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MIDDLE SOUTH UTILITIES SYSTEM

March 6, 1985

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Director of Nuclear Reactor Regulation
Attention: Mr. G.W. Knighton
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford SES Unit 3
Docket 50-382
Control Room Envelope

Dear Sir:

The purpose of this letter is to provide the NRC supplemental information regarding the bases applied by LP&L in the evaluation of the Control Room envelope. This letter also provides follow-up actions which will be taken by LP&L.

A. Background and Summary

LP&L was requested 1 March 1985 by the NRC to modify Technical Specification 4.7.6 to include a limit on the allowable makeup air required to maintain the Control Room envelope at a positive pressure of 1/8 inch water gauge. The request was predicated on the fact that two different Control Room envelope air exchange rates were used by LP&L in the evaluation of the Control Room envelope.

LP&L conducted a Control Room envelope air exchange test in accordance with LP&L approved procedure PE-5-004 and Technical Specification 3/4.7.6. The Control Room was pressurized to 0.13 inches water gauge, and a makeup air flow rate of about 190 cfm, equivalent to an air exchange rate of about 0.054 per hour, was measured. The test satisfied criterion e.3 of Technical Specification 3/4.7.6 which requires that the Control Room HVAC be able to maintain a Control Room positive pressure of greater than or equal to 1/8 inch water gauge relative to the outside atmosphere during system operation.

LP&L also, as documented in Section 2.2.3.3.2 of the FSAR, conducted a hazards analysis of airborne toxic chemicals. LP&L used an isolation air exchange rate of 0.012 per hour as a basis to conduct the analysis. While the Waterford Unit 3 Control Room design did not fit exactly the specifications delineated by Regulatory Guide 1.95 for the selection of a Control Room type, i.e. I, II, III, etc., the Waterford Unit 3 Control

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Room most closely approximated a type IV Control Room. A type IV Control Room specifies that an isolation air exchange rate of 0.015 should be used in the analysis.

Accordingly, given the air exchange test results and the analysis documented in FSAR Section 2.2.3.3.1, this letter provides justification for the two different Control Room air exchange rates applied by LP&L.

B. Justification

1. Actual Control Room Envelope Profile

The actual Control Room envelope immediately following a postulated toxic chemical release is expected to be at a net positive pressure and eventually at an ambient condition. Therefore, while Regulatory Guide 1.95 delineates that the Control Room envelope leakage characteristic should be determined by applying the 1/8 inch water gauge test, this provision is not indicative of the actual Control Room envelope profile during a postulated toxic chemical release.

During normal plant operating conditions, the Control Room envelope is maintained at a positive pressure, reference FSAR Section 9.4.1.2.1. Outside air, 2200 cfm, enters an air intake louver located at elevation +62 ft. MSL at the northeast corner of the Reactor Auxiliary Building (RAB). Air, 2000 cfm, is exhausted to the atmosphere from the Control Room through the toilet exhaust fans (E-34) and a conference room and kitchen exhaust fan (E-42). Thus, the Control Room has an air outleakage air exchange rate of about 0.054 per hour.

Additionally, immediately following detection of a postulated toxic chemical release the Control Room envelope would continue to be at a net positive pressure. Following a postulated toxic chemical release detection, the Control Room envelope would automatically be placed in the recirculation mode; therefore, no outside air would be drawn into the Control Room envelope during the toxic chemical emergency. The majority of the Control Room envelope is surrounded by the RAB. As indicated in FSAR Table 6.4-1, leakage between the Control Room envelope and the RAB would be through air locks, which consists of two sets of double doors. However, immediately following a postulated toxic chemical detection, the RAB would be at a negative pressure relative to the Control Room envelope due to operator actions taken in accordance with Off Normal Procedure OP-901-047. This procedure requires the operator to stop the RAB supply fans and to leave the RAB exhaust fans operational. Thus, any leakage between the Control Room envelope and the RAB would be Control Room envelope outleakage. After some period of time, the Control Room envelope would equalize with the RAB.

After a substantial period of time there would be no driving force other than molecular dispersion to cause any toxic gases to enter the Control Room envelope.

In conclusion, based on the Waterford Unit 3 plant configuration and anticipated plant normal operating and emergency conditions, there would be no substantial air inleakage into the Control Room envelope.

