

February 14, 2005

Mr. H. B. Barron
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526 South Church Street
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SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 - SUPPLEMENT NO. 1 TO ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO THE USE OF MIXED OXIDE LEAD TEST ASSEMBLIES (TAC NOS. MB7863, MB7864, MC0824, AND MC0825)

Dear Mr. Barron:

Enclosed is a copy of Supplement No. 1 to the Environmental Assessment (EA) and Finding of No Significant Impact related to your application for the Catawba Nuclear Station, Units 1 and 2, submitted on February 27, 2003, and its supplements. The proposed action would amend the Facility Operating Licenses to permit the use of mixed oxide (MOX) lead test assemblies in one of the two Catawba units and would grant exemptions from (1) the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.46(a)(1) and 10 CFR Part 50, Appendix K with respect to the use of M5™ fuel rod cladding; (2) 10 CFR 50.46(a)(1) and Appendix K to Part 50 with respect to the use of MOX fuel; and (3) from certain physical security requirements of 10 CFR Parts 11 and 73.

The Nuclear Regulatory Commission staff issued the EA and Finding of No Significant Impact on this matter by letter dated August 10, 2004, and also published it in the *Federal Register* on August 17, 2004 (69 FR 51112). However, in subsequent letters dated August 31, September 20, October 29, and December 10, 2004, Duke Power stated that certain radiological dose consequence information provided in previous submittals was based on out-of-date input values for design basis accident doses with low enriched uranium fuel and provided additional information describing the updated licensing basis dose consequences for the analyzed accidents. Since the EA that was published in the *Federal Register* on August 17, 2004, was based, in part, on the outdated information, the NRC staff is issuing this Supplement to address the updated information from Duke Power.

Supplement No. 1 to the Environmental Assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Robert E. Martin, Sr. Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosure: As stated

cc w/encl: See next page

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Docket Nos. 50-413 and 50-414

Enclosure: As stated

cc w/encl: See next page

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SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 - SUPPLEMENT NO. 1 TO ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO THE USE OF MIXED OXIDE LEAD TEST ASSEMBLIES (TAC NOS. MB7863, MB7864, MC0824, AND MC0825)

Dated: February 14, 2005

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UNITED STATES NUCLEAR REGULATORY COMMISSION
DUKE ENERGY CORPORATION
DOCKET NOS. 50-413 AND 50-414
CONCERNING THE APPLICATION FOR
IRRADIATION OF MIXED OXIDE LEAD TEST ASSEMBLIES AT
CATAWBA NUCLEAR STATION, UNITS 1 AND 2
SUPPLEMENT NO. 1 TO ENVIRONMENTAL ASSESSMENT AND
FINDING OF NO SIGNIFICANT IMPACT

The Nuclear Regulatory Commission (NRC) is considering issuance of amendments to the Facility Operating Licenses to permit the use of mixed oxide (MOX) lead test assemblies (LTAs) in one of the two Catawba units and is considering the granting of exemptions from (1) the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.44(a), 10 CFR 50.46(a)(1) and 10 CFR Part 50, Appendix K with respect to the use of M5™ fuel rod cladding; (2) 10 CFR 50.46(a)(1) and Appendix K to Part 50 with respect to the use of MOX fuel; and (3) certain physical security requirements of 10 CFR Parts 11 and 73 that are usually required at fuel fabrication facilities for the protection of strategic quantities of special nuclear material. A similar request for an exemption from the requirements of 10 CFR 50.44(a) with respect to the use of M5™ fuel rod cladding is not being granted since 10 CFR 50.44 has been changed and an exemption is no longer necessary. The amended licenses and exemptions would apply to Renewed Facility Operating License Nos. NPF-35 and NPF-52, issued to Duke Energy Corporation (Duke, the licensee), for operation of the Catawba Nuclear Station (Catawba), Units 1 and 2, located in York County, South Carolina.

Pursuant to 10 CFR 51.21, the NRC issued an environmental assessment (EA) and finding of no significant impact (FONSI) on this matter by letter dated August 10, 2004, and also

published it in the Federal Register on August 17, 2004 (69 FR 51112) (Reference 1). However, in letters dated August 31, September 20, October 29, and December 10, 2004, (References 2, 3, 5 and 6) the licensee stated that certain radiological dose consequence information provided in previous submittals was based on out-of-date input values for design basis accident doses with low enriched uranium (LEU) fuel and provided additional information describing the updated licensing basis dose consequences for the analyzed accidents. Since the EA that was published in the Federal Register on August 17, 2004, was based, in part, on the outdated information, the NRC staff is issuing this Supplement to the EA to address the updated information. The dose consequence analyses that were affected by this change are (a) the control room doses for the loss-of-coolant accident analysis (LOCA), the locked rotor analysis (LRA) and the rod ejection analysis (REA), (b) the exclusion area boundary (EAB) doses for the LRA and REA, and (c) the low-population zone (LPZ) doses for the LRA, the REA and the LOCA. Section 5.6, "Design Basis Accident Consequences," is the section of the EA that is affected by this change. This Supplement provides an update of the affected portions of Section 5.6 that supercedes and replaces the comparable portions of Section 5.6 of the EA published on August 17, 2004, to address the information provided in the licensee's letters dated August 31, September 20, October 29, and December 10, 2004, and reaffirms the NRC's conclusions for the EA and the FONSI.

