TECHNICAL EVALUATION REPORT

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EVALUATION OF FIRE PROTECTION EXEMPTION REQUESTS
FROM 10CFR50.48 AND APPENDIX R TO 10CFR50

WISCONSIN ELECTRIC POWER COMPANY
POINT BEACH NUCLEAR PLANT UNITS 1 AND 2

TER-C5506-667

Prepared for

Nuclear Regulatory Commission
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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center (FRC) under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

1. INTRODUCTION

1.1 PURPOSE OF REVIEW

This Technical Evaluation Report documents an independent review of exemptions or deviations from the fire protection requirements of 10CFR50.48 or Appendix R to 10CFR requested for Wisconsin Electric Power Company's Point Beach Nuclear Plant. This evaluation was performed with the following objectives:

- To assess if each exemption request demonstrates an equivalent level of overall protection of plant safe shutdown capability following a disabling fire event.
- To determine the bases for acceptance or denial of each exemption request.
- To recommend the minimum level of fire protection the Licensee should provide to achieve an equivalent level of fire protection in case a request is denied.

1.2 GENERIC BACKGROUND

Following a major fire at the Browns Ferry Nuclear Station in March 1975, the NRC established a Special Review Group which initiated an evaluation of the need for improving the fire protection programs at all nuclear power plants. The group found serious design inadequacies regarding fire protection at Browns Ferry, and its report, "Recommendation Related to Browns Ferry Fire" (NUREG-0050, February 1976), contained over 50 recommendations regarding improvements in fire prevention and control in existing facilities. The report also called for the development of specific guidance for implementing fire protection regulations, and for a comparison of that guidance with the fire protection program at each operating plant.

The NRC developed technical guidance from the technical recommendations in the Special Review Group's report, and issued those guidelines as Branch Technical Position (BTP) APCSB 9.5-1 [1]. This guidance did not apply to plants operating at that time. Guidance to operating plants was provided later in Appendix A to BTP APCSB 9.5-1 [2], which, to the extent practicable, relies on BTP APCSB 9.5-1. The guidance in these documents was also published as Regulatory Guide 1.120 [3].

By early 1980, most operating plants had implemented most of the guidelines in Appendix A. However, the fire protection program has had some significant problems with implementation. To establish a definitive resolution of these problems in a manner consistent with the general guidelines in Appendix A to the BTP and to assure timely compliance by licensees, the Commission issued a proposed fire protection rule and its Appendix R, which was described as setting out minimum fire protection requirements for the unresolved issues. The fire protection features addressed included protection of safe shutdown capability, emergency lighting, fire barriers, associated circuits, the reactor coolant pump lubrication system, and alternate shutdown systems.

On February 17, 1981, the final rule 10CFR50.48 [4] and Appendix R to 10CFR50 [5] became effective, replacing the proposed rule. Only three of the 15 items in Appendix R were of such safety significance that they should apply to all plants, including those for which alternative fire protection actions had been approved previously by the staff. These items are protection of safe shutdown capability (including alternate shutdown systems), emergency lighting, and the reactor coolant pump lubrication system. Accordingly, the final rule required all reactors licensed to operate before January 1, 1979, to comply with these three items even if the NRC had previously approved alternative fire protection features in these areas. However, the final rule is more flexible than the proposed rule because Item III.G now provides three alternative fire protection features which do not require analysis to demonstrate the protection of redundant safe shutdown equipment, and reduces the acceptable distance in the physical separation alternative from 50 feet to 20 feet. In addition, the rule now provides an exemption procedure which can be initiated by a licensee's assertion that any required fire protection feature will not enhance fire protection safety in the facility or that such modifications may be detrimental to overall safety.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of damage. Either fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazards analysis. Generally, the staff will accept an alternative fire protection configuration if:

- The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.
- The alternative ensures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited so that it can be repaired within a reasonable time (minor repairs using components stored on the site).
- Fire-retardant coatings are not used as fire barriers.
- Modifications required to meet Section III.G would not enhance fire protection safety levels above those provided by either existing or proposed alternatives.
- Modifications required to meet Section III.G would be detrimental to overall facility safety.

