Public Service Company of Colorado

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50-267

May 11, 1984
Fort St. Vrain
Unit No. 1
P-84142

Mr. Eric H. Johnson
Reactor Project Branch Chief
Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

DOCKET No: 50-267

SUBJECT: 10CFR50, Appendix R Fire Protection Review

REFERENCE: PSC Letter O.R. Lee to J.T. Collins Dated March 2, 1984 (P-84071)

Dear Mr. Johnson:

Enclosed is a summary of the Fire Protection Review (FPR) performed by the Public Service Company of Colorado (PSC) staff under the guidance of a Fire Protection Engineering Consultant to determine conformance of Fort St. Vrain (FSV) to Section III.G of 10CFR50, Appendix R. The summary is being submitted in response to a commitment made during the April 27, 1984 meeting with the NRC concerning Appendix R.

The complete FPR is in the form of notes and working documents which are also available for your review. Separate correspondence concerning emergency lighting at Fort St. Vrain will be forwarded in the near future.

Based on the results of the FPR, PSC remains convinced that the fire protection provisions at Fort St. Vrain are adequate to protect the health and safety of the public in the event of any accident involving a postulated fire of maximum credible size. Application of 10CFR50, Appendix R to FSV for the purpose of performing the FPR required some interperative latitude due to the unique design and licensing characteristics of this plant.

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We look forward to working with you in resolving this issue. Please feel free to contact either Mr. J.R. Reesy (303) 571-8406 or myself (303) 571-8404 should any questions arise.

Very truly yours,

Lawrence Brey

H. L. Brey, Manager
Nuclear Engineering Division

HLB:pa

Attachment

Fire Protection Review Summary

Introduction

A Fire Protection Review (FPR) was performed in support of the conclusions contained in PSC's Appendix R exemption request letter P-84071, Lee to Collins, dated March 2, 1984. The purpose of the FPR was to determine whether the fire protection provisions at Fort St. Vrain were adequate to protect the health and safety of the public. Section III.G of Appendix R to 10CFR50 and supplementary information received during the associated on-site NRC audit (August 22-26, 1983) were used as criteria during the course of the FPR.

Definition of Required Functions

Performance of this FPR required, in part, an evaluation to determine Fort St. Vrain's ability to be shut down and cooled down regardless of any single fire. This plant has been licensed with an extensive array of systems and equipment whose purpose is to safely shut down/cool down FSV in the event of any postulated accident. As part of the FPR, functions were identified which are required in order to protect the health and safety of the public. The plant was then evaluated to confirm that at least one system would be available to perform each function regardless of any single postulated fire at FSV.

The required functions are identified below:

1) Control core reactivity,

2) Maintain PCRV integrity,

3) Depressurize the core (2 hours after fire),

4) Maintain adequate PCRV liner cooling (continuous cooling even though the FSAR allows interruption for 30 hours),

5) Assure that the public health and safety consequences analyzed and presented in Design Basis Accident 1 (DBA-1) of the FSAR are not exceeded. DBA-1 involves a Loss of Forced Cooling (LOFC).

Systems Required for Fire Protection Review Shutdown/Cooldown Functions

Portions of the following systems were identified as containing equipment required to perform the Fire Protection Review shutdown/cooldown functions:

System 12 - Control Rods/Drives and Reserve Shutdown System

System 23 - Helium Purification System

System 25 - Liquid Nitrogen System

System 41 - Circulating Water System

System 42 - Service Water System

System 46 - Reactor Plant Cooling Water System

System 47 - Purification Cooling Water system

System 73 - Reactor Plant Ventilation System

Each system is discussed separately below:

System 12

This system is required to control core reactivity. This can be accomplished by either inserting the Control Rods into the core or by activating the Reserve Shutdown System. During LOFC conditions, both actions are initiated to assure reactivity control.

System 23

The portion of this system that provides a path through one of the two helium purification trains and then to the Reactor Plant Ventilation System was identified as being required during depressurization. Depressurization does not have to be initiated until 2 hours following the LOFC.

System 25

The Liquid Nitrogen Storage Tank, T-2501, and the supply lines from that tank to the Low-Temperature Adsorbers in the Helium Purification System were identified as being required for the Fire Protection Review shutdown/cooldown. This equipment would provide the cooling required during depressurization of the primary coolant.

System 41

The portion of this system identified as being required in connection with a Fire Protection Review shutdown/cooldown, is any one of the three Circulating Water Make-up Pumps and the piping to the Service Water Cooling Tower Basin. This equipment would be capable of continuously making up water to the Service Water System.

System 42

Any one of three Service Water Pumps and related piping is required to provide cooling water to the Reactor Plant Cooling Water Heat Exchangers. During the Fire Protection Review, it was assumed that the Service Water System would operate as a once-through cooling system, and no credit was taken for continued operation of the Service Water Cooling Tower.

System 46

Any one of the four Reactor Plant Cooling Water Pumps is required in the Fire Protection Review shutdown/cooldown to provide the needed PCRV liner cooling. This system operates as a closed loop using the selected Reactor Plant Cooling Water Pump and its associated piping, Reactor Plant Cooling Water Heat Exchanger, liner cooling tubes, and surge tank from which the pump obtains its suction. The piping which allows this system to supply cooling to the Purification Cooling Water Heat Exchangers and to the High Temperature Filter/Adsorbers in

the Helium Purification system is also required for the Fire Protection Review shutdown/cooldown.

System 47

The portion of this system which supplies cooling water to the Helium Purification Coolers is required only during depressurization of the primary coolant. Either one of the two redundant Purification Cooling Water Pumps along with its associated Purification Cooling Water Heat Exchanger and supply/return piping through the Helium Purification Cooler is required.

