DR 016

Docket No. 50-289

March 19, 1987

Mr. Henry D. Hukill, Vice President
and Director - TMI-1
GPU Nuclear Corporation
P. O. Box 480
Middletown, Pennsylvania 17057

Dear Mr. Hukill:

SUBJECT: FIRE PROTECTION EXEMPTIONS FOR TMI-1

By letters dated February 2, 1987, February 11, 1987, February 28, 1987, and March 10, 1987, GPUN requested exemptions to the technical requirements of Section III.G.2 of Appendix R to 10 CFR 50. Based upon our evaluation of your submittals, we conclude, for the exemptions requested, that the TMI-1 alternate fire protection configuration provides an equivalent level of safety to that achieved by conformance with Appendix R. Therefore, exemption requests as described in the enclosed Exemption are granted.

Compliance with Appendix R is to be achieved during your current shutdown per 10 CFR 50.48. Our overall safety evaluation of your efforts to satisfy Appendix R will be provided at a later date. As a result of the review to date, you have not identified any other exemptions outside those described herein or in previous Exemptions. A copy of the Exemption is being filed with the Office of the Federal Register for publication.

Sincerely,

/S/

John F. Stolz, Director
PWR Project Directorate #6
Division of PWR Licensing-B

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7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
GENERAL PUBLIC UTILITIES NUCLEAR CORPORATION, ET AL.	)	Docket No. 50-289
	)	
(Three Mile Island Nuclear Station, Unit No. 1)	)	

EXEMPTION

I.

General Public Utilities Nuclear (GPUN) Corporation (the licensee) and three co-owners hold Facility Operating License No. DPR-50, which authorizes operation of the Three Mile Island Nuclear Station, Unit No. 1 (TMI-1) (the facility) at power levels not in excess of 2535 megawatts thermal. This license provides, among other things, that the facility is subject to all rules, regulations, and Orders of the Nuclear Regulatory Commission (the Commission or the staff) now or hereafter in effect.

The facility is a pressurized water reactor located at the licensee's site in Dauphin County, Pennsylvania.

II.

10 CFR 50.48, "Fire Protection," and Appendix R to 10 CFR Part 50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979" set forth certain fire protection features required to satisfy the General Design Criterion related to fire protection (Criterion 3, Appendix A to 10 CFR 50).

Section III.G of Appendix R requires fire protection for equipment important to safe shutdown. Such fire protection is achieved by various combinations of fire barriers, fire suppression systems, fire detectors, and

separation of safety trains (III.G.2) or alternate safe shutdown equipment free of the fire area (III.G.3). The objective of this protection is to assure that one train of equipment needed for hot shutdown would be undamaged by fire, and that systems needed for cold shutdown could be repaired within 72 hours (III.G.1).

III.

By letters dated February 2, 1987, February 11, 1987, February 28, 1987, and March 10, 1987, the licensee requested approval of a number of exemptions from the technical requirements of Section III.G of Appendix R to 10 CFR 50. Additional information concerning some exemptions requested was provided in a letter dated February 10, 1987. A description of the exemption requests and a summary of the Commission's evaluation follow.

1. III.G.2; exemption requested to allow manual operation of certain valves and pumps and in some instances providing a roving fire partol in lieu of providing fire protection. The pumps and valves to be manually operated include MU-V-1B (normal makeup flow), MU-V-8 (letdown flow alignment to Makeup Tank or the Reactor Coolant Bleed Tanks), MS-V-2B (main steam block valve for atmospheric steam dump), EF-V-30 A, B, C and D (Emergency Feedwater Flow Control Valves), Nuclear River Cooling Water Pump NR-P-1c, IC-V-2, 3, 4 (Intermediate Cooling Valves), MU-V-37 (Makeup Valve), MU-V-1A, 1B, 2A, 2B, 3, 6A and 6B (Letdown Valves), MDL-V-1 and 2 (Letdown Valves), IC-V-1A and 1B (Intermediate Cooling Valves), and NR-V-15A and B (Nuclear River Valves). The specific components are as described in letters from the licensee dated February 2, 1987 and March 10, 1987.

The licensee states that if a fire damages cables associated with these components, sufficient time exists to manually align the valves and to manually control the pumps so as to achieve and maintain safe shutdown conditions. The time periods within which the licensee must accomplish these actions vary from 20 minutes for certain emergency feedwater system valves to 240 minutes for certain valves in the makeup system. The minimum time frame to establish local control of the intermediate cooling water pumps and the nuclear river cooling water pumps is 30 minutes.

The technical requirements of Appendix R are not met in the subject areas because cables and components for certain shutdown-related valves and pumps are not provided with fire protection in accordance with the options identified in Section III.G.

