-3 vicinity were first analyzed in the same manner as the stationary sources. The release was postulated to occur at the point on the road, river, or rail line closest to the plant. A probabilistic risk analysis was performed for those postulated accidents for which the habitability criteria discussed above were not met. The portion of the given transportation route within a five-mile radius of the control room was divided into a number of segments. An accident involving the total loss of lading of a single container was postulated to occur at the center of each segment. The probability that such an accident could cause the concentration in the control room to exceed the IDLH level within a specified time limit was calculated using the data on the joint frequency of occurrence of stability class, wind speed, and direction in FSAR Tables 2.3-126 to -132. An overall annual probability that a particular chemical could pose a hazard to WSES-3 was calculated, using data on the frequency of shipment of that chemical in the WSES-3 vicinity and on national accident statistics for losses of lading for the particular transport mode.

This methodology conforms with the model described in NUREG/CR-3685 [2], while retaining the superior thermodynamic release model embodied in TOXCHM.

4.0 RESULTS

4.1 Analyses of Stationary and Transient Sources

4.1.1 Stationary Sources Other Than Chlorine

Over 130 sources, either stationary sources or transient sources treated as stationary, were analyzed using the TOXCHMN2 program. None of the stationary sources were found to exceed the IDLH level in the control room under 95% percentile meteorological conditions.

4.1.2 Transient Sources

All frequent truck and barge shipments in the WSES-3 vicinity, as defined by RG 1.78, were analyzed. None of these shipments were found to exceed the IDLH level in the control room even if they were analyzed as stationary sources. A few of the chemicals transported on the Union Pacific Railroad could exceed the IDLH level in the control room if treated as stationary sources. These chemical s were analyzed by the probabilistic model described in Section 3.4. These analyses showed that the probability that a toxic chemical frequently transported on this rail line could exceed the IDLH level in the control room is less than 10^{-6} per year.

The model used to perform these probabilistic analyses employed a number of conservative simplifications.

- Exposure to a concentration exceeding the IDLH level would be immediately incapacitating. In fact, the IDLH is defined as a level to which a person can be exposed for 30 minutes without escape-impairing symptoms or irreversable health effects.
- Incapacitation of the operators would not necessarily lead to radiological releases in excess of 10 CFR 100 guidelines. NUREG/CR-2650 suggests a probability of 0.1 for such a consequence.
- The model took no credit for WSES-3 being alerted by the St. Charles Parish industrial hot-line or through other agencies.
- The worst consequences of a release usually occur under low wind speeds; therefore there would be a considerable time lapse between the occurrence of an accident and the arrival of the vapors at WSES-3.

4.2 Stationary Chlorine Sources

The largest stationary chlorine sources in the WSES-3 vicinity are the 500 ton tanks stored at Occidental Chemical in Taft. The WSES-3 control room has already been evaluated with respect to a hypothetical rupture of the nearest such tank, employing the methodology described in Regulatory Guide 1.95. This evaluation was included in the report transmitted to the NRC by LP&L letter W3P85-3154 dated January 24, 1986.

Table 1

Industrial Facilities Storing Significant Quantities of Toxic Chemicals Within Five Miles of WSES-3

Name	Location	Distance[1] and Direction
Agrico Chemicals Co. - Taft (formerly Beker Industries)	Taft	0.6 ESE
GATX Terminals Corp.	Norco	4.4 E
Henry Martin Oil Co.	La Place	3.0 N
Louisiana Power and Light Co.:		
Little Gypsy SES	Montz	0.7 NE
Waterford 1 & 2 G.P.	Killona	0.4 WNW
Occidental Chemical Corporation (formerly Hooker Chemical)	Taft	0.8 ESE
Occidental Chemical Corporation - Taft Ammonia Plant (formerly Occidental Agricultural Products)	Taft	0.9 SE
Shell Chemical Company	Taft	1.3 SE
Shell Offshore, Inc. - Crawfish Gas Plant (formerly Shell Western E&P)	Taft	2.8 ESE
Shell Oil Company (including Shell Chemical)	Norco	2.5 E
Trans-American Refining Corp.	Norco	3.9 E
Union Carbide Industrial Chemicals (formerly Ethylene Oxide/Glycol Plant)	Taft	1.5 ESE
Union Carbide - Linde Division	Taft	1.2 ESE
Union Carbide - Star Plant	Taft	1.5 SE
Witco Chemical Corp., Argus Division	Taft	1.2 SE

[1]Approximate distance specified in miles

REFERENCES

1 Wing, James, 1979: Toxic Vapor Concentrations in the Control Room Following a Postulated Accidental Release. NUREG-0570, U. S. Nuclear Regulatory Commission.

2. Chanin, D. I., A. E. Shiver and D. E. Bennet, 1984: Toxic Gas Accident Analysis Code User's Manual. NUREG/CR-3685, U. S. Nuclear Regulatory Commission.

