September 28, 1987

Docket Nos. 50-237
and 50-249

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Mr. L. D. Butterfield, Jr.
Nuclear Licensing Manager
Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

Dear Mr. Butterfield:

SUBJECT: FIRE PROTECTION APPENDIX R DRYWELL EXPANSION GAP EXEMPTION (TAC #61675 AND 61676)

Re: Dresden Nuclear Power Station, Unit Nos. 2 and 3

The Commission has issued the enclosed Exemption to the technical requirements of Section III.G.3 of Appendix R to CFR Part 50, relating to the installation of automatic fire detectors and a fixed suppression system in the drywell expansion gap at Dresden Units 2 and 3, in response to your request of June 5, 1986.

A copy of the Exemption is being forwarded to the Office of the Federal Register for publication. The Notice of Environmental Assessment and Findings of No Significant Impact was published in the Federal Register.

Sincerely,

Original Signed by/

Daniel R. Muller, Director
Project Directorate III-2
Division of Reactor Projects - III,
IV, V, and Special Projects

Enclosure:
As stated

cc w/enclosure:
See next page

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7590-01

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of COMMONWEALTH EDISON COMPANY Dresden Nuclear Power Station Units 2 and 3	)	Docket Nos. 50-237 and 50-249

EXEMPTION

I.

The Commonwealth Edison Company (CECo, the licensee) is the holder of Provisional Operating License No. DPR-19, which authorizes operation of Dresden Station Unit 2, and Facility Operating License No. DPR-25, which authorizes operation of Unit 3. These licenses provide, among other things, that Dresden Units 2 and 3 are subject to all rules, regulations, and Orders of the Commission now or hereafter in effect.

The station comprises two boiling water reactors at the licensee's site located in Grundy County, Illinois.

II.

On November 19, 1980, the Commission published a revised Section 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants. The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specified requirements for a particular aspect of the fire protection features at a nuclear power plant. One of these subsections, III.G, is the subject of the licensee's exemption request.

Subsection III.G.2 of Appendix R 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 nonsafety 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 nonsafety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated nonsafety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Subsection III.G.3 of Appendix R requires that where Subsection III.G.2 cannot be met, alternative or dedicated shutdown capability should be provided. Also, for areas, rooms, or zones where alternative or dedicated shutdown is provided, fire detection and a fixed-fire suppression system shall be installed.

III.

By letter dated June 5, 1986, the licensee requested an exemption from Section III.G.3 of Appendix R to the extent that it requires the installation of automatic fire detection and fixed-fire suppression systems in the drywell expansion gap.

The drywell is constructed of a steel containment shell that is surrounded by a concrete shield structure. The steel containment shell is spherical on the bottom and cylindrical at the top. The normal operation of the reactor (or accidents) will cause the steel shell to expand in all directions. This expansion is accommodated by providing a 2-inch gap. During construction, polyurethane foam sheets were installed over the exterior of the steel shell. An epoxy impregnated fiberglass tape was used over the joints and then 1/4- and 3/8-inch thick fiberglass-epoxy prefabricated cover panels were installed over the foam sheets. Concrete was placed over this material and, when hardened, the sandwiched materials provide the 2-inch gap because they are crushable as the steel containment shell expands. The foam materials serve no other purpose.

No fire protection is provided within the 2-inch gap. However, fire detectors are located in the reactor building fire zones adjacent to the electrical and mechanical drywell penetrations. Manual fire fighting equipment is available throughout the reactor building.

The only safe shutdown components located in the expansion gap are electrical conductors inside the electrical penetration assembly canisters and instrumentation taps in mechanical penetrations. These electrical conductors are associated with valves required for hot and cold shutdown and associated cables for automatic RHR system functions. The taps for reactor level indicating switches and pressure indicators are routed in mechanical penetrations.

The fire load in the 2-inch gap is composed of the polyurethane sheets and fiberglass cover panels, both combustible. The 2-inch gap is bounded on one side by the steel shell and on the other side by a 4-foot thick reinforced concrete shield/wall.

The electrical penetrations all have the same basic configuration. An electrical assembly is sized so that it can be inserted into the electrical penetration nozzle. The nozzles are 12-inch, schedule 80 steel pipe, with wall thickness of 0.688 inches. Each assembly is in conformance with the ASME Boiler and Pressure Code, Section III, for Class B Vessels. The penetrations extend 1 foot beyond the drywell wall on both sides. The drywell wall in the vicinity of the penetrations is about 6 feet thick.

The mechanical penetrations are of two types, viz., hot and cold. The hot ones are designed to accommodate thermal expansion and have guard pipes between the line and the penetration nozzle. The mechanical penetrations are also constructed of thick walled steel pipes and plates. The penetration nozzles conform to the ASME Pressure Vessel Code, Section VIII. The nozzle walls are welded to the steel shell containment structure.

The fire protection in the drywell expansion gap does not comply with the technical requirements of Section III.G.3 of Appendix R because a fixed-fire suppression system and a fire detection system have not been installed in an area for which an alternative shutdown system has been provided.