A number of the exemptions from Section III.G of Appendix R requested in the Licensee's submittal concerned fire area boundaries. The acceptance criteria for fire area boundaries are delineated in Appendix A to BTP APCSB 9.5-1, not in Appendix R to 10CFR50.

Deviations from Appendix A fire area boundary guidelines do not require exemptions. Accordingly, the fire area boundary exemptions have been reviewed as deviations from Appendix A guidelines rather than exemptions from Appendix R to 10CFR50.

Section III.J of Appendix R requires that emergency lighting units with at least an 8-hour battery-powered supply be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

Guidance to the industry and the NRC's position on certain requirements of Appendix R are covered by various documents, one of them being Generic Letter 83-33 [6], which has recently been superseded by Generic Letter 86-10 [7]. "The Interpretations of Appendix R" and "The Responses to Industry Questions," two sections of Reference 7, are written to facilitate industry implementation of Appendix R and represent the NRC's position on all issues covered.

Following the promulgation of the final rule, licensees have requested exemptions and deviations from Appendix R to 10CFR50. The exemptions and deviations are in the form of a fire hazards analysis. The NRC is to review exemption requests and associated analyses to ensure each alternative to

meeting the requirements of the rule provides an equivalent level of overall protection of plant safe shutdown capability. Franklin Research Center (FRC) was to provide technical assistance to the NRC within the context of the following scope of work:

Subtask 1: Review each exemption request for information deficiencies. Provide Request for Information (RFI) to resolve such deficiencies.

Subtask 2: Review and evaluate each exemption or deviation request submitted by the licensees and all additional information provided for conformance with acceptance criteria. Prepare final Technical Evaluation Report (TER) with recommendations, and their basis in support of granting or denying the exemption/deviation request.

1.3 PLANT-SPECIFIC BACKGROUND

By letter dated June 30, 1982 and as supplemented by letters of April 28 and October 26, 1983, Wisconsin Electric Power Company (the Licensee) requested an exemption from the requirements of Appendix R for the containment spray additive and monitor tank area which contains redundant trains of safe shutdown instrument cables for Units 1 and 2 of the Point Beach Nuclear Plant. The cables are required to provide indication in the control room. The October submittal proposed alternate shutdown capability independent of the zone of concern. The exemption was granted July 3, 1985.

The implementation of TMI-related modifications subsequent to the Licensee's 1983 submittal included the rerouting of several of the safe shutdown instrument cables from the monitor tank area through the component cooling water heat exchanger and boric acid tank tank room and the computer and instrument rack room to the control room. The previously proposed alternate shutdown capability was independent of the revised cable route.

As a result of these modifications, the component cooling water heat exchanger and boric acid tank room and the computer and instrument rack room are not in compliance with Section III.G.3.b of Appendix R, which requires automatic suppression for areas containing redundant trains of safe shutdown cables.

By letter dated June 11, 1986, the Licensee requested exemptions due to the aforementioned noncompliance. These exemptions are the subject of this TER.

1.4 REVIEW CRITERIA

The criteria used in reviewing the Licensee-submitted exemption requests are based on the following documents:

1. Fire Protection Program for Operating Nuclear Power Plants, 10CFR50.48
2. Appendix R to 10CFR50
3. Standard Review Plan, NUREG-0800, Branch Technical Position (BTP), CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants"
4. Appendix A to BTP APCSB 9.5-1
5. Generic Letter 86-10, "Implementation of Fire Protection Requirements," dated April 24, 1986.

2. EVALUATION

2.1 GENERAL

This section presents review and evaluation of exemptions or deviations from 10CFR50.48 or Appendix R to 10CFR50 requested by the Licensee (Wisconsin Electric) of Point Beach Nuclear Plant Units 1 and 2. Evaluation of exemption requests for each fire area/zone singly or collectively follows a format suggested by the NRC and is arranged in the following subsections:

- Exemption requested
- Discussion
- Evaluation
- Conclusion.

The fire area/fire zone numbering used in this section corresponds to that used in the Licensee's submittal.

2.2 COMPONENT COOLING WATER HEAT EXCHANGER AND BORIC ACID TANK ROOM (FIRE ZONE 237)

2.2.1 Exemption Requested

An exemption was requested from the requirements of Section III.G.3.b of Appendix R to the extent that it requires automatic suppression to be provided throughout the fire area, room, or zone under consideration.

