Mr. Roger O. Anderson, Director
Nuclear Energy Engineering
Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

August 12, 1999

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION CONCERNING THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT REQUEST FOR EXEMPTION FROM 10 CFR PART 50, APPENDIX R, SECTION III.G.2, "FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITIES" (TAC NOS. M99528 AND M99529)

Dear Mr. Anderson:

By letters dated August 14, 1997, and April 16, 1998, Northern States Power Company (NSP) has requested exemptions from the technical requirements of Section III.G.2 of Appendix R to Title 10 of the Code of Federal Regulations, Part 50, to the extent that it specifies the separation of certain redundant safe shutdown circuits with fire-rated barriers. Alternatively, NSP proposed to use fire-rated cables to replace portions of certain safe shutdown circuits at the Prairie Island Nuclear Plant. On September 17, 1998, the staff issued a letter requesting additional information based on its initial review of the NSP's submittals. On November 2, 1998, NSP responded to the staff's request.

Based on our detailed review of your submittals including your response dated November 2, 1998, the staff requests that NSP provide additional information as described in the enclosure. The enclosed request has been discussed with Mr. Eugene Eckholt and others of your staff on July 19, 1999. It is our understanding, based on my discussion with your staff on August 11, 1999, that you are considering the schedule for completing the response to our request for additional information (RAI). Since developing the response would likely require an extended period of time, we would accept an application to withdraw the exemption request with the understanding that you would resubmit when you have completed your response to the RAI. Please advise the staff with your schedule for responding to the enclosed request.

If you have any questions regarding this matter, please contact me at 301-415-1392.

Sincerely,

Original signed by:
Tae Kim, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos: 50-282, 50-306
Enclosure: As stated
cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 12, 1999

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Mr. Roger O. Anderson, Director
Northern States Power Company

Prairie Island Nuclear Generating Plant

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Site General Manager
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Northern States Power Company
1717 Wakonade Drive East
Welch, Minnesota 55089

REQUEST FOR ADDITIONAL INFORMATION
REGARDING
NSP'S REQUEST FOR EXEMPTION FROM SECTION III.G.2 OF
APPENDIX R TO 10 CFR PART 50
PRAIRIE ISLAND NUCLEAR GENERATING PLANT
DOCKET NOS. 50-282 AND 50-306

1) In the subject Exemption Request, dated August 14, 1997, Northern States Power, (NSP), typically describes the fire hazard as: "contains light combustible loading consisting of lubricating oil and cable insulation corresponding to a fire severity of less than 15 minutes on the ASTM E-119 standard curve." On April 16, 1998, NSP supplemented the August 14, 1997, exemption request with new information concerning combustible loading and fire severity: "The discussion of combustible loading corresponds to a fire severity for all four areas note that combustible loading corresponds to a fire severity of less than 15 minutes on the ASTM E-119 standard time temperature curve. In all four cases the noted fire severity should have been less than 30 minutes."

A) Does this change in combustible loading (i.e., "Light combustible loading. . . corresponding to a fire severity of less than 15 minutes," to "Very light combustible loading . . . corresponding to a fire severity of less than 30 minutes," change the validity of the existing exemption especially concerning the lack of automatic suppression, intervening combustibles, or lack of fire barriers? Also provide the technical justification for changing the classification of less than15 minutes as light, and less than 30 minutes as very light.

B) The Eighteenth Edition of the National Fire Protection Association (NFPA), Fire Protection Handbook (FPH) states that, "The original concepts of fire severity and fire load are very important even though they are technically obsolete." While this approach is a reasonable accounting method of tracking combustibles in the plant and may have been used in the past to estimate the fire endurance requirement of fire barriers used to form compartmentalization. However, in and of itself this method is not adequate to address the parametric fire exposure that potentially could threaten cables[1]. This "averaging" of the fire potential may misrepresent the actual fire hazard that could expose the required cables. Submit a fire hazard analysis that addresses the minimum following parameters:

- Amounts, types, configurations and locations of cable insulation and other combustibles (e.g., lubricating oil) with respect to the cables and the worst case postulated thermal insult they could receive in a fire.

---

[1] Also see: NUREG-1547 Methodology for Developing and Implementing Alternative Temperature-Time Curves for Testing the Fire Resistance of Barriers for Nuclear Power Plant Applications, p. 7-14

- Other in-situ fire hazards and potential ignition sources.

- Automatic fire detection and suppression capability

- Layout and configuration of safety trains

- Reliance on and the qualifications of fire barriers, including fire test results, the quality of the materials and system, and the quality of the installation

- Fire area construction (walls, floor, ceiling, dimensions, volume, ventilation, and congestion.

- Location and type of manual fire fighting equipment and accessibility for manual firefighting

- Alternative or dedicated shutdown capability.

2. Each application of Rockbestos Firezone R cable must be reviewed as a part of the exemption, (i.e., no "blanket" approval for its use.) In NSP's November 2, 1998, RAI response there is a discussion of each individual cable, its application, and the fire area in which it is located. There is no information provided regarding the use of Firezone R cable as a radiant energy shield as requested in NSP's August 14, 1997, letter. Indicate whether or not Firezone R cables are being used as a radiant energy shield. If Firezone R cables are being used as radiant energy shields please provide the following:

   (a) detail drawings or diagrams which depict the routing of the Firezone R cables and the basic features (equipment, storage, components, etc.) of the fire areas through which the Firezone R cables will pass.

   (b) detailed description of the configuration that the Firezone R cable will be in, the type of cable (e.g., 3C14 AWG) and the expected service loads that will be required of the cables (voltage and current).

   (c) the function of each cable, i.e., power, control, or instrumentation.

   (d) a basis for using radiant energy heat shields outside of containment, (fire areas 31 and 32) in lieu of rated fire barriers. Describe the fire protection features of these fire areas.

