ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

May 31, 1983

ØCANØ58317

Mr. W. C. Seidle, Chief
Reactor Project Branch #2
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Supplemental Response to Item 2 of
Inspection Reports 50-313/82-33
and 50-368/82-33

Gentlemen:

Please refer to our letter (ØCANØ483Ø7) dated April 5, 1983, in which we stated procedures 1405.16 and 2405.16, "Electrical Penetration Fire Barriers," would be revised by May 31, 1983.

Those procedures have been revised, but several unresolved items must be addressed prior to their implementation. The procedures currently reflect the inspection requirements for barriers instituted as a result of our Appendix R analysis. We requested an exemption for all barriers and suppression/detection systems in our March 28, 1983, letter (see attached ØCANØ38322) to NRR for approximately one year, in order to enable us to reanalyze ANO pursuant to new guidance obtained from the staff regarding 10CFR50 Appendix R. We have completed our analysis based on the new barrier requirements, and a rigorous engineering evaluation regarding modifications and schedules is nearing completion. We are unable to implement the revised procedures until June 30, 1983, as the issue of inspecting fire barriers scheduled for future implementation in accordance with exemptions to the schedule requirements of Appendix R has not been properly addressed. We plan to indicate in the procedure which barriers are scheduled for

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future implementation in accordance with exemptions. We are working with the staff on the resolution of the March 28, 1983, request, but final resolution is not expected until at least late July. At that time, it may be necessary to revise the inspection procedures to reflect that resolution.

Very truly yours,

John R. Marshall

John R. Marshall
Manager, Licensing

JRM:DLL:rd

Attachment

ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK ARKANSAS 72203 (501) 371-4000

March 28, 1983

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Director of Nuclear Reactor Regulation
ATTN: Mr. J. F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Director of Nuclear Reactor Regulation
ATTN: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Appendix R - Schedular Exemption Request

Gentlemen:

On March 1, 1983, a meeting was held in Bethesda, Maryland between members of the NRC Staff and representative utilities of the Nuclear Utility Fire Protection Group (NUFPG). It was the purpose of that meeting to discuss certain aspects of Appendix R which had been identified by NUFPG as areas of significant concern or "generic issues." These were submitted to the NRC Staff as agenda for the March 1 meeting.

In concluding that meeting, the NRC Staff suggested it would be appropriate to issue additional guidance concerning the generic issues. However, until that guidance is received, it is necessary for us to request specific action for AP&L based on our present understanding of the Staff position regarding two of those generic issues: fire barriers and suppression/detection systems. The nature and consequences of these requests are discussed in detail in the following.

Section III.G.2.a. of Appendix R states, "Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier...." The analysis performed by AP&L, and subsequently submitted to the NRC on July 1, 1982, ensured (where necessary) that at least one fire

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wall separated redundant trains. Complete enclosure was not considered a requirement. We believe this to be consistent with the requirement and intent of Appendix R. However, the interpretation stated by the NRC Staff on March 1 goes further and requires at least one redundant train be totally enclosed by fire walls. The difference between these interpretations is obvious and the impact on AP&L's July 1 submittal is expected to be significant since each fire zone must be reanalyzed to this new guidance.

Immediately following the March 1 meeting, a new analysis was begun using the NRC guidance. At this time we are aware that some previously identified barriers are no longer required, while on the other hand, credit must be taken for several new barriers. However, we will require additional time to complete our assessment and then to make the necessary modifications. For these reasons, we request an exemption to the schedule of 10CFR50.48(c) for all barriers and all penetrations thereto (doors, dampers, etc.). We do not, at this time, anticipate any new exemptions will be required.

The analysis to determine necessary fire barriers is proceeding rapidly and is expected to be completed by approximately the end of April. This will result in the identification of all walls for which penetration seals, doors, dampers, etc. must be procured and installed to effect a complete appropriately rated fire barrier in accordance with the NRC's March 1 interpretation. We then anticipate approximately 6 months will be required to prepare procurement documentation and take delivery of all the necessary equipment. This will be followed by approximately 6 months of installation efforts. Excepting where an outage is necessary in order to complete a modification (such as in areas of high radiation), we expect all work can be completed by the end of April 1984.

This represents our best estimate for time required to complete the analysis and necessary modifications. However, as we proceed, we will be able to provide more accurate information and will continue to revise the schedule as necessary to reflect a longer or shorter exemption period. Furthermore, if an outage is required to accomplish any modifications, we will provide justification and schedule.