5.6 Design-Basis Accident Consequences (DBAs)

Duke has evaluated the radiological consequences of several categories of postulated DBAs involving MOX LTAs including the category of at-power accidents involving fuel damage to a significant portion of the entire core. These accidents range from the LRA that is calculated to damage 9.5 percent of the fuel assemblies (FAs) in the core (18 FAs) for Unit 1 and 5.0 percent (10 FAs) for Unit 2, the REA that is calculated to damage 50 percent of the core (97 FAs) for either unit, to the large break LOCA that is calculated to damage the full core

(193 FAs). Accordingly, considering the proportion that four MOX LTAs represents of the number of fuel assemblies that are calculated to be damaged by each DBA, the calculated EAB thyroid dose increases that are attributable to the use of MOX are: for the LRA, 14.1 percent for Unit 1 and 25.4 percent for Unit 2; for the REA, 2.62 percent for each unit; and, for the LOCA, 1.32 percent.

The analysis of public doses for the EAB and LPZ resulting from this class of accidents considered by Duke is discussed below. In addition, the NRC staff has evaluated the radiological consequences of affected DBAs on personnel in the control room.

5.6.2 At-Power Accidents

The current licensing basis analyses assume that all FAs (193) are affected by a LOCA. For the LRA, 9.5 percent of the Unit 1 core is assumed to be affected and 5.0 percent of the Unit 2 core is assumed to be affected; for the REA, 50 percent of the core is assumed to be affected. For these events, Duke assumes that the four MOX LTAs are in the affected fuel population displacing four LEU assemblies. Because the dose is directly proportional to the fuel assembly inventory and gap fractions, the impact on the previously analyzed accident doses is based on quantifying the change in fission product release due to replacing up to four LEU fuel assemblies with the MOX LTAs. Although the consequences of these accidents could be determined by updating the current licensing basis analyses, Duke elected to perform a comparative evaluation, which the NRC staff has independently verified.

Duke selected the thyroid dose due to Iodine-131 (I-131) as the evaluation benchmark because the thyroid dose is typically more limiting than the whole body dose in that there is less margin between calculated thyroid doses and its associated dose criterion. Also, I-131 is generally the most significant contributor to thyroid dose due to its abundance and long decay half-life. Duke has determined that the I-131 inventory in a MOX LTA is 9 percent greater than that of an equivalent LEU fuel assembly.

Loss-of-Coolant Accident

For the LOCA, the four MOX LTAs represent 2.1 percent of the 193 assemblies in the core and the potential increase in the iodine release and the thyroid dose would be 1.32 percent. The resulting doses are 90.2 rem at the EAB and 12.9 rem at the LPZ. These doses are below the 300 rem dose reference value of 10 CFR 100.11, "Determination of exclusion area, low population zone, and population center distance," and are not considered to be significant.

Locked-Rotor Accident

For the LRA in Unit 1, the four MOX LTAs represent 22 percent of the 18 affected assemblies in the core. The potential increase in the iodine release and the thyroid dose is 14.1 percent for Unit 1. The resulting doses are 26.9 rem at the EAB, and 4.6 rem at the LPZ. These doses are below the 300 rem dose reference value of 10 CFR 100.11, and are not considered to be significant.

For the LRA in Unit 2, the four MOX LTAs represent 40 percent of the 10 affected assemblies in the core. The potential increase in the iodine release and the thyroid dose is 25.4 percent for Unit 2. The resulting thyroid doses are 27.8 rem at the EAB, and 4.5 rem at the LPZ. These doses are below the 300 rem dose criterion of 10 CFR 100.11, and are not considered to be significant.

Rod-Ejection Accident

For the REA in Unit 1, the four MOX LTAs represent 4.1 percent of the 97 assemblies in the core assumed to be involved in the postulated accident and the potential increase in the iodine release and the resulting thyroid dose would be 2.62 percent. The resulting calculated thyroid doses are 22.3 rem at the EAB, and 17.8 rem at the LPZ. These doses are below the 300 rem dose criterion of 10 CFR 100.11, and are not considered to be significant.

