PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, New Jersey 08038-0236

JUN 3 0 2003

LR-N03-0282

PSEG Nuclear LLC

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

CHANGE TO COMMITMENTS REGARDING
CARBON DIOXIDE SUPPRESSION SYSTEM
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

The purpose of this letter is to update PSEG Nuclear LLC (PSEG) commitments associated with the resolution of Carbon Dioxide (CO_2) suppression system deficiencies in the 4160 Volt Switchgear Rooms, 460 Volt Switchgear Rooms and Lower Penetration Area Rooms at Salem Units 1 and 2.

On June 3, 2002, PSEG submitted Special Report 311/02-003 describing the CO_2 fire suppression system as-found non-conforming conditions and proposed corrective actions. Subsequent to this report, a team was formed to address the issues associated with the CO_2 system and develop strategies for final resolution. As part of this effort, PSEG completed an engineering evaluation and operability determination using the guidance of Generic Letter 91-18, Rev 1. This engineering evaluation concluded upon completion of required surveillance testing, the CO_2 suppression system is operable though non-conforming and capable of maintaining sufficient concentration to suppress fires in the affected areas allowing for sufficient time for the on-site PSEG Fire Department to respond and take proper actions. The on-site PSEG Fire Department is an integral part of the Salem Fire Protection Program.

As stated in letter LR-N03-0130, dated March 31, 2003, PSEG Nuclear committed that the non-conforming condition will be terminated upon revision of the CO_2 suppression system licensing basis for Salem Units 1 and 2. PSEG has determined that these changes to the CO_2 suppression system licensing basis requires prior NRC approval. This submittal contains the request and basis for the commitment changes.

Therefore, PSEG is requesting that the licensing basis commitments relating to the CO2 system concentration and volume requirements for the 4160 Volt and 460 Volt Switchgear Rooms and the Lower Electrical Penetration Areas be revised to reflect the results of the engineering evaluation discussed above. The UFSAR for Salem Units 1 and 2 are being revised to read as follows:

A006

"Carbon Dioxide concentration of at least 27.6% for the Switchgear Rooms and Lower Electrical Penetration Areas will be maintained for a length of time sufficient to suppress a fire and allow the PSEG Nuclear Fire Department to respond and take proper actions thus preventing damage to equipment necessary for the safe shutdown of the plant."

"Carbon Dioxide tank volume will be sufficient for one full discharge to the affected areas and retain additional volume to be used as additional partial discharges at the discretion of the responding PSEG Nuclear Fire Department based on their assessment of the situation."

If you have any questions regarding this submittal, please contact Brian Thomas at 856-339-2022.

Sincerely,

John Carlin
Vice President – Nuclear Engineering

Attachments (2)

C Mr. H. J. Miller, Regional Administrator
U. S. Nuclear Regulatory Commission – Region 1
475 Allendale Road
King of Prussia, PA 19406

U. S. Nuclear Regulatory Commission
ATTN: Mr. R. Fretz, Licensing Project Manager – Salem
Mail Stop 08B2
Washington, DC 20555

USNRC Senior Resident Inspector – Salem (X24)

Mr. K. Tosch, Manager, IV
Bureau of Nuclear Engineering
P.O. Box 415
Trenton, NJ 08625

COMMITMENT CHANGE BASIS

Commitment Change Basis

Regulatory Background

The primary objective of the fire protection programs at U.S. Nuclear Power Plants (NPPs) is to minimize the probability and consequences of fires. Fire protection programs for operating NPPs are designed to provide reasonable assurance, through defense-in-depth (DID), that a fire will not prevent the performance of necessary safe shutdown functions and that radioactive releases to the environment will be minimized. Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," April 2001, summarizes the multilevel approach to fire safety. The fire protection DID program has three objectives:

1. To prevent fires from starting.
2. To detect rapidly, control, and extinguish promptly those fires that do occur.
3. To provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

The regulatory framework for nuclear plant fire protection programs (FPPs) is described in a number of regulations and guidelines, including General Design Criterion 3 (GDC 3), 10 CFR 50.48, Appendix R to 10 CFR Part 50, Regulatory Guide 1.189, and other regulatory guides, generic communications (e.g., generic letters, bulletins, and information notices), NUREG reports, the Standard Review Plan (NUREG- 0800) (SRP), and branch technical positions (BTPs).

Salem Generating Station Fire Protection Program

The Salem Generating Station Fire Protection Program has been established to prevent significant fires, to ensure the capability to shutdown the reactors and maintain them in a safe shutdown condition, and to minimize radioactive releases to the environment in the event of a significant fire. The Fire Protection Program implements the philosophy of defense-in-depth protection against the hazards of fire and its associated affects on equipment important to safety by:

1. Preventing fires from starting.
2. Rapidly detecting, controlling, and promptly extinguishing those fires that do occur.
3. Providing protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

The Salem Generating Station Fire Protection Program consists of design features, equipment, personnel, and procedures that provide defense-in-depth protection of the public health and safety.