2.2.2 Discussion

The Licensee stated, in enclosure 1 to the June 11, 1986 submittal, that Fire Zone 237 does not meet the requirements of Section III.G.3.b because redundant trains of safe shutdown cables are in the same fire area in which alternate shutdown capability is provided, but automatic suppression is not.

This fire zone is located on the 46-foot elevation of the auxiliary building. The zone is separated from other areas by 2-foot-thick non-fire-rated concrete walls on three sides and one 18-inch-thick wall on the west side. All walls, the ceiling, and the floor are provided with 3-hour

fire-rated penetration seals. The zone is accessed from the west through one 3-foot x 7-foot and one 12-foot x 13-foot doorless entranceways and from the 26-foot elevation via an open stairway.

The zone contains the component cooling water heat exchangers and redundant channels of required primary and secondary instrumentation of both units.

The redundant instrument cables rise through the floor from the containment spray additive and monitor tank area and exit through the east wall to the computer and instrument rack room. Cables of each train for each unit are routed in separate conduits. Conduit separation, however, is not in compliance with the requirements of Appendix R.

Section 4.3.2 of the Licensee's October 26, 1983 submittal describes modifications made to provide safe shutdown monitoring instrumentation independent of the control room, cable-spreading room, and containment spray additive and monitor tank area. These modifications also provided alternate shutdown capability independent of the component cooling water heat exchanger and boric acid tank room.

The zone is provided with six photoelectric smoke detectors located within the room. There is no automatic suppression system. Two 1-1/2 inch hose reel stations are located outside the room near the west wall entranceways for manual fire suppression capability. Portable fire extinguishers suitable for the hazards present are also available.

A summer 1986 modification increased the number of component cooling water heat exchangers from three to four. Normally, one heat exchanger is used for cold shutdown of each unit. One heat exchanger can, however, provide cold shutdown capability for both units over a longer period of time. The two outermost heat exchangers are separated by a center-to-center distance of 21 ft 6 inches. The combustible in the zone is cable insulation comprising an approximate fuel load of 22,500 Btu/ft^2.

2.2.3 Evaluation

The fire protection in the component cooling water heat exchanger and boric acid tank room does not comply with the technical requirements of Section III.G.3 of Appendix R because an automatic fire suppression system is not installed.

There was a concern that because an automatic suppression system is not installed, a fire of significant magnitude could develop and damage redundant component cooling water heat exchangers and/or redundant channels of required instrumentation. However, the combustible loading in the area is low, having an equivalent fire severity of less than 1/2 hour. The heat exchangers are of heavy metal construction and contain water when the plant is operating. There is reasonable assurance that a fire would not damage a heat exchanger sufficiently to prevent it from performing its safe-shutdown function. In addition, the zone is provided with early warning smoke detectors. It would be expected that if a fire were to occur, it would be detected in its incipient stages and the plant fire brigade would be summoned. The fire brigade would control the fire using installed hoses or extinguishers.

Although the redundant instrumentation cables are not provided with separation per Appendix R, a modification has provided for the necessary safe-shutdown monitoring, independent of the component cooling water heat exchanger and boric acid tank room.

With the fire protection features described above, there is reasonable assurance that a fire in Fire Zone 237 will not prevent the plant from safely shutting down.

2.2.4 Conclusion

Based on the above evaluation, it is concluded that the existing fire protection features, together with alternate shutdown capability for the component cooling water heat exhanger and boric acid tank room, provide a level of fire protection equivalent to the technical requirements of Section III.G.3.b of Appendix R. Therefore, the exemption from providing automatic suppression for Fire Zone 237 can be granted.

2.3 COMPUTER AND INSTRUMENT RACK ROOM (FIRE ZONE 336)

2.3.1 Exemption Requested

An exemption was requested from the requirements of Section III.G.3.b of Appendix R to the extent that it requires automatic suppression to be provided throughout the fire area, room, or zone under consideration.