The staff has several concerns regarding the reliance on manual actions in lieu of physical protection of shutdown systems. The first is that plant operators may have to enter the fire area before it is reasonable to expect that habitable conditions may be restored after the fire. The licensee, in the February ?, 1987 submittal, identified a number of locations where safe shutdown can only be achieved by reentering the fire area to assure proper valve alignment. However, in no instance is it necessary to enter these areas before two hours after fire damage occurs. Although it is not possible to predict the nature and duration of a fire in any location, the staff expects that within one hour a fire would have been detected and controlled and near ambient conditions restored. This conclusion is based on the description of plant hazards and available protection as provided by the licensee in Revision 7 of the Fire Hazards Analysis Report (FHAR) and staff observations made

during the Appendix R inspection held in December 1986. The licensee's analyses indicated that an additional hour exists beyond the staff's assumptions. This results in a sufficient margin of safety and provides reasonable assurance that manual actions within the fire area can be achieved.

The staff was also concerned that fire damage to valve operators would prevent manual valve alignment. However, the licensee responded to this concern by stating that fire damage to valve operators will not prevent the valve operators from being manually turned.

A further staff concern is that because not all fire areas are physically separated from adjoining locations by continuous fire-rated construction, fire propagation through non-rated boundaries might prevent operators from performing manual operations. However, where fire area boundaries are not completely fire-rated, the licensee indicates that 1) the areas on one or both sides of the boundary are protected by an automatic fire suppression system, or 2) the boundary wall or floor/ceiling forms a continuous non-combustible barrier to the propagation of fire, or 3) the adjoining area into which fire may spread is not relied upon for safe shutdown.

An additional concern is that the post-fire shutdown procedures and available personnel are adequate for the tasks to be performed. The licensee responded that procedures will be prepared in conformance with staff fire protection guidance as provided in Generic Letters 81-12 and 86-10. The staff considers this response acceptable. However, the adequacy of these procedures will be confirmed during the NRC staff's review of the safe shutdown and alternate shutdown capabilities.

The staff's remaining concern is that the manual actions required in locations outside the fire area could actually be accomplished within the

maximum available time period stipulated by the licensee while a plant fire is underway. As previously stated, these time limits range from 20 minutes to 240 minutes. It is not possible to predict the nature of a fire event or the actions of plant operators during an emergency. However, the staff expects that a degree of uncertainty and confusion will exist and that time delays will occur in the implementation of manual actions. To mitigate this potential problem, the licensee committed in a letter dated February 10, 1987 to revise the post-fire safe shutdown procedures. Upon confirmation of a fire in a fire area/zone where manual actions are required within 30 minutes, an operator will be immediately dispatched to the remote shutdown panels and stand by to begin implementing the required manual actions when directed. It is the staff's judgment that dispatching an operator(s) to these areas before loss of redundant capability occurs will provide significant additional time margin to assure that the required actions will be accomplished before an unrecoverable plant condition occurs. However, by letter dated March 10, 1987, the licensee notified the staff that under certain circumstances involving a fire in fire areas/zones CB-FA-2d or 2f that manual action must be taken to restore reactor coolant pump (RCP) seal cooling or trip the RCPs in less than ten minutes. The licensee still proposes that upon confirmation of a fire in these fire areas/zones that an operator be sent immediately to the remote shutdown area and stand by to take appropriate action if RCP seal cooling is lost. But the licensee is also proposing a roving fire watch for fire areas/zones CB-FA-2d and 2f. For reasons discussed under exemption 2 (ventilation systems), the staff concurs that the roving fire watch will detect fires early in their formative stages allowing time to extinguish the

fire and/or take appropriate manual actions. Therefore, the combination of a roving fire patrol watch and dispatching personnel to stand by at the remote shutdown area upon confirmation of a fire in fire areas/zones CR-FA-2d and 2f is acceptable to the Commission. For those actions which must be taken beyond 30 minutes, the staff concludes that a sufficient time margin exists which provides reasonable assurance that these actions can be achieved in the time required.

On this basis, the Commission concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Section III.G of Appendix R.

The special circumstances of 10 CFR 50.12 apply in that application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The underlying purpose of the rule is to accomplish safe shutdown in the event of a single fire and maintain the plant in a safe condition. The rule requires fire protection for circuits and components associated with shutdown-related valves and pumps. However, certain valve and pump components can withstand the effect of a fire and still be manually operated. Sufficient time exists to allow this manual operation and maintain the plant in a safe shutdown condition. Thus, the underlying purpose of the rule is satisfied allowing manual operation of these components. Additionally, the licensee argues that providing additional protection features, as required by the regulations, would not result in a significant increase in the level of protection provided and would result in undue hardship and costs significantly in excess of those incurred by others similarly situated. These costs consist of additional engineering, procurement of materials, fabrication, and installation costs.

2. III.G.2; exemption requested from providing fire protection for the heating, ventilation, and air conditioning (HVAC) system components located in or associated with the emergency feedwater pump room, diesel generator building, control building, screen water pumphouse, and decay heat removal and nuclear service closed cycle cooling pump room.