NFPA No. 12, 1968 Edition, Carbon Dioxide Extinguishing Systems

The Salem Fire Protection System was designed and constructed using the guidance of NFPA 12, 1968 Edition. Certain applicable sections from this document are listed below. Additional commitments were included during the initial licensing of the Salem units and in subsequent correspondence to the NRC.

Section 151. Quantities. The amount of carbon dioxide in the system shall be at least sufficient for the largest single hazard protected or group of hazards, which are to be protected simultaneously.

Section 1512. Where continuous protection is required, the reserve quantity shall be as many multiples of these amounts as the authority having jurisdiction considers necessary.

Section 2232. For deep seated fires, the required extinguishing concentration must be maintained for a sufficient period of time to allow the smoldering to be extinguished and the material to cool to a point at which re-ignition will not occur when the inert atmosphere is dissipated. In any event, it is necessary to inspect the hazard immediately thereafter to make certain that extinguishment is complete and to remove material involved in the fire.

Section 232. Flammable Materials. Proper consideration shall be given to the determination of the design concentration of carbon dioxide required for the type of flammable material involved in the hazard. The design concentration is determined by adding a suitable safety factor (20%) to the minimum effective concentration.

Section 241. General. The quantity of carbon dioxide for deep-seated fires is based on fairly tight enclosures because the concentration must be maintained for a substantial period of time to assure complete extinguishment. Any possible leakage must be given special consideration since no allowance is included in the basic flooding factors.

Section 2422. Flooding factors for other deep-seated fires shall be justified to the satisfaction of the authority having jurisdiction before use. Proper consideration shall be given to the mass of material to be protected because the rate of cooling is reduced by the thermal insulating effects.

General guidelines- In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards.

For commercial nuclear power plants, the NRC is the designated "authority having jurisdiction" for reviewing and approving deviations from NFPA guidelines.

Engineering Evaluation

For Salem, the CO_2 systems are designed to the 1968 Edition of NFPA Standard 12. This version of the standard required a 50% CO_2 concentration for deep-seated fires but did not specify the minimum hold time (soak time) required. NFPA-12 standard, 2000 Edition defines the required CO_2 soak time as 20 minutes. The Salem current licensing basis (CLB) states that 50% minimum CO_2 concentration will be held for 30 minutes, which was documented in PSEG to NRC correspondence dated September 26, 1978. Electrical cable fire suppression test results, documented in NUREG/CR-3656, "Evaluation of Suppression Methods for Electrical Cable Fires", indicated that a CO_2 concentration of 50% was effective in extinguishing fully developed cable trays fires, provided there was sufficient soak time and the room was adequately sealed. Minimum soak times of 10 minutes and 15 minutes were identified for unqualified cables and IEEE-383 qualified cables, respectively.

On March 28, 2003, Engineering Evaluation S-C-FP-FEE-1748, "CO_2 System Operability in Switchgear Rooms and Lower Penetration Areas," was completed to assess the current conditions of the carbon dioxide system in the Switchgear Rooms and Lower Electrical Penetration Areas. This engineering evaluation calculated the carbon dioxide system concentration in these rooms utilizing the initial system testing documents, the carbon dioxide sizing calculations, and the maximum leakage values measured during tracer gas tests. Although these calculations show that the concentration of carbon dioxide in these areas does not achieve or maintain 50% concentration for the required period of time, the concentration achieved was evaluated considering the types and species of combustible materials that are specific to these rooms. This evaluation concluded that sufficient carbon dioxide is available to suppress fires in the affected areas allowing for sufficient time for the on-site PSEG Fire Department to respond and take proper actions. Based upon this engineering evaluation, the carbon dioxide system is being returned from an inoperable/impaired status to an operable but non-conforming condition.

On September 14, 1977, PSEG submitted a comparison of the Salem Unit 1 Fire Protection Program to Branch Technical Position APCSB 9.5-1 Appendix A stating that the CO_2 total flooding systems will meet the applicable requirements of NFPA 12. In response to questions from the NRC, PSEG stated in a letter dated September 26, 1978 that the CO_2 total flooding systems in these areas will be designed to achieve 50% concentration (taking into account leakage during the initial room pressurization and leakage over the hold time) and maintain this concentration for 30 minutes.

The fire protection systems of the Switchgear and Electrical Penetration Areas are designed to rapidly detect, control, and promptly suppress fires. Surface fires are rapidly extinguished if adequate CO_2 concentration is available. Deep-seated fires, as opposed to surface fires, require a sustained suppression time to prevent the fire from re-flashing until it cools. Smoldering solids are extinguished by Fire Department action that typically includes application of water for rapid cooling and removal/reduction of debris. Fire suppression without reflash will be

successful if rapid suppression of open flames occurs and CO_2 concentration is maintained to prevent flaming combustion.