System 73

During primary coolant depressurization one Reactor Plant Exhaust Fan and Filter is required. This includes the associated ductwork and the Reactor Plant Exhaust Stack.

Fire Protection Review Procedure

After the portions of the systems required for the Fire Protection Review shutdown/cooldown were identified, they were reviewed to determine if a single fire would have the ability to disable redundant components and/or prevent shutdown/cooldown of FSV. This was accomplished by determining which components in the required systems could be disabled by a single fire. It was assumed that mechanical components with internal water flow would not be damaged

even if located in the fire zone, and credit was taken for valves remaining in their normal operating mode when the normal operating mode was the same as the loss-of-power failure mode. After locating the components and associated cables on drawings, an evaluation was performed and a determination made whether a single fire could prevent redundant components from performing the required function. This determination was made using the following separation criteria:

1) Do redundant components exist which can perform each selected function and are they separated by a 3 hour fire barrier?

   NOTE: A 3 hour barrier was considered to be concrete with a thickness of at least 5-1/2" or block wall with a thickness of at least 6". The barrier need not be totally enclosing but must completely divide any 20 foot diameter sphere which can encompass both pieces of equipment.

2) If the redundant components do not meet criteria 1) above, do they meet both of the following criteria (a&b)?

   a) Must meet one of the following:

      i) Components are separated by 20 feet with no intervening combustibles.

         NOTE: No 20 foot diameter sphere will encompass both components and associated cables. If

one component is above the other, the effects of rising heat will be analyzed.

ii) Components are separated by a one hour fire barrier.

NOTE: A 1 hour barrier was considered to be concrete with a thickness of at least 3-1/2" or block wall with a thickness of at least 3". The barrier need not be totally enclosing but must completely divide any 20 foot diameter sphere which can encompass both pieces of equipment.

b) In addition to 2a), the entire area containing the components must be protected with automatic fire detection and suppression.

NOTE: If the separation criteria in 2a) was met but area-wide automatic detection and suppression were not present, the fire load of combustibles in the postulated fire vicinity was reviewed. These fire loads were documented to the NRC via PSC letter P-78182, Fuller to Gammill, dated November 13, 1978. If the fire load was sufficiently low, the vicinity was accepted without automatic fire detection and/or suppression.

When the required systems identified earlier did not have sufficient redundancy and separation to satisfy either of the above criteria (1 or 2), alternate systems and/or power sources were considered. If an alternate system or power source was relied upon to perform the shutdown function, then that system was reviewed to the above separation criteria. The Alternate Cooling Method (ACM) System was considered to be an acceptable alternate power source, but was only considered when the normal power source could not provide the required separation.

Structures

During field inspections, a general review of structures was performed. The main structure considered to be essential was the PCRV. Due to the massive amount of concrete in the PCRV and its Support Ring, it was considered that no fire would jeopardize its capability to remain structurally sound.

Additionally, as the required systems were field inspected, an observation was made of surrounding structures. A determination was made whether or not it was feasible that any structure posed a serious threat of falling and damaging required shutdown/cooldown equipment during a fire. The amount of combustibles, the openness of the area, and the size of the nearby structure were factored into the determination. It was concluded that no modifications were necessary

to any structures because of a possible threat to shutdown/cooldown equipment during a fire.

Conclusions

Based upon the results of the Fire Protection Review, it was concluded that no single fire would prevent FSV from achieving a safe, stable shutdown/cooldown condition and the health and safety of the public would be protected.

The required systems identified (listed previously in this summary) did not in themselves satisfy the separation criteria. However, when alternate systems were considered, it could be shown that sufficient redundancy and separation exists at FSV to reach the conclusion stated above. The two most notable alternate systems considered were: 1) the Firewater System which can supply cooling water to the liner cooling tubes independent of both the Reactor Plant Cooling Water Pumps and the Service Water System; and 2) the ACM System which is an on-site, alternate power source which can power many of the required system components.

Additionally, certain deviations from the PSC-established Fire Protection Review criteria still existed after consideration of the alternate systems, but were determined to be justified for each specific case. One example is the fact that automatic fire detection

and suppression do not exist throughout the Reactor Building. However, upon review of combustibles near the required equipment, it was determined that additional automatic detection and suppression were not warranted. It was further determined that if such area wide suppression systems were installed and became activated a safety hazard could exist because the suppression system would create an environment for which shutdown/cooldown equipment is not qualified and could impede access by operating personnel. Another deviation example deals with mechanical components (e.g. manual valves) which are required for depressurization of primary coolant. In some cases, no alternate component was considered necessary because the normal component was not needed for two hours. It was concluded that a nearby fire could be extinguished and manual actuation of the component within two hours would be feasible. This conclusion was based upon a review of the surrounding combustibles and the openness of the surrounding building.

Application of Section III.G of Appendix R to FSV lead to PSC's conclusion that the health and safety of the public will be protected regardless of any single fire at FSV. That conclusion agrees with earlier conclusions made when PSC designed its ACM System to provide power to required shutdown components in the event of a fire in the Control Room, Auxiliary Electric Room, 480 Volt Switchgear Room or congested cables along the 'J' or 'G' wall. At that time it was determined that these were the only areas where a fire could prevent

shutdown/cooldown of the plant. It should be noted that the Fire Protection Review did not rely solely on the ACM System satisfying the criteria of Section III.G.3 of Appendix R. Rather, the ACM System was considered as one of the alternate systems which could be considered to satisfy the established separation criteria.