In Revision 7 to the FHAR and in letters to the staff dated July 22, 1986, February 11 and 28, 1987, the licensee identified a number of locations where redundant circuits for the above referenced systems are not protected per the fire protection options identified in Section III.G. The licensee has stated that if a fire were to damage the HVAC systems serving the above locations, sufficient time exists to take certain actions to prevent room temperatures from reaching critical levels. In some areas, such as the intake screen and pumphouse (ISPH), the licensee had proposed to rely upon portable fans to maintain acceptable room temperatures. In other locations, such as the control building, the licensee had proposed to shed non-essential loads to reduce the temperature rise. However, by letter dated February 28, 1987, the licensee identified another approach to assure that required ventilation systems were maintained free of fire damage. For every area which contains cables/components whose damage could result in the loss of HVAC, except the ISPH, the licensee proposes to implement a fire watch patrol. The patrol will be arranged such that no area will be left unattended for more than 20 minutes. In the instrument shop, control room and HP chemistry lab, the fire watch function will be performed by the personnel who normally occupy those areas on a continuous basis. In the ISPH, the licensee will utilize portable ventilation equipment to compensate for damaged HVAC components immediately upon loss of ventilation flow.

The staff's principal concern was that a fire of significant magnitude would damage HVAC system components, resulting in the loss of adequate ventilation in these locations. In those areas which are continuously attended or where a fire watch patrol is provided, there is reasonable assurance that a fire, if one should occur, would be discovered in its formative stages, before significant temperature rise or smoke propagation occurred. The personnel would then notify the control room that a fire was in progress, which would result in the dispatch of the plant fire brigade to the scene. Pending arrival of the fire brigade, these same personnel who are trained to use the available portable fire extinguishers, will attempt to control the fire. The expected quick response to such a postulated fire is sufficient to assure that one division of required ventilation systems would remain free of fire damage.

The licensee has stated that upon loss of ventilation in the ISPH, at least four hours is available before critical room temperatures are reached. The licensee has committed to immediately dispatch plant personnel to restore ventilation using portable equipment upon loss of normal HVAC systems. It is the staff's judgment that sufficient time exists, with a conservative margin of safety, to restore adequate ventilation flow rates. On the basis that portable fans taking suction from outside areas can provide sufficient ventilation and that the licensee's procedures will assure that these actions are completed on time, the staff concludes that the licensee's proposal is acceptable.

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Section III.G of Appendix R.

The underlying purpose of the rule is to ensure that safe shutdown capability exists during and after any postulated fire in the plant. Protection of supporting systems, their components and circuits is required if the support is essential for the operability of a safe shutdown system. For the ISPH, sufficient time exists to allow corrective manual actions to be taken. For the other HVAC systems, protection can be provided by detecting fires early in their formative stage and extinguishing them before they become large enough to damage both trains of important equipment in a given fire area/zone. Fire watches, either in the form of a continuous fire watch (either by a person physically in the area or via remote monitoring) or a roving patrol which is present in a fire zone/area at least once every 20 minutes, provide adequate assurance that fires in these areas will be detected early in their formative stage. The fires can be extinguished before they damage equipment necessary for the safe shutdown of the plant. Therefore, the exemption requested meets the special circumstances delineated in 10 CFR 50.12(a)(2)(ii), in that application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of the rule. In addition, the licensee claims that the special circumstances of 10 CFR 50.12(a)(2)(iii) apply in that providing additional protection features, required by the regulations, would not result in a significant increase in the level of protection provided and would result in undue hardship and cost significantly in excess of those incurred by others similarly situated. These costs consist of engineering, procurement of materials, fabrication and installation costs.

3. III.G.2; exemption requested from Appendix R to the extent that it requires that steel which is framed into or supports a fire barrier be protected to the same degree as the barrier itself.

In its Safety Evaluation Report (SER) of December 30, 1986, the staff described the locations in which fire-rated cable and/or fire-rated cable wraps will be used to protect one division of shutdown-related cables. In the following four areas, the licensee has not protected the supports for open raceways carrying the fire-rated cable or supports for the cables, conduits or trays protected by the cable wraps:

AP-FZ-4	ISPH-FZ-2
ISPH-FZ-1	FH-FZ-1

The staff's principal concern is that a fire of significant magnitude would cause room temperatures to rise to a level which would cause the steel supports to lose their structural integrity. The resulting collapse of the conduit or cable tray could damage the circuits which must remain functional to achieve and maintain safe shutdown conditions.

However, each of these areas is equipped with automatic fire detection and suppression systems. If a fire occurs, the Commission's staff expects the detection systems to actuate and transmit an alarm to the control room. Upon confirmation of a fire, the fire brigade would be dispatched to the area and would suppress the fire using available portable equipment. If rapid temperature rise occurred before the arrival of the brigade, the automatic fire suppression system would actuate to control the fire and to reduce room temperatures. This would occur well before the support steel would reach a temperature at which structural failure could be expected. Therefore, the absence of protection for this steel has no safety significance.

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Section III.G.2 of Appendix R.

