



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 22, 2020

Mr. J. Ed Burchfield, Jr.
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3 – U. S. NUCLEAR
REGULATORY COMMISSION STAFF REVIEW OF BORIC ACID
PRECIPITATION EFFECTS WITH RESPECT TO WCAP-16793-NP-A,
REVISION 2

Dear Mr. Burchfield:

In September 2004, the U. S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors [PWR]," (Agencywide Documents Access and Management System (ADAMS) Accession No. ML042360586) to holders of operating licenses for PWRs. In GL 2004-02, the NRC staff requested that licensees perform an evaluation of their emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions, considering the potential for debris-laden coolant to be circulated by the ECCS and the CSS after a loss-of-coolant accident (LOCA) or high-energy line break inside containment, and, if appropriate, take additional action to ensure system function. GL 2004-02 required, per Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(f), that licensees provide the NRC a written response describing the results of their evaluation and any modifications made, or planned, to ensure ECCS and CSS system function during recirculation following a design-basis event, or any alternate action proposed and the basis for its acceptability.

By letter dated August 27, 2014 (ADAMS Accession No. ML14218A807), the NRC documented that the licensee had provided all information required to close GL 2004-02 for Oconee Nuclear Station, Units 1, 2 and 3 (Oconee). Documentation for closure of the in-vessel portion of GL 2004-02 was performed by demonstrating that Oconee met the requirements of topical report (TR) WCAP-16793-NP-A, Revision 2, and the associated NRC staff safety evaluation (SE) (ADAMS Accession No. ML13239A114). In its SE, the NRC staff concluded that plants with relatively low fiber amounts reaching the core could use the TR methodology to show that core cooling would not be adversely affected by debris. However, the SE stated that the potential for debris to change flow patterns or inhibit the mixing of boric acid in the core that might result in earlier boric acid precipitation (BAP) had not been evaluated. This left the question of the effects of debris on the plant licensing basis for BAP open.

The Pressurized Water Reactors Owners Group continued to evaluate the effects of larger amounts of debris on long-term core cooling (LTCC). This work is documented in TR WCAP-17788, Revision 1 (ADAMS Package Accession No. ML20010F181). The NRC staff performed a thorough review of this TR but was unable to conclude that the methodology used for evaluating reactor core debris limits was acceptable for licensing basis calculations.

However, the NRC staff found that the TR methodology provided meaningful safety and regulatory insights regarding the treatment of BAP. The staff's technical review of the TR methodology is documented in its technical evaluation report (TER) (ADAMS Accession No. ML19178A252). WCAP-17788, Revision 1, evaluated the potential for debris to affect current BAP analyses and found that BAP timing would not be adversely affected. The NRC performed sensitivity studies during its review of WCAP-17788, Revision 1. These analyses explicitly modeled the physical phenomena that affect the potential for BAP and were conducted for reactor designs considered to be the most limiting with respect to BAP. The analyses found that debris collecting at the core inlet would not adversely affect BAP timing under conditions that conservatively modeled the effects of debris. The NRC staff determined that licensees that demonstrate that their plants fall within specific bounds can maintain their current licensing basis for BAP (Refer to Staff Guidance ADAMS Accession No. ML19228A011), even with debris amounts greater than those approved in WCAP-16793-NP-A, Revision 2.

In its response to GL 2004-02, Oconee demonstrated that it has a very small amount of fiber that may arrive at the core inlet. The NRC staff has determined that this amount of debris will not adversely affect BAP timing and Oconee can maintain its current licensing basis for BAP. The NRC staff has no further questions related to potential effects of post-accident debris on the reactor vessel. Therefore, the conclusion reached in the NRC letter dated August 27, 2014, indicating that Oconee has adequately responded to the GL remains unchanged.

If you have any questions, please contact me at (301) 415-1009 or via email at Shawn.Williams@nrc.gov.

Sincerely,

/RA/

Shawn A. Williams, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

cc: Listserv

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PRECIPITATION EFFECTS WITH RESPECT TO WCAP-16793-NP-A,
REVISION 2 DATED JUNE 22, 2020

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ADAMS Accession No. ML20170A510***via e-mail**

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