



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 23 TO FACILITY LICENSE NO. DPR-38

SUPPORTING AMENDMENT NO. 23 TO FACILITY LICENSE NO. DPR-47

SUPPORTING AMENDMENT NO. 20 TO FACILITY LICENSE NO. DPR-55

DUKE POWER COMPANY

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

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

Introduction

By letter dated March 22, and as supplemented April 12 and 15, 1976, Duke Power Company (the licensee) requested an exemption from the requirements of 10 CFR Part 50, Appendix II, Section II.C.2 to permit the continued operation of Oconee Unit 3 for the remainder of Cycle 1 with the reactor vessel surveillance capsules removed from the reactor vessel. The licensee requested corresponding changes to the Technical Specifications appended to Facility Operating Licenses Nos. DPR-38, DPR-47 and DPR-55 for the Oconee Nuclear Station, Units 1, 2 and 3. These changes would reflect the removal of the reactor vessel surveillance capsules for the remainder of Cycle 1 operation and would require the submittal of a revised surveillance capsule withdrawal schedule prior to Cycle 2 operation. In addition, these changes would add Limiting Conditions for Operation (LCO's) for Oconee 3 Cycle 1 to minimize the possibility of further damage to the surveillance capsule holder tubes and to assure that a failed holder tube could be detected.

Discussion

The Oconee Unit 3 design includes three reactor vessel surveillance capsule holder tubes located adjacent to the reactor vessel inside wall. Each holder tube contains two surveillance capsules which hold the specimens to be irradiated in accordance with the requirements of the reactor vessel material surveillance program as described in Appendix H to 10 CFR Part 50. The purpose of the surveillance program is to monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region resulting from their exposure to neutron irradiation and the thermal environment.

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In a recent inspection of the surveillance capsule holder tubes, evidence of wear was observed at several locations within and on the exterior surface of the holder tubes. The damage was evidently caused by flow-induced relative motion between the holder tubes and components of the surveillance capsule train which positions and holds the surveillance capsules in place during reactor operation. In addition excessive clearance between the shroud tube and the journal bearing indicates that flow-induced relative motion exists between the shroud tube and the journal bearing. In order to minimize the possibility of further wear damage to the Oconee Unit 3 reactor vessel surveillance capsule holder tubes, the licensee is proposing that 1) the surveillance capsules and push rod assemblies be removed for the remainder of Cycle 1 operation; and 2) the Technical Specifications be revised to reflect the removal of the surveillance capsules with the provision that a revised withdrawal schedule be established prior to Cycle 2 operation and to add LCO's for Oconee Unit 3 Cycle 1 operation.

#### Evaluation

As required by Paragraph II.C.2 of Appendix II to 10 CFR Part 50, the surveillance capsules of Oconee Unit 3 are positioned during reactor operation such that the neutron flux received by the specimens is at least as high as, but not more than three times as high as, that received by the vessel inner surface. More specifically, as reported in Babcock and Wilcox Topical Report BAW-10100A, February 1975, the specimen capsule locations in the Unit 3 reactor vessel provide a neutron flux 2.4 times greater than the inside  $\frac{1}{4}$  wall thickness ( $\frac{1}{4}t$ ) location of the reactor vessel beltline. The lead factor between the center of the specimens and the  $\frac{1}{4}t$  vessel wall location is considered when determining the relative fracture toughness properties of the beltline region materials. To date, Cycle 1 has accumulated 0.96 effective full power years (EFPY) of actual exposure for an equivalent capsule irradiation of 2.30 EFPY. Total Cycle 1 operation is anticipated to be approximately 1.33 EFPY and, therefore, we agree that there would be considerable margin between the present capsule irradiation of 2.30 EFPY and the maximum achievable exposure at the  $\frac{1}{4}t$  reactor vessel beltline irradiation at the end of Cycle 1. The irradiation effects accumulated by the specimens to this point in Cycle 1 operation will not be altered and appropriate allowances can be made to revise the capsule withdrawal schedule and thus insure that the required data is obtained. Based on the above we conclude that the licensee's proposed action to remove the Unit 3 reactor vessel surveillance capsules for the remainder of Cycle 1 operation will not adversely affect the Unit 3 surveillance program and present no danger to the public health and safety. In addition, a type B capsule removed from Unit 3 during the present outage will be analyzed as part of the reactor vessel surveillance program and will provide data for establishing the revised withdrawal schedule.