2.3.2 Discussion

The Licenee stated, in enclosure 2 to the June 11, 1986 submittal, that Fire Zone 336 does not meet the requirements of Section III.G.3.b because redundant trains of safe shutdown cables and components are in the same fire area in which alternate shutdown capability is provided, but automatic suppression is not.

This fire zone is located on the 60-foot elevation of the control building. The zone boundaries are reinforced concrete walls, floor, and ceiling. All boundaries are provided with 3-hour fire-rated penetration seals. The zone is accessed from the north and south through Class A fire doors.

The zone contains cable and instrument racks for redundant channels of required primary and secondary instrumentation for both units.

The zone is provided with eight photoelectric smoke detectors located within the zone. There is no automatic suppression system. Hose reel stations are located at the foot of the stairway on the 46-foot elevation for manual fire suppression capability. Portable fire extinguishers are also available.

The redundant instrument cables enter the zone through the west wall and are routed to the instrument racks in rigid steel conduits across the ceiling. They are, however, exposed for a short distance in cable trays above the instrument racks. Cable tray and instrument rack separation is not in compliance with Appendix R. Combustibles in this fire zone are cable insulation and paper products, which present a fuel load of approximately 20,000 Btu/ft^2.

Section 4.3.2 of the Licensee's October 26, 1986 report describes modifications to provide safe shutdown monitoring instrumentation independent of the

control room, cable-spreading room, and the containment additive and monitor tank area. These modifications also provide alternate shutdown capability independent of the computer and instrument rack room.

2.3.3 Evaluation

The fire protection in the computer and instrument rack room does not comply with the technical requirements of Section III.G.3 of Appendix R because an automatic fire suppression system is not installed.

There was a concern that because an automatic suppression system is not installed, a fire of significant magnitude could develop and damage redundant trains of required instrumentation racks and associated cables. However, the combustible loading in the area is low, having an equivalent fire severity of less than 1/2 hour. If a fire were to occur, it is expected that it would develop slowly with initial low heat release and slow rise in room temperature. Because of the presence of smoke detectors, a fire in the area should be detected in its incipient stage. The fire brigade would be dispatched to extinguish the fire manually, using the hose lines or portable extinguisher.

In addition, the Licensee has provided for safe shutdown monitoring instrumentation and circuitry, independent of the zone of concern.

With the fire protection features described above, there is reasonable assurance that a fire in Fire Zone 336 will not prevent the plant from safety shutting down.

2.3.4 Conclusion

Based on the above evaluation, it is concluded that the existing fire protection features, together with alternate shutdown capability for the computer and instrument rack room, provide a level of fire protection equivalent to the technical requirements of Section III.G.3.b of Appendix R. Therefore, the exemption from providing automatic suppression for Fire Zone 336 can be granted.

3. CONCLUSIONS

This section consolidates the results of the evaluation contained in Section 2 concerning the exemptions requested by the Licensee from the requirements of Section III.G of Appendix R to 10CFR50 for Point Beach Nuclear Plant. It is not meant as a substitute for the specific conclusions reached in the various subsections of Section 2 for which the reader is referred to specific subsections.

Based on the evaluation, it is found that the level of fire safety in the areas listed below is equivalent to that achieved by compliance with the technical requirements of Section III.G of Appendix R and, therefore, the Licensee's request for exemption in the following areas can be granted:

1. Component Cooling Water Heat Exchanger and Boric Acid Tank Room, Fire Zone 237

   Lack of fixed automatic fire suppression throughout the fire area. See Section 2.2 for additional information.

2. Computer and Instrument Rack Room, Fire Zone 336

   Lack of fixed automatic fire suppression throughout the fire area. See Section 2.3 for additional information.

4. REFERENCES

1. BTP APCSB 9.5-1, "Fire Protection Program," July 1981

2. Appendix A to BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," August 23, 1976

3. Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants," November 1977

4. 10CFR50, "Fire Protection Program for Operating Nuclear Power Plants," November 19, 1980

5. Appendix R to 10CFR50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," November 19, 1980

6. Generic Letter 83-33, "NRC Position on Certain Requirements of Appendix R to 10CFR50," October 19, 1983

7. Generic Letter 86-10, "Implementation of Fire Protection Requirements," April 24, 1986

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