The underlying purpose of the rule is to provide protection against fire damage to the structural steel supports associated with Appendix R safe shutdown cables, equipment, and associated non-safety circuits. This protection is being accomplished by ensuring that the temperatures within the expected zones will not rise to levels which could affect the structural steel integrity. Therefore, the exemption being requested meets the special circumstances delineated in 10 CFR 50.12(a)(2)(ii), in that application of the regulations in this particular circumstance is not necessary to achieve the underlying purpose of the rule.

4. III.G.2; exemption requested for the chiller room in the fuel handling building (area FH-F7-6) from the requirement that an automatic fire suppression system be installed in an area where one division of shutdown systems is protected by a one-hour fire barrier and a fire detection system.

Contained in this fire area are redundant power cables (LS5A and LS5B) for control center IC-ESV. These redundant power cables are protected with one-hour fire rated barriers. The area is protected by an automatic fire detection system and manual fire fighting equipment. As described in the licensee's FHAR, the fire loading in this area is minimal.

The staff's principal concern in this area was that a fire of significant magnitude could damage the above-referenced power cables for control center IC-ESV. However, the fire loading in the area is minimal, with combustible material dispersed throughout the area. Because of the fire detection system, the staff expects that a fire, if one should start, would be detected in its incipient stages before a significant room temperature rise occurred. An alarm would be automatically transmitted to the control room. The fire

brigade would subsequently be dispatched, and the fire suppressed using manual fire fighting equipment. Pending arrival of the brigade, the one-hour fire-rated barrier which protects these cables will provide reasonable assurance that they would remain undamaged. Therefore, the absence of an automatic fire suppression system has no safety significance.

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Section III.G of Appendix R.

The basic purpose of the rule is to ensure that equipment important to the safe shutdown of the plant is available in the event of a fire. The minimum fire loading in the area, coupled with a fire detection system and a one-hour fire-rated barrier, all insure that at least one of the two cables will remain undamaged in the event of a fire. The fire should be detected and extinguished early. Therefore, the exemption being requested meets the special circumstances delineated in 10 CFR 50.12(a)(2)(ii), in that application of the regulations in this particular circumstance is not necessary to achieve the underlying purpose of the rule.

5. III.G.2; exemption requested from the requirement that redundant shutdown divisions be separated by a three-hour fire-rated barrier. Specifically, the fire-rated barrier which forms the perimeter of intermediate building area IB-FZ-8 contains two steel plate doors which are not fire-rated, as determined by an independent testing authority. Each door is used for flood protection and is bolted in place. One door is located in a portion of the wall which is common to auxiliary building area AB-FZ-4. The other is located in a wall common to fuel handling building area FH-FZ-1.

The fire loading in IB-FZ-8 is low, as described in FHAR. Each of the adjacent areas is protected by an area-wide automatic sprinkler system. The three areas are also provided with automatic fire detection systems and manual fire fighting equipment as described by the licensee in the FHAR.

The staff was originally concerned that a fire of significant magnitude would cause these doors to fail, allowing fire to propagate and damage redundant shutdown-related systems. However, because of the protection provided by the automatic sprinkler systems in areas AB-FZ-4 and FH-FZ-1, the staff concludes that room temperatures resulting from a fire in these locations would not reach critical levels such as to cause the doors to fail. Because of the substantial nature of the doors (as confirmed by observation during the Appendix R audit) and their being bolted in place, the staff concludes that smoke and hot gases would be confined to the area of fire origin until the fire was suppressed.

Similarly, the nature and quantities of combustibles in IB-FZ-8 are such as to not produce a fire of intense magnitude or duration. The heat produced from a fire in this location would rise to the ceiling and stratify above and away from the doors. By the time the stratified hot gas layer would begin to envelope the doors, the plant fire brigade would have arrived to begin active fire suppression activities. If, under the most conservative fire scenario, fire spread through the doorways, the existing automatic sprinkler systems on the other side would actuate to protect safe-shutdown systems in the adjoining locations from fire damage.

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Section III.G.2 of Appendix R.

The underlying purpose of the rule is to provide assurance that one of the redundant trains of safe shutdown equipment is free of fire damage through adequate separation and protection, in order to ensure safe shutdown capability during and after any postulated fire in the plant. This assurance is being accomplished by providing area-wide automatic sprinkler coverage in fire zones AB-FZ-4 and FH-FZ-1 which adjoin IB-FZ-8, by providing adequate separation between the steel doors and by the low combustible loading in IB-FZ-8. Therefore, the exemption being requested meets the special circumstances delineated in 10 CFR 50.12(a)(ii), in that application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of the rule. In addition, the special circumstances of 10 CFR 50.12(a)(iii) apply in that providing additional protection features, required by the regulations, would not result in a significant increase in the level of protection provided and would result in undue hardship and cost significantly in excess of those incurred by others similarly situated. These costs consist of additional engineering, procurement of materials, fabrication and installation costs.

