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MEMORANDUM TO: Anna H. Bradford, Director
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FROM: Mahmoud Jardaneh, Director ***/RA/***
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SUBJECT: OFFICE OF NUCLEAR REACTOR REGULATION FINAL REPORT ON IMPROVING THE POWER UPRATE REVIEW PROCESS

This memorandum transmits the final report developed by the U.S. Nuclear Regulatory Commission's (NRC's) Power Uprate (PUR) Working Group to enhance the quality and efficiency of the power uprate review process. The report was prepared as a follow up to the memorandum dated September 30, 2024, "Preliminary Recommendations on Improving the Power Uprate Application and Review Process," (ML24239A394). The memorandum articulates NRC staff's completed and ongoing efforts to strengthen and streamline the PUR review process.

Enclosure:
NRR Final Report on Improving the
Power Uprate Review Process

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OFFICE OF NUCLEAR REACTOR REGULATION

FINAL REPORT

ON IMPROVING THE POWER UPRATE REVIEW PROCESS

The U.S. Nuclear Regulatory Commission (NRC) regulates the maximum power level at which a commercial nuclear power plant may operate. Improvements in instrument accuracy, computational tools and engineering models, in addition to plant hardware modifications, have allowed licensees to increase the maximum power level while maintaining safety. The process of increasing the maximum power level at which a commercial nuclear power plant may operate is a power uprate (PUR) and follows the license amendment request (LAR) process in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.90.

There are three categories of power uprates, as follows:

- measurement uncertainty recapture (MUR) power uprate, an increase of up to 2 percent licensed reactor power,
- stretch power uprate (SPU), an increase of up to 7 percent licensed reactor power, and
- extended power uprate (EPU), an increase up to 20 percent of licensed reactor power.

The current NRC staff guidance for power uprate reviews can be found in Review Standard (RS)-001, “Review Standard for Extended Power Uprates” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML033640024), NRR Office Instruction LIC-112, “Power Uprate Process,” Revision 2 (ML19254A627), and related sections of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (SRP) (ML070810350). A revision to LIC-112 is expected to be issued by August 2027.

The ADVANCE Act and Executive Order 14300, “Ordering the Reform of the Nuclear Regulatory Commission,” have increased interest in power uprates by encouraging more efficient use of existing nuclear generating capacity to meet growing energy demand. The NRC expects this renewed focus on maximizing output from operating reactors to significantly increase power uprate licensing activities in the coming years. This trend presents an important opportunity for the agency to enable the safe expansion of nuclear energy generation for the benefit of society, consistent with the NRC’s revised mission statement, while maintaining reasonable assurance of adequate protection of public health and safety and promoting regulatory efficiency.

The NRC issued Regulatory Issue Summary (RIS) 2025-02, “Planned Power Uprate-Related Licensing Submittals for All Power Reactor Licensees,” on February 7, 2025 (ML25007A001). The staff issued this RIS to request voluntary information on planned power uprate-related licensing submittals. This RIS was intended to promote early communication with NRC licensees regarding planned power uprate-related licensing activities. The information provided by the licensee in response to the RIS supports the NRC in planning and allocating resources for the review of power uprate applications, thereby enabling the agency to more efficiently and effectively manage its licensing work. The following table consolidates licensee responses to the RIS as of August 2026. This information is available on the NRC public website, which will

continue to be updated as the NRC staff learn about new potential applications, applications are submitted, and power uprates are approved.

Table 1: Summary of RIS 2025-02 Responses

Calendar Year	Total Power Uprates Expected	MUR Power Uprates	SPUs	EPUs	Megawatts Thermal	Approximate Megawatts Electric
2026	2	0	0	2	1,014	335
2027	17	8	2	7	2,650	875
2028	6	0	0	6	1,923	635
2029	1	0	0	1	598	197
2030	3	2	0	1	754	249
2031	1	0	0	1	200	66
2032	1	0	0	1	197	65
TOTAL	**31**	**10**	**2**	**19**	**7,336**	**2,422**

Although the NRC has a well-established process for reviewing power uprate applications, demonstrated by the successful approval of more than 170 PUR licensing actions, the agency established a PUR Working Group to identify additional opportunities for efficiency, consistency, and effectiveness in future reviews. The PUR Working Group issued its Preliminary Recommendations Memorandum on September 30, 2024 (ML24239A394) and has since engaged extensively with industry stakeholders to proactively identify and implement process improvements for power uprate licensing reviews.

This final report consolidates the resulting recommendations, findings, lessons learned, and guidance developed through those efforts. It is intended to support staff efficiency, promote review consistency, and facilitate the timely and effective completion of power uprate license amendment reviews.