The second generic issue of concern to AP&L regards the NRC Staff interpretation of suppression/detection requirements. Section III.G.2.b. and c. states these systems must be installed "...in the area." AP&L's July 1, 1982, submittal ensured (where necessary) that a suppression/detection system was available in the fire zone of concern to protect the necessary redundancy and/or equipment. Wall-to-wall coverage was not considered a requirement. A more detailed discussion of the logic leading to our position is included as Attachment 1. We request your review of this information. However, the interpretation stated by the NRC Staff on March 1 requires suppression/detection systems be installed "throughout the area." Again, the differences between these interpretations are obvious and, again, the impact on AP&L's July 1 analysis results is significant.

If, after your review of Attachment 1, the NRC Staff continues to require full area coverage for suppression/detection systems, we then request an exemption to the schedule of 10CFR50.48(c) for all suppression/detection systems. This is necessary since (1) specific exemption requests will have to be prepared where our systems do not meet the "new" guidance and for

where those systems are provided in zones covered by alternate shutdown means, and (2) additional time will be required to prepare the necessary procurement documentation, take delivery of that equipment, and complete installation.

As stated for the issue addressing barriers, a suppression/detection system analysis was also begun following the March 1 meeting. Although it is still being compiled, it is probable that the results of the barrier analysis will also affect this analysis. In our best estimation, since these two issues are directly related, the same schedule is required for suppression/detection as for the barriers, i.e., end of January 1984. We will continue to revise the schedule as work is completed.

Very truly yours,

John R. Marshall
Manager, Licensing

JRM:LVP:sl

Attachment

cc: J. M. Griffin

JUSTIFICATION FOR PARTIAL SUPPRESSION SYSTEM COVERAGE

In the letter (0CNA128208) which transmitted the draft Safety Evaluation of the July 1, 1982, Appendix R compliance submittal to Mr. William Cavanaugh III of Arkansas Power & Light Company (AP&L) dated December 8, 1982, the Nuclear Regulatory Commission (NRC) made the following statements pertaining to Arkansas Nuclear One (ANO):

> "By letter dated July 1, 1982, the licensee has also described proposed modifications to ten plant fire areas to comply with Section III.G of Appendix R. In several of these areas, specifically the cable spreading rooms, the licensee has indicated that alternate shutdown means will be provided, but has not indicated that a fixed fire extinguishing system will be provided as required by Section III.G.3 of Appendix R. The omission of a fixed extinguishing system does not comply with Appendix R, but could be the subject of an exemption request. In other areas only partial sprinkler system coverage of a fire area will be provided. This does not comply with Section III.G.2 of Appendix R, which requires automatic suppression to be installed throughout a fire area containing redundant safe shutdown equipment. Those areas where partial protection will be provided could also be the subject of exemption requests."

AP&L does not share the "interpretation" of the requirements for fire protection as set forth in Appendix R to 10CFR50 and has requested a meeting with the NRC to appeal their position as stated above. The justification for AP&L's position that Appendix R allows the licensee to choose "partial" suppression coverage without the need for exemption on a case-by-case review is presented as follows. This justification also addresses the apparent, yet erroneous, equating by the NRC of the terms "partial suppression coverage" and "partial protection."

Title 10CFR50 Appendix R Section III.G.2 requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

A. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

B. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

C. Enclosure of cable and equipment and associated non-safety

circuits of one redundant train in a fire barrier having a 3-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Clearly, the only Appendix R requirement for installation of an automatic fire suppression system is that it "be installed in the fire area." However, other documentation such as NFPA Standards and Branch Technical Position 9.5-1 (BTP 9.5-1) are listed as references which provide guidelines for nuclear power plant fire protection. Appendix R additionally states the applicability of these guidelines to individual nuclear plants, as well as the identification of open fire protection issues, is stated in the Fire Protection Safety Evaluation Report.

We have reviewed these and other documents. We have also talked with experts from various groups, including fire protection engineers and consultants associated with ANI, Rebsamen Insurance, NFPA, and EPRI. Our conclusion is that Appendix R does not require installation of suppression systems throughout fire areas, but instead requires adequate protection of fire areas through the use of available means, and applicable industry codes and standards. We offer the following specific discussions used to arrive at this conclusion. Attachment I presents definitions which have been obtained primarily from the NFPA Standards, and BTP 9.5-1, for terminology used herein.

