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December 15, 1999

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Subject: Duke Energy Corporation  
Oconee Nuclear Station, Unit 3  
Docket Number 50-287  
Notice of Enforcement Discretion (NOED) Request  
Technical Specifications (TS) 3.6.5 (Reactor Building  
Spray and Cooling Systems)

Attached is the written documentation of the background and technical information supporting the Oconee Unit 3 Notice of Enforcement Discretion (NOED) request. This information was discussed with the NRC staff in a telephone conference call on December 15, 1999.

As discussed in detail in Attachment 1, Oconee is requesting discretion from enforcing TS Limiting Condition for Operation (LCO) 3.6.5 as it pertains to Required Action B.1. This Required Action applies to the case of one Reactor Building Cooling Unit (RBCU) being inoperable. At present, Oconee is engaged in repair efforts on RBCU 3B and the Completion Time for the above Required Action expires on December 15, 1999 at 1830 hours. Necessary repair and subsequent testing activities will not be completed by December 15, 1999 at 1830 hours; therefore, this NOED request is being submitted. As shown in the attached justification, Duke Energy maintains that granting of discretionary enforcement in this case does not present an unreasonable risk to nuclear safety.

This request for enforcement discretion was approved by the Oconee Plant Operations Review Committee (FORC) on December 14, 1999.

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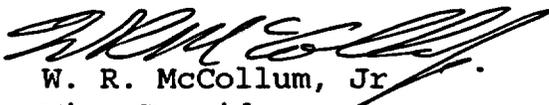
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December 15, 1999

Page 2

Should you have any questions concerning this request, please call Larry Nicholson at (864) 885-3292.

Very truly yours,

  
W. R. McCollum, Jr.  
Vice President  
Oconee Nuclear Station

Attachment

xc: Luis A. Reyes  
Regional Administrator, Region II

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M. C. Shannon  
Oconee Senior Resident Inspector

**Notice of Enforcement Discretion (NOED) Request**

Oconee has used Administrative Letter 95-05 to develop this request for enforcement discretion. Relevant information supporting this request for enforcement discretion is provided below.

Duke Energy (Duke) requests the NRC grant discretion in enforcing Technical Specification (TS) 3.6.5, Reactor Building Spray and Cooling Systems, relative to the 7-day Completion Time of Required Action B.1 and allow the Oconee Unit 3 to remain in Mode 1 until work is completed to repair Reactor Building Cooling Unit (RBCU) 3B. RBCU 3B was declared inoperable at 18:30 on December 8, 1999, after discovery of a failed fan motor strut. Duke has been aggressively performing a root cause investigation to determine the cause of the failure. The investigation identified looseness in the fan propeller hub connection to the motor shaft. A repair plan has been developed which replaces this motor/propeller assembly. Necessary repairs and performance of required testing will not be completed by December 15, 1999, the expiration of the allowed 7-day Required Action B.1 Completion Time. Duke is requesting enforcement discretion to enable exceeding the Completion Time of the Required Action B.1 by 10 days, that is until 18:30 on December 25, 1999.

**1. The TS or other license conditions that will be violated.**

TS 3.6.5, requires, in part, two Reactor Building (RB) Spray (RBS) trains and three RB cooling Units (RBCU) to be operable in Modes 1 and 2. Should one of these five cooling systems be inoperable, Required Action B.1 is to restore the inoperable system within 7 days. If the Required Action B.1 is not met, Condition D must be satisfied whose Required Action is to place the Unit in Mode 3 within the next 12 hours. The 7-day Completion Time of Required Action B.1 would be violated.

**2. Circumstances**

### **Background**

Indications of high RBCU 3B fan motor bearing temperatures were observed during routine RBCU cooler performance testing on December 7, 1999. On December 8, 1999, a Maintenance inspection of RBCU 3B found one of the three upper fan motor mounting struts broken. RBCU 3B was promptly stopped and TS 3.6.5, Required Action B.1 was entered.