1. Review Schedules and Resources

On May 7, 2024 (ML24106A068), the NRC issued a letter to the Nuclear Energy Institute (NEI) that provides NRC's power uprate LAR review targets of 12 months for an EPU, 9 months for an SPU, and 6 months for an MUR. These targets align with the Nuclear Energy Innovation and Modernization Act (NEIMA) milestone schedules. The 12-month review schedule also applies to submittals that include a combined or bundled application, such as an EPU with Maximum Extended Load Line Limit Analysis Plus (MELLLA+) for boiling-water reactors (BWRs). These timeframes directly support the agency's obligations under Executive Order 14300, which directs the NRC to improve the timeliness, predictability, and efficiency of regulatory reviews.

Additionally, the NRC's Fiscal Year (FY) 2026 Fee Rule established fixed caps on Part 170 service fees for licensing actions that result in a final safety evaluation, implementing Executive Order 14300 and advancing the agency's goals of greater efficiency, accountability, and cost predictability. The fee caps are intended to provide applicants with increased certainty regarding NRC review costs while encouraging continued improvements in licensing review processes.

To support implementation of the fee caps, the NRC staff evaluated historical resource expenditures for power uprate reviews and identified opportunities to improve review efficiency through the use of graded review approaches, lessons learned from recent reviews, licensing efficiency initiatives, and process improvements implemented under the ADVANCE Act and Executive Order 14300.

2. Bundled and Linked Applications

During public meetings held since 2024, the NRC staff has explained that existing agency processes offer sufficient flexibility to support bundled, sequential, and concurrent licensing actions. Therefore, the NRC does not plan to revise LIC-109, “Acceptance Review Procedures for Licensing Basis Changes” (ML20036C829), at this time. Through early pre-application engagement, applicants may pursue power uprate applications in parallel with related licensing actions if they clearly identify and appropriately manage dependencies, review strategies, and associated risks.

Applicants may pursue one of two approaches when a power uprate is associated with other licensing changes: (1) submit the power uprate and related licensing actions as separate, linked applications, or (2) submit a single, bundled application that includes the power uprate and related licensing actions. Both approaches are discussed below.

Pathway of License Amendment Requests Submitted Separately

One approach licensees have indicated that they may pursue is the phased submittal of power uprate-related changes. Under this approach, individual changes to the licensing basis would be submitted as separate LARs. Examples of such changes include, but are not limited to:

- 24-Month Fuel Cycle Extensions
- EPU-Related Changes
- Fuel Transitions
- Alternate Source Term (AST)
- Spent Fuel Pool Criticality Analyses
- Methodology Updates
- Increased Enrichment and High Burnup Fuel Implementation

This approach is largely driven by the need for many pressurized-water reactor (PWR) licensees to transition from their current operating conditions to their desired future operating state over multiple fuel cycles. For example, licensees seeking to implement both an EPU and a 24-month fuel cycle (and/or other fuel changes) may be unable to achieve both objectives within a single refueling outage because of the challenges associated with attaining significantly higher cycle energy with a single reload while maintaining acceptable core design margins. In addition, some licensees plan to utilize higher fuel burnups and are transitioning to advanced cladding materials with improved resistance to corrosion and hydrogen uptake. Full implementation of these fuel designs may require multiple reload cycles before legacy fuel assemblies are completely discharged from the reactor core.

A consideration associated with this phased approach is that certain LARs may rely on analyses intended to support not only the proposed licensing action but also future planned plant modifications or operating changes. At the time such analyses are performed, some future operating parameters or design details may not yet be fully defined (e.g., maximum boron concentration, core operating temperatures, or fuel design characteristics). As a result, NRC staff will carefully evaluate the assumptions and scope of these analyses to ensure they remain applicable to future licensing actions. Failure to appropriately account for subsequent changes could increase review complexity, necessitate additional analyses, or result in inefficiencies during future licensing reviews.

Pathway of Bundling Licensing Applications

Another approach that licensees have indicated they plan to pursue is the bundling of power uprate applications with other licensing actions. Industry has stated that bundled applications can significantly reduce the overall time required for implementation compared to submitting separate applications. During the 2025 Regulatory Information Conference (RIC) and other public meetings, industry representatives noted that bundling an EPU with other changes such as MELLLA+ implementation or fuel changes, could result in overall schedule savings of up to 4 years when considering both NRC review and licensee implementation activities.