It is of direct importance to this discussion to emphasize now the seemingly obvious statement that the term suppression system covers a wide range of different applications such as sprinkler, spray, halon, automatic, manual, etc. These are addressed as separate Standards within the NFPA, each indicating the specific requirements for that application selected (there are at least 11 different NFPA Standards for fixed suppression systems alone). It is not reasonable to expect for all suppression systems to meet NFPA 13, for example.

Sprinkler Systems are normally installed within guidelines presented in NFPA 13, which is entitled, "Standard for the Installation of Sprinkler Systems." In the "General Information" section of Chapter 4 of NFPA 13 (NFPA 13, Section 4-1.1.1), which is concerned with placement of sprinklers, the following statement is made:

> "The basic principles for providing proper protection are namely: (1) Sprinklers installed throughout the premises, including basements, lofts and all locations herein specified. (2) Definite maximum protection area per sprinkler. (3) Minimum interference to discharge pattern by beams, bracing, girders, trusses, piping, lighting fixtures and air conditioning ducts. (4) Correct location of automatic sprinklers with respect to ceilings, or beams and wood joists to obtain schedule sensitivity."

The 14th NFPA Handbook also makes the following statements regarding Sprinkler System installation:

> "It is obvious, in theory at least, that complete installation of sprinklers throughout a building is necessary for complete protection of life and property. No areas should be left

unprotected. The NFPA Sprinkler Standard treats specifically a number of locations where the need for sprinklers is sometimes questioned. These include locations such as stairways and vertical shafts; deep, blind, and concealed spaces; ducts; basements... (etc.). It is risky to omit sprinklers from any single area because it is judged that the hazard is not sufficient to warrant them.

"Frequently, building codes and ordinances require partial sprinkler protection for specific areas with the intent of providing limited protection for certain hazardous areas, and as a life safety measure. But the limitations of partial protection often outweigh the supposed advantages they offer..."

Section 4-1.2 of Appendix A to NFPA 13 additionally states:

"When buildings or portions of buildings are of combustible construction or contain combustible material, standard fire barriers should be provided to separate the areas which are sprinkler protected from adjoining unsprinklered areas."

These statements seem to indicate that sprinklers, where selected as the means of fire suppression, should be installed throughout the premises, though partial coverage is obviously a consideration. On January 5, 1983, we talked with Mr. Robert Hodnett, the Extinguishing Systems Engineer at NFPA who is the individual responsible for interpretations of NFPA 13, and he provided us with some clarifying information. Mr. Hodnett said individuals, i.e., design engineers, employed by the company selecting the sprinkler system are responsible for determining if an area is "completely sprinklered," not NFPA. He added that NFPA 13 is intended to be used to provide technical knowledge of how to install and/or select a system -- not to impose requirements on the purchasing party of where to install that system or under what conditions to make such a selection. Ideally, sprinkler protection should be installed "throughout the premises," and not just throughout the area. However, the definition of "throughout the premises" pertains to the performance of a case-by-case evaluation of affected fire areas by the purchaser of the sprinkler system. In considering a room partially containing combustibles, Mr. Hodnett said coverage of that combustible material usually constitutes "complete coverage." Also, if a room enclosed by three-hour fire barriers is empty, or if it contains absolutely no combustibles, then the lack of sprinkler protection within that room does not prevent classification of the subject building as "completely sprinklered." A room which contains a limited amount of combustibles which are directly protected by sprinklers can be classified "completely protected," according to Mr. Hodnett.

Seeking concurrent interpretation, we discussed this subject with Mr. Paul Giaccaglia, a Senior Administrative Engineer employed by American Nuclear Insurers (ANI), on January 5, 1983. Mr. Giaccaglia provided us with an official interpretation of NFPA 13, Section 4-1.1.1, from the Formal Interpretations published by the NFPA Standards Information Service in

Boston, MA. This particular interpretation was issued in January 1978 in response to a formal request for interpretation. The request is:

> "Is it the intent of NFPA 13, Section 4-1.1.1, to require installation of a sprinkler head in every area, including shower rooms and closed closets?"

The formal interpretation of NFPA 13, Section 4-1.1.1 is presented as follows:

> "It is the intent of Section 4-1.1.1 to require installation of a sprinkler head in every area including shower rooms and closed closets except where exluded by Section 4-4.4.2 or except where the authority having jurisdiction permits omission of the sprinklers."

The latter exception is taken from NFPA 13 Section 4-1.2, "Partial Installations," wherein the following is mentioned:

> "When partial sprinkler installations are installed, the requirements of this standard shall be used insofar as they are applicable..."

