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MIDDLE SOUTH UTILITIES SYSTEM

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SENIOR VICE PRESIDENT-
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September 21, 1988

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QA

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

SUBJECT: Waterford SES Unit 3,
Docket No. 50-382,
License No. NPF-38
Technical Specification License Amendment NPF-38-88
Broad Range Toxic Gas Detection System and Ammonia System

The purpose of this letter is to request NRC approval for a proposed change to the toxic chemical detection system.

Louisiana Power and Light through the past years has developed a program for the protection of Waterford 3 Control Room operators in the unlikely event of a toxic chemical release. This program consists of physical systems as well as other compensatory measures, such as the Saint Charles Parish Emergency Preparedness Industrial Hot Line. This program in large part was developed based on operating experience.

The Broad Range Toxic Gas Detection (BRTGD) System is a major part of the chemical detection system, and the system has been reliably operating since August 1986. The BRTGD system provides toxic chemical detection for ammonia as well as for other chemicals and thus duplicates the function of the ammonia system. After careful evaluation, LP&L believes that sufficient operating experience has been gained with the BRTGD system to conclude that there is no longer a need to keep both the ammonia and the BRTGD systems operable. The BRTGD system provides equivalent ammonia detection, and thus having solely the BRTGD system for ammonia detection is justified from a safety, regulatory, and cost benefit standpoint.

Particular effort has been expended to assure that equivalent ammonia protection will be provided by the BRTGD system. Testing of the BRTGD system for ammonia detection as well as analyses were performed to assure that equivalent ammonia protection will be provided. The attached safety evaluation provides a detailed discussion of the testing and analyses which were performed. The testing and analyses have demonstrated that the BRTGD system provides equivalent or better ammonia protection than the ammonia detection system.

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Accordingly, LP&L requests approval to delete the ammonia detection system from the chemical detection system and to delete the technical specification for the ammonia detection system. The technical specification bases change is attached as well as a safety evaluation concluding that there is no significant hazards consideration for this proposed change.

Please contact me or Robert J. Murillo should there be any questions regarding this letter.

J.G. Dewease
Senior Vice President
Nuclear Operations

JGD/RJM/smb

Attachments: technical specification bases change & LP&L check no. 08-6304

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

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of	)
	)
Louisiana Power & Light Company	) Docket No. 50-382
Waterford 3 Steam Electric Station	)

AFFIDAVIT

J.G. Dewease, being duly sworn, hereby deposes and says that he is Senior Vice President, Nuclear Operations of Louisiana Power & Light Company; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached Technical Specification Change Request; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

J.G. Dewease
J.G. Dewease
Senior Vice President
Nuclear Operations

STATE OF LOUISIANA)
) ss
PARISH OF ORLEANS)

Subscribed and sworn to before me, a Notary Public in and for the Parish and State above named this 21st day of September, 1988.

Notary Public

My Commission expires at death.

SAFETY EVALUATION
FOR
DELETION OF AMMONIA SYSTEM

1.0 Description of Proposed Change

This is a request to delete the ammonia detection system technical specification, including LCO 3.3.3.7.2 and surveillance requirements 4.3.3.7.2, from the Waterford 3 technical specifications. A corresponding change to technical specification bases 3/4.3.3.7 is also proposed.

2.0 Description of Control Room Envelope Protection

Protection provided to ensure control room operator habitability within the control room envelope is the following: radiological protection, toxic gas protection, emergency air supply system, and other compensatory measures like industry hot line and written emergency procedures. A description of these protective measures is herein provided:

- Radiological Protection:

The Airborne Radiation Monitoring (ARM) System provides information, both locally and in the main control room, for the purpose of maintaining low in-plant personnel radiation exposure in accordance with 10CFR20 and Regulatory Guide 8.8 (March 1977). The ARM system provides information on the airborne activity levels inside the control room outside air intakes and in the event of detection of high airborne activity generates a signal to isolate the normal outside air intakes and start the emergency ventilation system. The detectors also assist operators in picking one of two emergency intakes with the lowest airborne activity levels, thereby minimizing the amount of noble gases entering the control room environment and also minimizing the amount of emergency ventilation system filter loading.

- Toxic Gas Protection:

Toxic Gas Protection is provided by the chlorine, ammonia, and broad range toxic gas detection systems.

Chlorine System:

Redundant chlorine detectors are provided near the Control Room Air Conditioning System normal outside air intake.

Upon detection of chlorine, the control room envelope is automatically placed in the isolated mode. The chlorine detectors are provided with outputs to sound an alarm in the main control room, and chlorine concentration readout is available from the plant computer.

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The sensidyne chlorine detectors have been seismically qualified by Wyle Laboratories. In addition, the chlorine detection equipment has been installed in seismically qualified structures.

