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New York Power Authority

July 22, 1994
JPN-94-034

U.S. Nuclear Regulatory Commission
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SUBJECT: James A. Fitzpatrick Nuclear Power Plant
Docket No. 50-333
Response to Request for Additional Information
FitzPatrick Appendix R Safe Shutdown Capability Assessment

REFERENCE: NRC letter, J. E. Menning to W. A. Josiger, dated May 18, 1994, regarding "Request for Additional Information - Appendix R Assessment of Safe Shutdown Capability for the James A. FitzPatrick Nuclear Power Plant (TAC M84780)"

Dear Sir:

The Authority's response to the NRC staff's request for additional information (Reference) on the FitzPatrick Appendix R Safe Shutdown Capability Assessment is attached.

FitzPatrick complies with 10 CFR 50, Appendix R with respect to the use of low pressure Emergency Core Cooling Systems (ECCS) to achieve safe shutdown from inside the Control Room. The use of Automatic Depressurization System (ADS) and Low Pressure Coolant Injection (LPCI) or ADS and Core Spray (CS) from inside the Control Room to achieve safe shutdown in case of a fire is not considered alternative or dedicated shutdown and the requirements of Section III.L do not apply. No exemptions from the regulations are required. Low pressure ECCS is the safety-related redundant systems to HPCI and RCIC (Reactor Coolant Isolation Cooling) and the applicable performance requirements are those detailed in the FitzPatrick UFSAR and the associated NRC SERs. Low pressure systems are used by other nuclear power plants to comply with Appendix R safe shutdown requirements.

If you have any questions, please contact Mr. J. A. Gray, Jr.

Very truly yours,

William A. Josiger
Acting Executive Vice President
Nuclear Generation

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Attachment: Response to Request for Additional Information
FitzPatrick Appendix R Safe Shutdown Capability Assessment

cc: Regional Administrator
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Attachment to JPN-94-034
Response to Request for Additional Information
FitzPatrick Appendix R Safe Shutdown Capability Assessment

Question 1

Provide information which demonstrates that hot shutdown conditions can be maintained by the stated use of ADS in combination with low pressure injection systems (i.e., ADS/LPCI and/or ADS/CS), as required by 10 CFR Part 50, Appendix R.

Response 1

Conditions that would require use of low pressure injection systems (i.e. ADS/LPCI and/or ADS/CS) are of low probability. Low pressure systems will be used only when all other means of shutting down the reactor are not available or when the use of high pressure systems must be avoided. Should it be necessary to shutdown FitzPatrick using low pressure systems in the event of a fire, hot shutdown conditions would exist only for a short time before the reactor reached cold shutdown. Coolant temperature decreases rapidly once the ADS valves are opened, the reactor is depressurized and LPCI flow is initiated. Hot shutdown conditions cannot be maintained using only low pressure systems, nor does Appendix R require that they be except as an interim condition towards cold shutdown when alternate or dedicated shutdown capabilities are used.

10 CFR 50, Appendix R, Section III.G "Fire protection of safe shutdown capability" and Section III.L "Alternate and dedicated shutdown capability" do require the ability to "achieve and maintain hot standby conditions for a PWR (hot shutdown for a BWR);" but neither specify any minimum time requirements regarding how long hot shutdown must be maintained.

Hot shutdown duration was discussed in NRC Generic Letter 86-10 (Reference 2) in response to Question 5.3.3 (Generic Letter 86-10, Enclosure 2, Page 23). The response states, in part:

> "Section III.G.I requires that the one train of systems needed to achieve and maintain hot shutdown be free of fire damage. Thus, the systems needed are to be completely protected from the fire regardless of time. If the intent of the question concerns how long these systems must operate, these systems must be capable of operating *until the systems needed to achieve and maintain cold shutdown are available.*" [emphasis added]

This response is consistent with the ultimate objective of Appendix R which is safe shutdown, e.g. cold shutdown. There is no need to, or safety benefit associated with, maintaining hot shutdown for any longer than necessary to achieve cold shutdown.

The Generic Letter 86-10's approach to Appendix R has been accepted by the NRC Commissioners as discussed in SECY-85-306 (Reference 3).

Question 2

Section III.L of 10 CFR Part 50, Appendix R, requires, in part, that during post-fire shutdown, the reactor coolant system process variables be maintained within those predicted for a loss of normal AC power and that the reactor coolant makeup function be capable of maintaining the reactor coolant level above the top of the core. With regards to compliance with Appendix R at the FitzPatrick plant:

a. Will the stated use of ADS in combination with low pressure injection systems as a means of achieving and maintaining hot shutdown conditions in the event of fire in certain areas not requiring alternate shutdown from outside the Control Room satisfy the performance criteria of Section III.L? If not, provide justification for not requesting an exemption from 10 CFR Part 50, Appendix R.

b. If core uncovery is expected, please provide the results of your analysis which demonstrate that excessive fuel clad temperature will not occur. Additionally, please provide the results of your analysis which demonstrates that the suppression pool temperature limits will not be exceeded and net positive suction head for RHR pumps will be maintained.

c. For the specific areas where the stated reactor coolant makeup methodology is utilized, specify whether procedures direct the operator to immediately implement the methodology (ADS/LPCI/CS) or whether this methodology is maintained available as a last resort. Specify the additional systems (safety related and nonsafety related) that could/would be available for reactor coolant makeup.