Clearly, partial installations are allowed by NFPA 13. According to Messrs. Hodnett, Giaccaglia and Ivan Richardson (a fire protection insurance consultant currently employed by Rebsamen Insurance), if AP&L has decided to install a partial sy[illegible] then NFPA 13 should be used to provide guidance on installing that partial system.

As a final comment on sprinkler systems we note that the applicability of NFPA 13 (though not doubted) can be questioned. Paragraph 1-2, "Purpose," states that "the purpose of this standard is to provide a reasonable degree of protection of life..." Yet, in the introduction to the ANO Fire Protection Safety Evaluation Reports (SERs) the following statments are made:

> "We have reviewed the licensee's analyses and have visited the plant to examine the relationship of safety-related components, systems and structures with both combustibles and the associated fire detection and suppression systems. Our review has been limited to the aspects of fire protection within the NRC's jurisdiction, i.e., those aspects related to the protection of public health and safety. We have not considered aspects of fire protection associated with life safety of onsite personnel and with property protection unless they impact the health and safety of the public due to potential release of radioactive material.

Although we do not question the need for the guidance of standards such as NFPA 13, we present this comparison as one more example of the information used in reaching our interpretations of the applicability of available NRC and industry guidelines and standards.

With regards to spray systems, the justification for partial installations are equally as valid. For example, NFPA 15 states:

> "Water spray fixed systems are usually applied to special fire protection problems, since the protection can be specifically designed to provide for effective fire control, extinguishment, prevention, or exposure protection. Water spray systems may be independent of, or supplementing to, other forms of protection."

Also:

> "The design of specific systems may vary consideraly, depending on the nature of the hazard and the basic purposes of protection."

Appendix A, paragraph A-1-5, to NFPA 15 states that effective exposure protection is accomplished by application of water spray directly to the exposed structures or equipment.

We also make brief reference to paragraph 1-5.5.3 of NFPA 12A which describes local application of Halon systems. Clearly, this is but one more reference to a partial coverage suppression system.

In contacting Mr. Joseph Matte III (Project Manager - Fire Protection, Engineering and Operations Department, Nuclear Power Division) of EPRI, Messrs. Dennis Eaves and Paul Giaccaglia of ANI, Mr. Robert Hodnett of NFPA, and Mr. Ivan Richar[illegible] of Rebsamen Insurance, the interpretation, by each individual of the p[illegible]missibility of "partial coverage" by the NFPA codes has been affirmative.

Perhaps the most important reason for reaching our stated conclusion regarding the acceptability of partial suppression coverage is Appendix R itself. As previously stated, Appendix R directs the licensee to the issued Fire Protection Safety Evaluation Report for the licensee's plant for interpretation of the applicability of referenced guidelines to the performance of an evaluation against Appendix R criteria.

Attachment II presents extracts from the ANO SERs. Note marked items (1) and (2) which reference NFPA 13 and 15 and BTP 9.5-1. Obviously, we have utilized these Standards, as well as others, in the design of ANO; and we have thus far adequately addressed our position with regards to their usage and interpretation. Attachment III presents extracts from BTP 9.5-1. Items (1) through (5) in this attachment address essentially the same information as covered above. Each item clearly addresses the acceptability of partial suppression systems for particular applications.

We feel the conclusion that the NRC has justified the use of "partial coverage" suppression systems is obvious, and that additional examples from the SER will gain nothing.

As to the definition of who has the authority to make selections regarding partial versus full suppression system coverage, refer once again to NFPA 13 which states this is "the authority having jurisdiction." There can be little doubt this is AP&L. Nevertheless, we offer item (3) of Attachment II

as verification the NRC officially has placed this responsibility and authority upon AP&L.

Recall that AP&L's appeal statement also included the need to address the apparent equating by the NRC of the terms "partial suppression" and "partial protection." We take strong exception to this comparison if it is indeed the comparison being made. The information thus far offered presents overwhelming evidence of the acceptability of properly designed partial coverage suppression systems. Nowhere can it be inferred that "partial coverage" means "partial protection." On the contrary, Attachment IV presents a particular occurrence at ANO whereby the NRC judged a "full" coverage sprinkler system to be inadequate and suggested instead a "partial" directional spray system be installed. We agree with that ruling and feel sufficiently justified in light of that occurrence (as well as the other documentation) to continue that example by performing a case-by-case determination of the type suppression system coverage required without first receiving NRC approval to do so.