Should the exemption request be denied operation of the plant would be prohibited until a redesigned surveillance capsule holder assembly is available. Best information presently available indicates that replacement holder assemblies will not be available prior to September 1976. The licensee has verbally advised the staff that the shutdown of Unit 3 until September would incur substantial additional generating costs that would be reflected in increased customer rates. From this, we conclude that granting of the exemption request would be in the public interest.

In summary, we have concluded that the licensee's request for exemption from the requirements of 10 CFR 50, Appendix H, is authorized by law; will not endanger life or property or the common defense and security and is otherwise in the public interest.

In a meeting held on April 14, 1976 with representatives from Duke Power Company and Babcock and Wilcox, we reviewed the results of the inspection conducted on the Unit 3 holder tubes. Areas discussed included the mechanical integrity of the holder tubes, which would remain in the core, and the possibility of further damage occurring to the holder tubes. We agree with the licensee that by removing the surveillance capsules and push rod assemblies, the major source of internal wear would be removed. However, the inspection results also indicated evidence of wear at the journal bearing area located at the bottom of the shroud tube. A review of this information suggests that this wear may be the result of flow forces on the exterior of the shroud tube. To remedy the effects of this wear, the licensee has expanded each holder tube in the journal bearing area to restore adequate journal bearing support. In summary, based on the information provided, which included data of known stress levels recorded on the holder tubes during Hot Functional Testing, and analyses of the structural strength of the holder tubes in their present condition, we agree that there is reasonable assurance that the holder tubes can remain in the core for the remainder of Cycle 1 operation without experiencing significant additional damage.

In the remote possibility that the holder tubes would experience sufficient vibration to cause complete severance of the holder tubes at any of the wear locations, it is highly unlikely that significant core damage would result or that any accident would be involved. The sections of the holder tubes would fall into the lower core plenum and be constrained from reaching the core by the core flow distributor. For the pieces to break up into pieces small enough to reach fuel assemblies, several days of operation would be necessary. It is unlikely that this could occur without being detected by the Loose Parts Monitoring (LPM) system. The reliability of the LPM system has been demonstrated. For example, a guide pin of the dimensions 3/4" X 4" was determined to be missing from a Low Pressure Injection pump on Oconee Unit 2 in July 1974. Subsequent Monitoring on the LPM system detected the presence of a metallic noise which was later confirmed to be the missing pin when the reactor vessel was inspected. Even if some small fragments reached the region of the fuel assemblies, the most significant hazard would be the localized blockage of coolant flow which could lead to overheating of some fuel elements. If the overheating led to clad damage,

it would be promptly detected by an increase in the primary coolant system activity level. Clad damage from this occurrence is very unlikely (except in a very small area) because of the open lattice design of the core which permits redistribution of coolant flow to cool the affected assembly. In addition to the above, we have considered what possible effects small fragments of the holder tubes might have on the operation of the control rods. We have concluded that it is extremely unlikely that the control rods could be affected such that their normal or emergency functions would be jeopardized. Finally, we have reviewed the effects that fragments of the holder tubes might have during a hypothetical Loss-Of-Coolant accident. We have concluded that the core flow would not be affected to any significant degree and that the bases for such an accident remain valid. In summary, the breaking up of the holder tubes is a low probability event but, should it occur, there is a very low probability of it leading to any significant consequences with respect to public health and safety. We therefore conclude that the surveillance capsule holder tubes can remain in the Unit 3 core for the remainder of Cycle 1 operation (approximately 130 days).

