Portland General Electric Company

Bart D. Withers Vice President

December 20, 1985

Trojan Nuclear Plant
Docket 50-344
License NPF-1

Director of Nuclear Reactor Regulation
Attn: Mr. Steven A. Varga
Director, PWR-A
Project Directorate No. 3
U.S. Nuclear Regulatory Commission
Washington DC 20555

Dear Sir:

Response to Request for Additional
Information on Appendix R Exemption Requests

Attached for your review is Portland General Electric Company's (PGE) response to the NRC's request for additional information relative to the Appendix R exemption requests for the Trojan Nuclear Plant. This request was telecopied to PGE on November 13, 1985.

We would be pleased to discuss any questions or comments you may have regarding these responses.

Sincerely,

B D Withers

Bart D. Withers
Vice President
Nuclear

Attachment

c: Mr. Lynn Frank, Director
State of Oregon
Department of Energy

Mr. John B. Martin
Regional Administrator, Region V
Nuclear Regulatory Commission

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TROJAN NUCLEAR PLANT
PORTLAND GENERAL ELECTRIC COMPANY'S
RESPONSE TO NRC REQUEST FOR INFORMATION
ON APPENDIX R EXEMPTION REQUESTS[1]

280.1 Describe the intervening combustibles and fire hazards between redundant safe shutdown systems located in fire areas A-4, A-4a, E-1, and T-1 for which exemptions have been requested in Section 5.

Response

The separation between redundant cables is identified on the attached data sheets and electrical sketches. An exception to this is the electrical penetration area where the separation is not as straightforward. The type of combustibles in the vicinity of the redundant cables can be found in the combustible loading table (Table 2-2 of the Appendix R Review submittal). The attached data sheets refer to the appropriate portion of that table.

The redundant equipment in question can be identified from the Safe Shutdown Equipment subsection for each of the fire areas under review; A4, A4a, E1, and T1. The component numbers (Plant ID No.) for redundant equipment were taken from Table 3-1, which is sorted by system.

The information below is provided separately for each set of redundant components. Table 1 lists components for which information is provided. The information augments that contained in the submittal. It is an aid to the reviewer and does not stand by itself. The detailed information for the A4 exemption request only addresses newly identified equipment and cables. No new information is provided for the equipment and cable configuration covered by the existing exemption on the 45-ft Elevation of A4. It is hoped that this information, along with the tour conducted during the recent site visit, will be sufficient to address the reviewer's concerns.

The following is a brief description, by heading, of the detailed information sheets:

[1] The Appendix R exemption requests are contained in PGE's July 1984 submittal entitled "Trojan Nuclear Plant, 10 CFR 50 Appendix R Review" and Amendment 1 thereto, dated May 31, 1985. Page and figure numbers in this response refer to those of the submittal.

Item, Fire Area, Elevation - These are provided in the upper right-hand corners of the sheets. The item number is arbitrary and is used for locating information for specific components via Table 1. The item numbers separate information for each component by the fire area and elevation, where appropriate.

Component No. - Provides the component numbers of the redundant equipment. The other columns provide information on the cable routings for these components.

Cable - Identifies the cables routed through the area.

Conduit - Identifies the conduit the cable is routed through. (The conduit is highlighted on the corresponding electrical sketch, also provided.)

Tray - Identifies the sections of cable trays the cable is routed in. (The trays are also highlighted on the electrical sketch.)

E-Dwg - The electrical sketch which shows the cable trays and conduits the cable is routed through. A figure number is inserted parenthetically - it is the figure number in the Appendix R Review submittal which corresponds to the electrical sketch number.

A-Dwg - Refers to an architectural drawing which have room numbers on them.

Room - The room number through which the raceway traverses. The room number is listed opposite the corresponding raceway (conduit or tray) number. If more than one room is traversed, then both room numbers are listed.

Combustible Table - A quick reference on information provided in the combustible loading table (Table 2-1 of the Appendix R Review submittal). The page number of the combustible loading table is given, as is the combustible loading itself. More information on the type of combustible, etc, is provided in the combustible loading table.

Distance of Closest Approach - The distance between raceways which hold redundant cables is, in most cases, provided. The numbered distances are identified on the marked-up version of the corresponding electrical sketch.