CO_2 fire suppression system operability for 4160V Switchgear Rooms, 460V Switchgear Rooms, and Lower Electrical Penetration Areas were evaluated and documented in detail in engineering evaluation S-C-FP-FEE-1748, CO_2 System Operability in Switchgear Rooms and Lower Penetration Areas. Minimum CO_2 concentrations in each room were derived separately, since in some cases, measured leakages are considerably different and therefore results of evaluations may vary from unit to unit. The minimum CO_2 concentration required for fire suppression system design and current licensing basis was determined and evaluated against what is achieved in each room. In May 2002, tracer gas testing was performed to determine the amount of leakage from the 4160 Volt Switchgear Rooms and Lower Electrical Penetration Areas. As discussed in Special Report 50-311/02-003-00 submitted on June 3, 2002, the leakage measured during the testing was greater than anticipated. This engineering evaluation documents that a design concentration of 27.6% CO_2 is adequate for a time period sufficient to allow the PSEG Fire Department to respond. This 27.6% includes a safety factor of 20%.

It should also be noted that concentration in these rooms during the initial stages of the CO_2 discharge is almost double the 27.6% required concentration and the CO_2 concentration decays over the hold time due to leakage from the room.

The calculated minimum times (conservative based on the highest measured room leakage) to reach a CO_2 concentration of 27.6% in each area are as follow:

Room	Peak CO_2 Concentration		CO_2 Concentration 5-Minutes after CO_2 Discharge		CO_2 Concentration 12-Minutes after CO_2 Discharge		Time after Discharge to Reach 27.6% CO_2	
	U/1	U/2	U/1	U/2	U/1	U/2	U/1	U/2
4160V Switchgear	48.8%	50.8%	46.0%	49.4%	37.1%	44.8%	21 min.	>30 min.
Lower Penetration	45.0%	46.6%	41.3%	44.6%	30.0%	38.2%	14 min.	26 min.
460V Switchgear	54.1%	55.6%	50.1%	53.5%	38.0%	46.8%	20 min.	28 min.

The above concentrations and times were calculated utilizing the amount of CO_2 discharged in the areas during the preoperational tests conducted in February 1974 (Unit 1) and February 1979 (Unit 2), a determination of room volume and the measured air leakage rate determined by the tracer gas testing. Since tracer gas tests were not performed in the 460 Volt Switchgear Room, the highest leakage value measured in the other rooms that were tested was used in calculating the 460 Volt Switchgear Room CO_2 concentration. Tracer gas testing was not performed in the 460 Volt Switchgear Room since the initial pre-operational testing showed that proper concentration and hold time were maintained in this area, but due to the generic implications of the Switchgear and Penetration Area Ventilation (SPAV) system interface, this initial pre-operational

testing was not considered adequate to justify that the 460 Volt Switchgear Room would maintain 50% concentration, as documented in Special Report 311/02-003.

As described in the Salem UFSAR section 9.5.1.1.6, the PSEG Fire Department is an integral part of the Salem Fire Protection Program and consists of full time, dedicated fire fighting personnel with a minimum of five trained fire fighters onsite at all times. At least three of the on-shift Fire Department members are knowledgeable in Salem's safety systems and understand the effects of fire and fire suppressants on safe shutdown capability. The Salem units rely on the highly trained on-site Fire Department for immediate fire suppression response. Based on documented training and training drills, the PSEG Nuclear Fire Department can be relied upon to respond to fire alarms from the Switchgear Rooms or Lower Electrical Penetration Areas and be capable of placing fire suppressant agent on the fire within the time limits analyzed in the engineering evaluation. The response times are documented in procedures and the fire brigade training program.

The engineering evaluation conservatively assumed that a 13-minute response will occur from the initiation of the thermal detectors. The early warning alarm capability of the smoke detectors, that will typically initiate a Fire Department response well before the thermal detectors actuate, is not credited in the evaluation. As the Fire Department responds to the first alarm (including smoke detector alarms) in any of these rooms, the response of the Fire Department will typically begin prior to CO_2 discharge. The PSEG Fire Protection Training Program contains acceptance criteria for fire drill performance. The current criteria for these areas is 8-minutes for the assembly of the brigade.

SAFE SHUTDOWN ANALYSIS FOR SALEM UNITS 1 AND 2

Salem Generating Station achieves the required degree of defense-in-depth (DID) for fire protection using echelons of administrative controls, fire protection systems and features, and safe-shutdown capabilities. The Salem SSD analysis demonstrates that the plant will maintain the ability to perform safe-shutdown functions and minimize radioactive material releases to the environment in the event of a fire.