In order to minimize the possibility of further damage occurring to the surveillance capsule holder tubes, the licensee has proposed additional LCO's for the operation of Oconee Unit 3 for the remainder of Cycle 1 operation. The LCO's would minimize the stress the holder tubes would be subjected to and would assure the capability to detect and respond to the possible failure of the holder tubes. The additional LCO's proposed are as follows:

- 1) The Loose Parts Monitoring (LPM) must be in operation when any reactor coolant pumps are operating and shall have as a minimum two channels on the reactor vessel head service structure and one channel on the incore guide tubes.
- 2) Any abnormal indication on the LPM system must be promptly investigated and evaluated.
- 3) A reactor coolant system gross gamma analysis must be performed daily and if it exceeds 1.0 microcurie per millimeter whenever reactor coolant pumps are operating, a gross alpha analysis must be initiated within four hours and continued daily until the gross gamma activity is less than 1.0 microcuries per millimeter. Alpha concentration shall not exceed  $5 \times 10^{-5}$  microcuries per millimeter.
- 4) With the exception of startup and shutdown, operation is restricted to four primary coolant pumps.
- 5) Operation of Oconee 3 Cycle 1 shall be permitted only until September 1, 1976.

- 6) If the conditions of Specifications 1), 3) or 4) above are not met or if any abnormal indication of a loose part in the reactor vessel occurs, a reactor shutdown shall be initiated immediately and within 36 hours the reactor shall be in a condition in which no reactor coolant pumps are operating.

We have reviewed the proposed additional LCO's for the operation of Ocone Unit 3 and find them to be acceptable.

We have determined that these amendments do not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that these amendments involve an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR §51.5(d)(4) that an environmental statement, negative declaration, or environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

#### Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the change does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the change does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) 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.

Date: April 16, 1976

UNITED STATES NUCLEAR REGULATORY COMMISSION

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

DUKE POWER COMPANY

NOTICE OF ISSUANCE OF AMENDMENTS TO FACILITY  
OPERATING LICENSES

Notice is hereby given that the U.S. Nuclear Regulatory Commission (the Commission) has issued Amendments No. 23, 23., and 20 to Facility Operating Licenses No. DPR-38, DPR-47, and DPR-55, respectively, issued to Duke Power Company which revised Technical Specifications for operation of the Oconee Nuclear Station, Units 1, 2, and 3, located in Oconee County, South Carolina. The amendments are effective as of the date of issuance.

These amendments allow the removal of the reactor vessel surveillance capsules from the Oconee Unit 3 reactor for a portion of Cycle 1 operation.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments. Prior public notice of these amendments is not required since the amendments do not involve a significant hazards consideration.

The Commission has determined that the issuance of these amendments will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental statement, negative declaration or environmental impact appraisal need not be prepared in connection with issuance of these amendments.

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For further details with respect to the action, see (1) the application for amendment dated March 22, 1976, (2) Amendments No. 23, 23, and 20 to Licenses No. DPR-38, DPR-47, and DPR-55, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, NW., Washington, D.C. 20555, and at the Oconee County Library, 201 South Spring Street, Walhalla, South Carolina 29691.

A copy of items (2) and (3) may be obtained upon request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 16th day of April 1976.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert A. Purple, Chief  
Operating Reactors Branch #1  
Division of Operating Reactors

PRELIMINARY DETERMINATION

NOTICING OF PROPOSED LICENSING AMENDMENT

LICENSEE: Duke Power Company , Oconee Unit 3 (50-287)

REQUEST FOR: Technical Specifications to reflect the removal of the reactor vessel surveillance capsules from Unit 3 for a portion of Cycle 1 operation.