Redundant chlorine detectors are powered from independent non-safety-related uninterruptible power supplies which in turn draw power from safety related buses. The loss of power to a detector is annunciated in the control room.

Ammonia System:

Redundant, non-seismic ammonia detectors are provided near the Control Room Air Conditioning System normal outside air intake. The ammonia detectors use derivative gas phase spectroscopy activation.

Upon detection of ammonia, the control room envelope is automatically placed in the isolated mode. The ammonia detectors are provided with outputs to sound an alarm in the main control room and ammonia concentration readout is available from the plant computer.

Redundant ammonia detectors are powered from independent non-safety-related uninterruptible power supplies which in turn draw power from safety-related buses. The loss of power to a detector is annunciated in the control room.

Broad Range Toxic Gas Detection System:

The broad range toxic gas detection system purchased from HNU Systems, Inc., includes two redundant photoionization detectors (PID's), HNU Model 201. These detectors monitor the atmosphere in the Reactor Auxiliary Building (RAB) outside air intake duct and generate a signal whenever the concentration of detectable gases exceeds a pre-set limit.

Upon detection of a toxic gas concentration above the BRTGD system setpoint of 3 ppm (acrolein), the control room is automatically placed in the isolated mode. The BRTGD detectors are provided with outputs to sound an alarm in the main control room, and toxic gas concentration readout is available locally as well as in the control room.

Redundant broad range detectors are powered from independent non-safety-related uninterruptible power supplies which in turn draw power from safety-related buses. The loss of power to a detector is annunciated in the control room.

The photoionizaton gas detector consists of an air pump, a sampling chamber, a high-energy ultraviolet lamp, a pair of electrodes that maintain an electric field across the chamber and associated electronics. The sample atmosphere is drawn from the process stream, the air in the intake duct in this case, and pumped through the sample chamber. As the sample flows through the chamber, it is continuously irradiated by ultraviolet light emitted by the lamp.

In a process called photoionization, a photon of ultraviolet light is absorbed by a gas molecule and one or more electrons are emitted, leaving a positively charged ion. The electric field will cause these electrons to move across the chamber, creating an electric current in the associated circuit.

Ionization cannot occur if the energy of the incident photon is less than the ionization potential of the molecule. The ionization potential, the minimum energy required to ionize the molecule, is the same for all molecules of a given chemical. Each ultraviolet lamp has an energy spectrum that is characteristic for that type lamp, i.e., photons emitted by the lamp have energies that are uniquely distributed over a fixed range. In some cases, none of the photons emitted by a given lamp may have enough energy to ionize the molecules of a particular gas. Such a gas will then not be detectable by a PID equipped with that type lamp. The normal constituents of the atmosphere, nitrogen, oxygen, argon, carbon dioxide, etc. have ionization potentials that are higher than the energies of the lamps in the PID's, and these gases will therefore not be registered by the detectors.

- Emergency Air Supply:

An Emergency Air Supply System for the Main Control Room (MCR) 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 of 17 individuals. 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.

- Other Compensatory Measures:

Other compensatory measures are provided to ensure the habitability of the control room envelope is maintained.

For example, Waterford-3 is a participant in the St. Charles Parish Emergency Preparedness/Industrial Hot Line System. This is a dedicated communication network between St. Charles Parish Emergency Operations Center (EOC) and industries in St. Charles Parish. In the event of an emergency, the affected industry would promptly notify the EOC of the class of emergency, the type of incident and the recommended actions. The EOC will then notify affected neighboring industries.

Additionally, LP&L has in place wri[illegible] procedures to be initiated in the event of a toxic chemical rele[illegible] [illegible]ithin or near Waterford 3. Procedures are also in place coveri[illegible] [illegible]vacuation of personnel.

3.0 Testing of BRTGD System For Ammonia

Tests, utilizing the installed BRTGDS system at Waterford 3, were performed on July 28 and 29, 1988 to verify the capability of the BRTGD system to detect ammonia and the response times of the BRTGD system. Both BRTGD system monitors "A" and "B" were tested.

The following test procedure was used. Certified concentrations of ammonia, in air, were purchased from Lincoln Big Three Incorporated in New Orleans. The ammonia concentrations were provided in three pressurized bottles at a pressure of 2000 psig and at concentrations of 34 ppm, 40 ppm, and 90 ppm, respectively. The ammonia concentrations, one concentration at a time, were injected upstream of the BRTGD rotameter to control the discharge flow to the detector. The BRTGD system times to alarm for monitors "A" and "B" were then recorded. The BRTGD system monitor "A" was tested on July 28, 1988, and the BRTGD system monitor "B" was tested on July 29, 1988.