3. Sax, Irving N., 1984: Dangerous Properties of Industrial Materials, 6th Ed. Van Nostrand Reinhold Co.

4. Smith, Gordon J. and David E. Bennet, 1980: Models for the Estimation of Incapacitation Times Following Exposures to Toxic Gases or Vapors. NUREG/CR-1741, U. S. Nuclear Regulatory Commission.

REPORT B

1988 SURVEY AND ANALYSIS OF PIPELINES AND EXPLOSIVE HAZARDS IN THE VICINITY OF WATERFORD SES UNIT 3

1. INTRODUCTION

Technical Specification 6.9.1.10 for the Waterford SES Unit 3 requires LP&L to perform a survey of major pipelines, greater than four inches in diameter, within a 2 mile radius of Waterford 3, which contain explosive or flammable materials and may represent a hazard to Waterford 3, including scaled engineering drawings or maps which indicate the pipeline locations, and to submit the results to the NRC at least once every four years. This report discusses the survey and analysis of explosive hazards from pipelines as required by Technical Specification 6.9.1.10 as well as the survey and analysis of toxic chemical hazards from pipelines as required by Technical Specification 6.9.1.9.

2. SURVEY

2.1 Survey Methodology

Information on pipelines located within 2 miles of the Waterford 3 Unit was initially obtained from DTC Incorporated of Houston, Texas. This company specializes in producing maps illustrating pipeline locations throughout the United States. The company is a private firm producing pipeline maps for both public and private clients. The pipeline map produced by DTC Incorporated for St. Charles Parish, where Waterford 3 is located, is a 1987 publication.

Utilizing the information obtained from DTC, all companies with pipelines within two miles of the Waterford 3 Unit were contacted. Representatives from each company were contacted by telephone followed with a letter, questionnaire, and accompanying map requesting specific pipeline information. Information requested on the questionnaire for each pipeline included the following:

- Person contacted
- Agency
- Address
- Telephone
- Name or designation of line
- Type of gas or liquid carried
- Pipe size
- Pipe age
- Operating pressure
- Depth of burial
- If the pipeline can carry a different product
- Signature, title, and date of employee validating the above information.

The pipeline companies were also requested to delineate the location of each pipeline on a provided USGS 1:24,000 scale map and to show location and type of isolation valve for each pipeline nearest to the Waterford 3 Unit.

2.2 Survey Results

Questionnaires and maps were sent to seven pipeline companies shown in Table One. All pipeline companies provided the requested information. There is a total of 27 pipelines within 2 miles of the Waterford 3 Unit. Pipeline locations are illustrated in the attached engineering scaled drawing.

2.2.2 Survey Results for Explosive Hazards (Pipelines)

The survey of pipelines within a 2-mile radius of WSES-3 revealed only one new line built since the previous survey. This pipeline is a 16-inch LP&L natural gas line which carries natural gas from the Bridgeline main line to the LP&L Waterford Units 1 & 2.

2.2.3 Survey Results for Explosive Hazards (Industrial Facilities)

No new significant sources of explosive materials were found since the last survey. The current survey provided the exact location of many major sources of hazardous materials in the area. As a result, it was determined that several sources are further away than previously assumed, and consequently pose less of a hypothetical hazard. The ammonia tank at Agrico, mentioned as a possible explosive source in Section 2.2.1.3.3 of the FSAR, is actually 3,600 feet from the nuclear island, instead of 3,200 feet, while the Shell Chemical butene sphere is 7,000 rather than 6,300 feet away.

The most severe hypothetical explosive event involving a stationary tank discussed in the FSAR was a postulated explosion of a tank containing 5.78×10^6 lbs of propylene at Union Carbide. The current safety director at that facility has confirmed that inventories of hazardous materials have been reduced whenever possible, and that no new materials capable of posing a comparable hazard have been introduced.

3. ASSESSMENT

3.1 Toxic chemical pipelines

The only two commercial pipeline companies that operate pipelines carrying toxic chemicals in the WSES-3 vicinity are the Shell Pipeline Co., which has a 6-inch chlorine line that terminates 7500 feet from WSES-3, and the Santa Fe Pacific Pipelines, Inc., which operates two ammonia lines: a 6-inch line that is one mile from WSES-3, and a 4-inch line that is 2600 feet away.

3.1.1 Chlorine pipeline

Performing a log-log extrapolation of the data listed in Table 1 of Regulatory Guide 1.95, it was determined that 2,600 tons of chlorine meet the distance and storage criteria. The amount of chlorine escaping through a six-inch hole in a storage tank under its own vapor pressure at ambient conditions is calculated to be about 46 tons per minute. This calculation assumes single-phase liquid flow, which is much greater than the choked, two-phase flow emanating from a pipe, and takes no credit for isolation or the loss of pressure that such a break would cause. Furthermore, the flow is gradual and thus poses a lesser threat than the instantaneous release postulated by RG 1.95. Even with these conservative assumptions, it would take almost 1 hour for the maximum quantity to be discharged through such a break, giving ample time for notification of WSES-3 by the St. Charles Parish industrial hot-line and for action to shut off the flow by pipeline personnel.