REQUEST DATE: March 22, 1976

PROPOSED ACTION: ( ) Pre-notice Recommended  
 (xx) Post-notice Recommended  
 ( ) Determination delayed pending completion of Safety Evaluation

BASIS FOR DECISION: Vibration damage to reactor vessel surveillance capsule holder tubes has been found in all operating B&W reactors. In some cases, the damage has led to pieces that have broken off within the reactor vessel. In no case has there been evidence of any damage to fuel assemblies, control rod drives, or core support structure components.

The damage was initially believed to be caused by vibration of the push rods that are within the holder tubes. Removal of these push rods and the surveillance specimens they constrained was therefore believed to be a fix that would permit further reactor operation without incurring further damage. This is the action that was taken on Oconee Unit 1 and it was subsequently returned to normal operation.

On April 7, 1976, abnormal noise within the pressure vessel of Oconee Unit 2 was detected by the Loose Parts Monitoring (LPM) system and the reactor was shut down. It has not yet been examined. The licensee voluntarily shut down Unit 3 in order to examine whether damage to the holder tubes was occurring in that reactor. Examination revealed significant wearing (but no broken off pieces) and the licensee has removed the push rod assemblies and surveillance specimens. The examination also revealed that the vibration of the holder tubes may also be caused by water flow external to the tubes. This new information indicates that removal of the tube internals may not be sufficient to completely stop vibration damage. The remaining source for damage is in the journal bearing supporting the tube against the vessel wall. Wear and excessive looseness was observed at this bearing. The licensee has rolled out the tube in an effort to minimize . . . . . (CONTINUED ON BACK)

CONCURRENCE:

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|----|---------------|---------|
| 1. | G. G. Zech    | 4-15-76 |
| 2. | R. A. Purpye  | 4/15/76 |
| 3. | K. R. Collier | 4/15/76 |
| 4. | OELO          | 4/16/76 |

the gap between the tube and the bearing and thereby reduce vibration damage.

The licensee is now proposing to resume operation of Unit 3 until the end of this fuel cycle (or September 1, whichever occurs first). A license amendment is required to reflect operation without the surveillance specimens in place for the rest of this cycle and to incorporate certain added restrictions that provide added assurance that damage will not occur and that if it does, it will be promptly detected and the reactor shut down.

#### Significant Hazards Consideration Determination

The proposed amendment would involve a significant hazards consideration if: (1) it involves a significant increase in the probability or consequences of an accident, (2) it involves a significant decrease in a safety margin.

Based on the evidence available and the analyses that have been performed, we consider it unlikely that the holder tubes will break apart during the limited period of operation proposed. Even if they did, it is very unlikely that significant core damage would result or that any accident would be involved. The pieces would fall into the lower core plenum and would be constrained from reaching the core by the lower core flow distributor. For the pieces to further break up into fragments small enough to reach fuel assemblies would require several days of operation; it is very unlikely that this would occur without being detected by the LPM. Even if some small fragments reached the region of the fuel assemblies, the most significant hazard would be the localized blockage of cooling flow which could lead to overheating of some fuel elements. If the overheating led to clad damage, it would be promptly detected by an increase in primary system fission products. Clad damage from this occurrence is very unlikely (except in a very small area) because of the open-lattice arrangement of this core which permits redistribution of flow to cool the affected assembly. In any event, the breaking up of the holder tubes, itself a low probability event, has a very low probability of leading to any significant consequences with respect to public health and safety and does not significantly decrease any safety margins. For these reasons, we conclude that the proposed operation does not involve a significant hazards consideration.

Note further that the general question of operating the Oconee units with the possibility of vibration damage to the holder tubes was the subject of a license amendment issued March 26, 1976 (for Unit 1). This amendment was also found not to involve a significant hazards consideration. It also served as an opportunity for revealing the existence of any local public interest or concern about the continued operation of Unit 1, a situation very similar to the present situation for Unit 3. No request for hearing has been received or other public reaction noted as a result of the Unit 1 licensing action.