The Commission had previously granted exemptions to Appendix R in an Exemption dated December 30, 1986. One exemption granted concerned the lack of a fire detection system in fuel handling building area FH-FZ-2. By letter dated February 2, 1987, the licensee clarified this exemption request to include the fact that the existing automatic sprinkler system does not extend throughout the area. The partial sprinkler system was acknowledged in the staff's evaluation and, therefore, this clarification does not alter the staff's conclusion that the exemption should have been granted. This condition

conforms with the guidance issued on partial fire detection and suppression systems in Generic Letter 86-10. No specific exemption for the partial sprinkler system in this area is therefore necessary.

In its December 30, 1986 Exemption, the staff granted an exemption from the requirement to protect certain shutdown-related circuits where the licensee has stated that sufficient time exists (in excess of 30 minutes) to take manual actions to compensate for the loss of those circuits. By letter dated February 2, 1987, the licensee has again changed the approach to safe shutdown in a number of locations. Certain valve alignments are no longer required; other valve alignments are now considered necessary; and certain required manual actions which had not been previously included in docketed submittals are now identified. The licensee states that these changes are within the scope of the staff's previous evaluation. On this basis, the clarifications regarding manual valve alignments, as identified in the licensee's February 2, 1987 letter, are acceptable and should be considered to be encompassed by the previous exemption.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12, these exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. The Commission further determines that special circumstances, as provided in 10 CFR 50.12(a)(2)(ii), are present justifying the exemption; namely, that application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. Specifics are

discussed in each exemption request; but in general, the underlying purpose of the rule is to accomplish safe shutdown in the event of a single fire and maintain the plant in a safe shutdown condition. This is accomplished by assuring that sufficient undamaged equipment is available to support safe shutdown assuming a fire within the area of concern. In the areas for which an exemption is being requested, passive as well as active fire protection features assure that any single fire will not result in the loss of safe shutdown capability. These features include manual actions, automatic suppression, and early detection of fires in their incipient stages. The fire protection features, in conjunction with low combustible loadings, provide a high degree of assurance that a single fire will not result in loss of safe shutdown capability. In addition, the special circumstances of 10 CFR 50.12 (a)(2)(iii) apply in that compliance would result in costs that are significantly in excess of those contemplated when the regulation was adopted. Providing additional protection features, as would be required to meet the regulations, would not result in a significant increase in the level of protection and would result in undue costs for additional engineering, procurement of materials, fabrication, and installation. Accordingly, the Commission hereby grants the exemptions listed in Section III above from the requirements of 10 CFR 50, Appendix R.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this Exemption will have no significant impact on the environment (52 FR 8389).

This Exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Frank J. Miraglia

Frank J. Miraglia, Director
Division of PWR Licensing-B

Dated at Bethesda, Maryland, this 19th of March 1987

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 155 TO FACILITY OPERATING LICENSE NO. DPR-38

AMENDMENT NO. 155 TO FACILITY OPERATING LICENSE NO. DPR-47

AMENDMENT NO. 152 TO FACILITY OPERATING LICENSE NO. DPR-55

DUKE POWER COMPANY

OCONEE NUCLEAR STATION, UNITS NOS. 1, 2 AND 3

DOCKETS NOS. 50-269, 50-270 AND 50-287

INTRODUCTION

By letter dated December 12, 1986 (Ref. 1), as revised on January 29, 1987 (Ref. 2) and supplemented on February 11, 1987 (Ref. 6), Duke Power Company (the licensee) proposed changes to the Technical Specifications (TSs) of Facility Operating Licenses Nos. DPR-38, DPR-47 and DPR-55 for the Oconee Nuclear Station, Units Nos. 1, 2 and 3. These amendments would consist of changes to the Station's common TSs. Oconee Unit 3 is currently completing a refueling outage.

These amendments would authorize changes to the Oconee Nuclear Station TSs which are required to support the operation of Oconee Unit 3 at full rated power during the upcoming Cycle 10. The amendments would change Figure 3.5.2-12, the Unit 3 Operational Power Imbalance Envelope curve. The Figure would be updated to reflect current cycle operating characteristics.

These amendments would also provide a more conservative curve for Oconee Unit 1 Operational Power Imbalance Envelope (Figure 3.5.2-10) to allow 10 CFR Part 50.59 reviews of future core reloads; update TS 3.5.2.4.b.2 (quadrant power tilt) to reflect the fact that power level cutoffs (other than 100%) are no longer applicable to Oconee; delete TS 3.5.2.6 (xenon reactivity) because operating restrictions resulting from transient xenon power peaking are implicitly included in the limits of TS 3.5.2.5 (control rod positions) and proposed TS 3.5.2.6 (reactor power imbalance) and note this in the bases of TS 3.5; and change TSs 3.5.2.7, 3.5.2.8 and 3.5.2.9 to reflect the deletion of TS 3.5.2.6 (xenon reactivity).

For Oconee Unit 3 only, these amendments would raise the minimum boron concentration in the borated water storage tank (BWST) from 1835 parts per million (ppm) to 2010 ppm to ensure that the core is at one percent delta k over k, 1% Δ k/k or shutdown margin, at 70°F without any control rods in the core. Other administrative type changes requested in the February 11, 1987 application are being handled separately.