In conclusion, our appeal to the NRC is that it be stated for AP&L that "partial" suppression system coverage is not the basis, or possible basis, of an exemption request. We admit that where "partial protection" is afforded, that does require an exemption request. Otherwise, the decision for adequacy of suppression system rests with AP&L (with a possible challenge by I&E as in all Appendix R matters).

If the NRC position cannot be changed, we request additional information, to our complete understanding, regarding the definition of such terms as "partial" suppression and "partial" protection and regarding the application of the systems in light of your interpretation of the applicability of existing industry standards and NRC guidance documents. We would additionally expect, because of the gross ambiguity of Appendix R in this matter, that your ruling give consideration to the additional time that will be required to meet these newly defined criteria.

ATTACHMENT I
SELECTED FIRE PROTECTION TERMINOLOGY

A. From BTP 9.5-1, one finds the following definitions which are consistent with those found in the NFPA Standards:

1. Fire Area - that portion of a building or plant that is separated from other areas by boundary fire barriers;

2. Fire Barrier - those components of construction (walls, floors, and their supports), including beams, columns, penetration seals or closures, fire doors, and fire dampers that are rated by approving laboratories in hours of resistance to fire and are used to prevent the spread of fire;

3. Fire Zones - the subdivisions of fire areas in which the fire suppression systems are designed to combat the particular types of fires;

4. Fire Suppression - control and extinguishing of fires (firefighting). Manual fire suppression is the use of hoses, portable extinguishers, or manually-actuated fixed systems by plant personnel. Automatic fire suppression is the use of automatically actuated fixed systems such as water, Halon, or carbon dioxide systems;

5. Sprinkler System - a network of piping connected to a reliable supply that will distribute the water throughout the area protected and will discharge the water through sprinklers in sufficient quantity either to extinguish the fire entirely or to prevent its spread. The system, usually activated by heat, includes a controlling valve and a device for actuating an alarm when the system is in operation. The following categories of sprinkler systems are defined in NFPA 13, "Standard for the Installation of Sprinkler Systems":

   - Wet-Pipe System
   - Dry-Pipe System
   - Preaction System
   - Deluge System
   - Combined Dry-Pipe and Preaction System
   - On-Off System; and, finally

6. Water Spray System - a network of piping similar to a sprinkler system except that it utilizes open-head spray nozzels. NFPA 15, "Water Spray Fixed Systems," provides guidance on these systems.

B. In the NFPA Standards, the following supplementary definitions were obtained:

1. Authority Having Jurisdiction - the "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure;

2. Approved - means "acceptable to the authority having jurisdiction";

3. Exposure Protection - application of water spray to structures or equipment to limit absorption of heat to a level which will minimize damage and prevent failure, whether source of heat is external or internal;

4. Impingement - the striking of a protected surface by water droplets issuing directly from a water spray nozzle;

5. Water Spray Nozzle - a normally open water discharge device which, when supplied with water under pressure, will distribute the water in a special, directional pattern peculiar to the particular device; and

6. Water Spray System - a water spray system is a special fixed pipe system connected to a reliable source of fire protection water supply, and equipped with water spray nozzels for specific water discharge and distribution over the surface or area to be protected. The piping system is connected to the water supply through an automatically or manually actuated valve which initiates the flow of water. An automatic valve is actuated by operation of automatic detection equipment installed in the same areas as the water spray nozzles. (In some cases the automatic detection equipment may also be located in another area.)

ATTACHMENT II

EXTRACTS FROM THE ANO FIRE PROTECTION SAFETY EVALUATION REPORTS

The following information was obtained from pages 2-1 and 2-2 of the ANO-2 SER:

"2.0 FIRE PROTECTION GUIDELINES

2.1 General Design Criterion 3 - "Fire Protection"

The Commission's basic criterion for fire protection is set forth in General Design Criterion 3, Appendix A to 10CFR Part 50, which states:

> "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.
>
> "Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and the control room.
>
> "Fire detection and protection systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety.
>
> "Fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components."

2.2 Supplementary Guidance

Guidance on the implementation of GDC-3 for existing nuclear power plants has been provided by the NRC staff in "Appendix A" of Branch Technical Position 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants." (1)

Appendix A provides for a comprehensive program assuring a substantial level of fire protection, beyond minimums that might be deemed to satisfy GDC-3.

The overall objectives of the fire protection program embodied in BTP 9.5-1 and Appendix A, are to:

(1) reduce the likelihood of occurrence of fires;

(2) promptly detect and extinguish fires if they occur;

(3) maintain the capability to safely shut down the plant if fires occur; and

(4) prevent the release of a significant amount of radioactive material if fires occur.