2. Postulated Release of Toxic Chemicals

LP&L has previously evaluated the impact of the postulated release of toxic chemicals, reference FSAR Section 2.2.3.3.2 and LP&L letter W3P84-2152. These analyses did not take credit for Control Room isolation, except in the case of chlorine and ammonia. Detectors for these gases have been installed and tested, reference FSAR Section 6.4.4.2. The analysis determined that the probability of Immediately Dangerous to Life or Health (IDHL) levels being exceeded is smaller than 10-6 per year if credit is taken for odor detection.

The analysis of the postulated ammonia releases were extremely conservative, and showed a wide margin of safety in terms of achievable setpoints and response times. Consequently, higher assumed Control Room inleakage would not be expected to pose a problem in case of an accidental ammonia release.

The two potentially dangerous chlorine sources are the Missouri-Pacific railroad and Occidental Chemical Corp. The Missouri-Pacific transports about 1000 tank cars of chlorine per year with an average lading of 87.8 tons, past the Waterford plant. A preliminary analysis indicated that the probability of an accident which could cause potentially harmful chlorine concentrations in the Control Room before the operators could don breathing apparatus is 1.5×10^{-7} per year. This is an extremely conservative analysis, assuming the worst performance of the chlorine detectors, and not taking credit for reduced detector response time due to concentration buildup in the detectors. The actual probability would be less than 10^{-7} per year.

The Occidental Chemical Corp. stores chlorine in 500 ton capacity tanks. A preliminary analysis of the consequences of the rupture of such a tank showed that, if credit for the minimum acceptable performance of the chlorine detectors is taken, and a 200 cfm inleakage rate is assumed, it is possible for IDLH concentrations in the Control Room to be exceeded after one minute and forty seconds following detection. It should be pointed out, however, that this IDLH value (25 ppm) is the upper limit for exposures of up to 30 minutes. The maximum concentration achieved before breathing apparatus is donned is only 50 ppm. Standard toxicological references give 50 or 100 ppm as concentrations that

are dangerous for brief (unspecified) periods of time. The postulated exposure, which is itself a conservative overestimate, should not result in incapacitation of the Control Room operators.

3. Mitigating Physical Factors

The impact of the postulated release of any toxic chemicals would be substantially precluded or mitigated because of the effect of actual physical factors. Some of these physical factors include, for example, the following:

a. Processes would act on the chemical which would tend to reduce the concentrations. These processes would include condensation and dissolution in the atmosphere as well as deposition on the ground.

b. Both source and receptor in the toxic chemical analysis are assumed to be at ground level. In reality the effects of gravity would act on dense vapors from pressurized liquids and tend to reduce the concentration at the 17 meter height of the Control Room air intake.

c. A portion of toxic chemical spilled on the ground would remain there and would not all evaporate as assumed in the toxic chemical analyses. Material spilled on the ground is assumed to evaporate from a pool which has depth of 1 cm. While this conservative assumption eliminates the need for a detailed characterization of the spill terrain, it results in unrealistically large evaporation rates.

4. Emergency Air Supply System

An Emergency Air Supply System for the Control Room is provided to ensure a minimum six hour supply of air for Control Room and security personnel. The system is designed to provide Grade D breathable air, as defined by the Compressed Gas Association standards, at a rate of 6 scfm for each individual. An air storage system with a capacity of 50,000 scf at 2000 psig is provided to maintain a supply of air for use upon demand, reference FSAR Section 6.4.4.2(f).

C. Follow-up Action

LP&L will submit to the NRC by 1 March 1986 a change to Technical Specification 4.7.6 which will specify a limit on the allowable makeup air required to maintain the Control Room envelope at a positive pressure of 1/8 inch water gauge. LP&L will also provide by 1 March 1986 the results of the analysis which will confirm no adverse impact from a postulated toxic chemical release based on a Control Room envelope air exchange rate equivalent to the Technical Specification

allowable makeup air limit. Subject to NRC approval, the Technical Specification change will be implemented prior to startup following the first refueling outage.

Please feel free to contact me or Robert J. Murillo, Safety and Environmental Licensing Coordinator, should you have any questions regarding this letter.

Yours very truly,

K W Cook

K. W. Cook
Nuclear Support & Licensing Manager

KWC/RJM/pcl

cc: E. L. Blake, W. M. Stevenson, R. D. Martin, D. M. Crutchfield,
J. H. Wilson, NRC Resident Inspector Office

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