The test showed that for ammonia concentrations of 34 ppm, 40 ppm, and 90 ppm, the BRTGD system monitor "A" would isolate the control room in 1.90, 1.07, and 0.30 minutes respectively, with an environmental background of 1.2 ppm acrolein. The test showed that for ammonia concentrations of 34 ppm, 40 ppm, and 90 ppm, the BRTGD system monitor "B" would isolate the control room in 0.65, 0.45, and 0.15 minutes respectively with an environmental background of 2.1 ppm acrolein.

3.0 Safety Evaluation

The Threshold Limit Value* (TLV) for ammonia is 50 ppm. The current setpoint for the ammonia system is 50 ppm ammonia. The response time for the ammonia system is 0.33 minutes. The response time for the ammonia system is a fixed constant irrespective of the ammonia concentration, that is, ammonia concentrations less than 50 ppm will not initiate a system response, and ammonia concentrations greater than 50 ppm will cause the system to respond in 0.33 minutes. The BRTGD system response time, however, is a function of the concentration of the chemical being detected. Higher concentration of a particular chemical will cause a faster system response time. Therefore, a direct comparison of the ammonia and BRTGD system cannot be made. However, it can be shown that for low concentrations of ammonia (about 90 ppm), the TLV for ammonia, 50 ppm, will not be reached in the control room envelope and for higher concentrations of ammonia, the BRTGD system will have a faster response time than the ammonia system. Such a comparative evaluation thus demonstrates equivalent or better ammonia protection by the BRTGD system than the ammonia system.

The following equation for computation of a chemical concentration of a controlled volume is used to demonstrate that the TLV will not be exceeded for low concentrations of ammonia:

$C(t) = X * (1-\exp(-Vt)$, where
$C(t)$: is the instantaneous volume concentration
X : is the inflow concentration
V : is the total volume rate change
t : is the time in minutes

* TLVs, Threshold Limit Values and Radiological Exposures and Diseases for 1987-1988, American Conference of Governmental Industrial Hygienist, Cincinnati, Ohio.

The foregoing equation is based on the equation for measuring concentrations provided in Nuclear Chemistry Theory and Applications, G.R. Choppin and J. Rydberg, 1980, formula 17.6b.

The values for the parameters used in the foregoing equation are based on the following.

- The control room envelope has a volume of approximately 220,000 ft^3, reference FSAR Section 6.4.2.2.
- The normal outside air intake flow during the normal ventilation mode is 2200 cfm, reference FSAR Figure 6.4-1.
- The control room isolation valves operate in less than 3 seconds after receipt of a closure signal, reference FSAR Section 6.4.4.2.
- The control room in-leakage is 0.06 volume changes per hour, reference LP&L Letter W3P85-3154, dated January 24, 1986.

The control room envelope volume rate change as a result of air intake and in-leakage is given by:

$$V = \frac{2200}{220{,}000} + 0.001 = 0.011 \text{ volume changes per minute.}$$

The following values of ammonia are calculated assuming that the outside ammonia concentrations of 34 ppm, 40 ppm, and 90 ppm went undetected for 10 minutes:

$$C(t) = 34 * (1\text{-exp } (-0.011 * (10 + 1.90)) = 4.17 \text{ ppm,}$$
$$C(t) = 40 * (1\text{-exp } (-0.011 * (10 + 1.07)) = 4.58 \text{ ppm,}$$
$$C(t) = 90 * (1\text{-exp } (-0.011 * (10 + 0.30)) = 9.64 \text{ ppm.}$$

In fact, using the foregoing equation, even after 63 minutes, the ammonia concentrations in the control room envelope will be half the outside concentration or 17, 20, and 45 ppm, below the Ammonia TLV.

The tests and analysis also demonstrate that for ammonia concentrations greater than 90 ppm, the response times of the BRTGD system monitors will be faster than the response time of the ammonia system. Therefore, the BRTGD system monitors will provide better ammonia detection than the current ammonia system.

5.0 Significant Hazards Consideration

The proposed change shall be deemed to involve a significant hazards consideration if there is a positive finding in any of the following areas:

1. Will operation of the facility in accordance with the proposed change involve a significant increase in the probability or consequences of any accident previously evaluated?

   Response: No.

The BRTGD system provides toxic chemical protection for ammonia. The BRTGD system duplicates the function of the ammonia detection system, and thus the ammonia detection system is not required to protect the control room envelope from an ammonia toxic chemical release. The BRTGD system will isolate the control room before the Immediately Dangerous To Life and Health* (IDLH) concentration for ammonia is reached. The BRTGD system has operated reliably since August 1986. Additionally, technical specification 3.3.3.7.3 requires that the control room ventilation system be maintained in the isolation mode should the required LCO for the BRTGD system not be met. Therefore, the proposed change will neither increase the probability or consequences of any accidents previously evaluated.