There was a concern that a fire within the drywell expansion gap could damage safe shutdown related penetrations (electrical and/or mechanical). Because of the combustible material sandwiched within the 2-inch expansion gap, it is possible that a fire could develop and spread through the gap.

There are two fire protection concerns for the drywell expansion gap. The first concern is whether or not a fire in the gap can spread out of the

gap and into other fire areas or fire zones. The second concern revolves around whether or not a fire in the 2-inch gap proper can affect the safe shutdown capability by damaging the penetrations directly.

With respect to a fire in the drywell expansion gap spreading into other areas, the concern is mitigated by the fact that the 2-inch gap is sandwiched between the steel shell containment structure and the 4 to 6 foot thick reinforced concrete shield wall. The total mass of these two boundaries would serve as a heat sink and dissipate most of the energy of a fire in the drywell gap. The penetrations consist of steel penetration nozzles that are welded firmly in place and surrounded by the concrete wall. This forms a complete enclosure of the gap except for a 2-inch annulus around each penetration. The drywell is inerted and the spread of fire into the drywell is, therefore, not possible during operation. Should a fire in the drywell gap spread into the reactor building, it would effect only one fire area of one unit and, therefore, an independent safe shutdown path would be available.

With respect to the effects of a drywell gap fire on the penetrations and the possible degradation of safe shutdown capability, it is unlikely that the electrical and mechanical penetrations would be damaged by an expansion gap fire to the extent that their function would be impaired, because of the schedule 80 steel pipe, heavy metal plates, and their weld attachment to the steel containment shell. However, the licensee did consider this possibility. In Tables 11.2-3 and 11.2-4 of their June 5, 1986 submittal, the licensee listed all of the safe shutdown functions that they had identified as being contained within the penetrations. As a result of that evaluation, the licensee concluded that a fire in the drywell gap would not result in any impairment of safe shutdown capability in either unit for the following reasons:

1. Some electrical penetrations contain power cables to individual safe shutdown valves that are normally open and that must remain open for hot shutdown. A fault in, or loss of, these cables will not change the position of the valves.
2. Other penetrations contain cables which could disable the Target Rock valve if they were damaged. However, the mechanical function of the Target Rock and other safety relief valves will not be affected by a fire in the expansion gap, thus assuring availability of Reactor Pressure Vessel pressure control capability.
3. Instruments are available to monitor reactor vessel level that have their essential and associated circuits routed independent of the expansion gap, and
4. Manual actions can be performed to open valves required for cold shutdown or to close valves in lines that are not used as fluid paths for hot shutdown.

A fire could cause a spurious readout of reactor water level indicator instruments located in the expansion gap. Correct readings could still be obtained from other redundant division instruments because the spacing between the redundant divisions routed through the gap is 45 feet. The amount of urethane is limited and a fire would involve only one division at a time. Once the material burned away from a penetration, the temperature would return to ambient level quickly. In the Dresden Unit 3 gap fire investigative report dated May 6, 1986, this was found to be the case, and, further, it was also concluded that plant safe shutdown capability is still maintained given a drywell expansion gap fire.

A final reason that a fire detection and a fixed-fire suppression system should not be required for the drywell expansion gap space is that it would be physically impossible to remove the existing foam and install the fire protection systems. In any event, the installation of a fire detection system and a fixed-fire suppression would not significantly upgrade the level of fire protection for either Unit 2 or Unit 3.

Based on the above evaluation, the staff concluded that the existing fire protection features and physical characteristics of the drywell expansion gap and its boundaries provide a level of fire protection equivalent to the technical requirements of Section III.G.3 of Appendix R.

The licensee provided information relevant to the "special circumstances" finding required by revised 10 CFR 50.12(a). The licensee stated that existing and proposed fire protection features at Dresden Nuclear Power Station Units 2 and 3 accomplish the underlying purpose of the rule. Implementing modifications to provide additional suppression systems and detection systems would require the expenditure of engineering and construction resources, as well as the associated capital costs, which would represent an unwarranted burden on the licensee's resources.

The licensee also stated that these costs are significantly in excess of those required to meet the underlying purpose of the rule. The staff concludes that "special circumstances" exist for the licensee's requested exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to 10 CFR 50. See 10 CFR 50.12(a)(2)(ii).

IV.

Accordingly, the Commission has determined, pursuant to 10 CFR 50.12(a), that (1) these exemptions as described in Section III are authorized by law and

will not present an undue risk to the public health and safety and are consistent with common defense and security, and (2) special circumstances are present for the exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to 10 CFR 50. Therefore, the Commission hereby grants the aforementioned exemptions from the requirements of Section III.G of Appendix R to 10 CFR 50 as described in Section III above.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of these exemptions will have no significant impact on the environment (52 FR 35978 dated September 24, 1987).

This Exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Dennis M. Crutchfield

Dennis M. Crutchfield, Director
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland
this 28th day of September 1987