We have used the guidance in Appendix A as appropriate in our review. We have evaluated alternatives proposed by the licensee to various specific aspects of Appendix A using the overall objectives outlined above to assure that these objectives are met for the actual relationship of the existing hose stations. The applicant has committed to install additional fire hose stations so that all such areas containing combustibles can be reached including inside containment.

Nozzels on the hose lines are of the adjustable spray tube; in areas of potential electrical fires, they are of a type rated for this service.

We find that, subject to implementation of these modifications, the interior hose installation will fully conform to provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

From page 4-4 of the ANO-2 SER, we find:

"4.3.1.5 Automatic Water Suppression Systems

Automatic water suppression systems (wet pipe sprinklers, preaction sprinklers and water spray) have been provided in most areas of the plant containing significant combustibles. Details concerning these systems are addressed in specific plant area sections of this report.

In some areas containing multiple tiers of electrical cable in trays, ceiling level sprinklers may be unable to effectively suppress fires in the lower trays. However, our review of these areas indicates that, with the separation provided and modifications proposed, the protective systems as installed will prevent unacceptable damage to redundant systems required for safe shutdown.

The water spray system in the cable spreading room is designed to provide a density based on the entire floor area, which may not meet current NFPA 15 requirements for a density of 0.15 gpm per square foot on each level of cable trays. The applicant has committed to evaluate the adequacy of the protection as installed and to modify the design if required to comply with the NFPA standards.

The water spray systems protecting the diesel fuel storage vaults are manually actuated from the control rooms. This is acceptable because the redundant tanks are separated from each other by a three-hour fire barrier which precludes loss of more than one tank.

Other than for the above exceptions, the systems have been designed in accordance with applicable standards: NFPA 13, 'Sprinkler Systems,' and NFPA 15, 'Water Spray Fixed Systems.' (2)

We find that, subject to modification of the cable spreading room suppression system as described above, the cable spreading room fire protection will fully satisfy the objectives of Section 2.2 of this report and is, therefore, acceptable.

4.3.1.6 Foam

The plant has available a supply of foam and a nozzle for manual fire fighting, to be used as a supplement to manual suppression means. We find that the use of foam in this manner conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

Finally, from page 8-1 of the ANO-2 SER, we find:

"8.0 CONCLUSIONS

The applicant has performed a fire hazards analysis and has proposed certain modifications to improve the fire protection program. Additional modifications have been proposed by the applicant during the course of our review of the fire hazards analysis and our onsite evaluation of the fire protection program. These proposed modifications are summarized in Section 3.1.

In summary, significant steps have been taken to assure that safe shutdown can be accomplished and the plant maintained in a safe condition during and following potential fire situations. Upon implementation and NRC verification of the applicant's proposed modifications summarized in Section 3.1, we find that the requirements of General Design Criterion 3 will be fully satisfied and that the applicant's complete fire protection program shows that:

(1) Combustibles in safety-related areas are limited to the extent practicable;

(2) Fire detection and suppression systems will minimize the effects of fire on safety-related systems and will not in themselves significantly impair the capability of safety-related systems;

(3) Redundant safe shutdown systems are separated from each other and, where practicable, from significant combustibles by barriers or distances, or are adequately protected by fire suppression systems, such that a fire in any fire area will not prevent safe shutdown of the plant;

(4) A fire in any fire zone will not damage safety-related structures such that they cannot perform their safety function;

(5) The fire protection organization has the professional qualifications to implement the fire protection program, and administrative controls are adequate to maintain control of combustibles, ignition sources, and the fire protection organization; and

(6) A fire in any fire zone will not cause the release of amounts of radioactive material in excess of those considered in previous safety evaluations.

We find that the applicant's proposed modifications described herein are acceptable both with respect to the improvements in the fire protection program that they will provide upon full completion of the program and with respect to present safe operation of the facility, while the remaining items are completed."

ATTACHMENT III
EXTRACTS FROM BRANCH TECHNICAL POSITION 9.5-1

The following information was obtained from pages 9.5.1-28 and 9.5.1-29 of Revision 1 of Branch Technical Position 9.5-1 (BTP 9.5-1):

"c. Electrical Cable Construction, Cable Trays and Cable Penetrations

(1) Only metal should be used for cable trays. Only metallic tubing should be used for conduit. Thin-wall metallic tubing should not be used. Flexible tubing should only be used in short lengths to connect to equipment. Other raceways should be made of noncombustible material.