2. Will operation of the facility in accordance with the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated.

   Response: No.

   The function of both the BRTGD and ammonia systems is solely to isolate the control room in the unlikely event of a toxic chemical release in the area. The BRTGD and ammonia system do not provide any other protective function. Since the BRTGD system will provide ammonia detection, the deletion of the ammonia detection system will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Will operation of the facility in accordance with the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The ammonia detection system setpoint is currently 50 ppm ammonia. The BRTGD system setpoint is 3 ppm (acrolein) which corresponds to a setpoint of 7.1 ppm ammonia. Tests of the BRTGD system were performed in July 1988, and the tests of the BRTGD system verified the capability of the system to detect ammonia and the response times of the BRTGD system monitors. The test analysis demonstrated that for ammonia concentrations of 90 ppm or less, the TLV for ammonia would not be exceeded, even for the incredible situation where an ammonia release was assumed to be undetected for 63 minutes. The test analyses also demonstrated that for ammonia concentrations higher than 90 ppm, the response times of the BRTGD system monitors would be faster than the response time of the ammonia system. Accordingly, while the BRTGD system has different response characteristics than the ammonia system, the margin of safety would not be reduced, and in fact, the BRTGD system provides better ammonia detection than the ammonia system for higher concentrations of ammonia.

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* National Institute of Occupational Safety and Health (NIOSH) Pocket Guide To Chemical Hazards, U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control, NIOSH, Septemter 1985.

ATTACHMENT A

NPF - 38 - 88

EXISTING

EXISTING

CHEMICAL DETECTION SYSTEMS

AMMONIA DETECTION SYSTEM

LIMITING CONDITION FOR OPERATION

3.3.3.7.2 Two independent ammonia detection systems, with their alarm/trip setpoints adjusted to actuate at an ammonia concentration of less than or equal to 50 ppm, shall be OPERABLE.

APPLICABILIITY: All MODES.

ACTION:

a. With one ammonia detection system inoperable, restore the inoperable detection system to OPERABLE status within 7 days or within the next 6 hours initiate and maintain operation of the control room ventilation system in the recirculation mode of operation.

b. With no ammonia detection system OPERABLE, within 1 hour initiate and maintain operation of the control room ventilation system in the recirculation mode of operation.

c. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.7.2 Each ammonia detection system shall be demonstrated OPERABLE by performance of a CHANNEL CHECK at least once per 12 hours, a CHANNEL FUNCTIONAL TEST at least once per 31 days and a CHANNEL CALIBRATION at least once per 18 months.

EXISTING

3/4.3.3.6 ACCIDENT MONITORING INSTRUMENTATION

The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables following an accident. This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Plants to Assess Plant Conditions During and Following an Accident," December 1980 and NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations." Table 3.3-10 includes Regulatory Guide 1.97 Category I key variables. The remaining Category I variables are included in their respective specifications.

The Subcooled Margin Monitor (SMM), the Heated Junction Thermocouple (HJTC), and the Core Exit Thermocouples (CET) comprise the Inadequate Core Cooling (ICC) instrumentation required by Item II.F.2 NUREG-0737, the Post TMI-2 Action Plan. The function of the ICC instrumentation is to enhance the ability of the plant operator to diagnose the approach to existence of, and recovery from ICC. Additionally, they aid in tracking reactor coolant inventory. These instruments are included in the Technical Specifications at the request of NRC Generic Letter 83-37. These are not required by the accident analysis, nor to bring the plant to Cold Shutdown.

In the event more than four sensors in a Reactor Vessel Level channel are inoperable, repairs may only be possible during the next refueling outage. This is because the sensors are accessible only after the missile shield and reactor vessel head are removed. It is not feasible to repair a channel except during a refueling outage when the missile shield and reactor vessel head are removed to refuel the core. If only one channel is inoperable, it should be restored to OPERABLE status in a refueling outage as soon as reasonably possible. If both channels are inoperable, at least one channel shall be restored to OPERABLE status in the nearest refueling outage.

3/4.3.3.7 CHEMICAL DETECTION SYSTEMS

The chemical detection systems are the ammonia, chlorine, and broad range toxic gas detection systems.

The OPERABILITY of the chemical detection systems ensures that sufficient capability is available to promptly detect and initiate protective action in the event of an accidental chemical release.

The chemical detection systems provide prompt detection of toxic gas releases which could pose an actual threat to safety of the nuclear power plant or significantly hamper site personnel in performance of duties necessary for the safe operation of the plant.

The broad range toxic gas detection system operates on the principle of gas photoionization, and therefore, the system is sensitive to a broad range of gases. The system is therefore sensitive to both atmospheric and chemical composition normal fluctuations affecting the Waterford 3 site. The setpoint

EXISTING