A Failure Investigation Process (FIP) team was assembled and is investigating the cause of the RBCU 3B failure, as well as identifying the actions needed to restore the RBCU. The team's objective is to diagnose the as-found RBCU condition, including its various components. The FIP team and supporting personnel are providing continuous 24-hour a day coverage.

Initial inspections of the 3B RBCU identified that a motor strut (one of three) had broken and was lodged against the motor housing. Subsequent metallurgical examinations preliminarily concluded that the strut initially failed on one end due to a fatigue crack at a weld, then the bolting sheared at the other end due to low cycle fatigue. A replacement strut was fabricated and installed.

Following re-assembly of the motor supports, the propeller was observed rubbing on the fan housing. Further inspections revealed that the propeller was loose on the motor shaft, creating a possible source of vibration. Initial investigation indicated that the problems could be resolved by tightening the fan hub on the motor shaft. This work was completed on December 13. Following this initial repair effort, testing results showed that it would be necessary to replace the motor and fan because of excessive vibration at running speed.

A review of significant indicators for the three Unit 1 RBCUs, the three Unit 2 RBCUs and the 3A and 3C RBCUs has been performed and a determination has concluded that each of the evaluated RBCUs is operable. These indicators

included bearing temperature trends, vibration alarm data, run time information, and performance testing.

Approximately six months of bearing temperature data was reviewed on each of the above listed RBCUs. No instance of elevated temperatures was noted, with the historical trends displaying normal seasonal variations. A review was also performed to determine if any high vibration alarms were received during this same time period. None were noted. Normal configuration for RBCU operation at Oconee is for the "A" and "C" RBCUs to operate in high speed, with the "B" RBCU off in stand-by. Therefore, relative to the "A" and "C" RBCUs, significant operational run time accrued during the six-month period, allowing for more available data, with no abnormalities observed. Additionally, evaluation of periodic performance test data (monthly runs of all fans in low speed ES configuration and airflow measurements conducted each refueling) indicates acceptable performance.

The current 3B RBCU motor was installed and coupled to the propeller assembly in September of 1997, and therefore has relatively low total time in service compared to the other RBCU units at Oconee.

In addition to the above evaluations, containment entries were made by qualified, experienced personnel to visually and audibly assess the running condition of all other RBCUs. The RBCU motor struts and hangers were visually inspected with no unusual problems detected. Based on the above review of operational data and field observations, no operability concerns exist with these RBCUs.

#### **Cause of the Failure**

The RBCU 3B propeller has a tapered fit to the tapered motor shaft. As described above, the propeller was found loose on the motor shaft. Although a retaining nut was securing the propeller to the shaft and maintaining compression of the tapered fit, the propeller hub had dropped down by about 0.3 inch, with indications of wear on the retaining nut and propeller hub.

The cause for the loose RBCU 3B propeller appears to be inadequate engagement of the fan propeller to the motor shaft. The cause for the inadequate engagement is at this time attributed to excessive clearances in the stacking of the propeller and associated hardware on the shaft. The exact cause for the excessive clearance will be determined and validated after removal of the RBCU 3B motor/propeller assembly from the reactor building.

#### **Need for prompt action**

Prompt action is requested in granting this request for enforcement discretion to avoid an unnecessary shutdown/restart evolution of Oconee Unit 3 as the result of compliance with the TS 3.6.5 shutdown Action Requirement. There is less risk associated continuing power operation than that associated with both a shutdown and restart evolution.

#### **Relevant historical events**

This event could not have been averted or avoided. High bearing temperature alarms were first received on December 7, 1999. The 3B RBCU was then stopped, restarted in low speed, and bearing temperatures remained relatively stable for the next 24 hours. A subsequent containment entry on December 8, 1999, identified a broken motor strut; the 3B RBCU was secured and declared inoperable. Previous vibration alarms were noted and dispositioned as erroneous, primarily due to their occurrence during periods when the fan was shutdown. The FIP team has since concluded that these vibration alarms could have been caused from reverse rotation.

- 3. The safety basis for the request, including an evaluation of the safety significance and potential consequences of the proposed course of action.**

There is minimal safety consequence associated with this request. Granting enforcement discretion will have no adverse safety impact as the containment heat

removal requirements (described below) will continue to be met.