   (e) a discussion about how this meets the requirements of Appendix R to 10 CFR Part 50.

3. NSP's November 2, 1998 letter states that stainless steel armored cable is run in conduits. Demonstrate how this configuration is bounded by the UL fire test.

4. In the subject Exemption Request, dated August 14, 1997, Attachment 3 was a test report from Faverdale Technology Centre for Darmatt fire barrier material (Report No. FTCR/94/0060). On September 17, 1998, the staff requested additional information (RAI) concerning PI's use of this test configuration to qualify unprotected supports. Specifically, Question 6 requested PI demonstrate how this test qualified the use of unprotected unistrut for raceway supports. On November 2, 1998, NSP responded to the RAI and stated that (this test) "was not specifically a test of the unistrut support system, however the ability of an unprotected unistrut to meet the design criteria of GL 86-10, Supplement 1, can easily be inferred by the results of this test." Thus, NSP concluded that this test qualifies their Rockbestos cable installation supported by unprotected unistrut supports. The staff has concluded this is incorrect for the following reasons:

   A) The trapeze support in the Darmatt fire test did not carry the weight of the raceway. Test report FTCR/94/0060 states, "Attached to the unexposed surface were steel frameworks from which the raceways were supported externally," (p. 6 of 93) and "The raceways were supported from the floor/roof at each end from outside of the furnace" (p. 11 of 93). This is typical of most full-scale Electrical Raceway Fire Barrier System (ERFBS) tests.

   B) The concern with the trapeze support in the full-scale ERFBS fire test would be the ability of the support to conduct heat into the ERFBS during the exposure and damage protected cables. Review of Frame 8 (p. 72 of 93) clearly shows that the complete horizontal section and half of each vertical riser is protected.

   C) With the raceway externally supported (as stated in A), the trapeze support did not have to carry any weight of the raceway during the fire test. ASTM E36 structural steel loses between 60% to 70% of its strength at 1100 ^{0}F to 1200 ^{0}F. Greater loses will be encountered at 1700 ^{0}F (i.e., temperature at the 1-hour mark of the ASTM E119 test). Note that in the UL test report for the Rockbestos Fire Wall III cables (File R10925-1) the supports were protected with insulating material (p. 13), and the steel cable tray structurally failed at 40 minutes into the test (p. 17).

   Submit a test/analysis that demonstrates the Rockbestos cable's unprotected steel supports (for cables routed in cable trays or independently) can withstand the 1-hour ASTM E119 exposure and maintain their load carrying ability.

The following questions concern the UL test on Rockbestos Cable.

5. The 1984 UL fire test report (File R10925-1, p. 6) identifies the fire resistant cables as, "Firewall FR SR Class 1E Electric Cables." The cover page of the UL report states, "Information conveyed by this Report applies only to the specimens actually involved in these tests." The cables PI is planning to install are identified as "Rockbestos Firezone R." Verify that the specific type of Rockbestos cables that are, or will be, installed are the same as the specific type of Rockbestos cables that were fire tested.

6. For the Rockbestos cables tested, the amount of current carried by the cables during the fire test was considerably less than the rated current for the cable sizes tested (according to the National Electric Code, NEC-NFPA 70). Likewise, the resistor arrangement shown in Illustration 17 (of R10925-1) shows a reduction in voltage. Please explain how the UL test bounds the current loads and reduced voltages on the cables that are, or will be, installed in the plant.

7. The UL test report states that the cables tested in the full scale test were monitored for faults from the cable sheath to the cable shield, conductor to conductor, and from conductor to ground. The low voltage ac electrical current was applied to each conductor and a separate low voltage dc voltage was applied to monitor for electrical faults. A single ac and single dc source was used. Light-emitting Diodes (LED) were arranged to determine the fault flow paths. During the test all the fault indicating LED's illuminated. The discussion section of the UL report justifies this as acceptable and determined it was caused by leakage currents due to the temperature effects on the insulation resistance. Considering the single sources of low voltage power supplied (ac and dc), the series of in-line resistors, and illuminated LEDs provide further justification that this test report qualifies PI's installation that the cables will remain fully functional when exposed to a thermal insult similar to that of an one-hour ASTM E-119 standard time/temperature exposure.

8. The method and values for determining insulation resistance (IR) in the UL test report do not appear to coincide with those methods and acceptable practices used in industry accepted standards such as the Institute of Electrical and Electronics Engineers (IEEE) standard 690 "IEEE Standard for the Design and Installation of Cable Systems for Class 1E Circuits in Nuclear Power Generating Stations." For example IEEE 690 recommends a minimum of 500 V dc for IR testing. The UL test used considerably less voltage for some of the testing. Justify the use of these lower values and how this testing qualifies values used for the installations at PI.

9. Section 17.0 "Conductor Resistance"of the Rockbestos Firezone R specification (Issue 5, RSS-5-144), provides the calculated resistance of the Firezone R cable with a 20-foot segment at 1700 ^{0}F. Provide the values used to calculate conductor resistance(due to elevated temperatures) and the basis for these values for the cables installed at PI.

10. Section 7.1 of the Rockbestos Fire Zone R specification (Issue 5, RSS-5-144) states that, "A stainless steel corrugated impervious welded sheath at least 12 mils in thickness shall be applied over the jacket when the cable is to be used in cable tray or run as conduit." In a fire exposure, this stainless steel sheath can be expected to heat up quicker than other jacketed cables installed in the tray. As the stainless steel sheath continues to heat, it could begin to penetrate through the other energized cables in the tray providing a potential short path. Describe the analysis performed and the methods used to address and mitigate the potential for the Rockbestos Firezone R cable installed in cable trays at PI, shorting to other energized cables in the same tray.