To support the license amendment application, the licensee submitted "Oconee Unit 3, Cycle 10 Reload Report" as an attachment to the December 12, 1986 application. A summary of the Cycle 10 operating parameters is included in the report, along with safety analyses. On January 29, 1987, the licensee revised the reload report because Oconee Unit 3 was shutdown on December 17, 1986--earlier than scheduled because of possible wear indications in the 3B2 reactor coolant pump. The Oconee Unit 3 Cycle 10 core was then redesigned based on the shortened Cycle 9 length of 349 effective full power days. Results of this redesign indicated that to ensure the core will be shutdown in conformance with applicable criteria, the beginning of cycle, all rods out, 70°F 1% Δ k/k shutdown boron concentration should be increased from the present 1835 to 2010 ppm. In a letter dated February 11, 1987, the licensee proposed revisions to the TSs to raise the minimum boron concentration in the BWST.

The Cycle 10 core consists of 177 fuel assemblies, each of which is a 15 by 15 array containing 208 fuel rods, 16 control rod guide tubes, and one incore instrument guide tube. The fuel consists of dished-end, cylindrical pellets of uranium dioxide clad in cold-worked Zircaloy-4. The fuel assemblies in all batches have an average nominal fuel loading of 463.6 kilograms (kg) uranium. The undensified nominal active fuel lengths, theoretical densities, fuel and fuel rod dimensions, and other related fuel parameters are given in Table 4-1 (Ref. 3). The Cycle 10 core loading diagram, enrichments, control rods and burnable poison rod assembly (BPRA) locations and enrichments are also given in Reference 3.

Cycle 10 will operate in a rods-out, boron feed-and-bleed mode. Core reactivity control is supplied mainly by soluble boron and supplemented by 61 full-length Ag-In-Cd control rods and 60 BPRAs. In addition to the full-length control rods, eight Inconel gray axial power shaping rods (APSRs) are provided for additional control of axial power distribution. Since gray APSRs are being utilized, there are eight control rods in group seven and twelve in group five to reduce the negative offset response to the group seven rod movement.

The present reload involves no significant changes in core fuel design or methodology. Proposed revisions to the TSs required for Cycle 10 operation were made in accordance with methods and procedures found acceptable in connection with previous reloads (Ref. 4) and are the result of minor cycle-to-cycle fuel changes.

EVALUATION

Evaluation of Fuel System Design

The types of fuel assemblies and pertinent fuel design parameters for Oconee 3 Cycle 10 are listed in Table 4-1 (Ref. 3). All fuel assemblies are mechanically interchangeable. Two regenerative neutron sources will be used in the Mark BZ fuel assemblies. The Cycle 10 core contains only fuel designs which have been previously loaded in the Oconee Unit 3 reactor and have been previously approved by the NRC staff. The fuel rod design, cladding collapse, cladding stress and strain, and the thermal design fuel analyses for Cycle 10 fuel designs, including the gray APSRs, are either bounded by conditions previously analyzed for Oconee 3 or were analyzed specifically for Cycle 10 using methods and limits previously reviewed and approved by the NRC staff. Therefore, we conclude that the overall fuel system design for Oconee 3 Cycle 10 is acceptable.

Nuclear Design

Table 5-1 (Ref. 3) compares the core physics parameters of Cycle 10 with those of the reference Cycle 9. The values for Cycle 9 and Cycle 10 were generated by Duke Power Company using the reload design methods described in Reference 5 which have been reviewed and approved by the NRC staff.

We have determined that approved methods have been used, and the nuclear design parameters meet the acceptance criteria of Standard Review Plan, Section 4.3, Part II, and, therefore, conclude that the nuclear design of Oconee 3 Cycle 10 is acceptable.

Evaluation of Thermal-Hydraulic Design

The generic Mark B and Mark BZ thermal-hydraulic design analyses supporting Cycle 10 operation were performed by Duke Power Company using the methods described in Reference 5. The Cycle 9 and Cycle 10 thermal-hydraulic design conditions are summarized in Table 6-1 (Ref. 3).

The Cycle 10 core will include 60 fresh Mark BZ Batch 12 fuel assemblies, all of which will contain BPRAs. This results in a core bypass flow of 7.9% of the total system flow, which is less than the bypass flow assumed in the generic thermal-hydraulic analyses.

The Mark BZ fuel assembly has a slightly higher pressure drop than the Mark B assembly as a result of the increased flow resistance of the Zircaloy spacer grids. The presence of Mark BZ and Mark B assemblies in a core results in less coolant flow in the Mark BZ fuel than would occur in an all Mark BZ core. The generic Mark BZ analyses conservatively account for this transition core effect.

In a Mark BZ transition core, the limiting Mark B hot channel will receive more coolant and yield better departure from nucleate boiling (DNB) performance than would be predicted for a full Mark B core. Thus, the generic Mark B analyses, based on the B&W-2 critical heat flux (CHF) correlation, are bounding and are applicable to the Cycle 10 transition core.