The RBCUs provide a means of cooling containment sump water in the event that the LPI coolers are unavailable. This is the only function they provide relative to core damage prevention. The unavailability of a single RBCU has an insignificant impact on the core damage frequency (CDF) assessment since only one RBCU is needed to provide adequate core cooling: Two RBCUs will remain available. No common cause implications for the remaining units have been identified. Therefore, the impact on CDF and containment performance, including large early release frequency (LERF), is evaluated to be insignificant (i.e.,  $< 1E-8$ /year).

The peak containment pressure and temperature transients are described in UFSAR Sections 6.2.1.1.3.1 and 6.2.1.1.3.3, respectively. In the LOCA Short Term Containment Pressure Response transient, the peak Reactor Building pressure occurs within the first 20 seconds after the postulated LOCA, prior to the assumed actuation of the RBCUs. In the Steam Line Break transient, the timing of the Reactor Building temperature peak within the first minute of the event is again too rapid for the RBCUs to have any effect on the peak containment temperature. Therefore, the inoperability of one RBCU has no impact on meeting the respective design criteria for these transients.

As described in UFSAR Section 6.2.1.1.3.2, concerning design evaluation for LOCA long term containment response, the most limiting single failure is that of a 4160 volt switchgear. The failure of one of the three available switchgear would result in the loss of:

- One High Pressure Injection (HPI) pump
- One Low Pressure Injection (LPI) pump
- One RBS pump
- One RBCU

The design basis analysis for containment heat removal systems (RBS and RBCUs) for the most limiting accident (Large Break LOCA) credits one of the two RBS trains and two of the three RBCUs for containment heat removal at the design basis conditions. One LPI cooler was also credited. Low Pressure Service Water (LPSW) is supplied to the RBCU cooling coils to remove containment heat during normal operation and post-accident.

Actual performance data of the 3A and 3C RBCUs, collected on December 7, 1999, revealed that each RBCU individually has sufficient heat removal capacity. Assuming conservative values of 150F for the Reactor Building average temperature and 85F for LPSW cooling water to the RBCU cooling coils at the initiation of an event, the required heat removal capacity for the Unit 3 Reactor Building Cooling System is 54.4E6 BTU/Hr. The testing performed on December 7, 1999 demonstrated that the 3A and 3C combined heat removal capacity was 148.5E6 BTU/Hr. Each cooler individually has a capacity of 74.25E6 BTU/Hr. Therefore, assuming a single failure of either one of the two remaining coolers, there is 36.5% excess capacity. Assuming a conservative fouling rate coupled with this available margin, there is ample heat removal capacity, even with a single failure, to meet post-LOCA requirements until the next Unit 3 refueling outage, currently scheduled to begin April 13, 2000. This analysis also demonstrated that post-LOCA equipment qualification temperature requirements are met.

Other factors provide additional margin. At present, LPSW (drawn from Lake Keowee) is less than 63F and is expected to continually decrease through the duration of the request for enforcement discretion due to the expected seasonal lake water temperature changes as winter approaches. Additionally, the Reactor Building average temperature is significantly below the 150F initial value assumed in the analysis. The reduced LPSW temperature of < 63F and the fact that average Reactor Building temperature is much less than 150F provide considerable additional cooling capacity margin.

4. **The basis for the licensee's conclusion that the noncompliance will not be of potential detriment to the public health and safety and that a significant hazard consideration is not involved.**

Granting this request for enforcement discretion will not have any adverse consequences from the standpoint of public health and safety. Relief from the applicable 7-day Completion time to support the corrective maintenance and testing activities is preferable to the evolution that would be incurred if Unit 3 were shut down while the RBCU work is in progress. Duke has evaluated the consequences from a probabilistic risk standpoint and the results were found to be acceptable.