(2) Redundant safety-related cable systems outside the cable spreading room should be separated from each other and from potential fire exposure hazards in nonsafety-related areas by fire barriers with a minimum fire rating of three hours. These cable trays should be provided with continuous line-type heat detectors and should be accessible for manual firefighting. Cables should be designed to allow wetting down with fire suppression water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided. Safety-related equipment in the vicinity of such cable trays that does not itself require fixed water suppression systems but is subject to unacceptable damage from water should be protected.

Safety-related cable trays of a single division that are separated from redundant divisions by a fire barrier with a minimum rating of three hours and are normally accessible for manual firefighting should be protected from the effects of a potential exposure fire by providing automatic water suppression in the area where such a fire could occur. Automatic area protection, where provided, should consider cable tray arrangements and possible transient combustibles to ensure adequate water coverage for areas that could present an exposure hazard to the cable system. Manual hose stanpipe systems may be relied upon to provide the primary fire suppression (in lieu of automatic water suppression systems) for safety-related cable trays of a single division that are separated from redundant safety divisions by a fire barrier with a minimum rating of three hours and are normally accessible for manual firefighting if all of the following conditions are met:

(a) The number of equivalent standard 24-inch-wide cable trays (both safety-related and nonsafety-related) in a given area is six or less;

(b) The cabling does not provide instrumentation, control or power to systems required to achieve and maintain cold shutdown; and

(c) Smoke detectors are provided in the area of these cable routings, and continuous line-type heat detectors are provided in the cable trays.

Safety-related cable trays that are not accessible for manual fighting should be protected by a zoned automatic water system with open-head deluge or open directional spray nozzles arranged so that adequate water coverage is provided for each cable tray. Such cable trays should also be protected from the effects of a potential exposure fire by providing automatic water suppression in the area where such a fire could occur.

In such plant areas as primary and secondary containment or other areas where it may not be possible because of other overriding design features necessary for reasons of nuclear safety to separate redundant safety-related cable systems by three-hour-rated fire barriers, cable trays should be protected by an automatic water system with open-head deluge or open directional spray nozzels arranged so that adequate water coverage is provided for each cable tray. Such cable trays should also be protected from the effects of a potential exposure fire by providing automatic water suppression in the area where such a fire could occur. The capability to achieve and maintain safe shutdown considering the effects of a fire involving fixed and potential transient combustibles should be evaluated with and without actuation of the automatic suppression system and should be justified on a suitably defined basis.

(3) Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to given protection at least equivalent to that required of the fire barrier. The design of fire barrier penetrations for horizontal and vertical cable trays should be qualified by tests. The penetration qualification tests should use the time-temperature exposure curve specified by ASTM E-119, "Fire Test of Building Construction and Materials." Openings inside conduit larger than four inches in diameter should be sealed at fire carrier penetration; these seals should be qualified by tests as described above. Openings inside conduit four inches or less in diameter should be sealed at the fire barrier and should be qualified by tests as described above unless the conduit extends at least five feet on each side of the fire barrier and is sealed either at both ends or at the fire barrier with noncombustible material to prevent the passage of smoke and hot gases. Fire carrier penetrations that must maintain environmental isolation or pressure differentials should be qualified by test to maintain the barrier integrity under the conditions specified above.

(4) Fire steps should be installed every 20 feet along horizontal cable routings in areas that are not protected by automatic water systems. Veritical cable routings should have fire stops installed at each floor/ceiling level. Between levels or in vertical cable bases, fire stops should be installed at the midheight if the vertical run is 20 feet or more but less than 30 feet or at 15-foot intervals in vertical runs of 30 feet or more unless such vertical cable routings are protected by automatic water systems directed on the cable trays. Individual fire stop designs should prevent the propagation of a fire ..."

The following information was obtained from page 9.5.1-40 of Rev. 1 of BTP 9.5-1.

"All cables that enter the control room should terminate in the control room. That is, no cabling should be simply routed through the control room from one area to another. Cables in the control room should be kept to minimum necessary for plant operation.