The 4160 and 460 Volt Switchgear Rooms are currently 10CFR50 Appendix R III.G.3 alternate shutdown areas. Prior to the implementation of the Electrical Raceway Fire Barrier System (ERFBS) project these areas were III.G.2 normal shutdown areas. Safe shutdown in the event of fire in these areas does not rely on any components in these rooms. Alternate shutdown capability is provided independent of these areas. In accordance with paragraph III.G.3 of Appendix R, these areas are required to have fire detection and a fixed fire suppression system. The 4160 Volt Switchgear Rooms have manual fixed carbon dioxide systems. The 460 Volt Switchgear Rooms have automatic fixed carbon dioxide systems.

The Lower Electrical Penetration Areas are 10CFR50 Appendix R III.G.2 normal shutdown areas that rely upon 1-hour fire barriers to protect redundant safe shutdown equipment. An exemption was granted from Appendix R III.G.2, on July 20, 1989, for the Unit 1 and 2 Lower Electrical Penetration Areas since these areas do not have complete one-hour fire barriers (partial height marinite walls, etc.) protecting redundant safe shutdown trains. During the ERFBS project cables in the Lower Penetration areas required for safe shutdown protected with 1-hour qualified fire wrap material. Section III.G.2 of Appendix R requires that areas that utilize 1-hour fire barriers also have fire detectors and an automatic fire suppression system. The Lower Electrical Penetration Areas have automatic carbon dioxide systems.

It should be noted that current regulations do not require dedicated fire brigades (fire fighting personnel who have no event related operational responsibilities). However, PSEG Nuclear has established controls and a dedicated Fire Brigade to ensure shift staffing is sufficient to accomplish all necessary functions required by an event.

Salem Units 1 and 2 UFSAR section 9.5.1.7.4, states that the carbon dioxide storage tank contains a sufficient supply of carbon dioxide for two full discharges into the largest protected area. The largest protected areas are the 4160 Volt Switchgear Rooms that were calculated to require 9820 pounds of carbon dioxide for a single discharge. The installed tank has a capacity of 10 tons. Evaluations performed under the Corrective Action Program identify that even if the 10-ton tank was 100% full, not all of the carbon dioxide can be delivered to the switchgear rooms and as such, the available quantity of CO_2 is not sufficient to provide two full discharges to either of these areas. The tank volume will be sufficient for one full discharge to the affected areas and retain additional volume to be used as additional partial discharges at the discretion of the responding PSEG Nuclear Fire Department based on their assessment of the situation.

In summary, PSEG concludes that the evaluation performed shows that Salem Generating Station meets the requirements of Appendix R and the provisions of the Fire Protection Program. The proposed commitment changes do not affect the ability to safely shutdown and maintain the shutdown conditions of either unit following a fire in the affected areas described above without reliance on compensatory measures or actions deviating from the design basis.

UFSAR Mark-Ups

Hose stations are provided for all floors of these buildings, except on Elevation 45 ft. of the Auxiliary Building, and the Fuel Handling Building. These areas can be reached from existing hose stations in other areas.

Hose stations are not provided in the Service Water Pump House. Since access to each of the pump rooms is from outside, a fire hydrant is provided in the yard near the building.

All standpipes are 2-1/2 inch diameter. The individual branch supply to the hose reel is 1-1/2 inch diameter.

9.5.1.7.4 *Other Suppression Systems*

Foam System

At Salem Generating Station, a manually operated foam fire suppression system protects the Bulk Fuel Oil Storage Tank. This tank is a non-safety related facility, located above ground, outdoors, and approximately 400 feet south of the Turbine-Generator Building

CO_2 Fire Suppression Systems

Low pressure carbon dioxide fire protection systems are provided for the Diesel-Generator Rooms and associated control rooms, day tanks, fuel oil storage tanks and pumps, and the Switchgear Rooms and the Lower Electrical Penetration Area. ~~Each CO_2 tank contains a sufficient supply of carbon dioxide for two full discharges into the largest protected area~~. Carbon Dioxide tank volume will be sufficient for one full discharge to the affected areas and retain additional volume to be used as additional partial discharges at the discretion of the responding PSEG Nuclear Fire Department based on their assessment of the situation. Carbon Dioxide concentration of at least 27.6% for the Switchgear Rooms and Lower Electrical Penetration Areas will be maintained for a length of time sufficient to suppress a fire and allow the PSEG Nuclear Fire Department to respond and take proper actions thus preventing damage to equipment necessary for the safe shutdown of the plant.

There are three diesel-generator sets per unit at the Salem Generating Station. Each set is flooded by independent CO_2 actuation. Each Diesel-Generator Room and its associated control room and day tank area are actuated together. The two diesel fuel oil pump rooms for each unit are also actuated together.