

NUCLEAR REGULATORY COMMISSION

[NRC-2023-0113]

**NUREG: Environmental Evaluation of Accident Tolerant Fuels with Increased
Enrichment and Higher Burnup Levels**

AGENCY: Nuclear Regulatory Commission.

ACTION: Final report; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing NUREG-2266, “Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels.” This study evaluates the reasonably foreseeable impacts of near-term accident tolerant fuel (ATF) technologies with increased enrichment and higher burnup levels for light-water reactors (LWRs) (i.e., a bounding analysis). The final NUREG was revised based on public comments to reflect a bounding analysis of up to 10 wt% U-235 enrichment for the uranium fuel cycle and decommissioning to, among other things, add transportation impacts for half-batch reloads, and to provide clarification on the use of NUREG-2266 if exceeding 10 wt% U-235 for uranium fuel cycle and decommissioning, exceeding 8 wt% U-235 enrichment for the transportation of fuel and waste, or exceeding assembly averaged burnup levels of 80 GWd/MTU.

DATES: NUREG-2266 is available on August 6, 2024.

ADDRESSES: Please refer to Docket ID **NRC-2023-0113** when contacting the NRC about the availability of information regarding this document. You may obtain publicly available information related to this document using any of the following methods:

- **Federal Rulemaking Website:** Go to <https://www.regulations.gov> and search for Docket ID **NRC-2023-0113**. Address questions about Docket IDs to Stacy

Schumann; telephone: 301-415-0624; email: Stacy.Schumann@nrc.gov. For technical questions, contact the individual listed in the “For Further Information Contact” section of this document.

- **NRC’s Agencywide Documents Access and Management System**

(ADAMS): You may obtain publicly available documents online in the ADAMS Public Documents collection at <https://www.nrc.gov/reading-rm/adams.html>. To begin the search, select “Begin Web-based ADAMS Search.” For problems with ADAMS, please contact the NRC’s Public Document Room (PDR) reference staff at 1-800-397-4209, at 301-415-4737, or by email to PDR.Resource@nrc.gov. NUREG-2266, “Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels” is available in ADAMS under Accession No. ML24207A210.

FOR FURTHER INFORMATION CONTACT: Donald Palmrose, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3803; email: Donald.Palmrose@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Discussion

To support efficient and effective licensing reviews of new ATFs and to reduce the need for a complex site-specific environmental review for each ATF license amendment request, this study evaluated the likely impacts of near-term ATF technologies with increased enrichment and higher burnup levels on the uranium fuel cycle, transportation of fuel and waste, and decommissioning for LWRs (i.e., a bounding analysis). Near-term first-generation ATF technologies are coated cladding and doped pellets; a second-generation ATF technology is iron-chrome-aluminum (FeCrAl) cladding. Long-term ATF technologies are not a part of this study. The NRC staff evaluated the impact of increased enrichment and higher burnup levels by assessing

and applying NRC-sponsored ATF technology reports, prior environmental reviews, transportation studies, and new or updated data sources to determine the bounding (generic) environmental impacts of deploying ATF technologies with increased enrichment and higher burnup levels in LWRs.

Based on findings in this study, the NRC staff concludes, with regard to near-term first- or second-generation ATF technologies (i.e., coated cladding, doping, and FeCrAl cladding), the environmental effects associated with deploying and using ATF would be bounded by the NRC staff's prior analyses. With regard to the uranium fuel cycle and decommissioning, Table S-3, paragraph 51.51(b) of title 10 of the *Code of Federal Regulations* (10 CFR), NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," and NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1" bound enrichments up to 10 wt% U-235 enrichment and assembly averaged burnup up to 80 GWd/MTU. For the transportation of ATF with increased enrichment and higher burnup levels, environmental impacts of Table S-4 of 10 CFR 51.52(c) are bounding for environmental impacts up to 8 wt% U-235 and assembly averaged burnup up to 80 GWd/MTU. Additionally, if in a future licensing action where the enrichment and burnup levels are greater than the previously mentioned values, an applicant can apply the methodology and guidance of NUREG-2266 for completing the needed revised analysis for the higher enrichment and burnup levels.

The NRC staff continues to prepare to review license applications related to ATF technologies and fuel with increased enrichment and higher burnup levels. Once such licensing applications are submitted after the final publication of NUREG-2266, the NRC staff will, as appropriate, evaluate new industry developments and other subsequent ATF activities using this NUREG as the environmental baseline for considering further

refinements of the ATF environmental evaluation that those licensing actions may require.

II. Additional Information

The NRC published a notice in the *Federal Register* on September 1, 2023, (88 FR 60507) requesting public comment on draft NUREG-2266, “Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels.” The comment period closed on October 31, 2023. Two members of the public and two organizations provided comments on the draft NUREG-2266. Appendix F of the final NUREG-2266 presents the comments received on the draft NUREG-2266, with responses to the comments and indicates whether and where the final NUREG-2266 was revised as a result of a comment. Other text revisions were made for additional clarity. All changes based on public comments are noted with an associated margin mark.

III. Congressional Review Act

This NUREG-2266, “Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels,” is a rule as defined in the Congressional Review Act (5 U.S.C. 801-808). However, the Office of Management and Budget has not found it to be a major rule as defined in the Congressional Review Act.

IV. Backfitting, Forward Fitting, and Issue Finality

The NRC’s issuance and use of this report does not constitute backfitting as that term is defined in 10 CFR 50.109, 70.76, and 72.62, “Backfitting,” and as described in NRC Management Directive (MD) 8.4, “Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests”; does not affect the issue finality of an approval under 10 CFR part 52, “Licenses, Certifications, and Approvals for Nuclear

Power Plants” and does not constitute forward fitting as that term is defined and described in MD 8.4.

Dated: July 31, 2024.

For the Nuclear Regulatory Commission.

/RA/

Christopher M. Regan, Director,
Division of Rulemaking, Environmental,
and Financial Support,
Office of Nuclear Material Safety,
and Safeguards.