3.1.2 Ammonia pipelines

Hypothetical accidents for the ammonia pipelines were modelled as holes in stationary tanks, four and six inches in diameter, at the nearest distances for the two lines. The flow model, as discussed in the preceding section, is highly conservative for modelling a pipeline break. The four-inch pipe did not exceed the IDLH under 95 percentile meteorological conditions. The six inch line did exceed the IDLH under 95 percentile meteorological conditions. However, this pipeline does not pose a hazard since the earliest time the IDLH concentration is exceeded is 33 minutes after the accident, giving ample time for notification by the St. Charles Parish industrial hot-line.

Additionally, significant conservatism is employed in all the ammonia analyses because of the simple step-function model used in modeling the detector. The detector is assumed to take 20 seconds to respond after the concentration reaches 50 ppm, ignoring the rapid rise of concentration that will accelerate the response. Using a more realistic detector response time of 10 seconds for the 6-inch pipeline rupture, the analysis indicates that the IDLH would not be exceeded under 95 percentile meteorological conditions.

The BRTGDS will also detect ammonia, however, credit for this detection has not been taken.

3.2 Hazard assessment of 16-inch LP&L natural gas line

A simple scoping analysis was performed to assess the effect of a pipe break of the new LP&L natural gas line on WSES-3, employing the methodology used in FSAR Section 2.2.3.1.3.1 for evaluating the effect of a break in the Bridgeline 26-inch pipeline. The nearest isolation valve on the new line is 2,600 feet from the safety-related structures of WSES-3. This line, with a nominal pipe size of 16 inches, was reported to have a maximum capacity of 8.5 x 10^6 scf/hr. The 16 inch pipeline however would normally operate at a much lower rate since it is fed by the 26-inch Bridgeline main line which has a normal flow of 6.5 x 10^6 scf/hr.

The final product of the previous analysis is the calculation of the peak overpressure which would be experienced by safety-related structures at WSES-3. The mass and the dimension of the detonable cloud will be the same as calculated in the FSAR if the same pumping rate is used for the 16-inch line as was used for the 26-inch line. This assumed rate is very conservative, inasmuch as the Bridgeline pipeline feeds the Waterford line.

Figure 2.2-7 of the FSAR presents a curve which relates the overpressure to the scaling parameter, Z. This parameter is calculated by the following equation, which is adapted from the one shown in Section 2.2.3.1.3.1 of the FSAR:

$$Z = \frac{R - r}{M^{1/3}}$$

Z = scaling parameter for determining overpressure

= 32.5

R = distance of pipe break to safety-related structure

= 2,600 feet

r = maximum distance of detonation from pipe break under assumed meteorological conditions

= 1,104 feet

M = equivalent mass of TNT

= 9.76×10^4 lbs

To increase the accuracy of interpolating the curve in Figure 2.2-7 of the FSAR to determine the overpressure, it is noted that the portion of the curve between lines representing 10 psi and 1 psi is very nearly linear. The linear equation representing this portion of the curve can be written as

$$\log p = \log 300 - 1.5 \log Z$$

p = overpressure

= 1.6 psi,

using the value of Z calculated above. This overpressure is compared with that from one of the design basis explosive events discussed in FSAR Section 2.2.3.1.1, namely the explosion of a gasoline tanker on the Mississippi River. For that event, Z = 34.2, not very different from the value of 32.5. To compare the results of the new calculation with the tanker explosion, the overpressure for Z = 34.2 was re-calculated, using the previous equation, and an overpressure of 1.5 psi was obtained. The difference between the value of 1.5 psi and the 1.3 psi given in the FSAR is attributed to individual judgement in reading the graph in Figure 2.2-7 of the FSAR. Thus, the calculated overpressure from a rupture of the new pipeline is not significantly higher than that from the tanker explosion. In any event, the calculated overpressure from a rupture of the new pipeline is considerably less than the 3.0 psi which was calculated in Section 2.2.3.1.2 of the FSAR for the postulated explosion of an LPG truck on Louisiana highway 18.

The pumping speed inside the new pipe would in reality be less than that assumed in this analysis, resulting in a detonable cloud both smaller in spatial dimension, therefore remaining at a greater distance from safety-related structures, and lower in explosive power. It is thus concluded that the potential explosive effects of this new pipeline are bounded by previously analyzed FSAR events.

TABLE ONE

COMPANIES WITH PIPELINES WITHIN TWO MILES OF WSES-3

NAME

Acadian Gas
Pipeline System

Shell Pipe Line
Corporation

Ucar Pipeline
Incorporated

Dow Chemical
USA

Louisiana Power
and Light

Santa Fe Pacific
Pipelines Inc.

Bridgeline Gas
Distribution [illegible]any

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