Notes - Asterisked notes identify raceways which are provided with one- or three-hour wraps. Routings through Area A4a are also noted.

280.2 Provide the design details and design criteria for the water curtain proposed to be installed between fire areas A-4 and A-4a on elevation 61 ft described on pages 2-15 and 2-16. Indicate how this water curtain provides "3-hour barrier protection to train B cables" as claimed on page 5-12.

Response

Design details of the 61-ft water curtain are shown on the following attached drawings:

(1) Location

A-70 (Auxiliary Building floor plan, Elevation 61 ft)

(2) Piping

- KBF-1-86 (spray nozzle)
- KGF-1-301 (release line)
- Preliminary design sketches (1 plan, 2 section, and 1 isometric)

Design criteria for the water curtain is summarized as follows:

(1) Type of System

Automatic deluge using hydraulic operated deluge valve (Viking D-5).

(2) Type of Detection

Fixed temperature - sprinkler heads 155°F using existing 42-inch beam as a draft stop.

(3) Area of Coverage

Width of corridor on both sides of draft stop approximately 8 ft in width.

(4) Location and Spacing

Open heads are 3/8-inch orifice positioned with one on each side of the draft stop 6-12 inches from the ceiling. One additional head is located just below major obstructions centered directly under the draft stop.

(5) Hydraulic Design

The system is hydraulically calculated per Section 4-4.8.2.3 of NFPA-13, with a minimum 3 gpm/lineal ft and no sprinkler providing less than 15 gpm with a 1000 gpm allowance for outside hose lines. Preliminary hydraulic calculations indicate flow in excess of 3 gpm/lineal ft is available.

Page 5-12 of the Appendix R Review does not claim that the water curtain provides "a 3-hour barrier protection to Train B cables", as stated in the above request. The exemption request for Area A4/A4a relates to the fact that the water curtain, although not a 3-hr-rated fire barrier, provides adequate protection of redundant trains of safe shutdown equipment and cables on the 61-ft Elevation. The water curtain is designed in a manner consistent with NFPA codes and, together with the associated draft stop, will prevent significant amounts of hot gases and smoke from crossing the fire area boundary in the corridor due to a fire in either Area A4 or Area A4a (see also Section 2.3.1.4.5 of the Appendix R Review). The water curtain also affords local fire suppression capability. This design provides a level of protection equivalent to the technical requirements of Section III.G.2 to Appendix R.

280.3 Provide plant fire area drawings to show room numbers corresponding to Table 2-2. This table lists a room-by-room summary of plant fire protection features but is not keyed to Section 5 where exemption requests are discussed. The drawings attached to the licensee submittal do not provide the above information.

Response

Copies of Drawings A-115 through A-118 are provided to show room numbers corresponding to Table 2-2. These drawings are used to represent as-built fire protection features in the Plant; however, the fire loading symbols have not been upgraded to conform to Table 2-2. Copies of updated Fire Area Drawings C-2100 through C-2104 are also included because the drawings now show which floor slabs are used as fire area boundaries.

280.4 On Page 5-16 (and others), reference is made to the analysis of structural steel fire resistance in Appendix C. Provide an evaluation which describes the results of a sensitivity analysis in terms of the need for the protection of structural steel. Include the evaluation of localized fire plume effects on the steel fire resistance.

Response

The conservative load factors and the partially embedded steel makes these floor slabs generally much less sensitive to fire exposure than the normal industrial floor slab configuration. The analysis described in Appendix C of the Appendix R Review shows that in most cases, additional fireproofing of exposed structural steel is not required for the fire barrier to retain adequate structural capacity during exposure equivalent to a standard 3-hour fire. In each case, the analysis assumed a standard 3-hour fire exposure of the concrete slab and exposed portions of the structural steel. This is the same acceptance criteria as for protective floor assemblies. The massive slabs generally retain considerable load carrying capacity. Additional strength, where needed, is often provided by the embedded portions of steel members which remain relatively cool because of the insulating and heat absorption properties of the concrete. Numerous concrete and masonry walls provide support of these floor slabs, which often results in span lengths which are less than the design span length between column lines, thereby reducing the capacity required to support the slab and fixed live load during a fire exposure.