Responses 2a and 2b

The requirements of Section III.L of Appendix R to 10 CFR 50 apply only when "alternate or dedicated" systems are used to achieve and maintain cold shutdown. At FitzPatrick, low pressure emergency core cooling systems (ECCS) are redundant to the preferred high pressure ECCS systems because they are being used to provide their design function. Therefore, the performance criteria detailed in Section III.L do not apply and no exemptions are necessary. The basis for this is outlined in detail below.

Definition of Dedicated of Alternate Shutdown Capabilities in 10 CFR 50

Footnote 2 to III.G.3 defines alternate and dedicated shutdown capabilities as:

> "Alternative shutdown capability is provided by rerouting, relocating or modifications of existing systems; dedicated shutdown capability is provided by installing new structures

and systems for the function of post-fire shutdown."

If a plant cannot protect one redundant safety-related train per the requirements of III.G.2, III.G.3 requires the plant to provide alternative or dedicated shutdown capability.

Definition of Alternate Shutdown in Generic Letter 86-10

The definition of alternative shutdown capability raised concerns among utilities, since that definition means that the rerouting of even just one cable to assure compliance of a system to III.G.2 would classify the system as "alternative". This concern was addressed by the NRC in Generic Letter 86-10 (Reference 1) in response to two questions that clarified what the NRC staff meant by alternate or dedicated shutdown.

Question 3.8.3 (Generic Letter 86-10, Enclosure 2, Page 17) states in part:

> "If the system is being used to provide its design function, it generally is considered redundant. If the system is being used in lieu of the preferred system because the redundant components of the preferred system do not meet the separation criteria of Section III.G.2, the system is considered an alternative shutdown capability."

Question 5.1.2 (Generic Letter 86-10, Enclosure 2, Page 20) states in part:

> "For the purpose of analysis to Section III.G.2 criteria, the safe shutdown capability is defined as one of the two normal safe shutdown trains. If the criteria of Section III.G.2 are not met, an alternative shutdown capability is required. The alternative shutdown capability may utilize existing remote shutdown capabilities and must meet the criteria of Sections III.G.3 and III.L of Appendix R."

FitzPatrick's safe shutdown capabilities which rely on low pressure ECCS systems use these systems "to provide [their] design function" and qualify as "one of the normal safe shutdown trains." (In this context, "normal" does not mean an anticipated, preferred, planned, controlled shutdown. Rather "normal" is interpreted to be consistent with the response to Question 3.8.3 where the word is used to mean that, in an emergency, ECCS systems are providing their design functions.)

Appendix R distinguishes between three different methods of achieving safe shutdown: (1) normal safe shutdown, (2) alternate safe shutdown, or (3) dedicated safe shutdown. The rule did not need to establish performance criteria for normal safe shutdown. This criteria was already established in many other places, e.g. other parts of Title 10, Regulatory Guides, and in the Final Safety Analysis Report. Section III.L provided the performance criteria for alternative or dedicated shutdown which did not exist elsewhere.

Applicability of Section III.L in Generic Letter 86-10

The applicability of Section III.L was addressed by the NRC in Generic Letter 86-10 (Reference 1) by their response to Question 5.1.3 (Generic Letter 86-10, Enclosure 2, Page 20) which, in part, states:

> "Although 10 CFR 50.48(b) does not specifically include Section III.L with Sections III.G, J, and O of Appendix R as a requirement applicable to all power reactors licensed prior to January 1, 1979, the Appendix, read as a whole, and the Court of Appeals decision on the Appendix, Connecticut Light and Power, et al. v. NRC, 673 F2d. 525 (D.C. Cir., 1982), demonstrate that *Section III.L applies to the alternative safe shutdown option under Section III.G if and where that option is chosen by the licensee.* This does not preclude licensees from proposing and justifying other methods . . . ." [emphasis added]

Therefore, the performance detailed in Section III.L applies only when the Authority chooses the alternate or dedicated shutdown option of Appendix R.

FitzPatrick Low Pressure ECCS

"Normal" safety-related systems that are used for safe shutdown during and after a fire, whose configuration during safe shutdown is that of a redundant safety-related train, have their performance goals defined by the UFSAR and the associated NRC SERs. Analyses for design basis accidents (LOCA etc.) using low pressure systems are applicable to Appendix R safe shutdown scenarios.