- a. **Involve a significant increase in the probability or consequence of an accident previously evaluated?**

No. Granting this request will have no significant effect on accident probabilities since post-accident containment heat removal requirements will continue to be met. The RBCUs are not considered accident initiating equipment and no physical changes are being made to the plant that would impact initiating event frequencies. The RBCUs provide a means of cooling containment sump water in the event that the LPI coolers are unavailable. This is the only function they provide relative to core damage prevention. The unavailability of a single RBCU has an insignificant impact on the core damage frequency assessment since either one of the remaining RBCUs (3A & 3C) can provide adequate cooling. No common cause implications for the remaining units have been identified. Therefore, the impact on CDF and containment performance, including LERF, is evaluated to be insignificant. Granting this request would not result in any adverse impact from the standpoint of availability or reliability of other systems or components required for containment heat removal. Therefore, there will be no significant increase in any accident consequence.

- b. **Create the possibility of a new or different kind from any accident previously evaluated?**

No. No new accident causal mechanisms are created as a result of the NRC granting of this request for enforcement discretion. No changes are being made to the plant which will introduce any new accident causal mechanisms. The LBLOCA scenario has been evaluated and the effect of one RBCU remaining out of service for the duration of noncompliance does not create the possibility for any accident of a different type than any previously analyzed.

- c. **Involve a significant reduction in a margin of safety?**

No. As described in the safety basis described in section 3 above, the design basis for containment heat removal will be maintained during the period of noncompliance with one RBCU out of service. Further, the design basis will be met in the remote event of the most limiting single failure. Therefore, no safety margins will be impacted.

No function of any important to safety SSC will be adversely affected or degraded as a result of continued operation. No safety parameters, setpoints, or design limits are changed. There is no adverse impact to the nuclear fuel, cladding, RCS, or required containment systems.

No QA conditions or code requirements are degraded. No equipment or components of a new design or type will be installed. No credible new failures are postulated.

#### **CONCLUSION**

Based on the preceding evaluation, the noncompliance will neither be a potential detriment to the public health nor is there a significant hazard consideration involved.

5. **The basis for the licensee's conclusion that the non-compliance will not involve adverse consequences to the environment.**

No environmental impact analysis is necessary since this request does not involve a significant hazard consideration, a significant change in the types/amounts of effluents that may be released offsite, or a significant increase in the individual/cumulative occupational radiation exposure.

6. **Any proposed compensatory measure(s).**

Analysis has demonstrated that compensatory measures are unnecessary during the period of noncompliance. As a conservative measure, Duke will maintain all trains of the following Unit 3 systems operable, with the exception of any TS Surveillance test which cannot be deferred beyond the limits of Surveillance Requirement 3.0.2:

- Low Pressure Injection,
- Reactor Building Spray,
- Two Reactor Building Cooling Units, and
- Low Pressure Service Water.

Should it be necessary to remove any of the above trains from service, the PORC will review the situation and consider additional appropriate actions beyond compliance with all applicable Technical Specifications.

7. **The justification for the duration of the noncompliance.**

The requested 10-day duration of enforcement discretion is limited to the time required to repair and restore RBCU 3B to Operability, including assembly of the propeller to the motor, correction of potential unidentified vibration damage to the RBCU, and extensive post-maintenance testing. Duke plans to

perform the work with two 12-hour shifts per day until completion. Duke has previously replaced RBCU motors in slightly less than seven days. However, there are schedule uncertainties associated with the repair, as Duke has not previously replaced a motor and propeller assembly together.

This duration will assure the work can be accomplished in a controlled manner providing reasonable assurance that personnel safety will be maximized, human errors will be minimized, and quality will be maintained.

8. **A statement that the request has been approved by the Plant Operations Review Committee.**

On December 14, 1999, the Plant Operations Review Committee reviewed and approved this request for enforcement discretion.

9. **The request must specifically address how one of the NOED criteria for appropriate plant conditions is satisfied.**

This request is intended to avoid an undesirable unit shutdown and restart evolution as the result of requiring compliance with the TS and, thus, minimize potential safety consequences and operational risks.

Thus, it is Duke's position that this issue fully conforms to the NOED criteria that have been issued by the staff.