For the REA in Unit 2, the four MOX LTAs represent 4.1 percent of the 97 assemblies in the core assumed to be involved in the postulated accident and the potential increase in the iodine release and the resulting thyroid dose would be 2.62 percent. Even though the percentage of iodine released from the fuel is the same for Units 1 and 2 (2.62 percent), the release of radioiodine to the environment is greater for Unit 2 due to differences in the design of the steam generators, thus resulting in a higher dose than calculated for Unit 1. The resulting calculated thyroid doses are 31.5 rem at the EAB, and 19.8 rem at the LPZ. These doses are below the 300 rem dose criterion of 10 CFR 100.11, and are not considered to be significant.

5.6.3 Control Room Dose

Control room dose is the only occupational dose that has been previously considered for DBA conditions. The at-power accident with the most severe consequences for the control room personnel is the LOCA; the control room doses from postulated locked-rotor or rod-ejection accidents are bounded by the calculated control room dose from the LOCA. Duke determined that the resulting control room thyroid dose after a postulated LOCA considering the use of four MOX fuel LTAs would be 13 rem. This is below the NRC staff's 30 rem acceptance criterion and is not considered to be significant.

5.6.4 Conclusion

The DBA with the greatest consequences at the EAB (a LOCA) would result in a calculated offsite dose of 90.2 rem to the thyroid. The DBA with the greatest consequences at the LPZ (a REA) would result in calculated offsite doses of 17.8 and 19.8 rem to the thyroid for Units 1 and 2, respectively. These doses remain below the 300 rem reference value to the thyroid specified in 10 CFR 100.11 for offsite releases. The calculated change in dose consequences at the EAB and at the LPZ that could be attributable to the use of the four MOX fuel LTAs is not significant.

The DBA with the greatest consequences to the control room personnel, a LOCA, would result in a calculated dose of 13 rem to the thyroid. This dose remains below the 30 rem acceptance criterion. The calculated change in dose consequences for control room personnel that could be attributable to the use of the four MOX fuel LTAs is not significant.

The NRC staff concludes that the environmental impact resulting from incremental increases in EAB, LPZ, and control room dose following postulated DBAs that could occur as a result of the irradiation of four MOX LTAs does not represent a significant environmental impact.

11.0 AGENCIES AND PERSONS CONSULTED

Related to the publication of the EA in August 2004, (Reference 1), on July 30, 2004, the NRC staff consulted with the South Carolina State official, Mr. Mike Gandy of the Department of Health and Environmental Controls, regarding the environmental impact of the proposed action. The State official had no comments. Related to the issuance of this Supplement to the EA, on February 8, 2005, the NRC staff consulted with the South Carolina State official, Mr. Mike Gandy, of the Department of Health and Environmental Controls, regarding the environmental impact of the proposed action. The State official had no comments.

12.0 REFERENCES

1. NRC letter to Duke, Catawba Nuclear Station, Units 1 and 2 - Environmental Assessment and Finding of No Significant Impact Related to the Use of Mixed Oxide Lead Test Assemblies (TAC Nos. MB7863, MMB7864, MC0824, MC0825), dated August 10, 2004 (ADAMS ML042230368). Also published in the *Federal Register* on August 17, 2004, 69 FR 51112.
2. Duke letter to NRC, Dose Inputs, August 31, 2004 (ADAMS ML042660144).
3. Duke letter to NRC, Revised Dose Evaluations, September 20, 2004 (ADAMS ML042890343).
4. NRC Letter to Duke, Requesting Additional Information, October 7, 2004 (ADAMS ML042860050).

5. Duke letter to NRC, Response to Request for Additional Information on Revised Dose Evaluations, October 29, 2004 (ADAMS ML043150030).
6. Duke letter to NRC, Additional Information on Revised Dose Evaluations, December 10, 2004 (ADAMS ML043560170).

13.0 FINDING OF NO SIGNIFICANT IMPACT

On the basis of the EA and Supplement No. 1 to the EA, the NRC reaffirms its conclusion that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated February 27, 2003, and subsequent letters dated September 15, September 23, October 1 (two letters), October 3 (two letters), November 3 and 4, December 10, 2003, and February 2 (two letters), March 1 (three letters), March 9 (two letters), March 16 (two letters), March 26, March 31, April 13, April 16, May 13, June 17, August 31, September 20, October 4, October 29, and December 10, 2004. Documents may be examined, and/or copied for a fee, at the NRC's Public Document Room (PDR), located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Documents Access and Management System (ADAMS) Public Electronic Reading Room on the Internet at the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS, should contact the

NRC PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail to pdrc@nrc.gov.

Dated at Rockville, Maryland, this 14th day of February 2005.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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