Section 6.5 of the FitzPatrick Updated Final Safety Analysis Report (UFSAR) describes ADS, LPCI and CS as safety-related systems redundant to HPCI. This section outlines the performance requirements for the use of ADS/LPCI or ADS/CS from inside the Control Room to achieve safe shutdown in case of a fire. This section also provides a discussion of suppression pool performance requirements and ECCS pump net positive suction head. Using ADS/LPCI or ADS/CS to cool the core, it is possible to temporarily uncover the core depending on the coolant level in the reactor when the low pressure ECCS are initiated. This section states that analyses show that although the core may become temporarily uncovered, no fuel damage occurs.

FitzPatrick UFSAR Section 6.5.1 states:

> "As stated in the safety objective and in the Safety Design Bases, the ECCS remove the residual and decay heat from the reactor core so that excessive fuel clad temperature is prevented."
>
> "Since core cooling can be shown to be effective if the core geometry is maintained,

clad integrity must be maintained. Since highly oxidized Zircaloy may fracture upon cooling, this must be prevented to maintain core geometry after cooldown. Based on the worst case experimental data, clad fragmentation upon cooldown can be prevented for the time scale of interest here if the maximum cladding temperature is limited to less than 2700°F."

"A 2200°F limit, has been established by 10 CFR 50.46 instead of a 2700°F limit."

"The actual performance of the Emergency Core Cooling Systems is such that peak cladding temperatures (PCT) lower than 2200°F result across the complete break spectrum."

At FitzPatrick, for those areas requiring the use of ADS/LPCI or ADS/CS from inside the Control Room to achieve safe shutdown in case of a fire, the low pressure systems (LPCI and CS) are considered redundant safety-related trains to the high pressure systems (HPCI and RCIC) for the fire area under consideration. The ADS/LPCI and the ADS/CS achieve and maintain cold shutdown in accordance with the performance goals defined in the UFSAR and the associated NRC SERs.

Conclusion

Since the use of ADS/LPCI and/or ADS/CS from inside the Control Room to achieve safe shutdown in case of a fire is not considered alternative or dedicated shutdown, the requirements of Section III.L do not apply. FitzPatrick complies with 10 CFR 50, Appendix R with respect to the use of ADS/LPCI and/or ADS/CS from inside the Control Room to achieve safe shutdown. Therefore, no exemptions are required.

Low pressure ECCS are the safety-related systems redundant to HPCI and RCIC and the applicable performance requirements are those detailed in the FitzPatrick UFSAR and the associated NRC SERs. FitzPatrick's Emergency Operating Procedures (EOPs) instruct operators to use low pressure systems to mitigate design basis accidents. The EOPs are based on Emergency Procedure Guidelines which were developed with nuclear industry groups and reviewed and approved by the NRC. Other commercial nuclear power plants also use low pressure systems to comply with Appendix R's safe shutdown requirements.

Response 2c

As mentioned in response to question 1, conditions that would require use of low pressure injection systems (i.e. ADS/LPCI and/or ADS/CS) are of low probability and will be used only when all other means of shutting down the reactor are not available or when the use of high pressure systems must be avoided. Existing procedures reflect this.

Safety related systems that could/would be available for reactor coolant makeup are detailed in the Authority's Appendix R analysis report. See References 4, 5 and 6. Except for portions

of RCIC (Reactor Core Isolation Cooling) and the alternate shutdown systems, non-safety related equipment was not modeled in the report. However, Abnormal Operating Procedure 28 ("Operation During Plant Fires," Reference 7) does direct the operator to use non-safety-related systems like the main feedwater and condensate systems if they are available and can be used safely.

References:

1. NRC letter, J. E. Menning to W. A. Josiger, dated May 18, 1994, regarding "Request for Additional Information - Appendix R Assessment of Safe Shutdown Capability for the James A. FitzPatrick Nuclear Power Plant (TAC M84780)"

2. NRC Letter, D. G. Eisenhut to All Power Reactor Licensees and Applicants for Power Reactor Licenses, dated April 24, 1986, regarding "Implementation of Fire Protection Requirements (Generic Letter 86-10)."

3. SECY-85-306, NRC Rulemaking Issue (Notation Vote) from W. J. Dircks for the Commissioners, dated September 17, 1985, regarding "Staff Recommendations Regarding the Implementation of Appendix R to 10 CFR 50."

4. NYPA letter, R. E. Beedle to USNRC, dated October 26, 1992 (JPN-92-064), regarding "Fire Protection Program, 1992 Safe Shutdown Capability Assessment."

5. NYPA letter, R. E. Beedle to USNRC, dated December 22, 1994 (JPN-92-071), regarding "Fire Protection Program, Safe Shutdown Scenario and Timetable."

6. NYPA letter, R. E. Beedle to USNRC, dated December 22, 1994 (JPN-92-074), regarding "Fire Protection Program, AC/DC Coordination Analysis."

7. FitzPatrick Abnormal Operating Procedure 28, "Operation During Plant Fires," Revision 5, effective November 17, 1993.