The analysis of the Auxiliary and Fuel Buildings fire barrier slabs was performed to demonstrate that the barriers can survive a standard 3-hour fire exposure and therefore meet the requirements of 10 CFR 50 Appendix R. Where the existing condition is not shown by the analysis to retain adequate capacity, additional fireproofing is provided for the exposed structural steel.

As requested, the analysis has been evaluated to determine the effect of a variance in the properties of steel at high temperatures. This evaluation includes two different assumptions for reduced strength at high temperature and evaluates those locations where the residual strength of the partially embedded steel beam is shown to be needed to assist the slab in supporting the loads. The results indicate that where strength of steel at temperatures above 1600°F is assumed to be zero, the total calculated capacity of the slab and partially embedded steel members would be reduced by about 5 percent to 25 percent. Also, where the strength of steel above 1000°F is assumed to be zero, the total calculated capacity of the barriers is reduced by 10 percent to 35 percent. Only one or two locations were found where the use of these reduced properties would result in reduction of the calculated capacity below the actual load demand. No fireproofing will be applied at these locations because the original analysis contains sufficient conservatisms to assure that the unmodified fire barrier is adequate. The evaluation demonstrates that the analysis of Auxiliary and Fuel Building fire

barriers is not very sensitive to changes in high temperature steel properties.

In the Fuel and Auxiliary Buildings, the use of the 3-hour standard fire exposure is very conservative and results in much more heat input into the structure than would result from any localized fire plume effects. Localized fire plume effects were, therefore, not quantified for analysis of Appendix R fire barriers.

280.5 Provide drawing(s) showing the layout and arrangement of the diesel fuel oil storage tanks discussed on page 5-29.

Response

Attached Drawings M-144, M-145, and M-149 provide the details requested.

280.6 Provide additional design information for the emergency diesel generator air intakes in the form of drawings showing duct layouts, damper locations, and fans to augment the information provided on pages 3-48 and 5-26.

Response

Attached Drawings M-294 and M-295 provide the additional design information requested.

280.7 For the wall between fire areas E-1 and T-1, describe the type of sealant, wall construction details, grout, penetration seal, rating of labeled fire door, and design criteria for the proposed sprinkler system. Particular emphasis should be placed on the ability of the materials to achieve the desired fire rating. This wall is described in Section 2.3.3.1.1 (page 2-35) and Section 5.2.2 (page 5-18).

Response

Description of the details of the boundary wall between Fire Areas T1 and E1 are provided in an attached sketch. This sketch describes portions of the wall, including all of the boundary wall below the Turbine Building Elevation 63 ft floor slab, which will be upgraded to essentially meet requirements for a 3-hour fire rating.

Much of the remaining portion of the boundary, which includes the wall between Turbine Building floors at Elevations 63 ft and 93 ft and up to the roof at Elevation 116 ft, will not be upgraded to a fire rated configuration. This portion of the boundary consists largely of insulated metal siding exposed to the outside. The

siding will act as a barrier for smoke and hot gases and together with the new Turbine Building sprinkler systems described below will prevent a fire in the Turbine Building (Fire Area T1) from spreading to safe shutdown equipment in Fire Area E1.

The new Turbine Building sprinkler system is a change from the water spray system design described in Section 2.3.3.1.1 of the Trojan Appendix R Review. The automatic water spray system, which would have covered the metal siding and structural members of the wall, will be changed to an automatic wet pipe sprinkler system which will be provided at the 63-ft and 93-ft Elevations of the Turbine Building, between Columns P-S and 56-75. The fire protection objective of the system will remain the same, ie, prevent a Turbine Building fire in Area T1 from propagating to the electrical penetration area in Area E1, which contains safe shutdown electrical cabling. The primary advantages of using an automatic wet pipe sprinkler system, rather than an automatic water spray system, include the following:

- The sprinkler system will control and/or extinguish a fire in the Turbine Building. A water spray system on the wall would not control and/or extinguish a fire.

- The estimated flow of the sprinkler system will be 1,000 gpm. The estimated flow to the water spray system would require 2,800 gpm, not including additional water required to extinguish the fire.

- The sprinkler system's reliability is high, with inadvertent discharge of water very unlikely. The water spray system's reliability is not as high, with an inadvertent discharge of system involving water flow from all nozzles.