We have determined that approved methods have been used, and the thermal-hydraulic design parameters meet the departure from nucleate boiling ratio (DNBR) safety limit using approved CHF correlations and, therefore, conclude that the thermal-hydraulic design of Oconee 3 Cycle 10 is acceptable.

Safety Analyses

The important kinetics parameters for Cycle 10 have been compared to the values used in the Final Safety Analysis Report (FSAR) and/or the densification report. The licensee has shown that the Cycle 10 values are bounded by those previously used. The licensee has also determined that the initial conditions of the transients in Cycle 10 are bounded by either the FSAR, the fuel densification report, previous reload analyses, or analyses using approved methods.

Babcock & Wilcox (B&W) has performed a generic loss of coolant accident (LOCA) analysis for the B&W 177-FA, lowered-loop nuclear steam supply system using the final acceptance criteria Emergency Core Cooling System evaluation model. The combination of average fuel temperature as a function of linear heat rate (LHR) and the lifetime pin pressure data used is conservative relative to those calculated for this cycle. These results are based upon a bounding analytical assessment of NUREG-0630 on LOCA and operating LHR limits performed by B&W. The B&W analyses have been approved by the NRC staff and the LHR limits are satisfactorily incorporated into the TSs for Cycle 10 through the operating limits on rod index and axial power imbalance and, therefore, are acceptable.

Technical Specification Modifications

Oconee Unit 3 Cycle 10 TSs have been modified to account for normal cycle-to-cycle fuel changes in power peaking and control rod worths. We have reviewed the proposed specification revisions for Cycle 10. These changes concern the Operational Power Imbalance Envelope (Figure 3.5.2-12). In addition, the licensee has provided a more conservative curve for the Unit 1 Operational Power Imbalance Envelope (Figure 3.5.2-10) in order to reduce future TS changes and to allow more of their future reload cores to be reviewed under 10 CFR 50.59. On the basis that approved methodology was used to obtain these limits which assure that general design criteria 10 and 12 are satisfied, we find these TS modifications acceptable.

The licensee also proposed administrative changes to TSs 3.5.2.4.b.2, 3.5.2.6, 3.5.2.7, 3.5.2.8 and 3.5.2.9 which are common to all three Oconee units. These changes reflect the fact that power level cutoff is no longer applicable to Oconee and operating restrictions resulting from transient xenon power peaking are implicitly included in the control rod position and reactor power imbalance limits. Therefore, we find these changes acceptable.

Increase in Boron Concentration in the Borated Water Storage Tank

As a result of a shortened Cycle 9 of Oconee Unit 3 the design of the Cycle 10 core will require an increase in the BWST boron concentration to ensure the core will be shutdown in conformance with TS 3.8.4 and TS 3.3 criteria. By letter dated February 11, 1987 (Ref. 3), as supplemented on February 27, 1987 (Ref. 6), Duke Power Company presented the results of its analysis which indicates that the beginning of cycle, all rods out, 70°F, 1 percent delta k over k shutdown boron concentration should be increased from the present 1835 ppm to 1873 ppm in order to meet the 1 percent subcritical acceptance criteria. Duke has requested TS changes which will conservatively increase the minimum concentration in the Oconee Unit 3 BWST to 2010 ppm for Cycle 10.

We have determined that approved methods have been used to insure that the 1 percent subcritical acceptance criteria are conservatively met, and that the plant will remain bounded by the FSAR safety analyses. Therefore, we conclude that the increase in the BWST boron concentration to 2010 ppm for Oconee Unit 3 Cycle 10 is acceptable.

EMERGENCY CIRCUMSTANCES

In its February 11, 1987 letter, the licensee requested that these amendments be treated as an emergency because insufficient time exists for the Commission's usual 30-day notice without extending the current outage. Because of the early shutdown of Oconee Unit 3, the licensee determined that emergency circumstances exist for approval of these proposed revisions to support startup of Oconee Unit 3, Cycle 10.

The licensee revised the reload report because Oconee Unit 3 was shutdown on December 17, 1986 - earlier than scheduled because of possible wear indications on a reactor coolant pump. The Oconee Unit 3 Cycle 10 core was then redesigned based on the shortened cycle. Results of this redesign indicated that to ensure the core shutdown margin, the boron concentration in the BWST would need to be increased from the present 1835 to 2010 ppm. In its February 11, 1987 letter, the licensee proposed revisions to the TSs to raise the minimum boron concentration in the BWST.

The Commission has determined that emergency circumstances exist in that swift action is necessary to avoid a delay in startup not related to safety and finds that, for the reason stated above, emergency circumstances exist.

In connection with a request indicating an emergency, the Commission expects its licensees to apply for license amendments in a timely fashion. However, with this consideration in mind, it has been determined that a circumstance has arisen where the licensee and the Commission must act quickly, and the licensee has made a good effort to make a timely application.

FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards considerations if operation of the facility in accordance with the amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

We have confirmed the basis of the no significant hazards consideration findings described in the notice published in the FEDERAL REGISTER on March 6, 1987 (52 FR 7050). The amendments change the TSs to reflect new operating limits based on the fresh fuel to be inserted into the core. These parameters are based on the new physics of the core and fall within the acceptance criteria. There are no significant changes in the fuel being used, or the fuel assembly design. We have previously reviewed postulated fuel-related transients and accidents. As part of these analyses, bounding parameters were used, for example, power peaking limits and reactor system pressure. Accident analyses previously submitted by the licensee and approved by the NRC staff for Oconee 3

utilized input values of physics parameters which are designed to be bounding for various operating cycles and operating conditions. The power imbalance limit curve for Cycle 10 was derived by the licensee so that the previous analyses for the postulated accidents would remain valid for Cycle 10. Therefore, it was unnecessary to analyze any accident for Cycle 10 of Oconee 3. Since the postulated accidents previously analyzed remain applicable to the new core (i.e., continue to be bounding), the probability or consequences of an accident previously evaluated have not increased. Because of the fundamental identity of the new fuel in terms of its nuclear and fuel assembly design, the possibility of a new or different kind of accident from any accident previously evaluated has not been created. Finally, the power imbalance curve ensures that the licensed margin of safety has not been reduced.

To ensure that the core shutdown margin is 1 percent delta k over k, at 70°F without any control rods in the core, the minimum boron concentration in the BWST will have to be raised from 1835 ppm to 2010 ppm. We have confirmed that approved methods have been used to ensure that the 1 percent subcritical acceptance criteria are conservatively met, and that the plant will remain bounded by the FSAR safety analyses. Therefore, the probability of any Design Basis Accident (DBA) is not affected by this change, nor are the consequences of a DBA affected by this change. The key physics parameter affected by the Oconee Unit 3 Cycle 10 redesign is the BOC boron concentration. The limiting FSAR transient with respect to changes in the boron concentration is the moderator dilution transient at power. Only the non-LOCA boron dilution transient was found to have a more potentially severe result due to increased boron concentration. This event is bounded by the values assumed in the FSAR. Therefore, the moderator dilution transient presented in the FSAR remains conservative for Oconee Unit 3, Cycle 10. Analysis of the increase in the Oconee Unit 3, Cycle 10, minimum BWST boron concentration has indicated that the 2010 ppm concentration is well within all acceptance criteria. For refueling and LOCA conditions, the proposed concentration is sufficient to maintain the core 1 percent subcritical at 70°F with all control rods removed; this change affects only previously evaluated accidents, discussed above, and does not create the possibility of a new or different kind of accident from any accident previously evaluated. The predicted boron concentration required to maintain the core 1 percent subcritical at 70°F with all rods out of the core during refueling or a LOCA has been compared to the current TS value for the BWST. The predicted BOC, all rods out, 70°F, 1 percent subcritical boron concentration of 1873 ppm has necessitated a change in the required boron concentration for the BWST from 1835 ppm. To provide additional shutdown margin during refueling or a LOCA, a more conservative BWST boron concentration of 2010 ppm will be used. For the non-LOCA events, the moderator dilution transient has been shown to be bounded by the FSAR analysis and involves no significant reduction in a margin of safety.

Therefore, we conclude that:

(1) Operation of the facilities in accordance with the amendments would not significantly increase the probability or consequences of an accident previously evaluated.

(2) Operation of the facilities in accordance with the amendments would not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Operation of the facilities in accordance with the amendments would not involve a significant reduction in a margin of safety.

Accordingly, we conclude that the amendments to Facility Operating Licenses Nos. DPR-38, DPR-47 and DPR-55 to support operation of Oconee Unit 3 at full rated power during the upcoming Cycle 10, involve no significant hazards considerations.

STATE CONSULTATION

In accordance with the Commission's regulations, consultation was held with the State of South Carolina by telephone. The State expressed no concern either from the standpoint of safety or of our no significant hazards consideration determination.

ENVIRONMENTAL CONSIDERATION

These amendments involve a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. We have determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of these amendments.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Dated: March 19, 1987

Principal Contributor:
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REFERENCES

1. Letter, H. B. Tucker (Duke) to H. R. Denton (NRC), "Oconee Nuclear Station Unit 3," December 17, 1986.

2. Letter, H. B. Tucker (Duke) to H. R. Denton (NRC), "Oconee Nuclear Station," January 29, 1987.

3. Report, "Oconee Unit 3, Cycle 10 Reload Report," DPC-PD-2008, Duke Power Company, January 1987.

4. Letter, H. Nicolaras (NRC) to H. B. Tucker (Duke), September 19, 1985.

5. Report, "Oconee Nuclear Station Reload Design Methodology II," DPC-NE-1002, Duke Power Company, Charlotte, North Carolina, March 1985.

6. Letter, H. B. Tucker (Duke) to H. R. Denton (NRC) "Oconee Nuclear Station", February 27, 1987.