Cables in underfloor and ceiling spaces should meet the separation criteria given in Regulatory Guide 1.75. Air-handling functions should be ducted separately from cable runs in such spaces; i.e., if cables are routed in underfloor or ceiling spaces, these spaces should not be used as air plenums for ventilation of the control room. Fully enclosed electrical raceways in such underfloor and ceiling spaces, if over one square foot in cross-sectional area, should have automatic fire suppression inside. Area automatic fire suppression should be provided for underfloor and ceiling spaces if used for cable runs unless all cable is run in 4-inch or smaller steel conduit or the cables are in fully enclosed raceways internally protected by automatic fire suppression. (3)

c. Cable Spreading Room

The primary fire suppression in the cable spreading room should be an automatic water system such as closed-head sprinklers, open-head deluge system, or open directional water spray system. Deluge and open spray systems should have provisions for manual operation at a remote station; however, there should be provisions to preclude inadvertent operation. Location of sprinkler heads or spray nozzles should consider cable tray arrangements and ; ible transient combustibles to ensure adequate water coverage for areas that could present exposure hazards to the cable system. Cables should be designed to allow wetting down with water supplied by the fire suppression system without electrical faulting.

Open-head deluge and open directional spray systems should be (4) zones.

The use of foam is acceptable.

Automatic gas systems (Halon or CO_2) may be used for primary fire suppression if they are backed up by a fixed water spray system.

Cable spreading rooms should have:

(1) At least two remote and separate entrances for access by fire brigade personnel;

(2) An aisle sepration between tray stacks at least three feet wide and eight high;

(3) Hose stations and portable extinguishers installed immediately outside the room; "

Finally, the following was taken from page 9.5.1-35 of BTP 9.5-1, Rev. 1

"c. Water Sprinkler and Hose Standpipe Systems

(1) Sprinkler systems and manual hose station standpipes should have connections to the plant underground water main so that no single active failure or crack in a moderate-energy line can impair both the primary and backup fire suppression systems. Alternatively, headers fed from each end are permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, "Power Piping," are used for the headers up to and including the first valve supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. When provided, such headers are considered an extension of the yard main system. Hose standpipe and automatic water suppression systems serving a single fire area should have independent connections to the yard main systems. Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve or other approved shutoff valve and waterflow alarm. Safety-related equipment that does not itself require sprinkler water fire protection but is subject to unacceptable damage if wet by sprinkler water discharge should be protected by water shields or baffles.

(2) Control and sectionalizing valves in the fire water systems should be electrically supervised or administratively controlled. The electrical supervision signal should indicate in the control room. All valves in the fire protection system should be periodically checked to verify position (see NFPA 26, "Supervision of Valves").

(3) Fixed water extinguishing systems should, as a minimum, conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems," and NFPA 15, "Standard for Water Spray Fixed Systems."

(4) Interior manual hsoe installation should be able to reach any location that contains, or could present a fire exposure hazard to, safety-related equipment with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 100 feet of 1-1/2-inch woven-jacket, lined fire hose and suitable nozzles should be provided in all buildings on all floors. Individual standpipes should be at least four inches in diameter for multiple hose connections and 2-1/2 inches in diameter for single hose connections. These systems should follow the requirements of NFPA 14, "Standpipe and Hose Systems," for sizing, spacing, and pipe support requirements.

Hose stations should be located as dictated by the fire hazard analysis to facilitate access and use for firefighting operations. Alternative hose stations should be provided for an area if the fire hazard could block access to a single hose station serving that area.

Provisions should be made to supply water at least to standpoints and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of a safe shutdown earthquake. The piping system serving such hose ..."

ATTACHMENT IV
SUMMARY OF HISTORY OF ANO-1 SER ITEM 3.7

In SER item 3.7 concerning the ANO-1 Cable Spreading Room, a deluge system was installed in accordance with NFPA 15. It is important to note that this deluge system was not a sprinkler system, but a water spray system. Water spray systems are designed to protect a local hazard, i.e., cable trays, and not to protect an entire area. The original suppression system installed in the ANO-1 Cable Spreading Room was a wet-pipe sprinkler system with ceiling level sprinkler heads and one intermediate layer of sprinkler heads, as described in our September 17, 1976, letter to Mr. Victor Stello, Jr. This system provided complete coverage of the Cable Spreading Room. However, because of disbelief by the NRC that this system could safely extinguish fires in the lower cable trays, either an analysis demonstrating the adequacy of the system or proposed system modifications was requested by the NRC on February 22, 1977. As of January 18, 1978, a deluge water spray system actuated by head and smoke detectors with directional nozzels to insure impingement on cables trays was proposed and was installed per NFPA 15 requirements, and the pre-existing wet-pipe sprinkler system was removed. The new system provides "partial protection" according to the apparent NRC definition regarding "partial" systems, but "complete coverage" according to the NFPA.