The NRC staff agrees that there is a strong technical nexus between EPU and MELLLA+ reviews. For example, the accident analyses described in the updated final safety analysis report (UFSAR) Chapter 15 are updated as part of an EPU review and are subsequently reevaluated for MELLLA+ implementation. By performing a single set of analyses using the bounding EPU/MELLLA+ operating conditions, licensees can avoid duplicative analytical efforts. Similarly, the NRC staff would review a single integrated set of analyses rather than conducting separate reviews for EPU and MELLLA+ submittals. This approach has the potential to improve efficiency, reduce regulatory burden, and shorten the overall implementation schedule while maintaining the same safety standards.

3. Pre-Application Engagements

The NRC staff's interactions with industry through PUR Working Group workshops, tabletop exercises, and other engagement activities highlighted the importance of early and substantive pre-application engagement in facilitating efficient, predictable, and high-quality power uprate reviews. These early interactions provide an opportunity for the NRC staff and licensees to align on application strategies, discuss the packaging and coordination of related licensing actions, and identify potential technical and regulatory challenges before a formal submittal is made.

The NRC staff discussed and recommended that licensees develop regulatory engagement plans that outline their overall licensing strategy (e.g. submittal timelines and proposed binning categorization) and identify dependencies among sequential, concurrent, or bundled licensing actions. This regulatory engagement plan can be submitted to the NRC for review. The NRC staff would assess the feasibility of the proposed licensing approach, identify potential regulatory or scheduling challenges, and provide feedback as appropriate. Following its review, the staff may acknowledge the proposed strategy in a letter documenting its understanding of the planned licensing approach, including whether the overall engagement plan appears viable and suitable to support an efficient review process. Such feedback would not constitute NRC approval of future licensing actions but would provide greater clarity and predictability regarding the planned path forward.

Additionally, the NRC staff discussed that when appropriate, readiness assessments (using guidance in LIC-116, “Preapplication Readiness Assessment” (ML20104B698)) of draft applications can help identify and resolve potential gaps before submittal, improving application quality and reducing the need for extensive requests for additional information (RAIs). These assessments provide an opportunity for the NRC staff and licensee to discuss the maturity of the application, confirm that key technical and regulatory issues appear to have been adequately addressed, and evaluate whether supporting information is sufficiently developed to support an efficient review. Following the assessment, the staff would provide written feedback identifying potential areas of concern, information gaps, or opportunities to improve the quality of the planned submittal. Although this feedback would not represent NRC approval or

acceptance of the application, it can help increase the likelihood of a complete and technically robust submittal and support more predictable review schedules.

Overall, these different types of optional pre-application engagements provide a valuable forum to discuss key technical and regulatory issues that may warrant focused attention during the review. Collectively, these activities help ensure that applications are complete, technically robust, and positioned for an efficient review consistent with established timeliness goals.

4. Exemptions

Discussions during workshops, tabletop exercises, and stakeholder engagements highlighted that, although the NRC is actively pursuing numerous regulatory modernization initiatives and rulemaking activities in response to Executive Order 14300, the timing of those regulatory changes may not align with the schedules of all planned power uprate projects. As a result, the NRC staff acknowledged that some licensees may need to pursue exemptions as an interim licensing approach to support timely implementation of power uprates while longer-term regulatory changes are under development or consideration.

Examples may include exemptions associated with provisions in 10 CFR 50.67, “Accident source term”; 10 CFR 50.68, “Criticality accident requirements”; and Appendix A to 10 CFR Part 50, General Design Criterion 19, “Control room.” The NRC staff found that identifying potential exemption needs early in the licensing process and discussing them during pre-application engagements can improve application quality, enhance review predictability, and support efficient processing while ensuring compliance with applicable regulatory requirements and agency policy.

5. Graded Approach for Power Uprate Reviews (LIC-112, Draft Appendix A)

In the preliminary recommendations memorandum, the NRC staff identified the need for a more structured, risk-informed approach to power uprate reviews. To address this need, the staff developed draft Appendix A to LIC-112, “Graded Approach for Determining Power Uprate Level of Review” (ML25273A236). The draft guidance establishes a framework for scaling the scope and depth of technical reviews commensurate with the safety significance, risk insights, and complexity of the proposed changes. By aligning review effort with the potential safety significance of the proposed uprate, the framework is intended to improve consistency, efficiency, and predictability while maintaining the NRC's standards for safety.

The graded review approach enhances the existing review framework by providing a systematic method for focusing NRC resources on those technical areas that are most affected by the proposed uprate and that have a nexus to safety. The approach incorporates risk-informed principles and considers the impact of the proposed changes on safety margins, defense-in-depth, and overall plant risk. This ensures that review activities remain commensurate with the safety significance and complexity of the issues being evaluated.

Under the graded review framework, SRP review areas are categorized into one of three review bins: Bin 1 (minimal review), Bin 2 (limited review), and Bin 3 (comprehensive review). The assigned review bin reflects the extent to which the proposed uprate affects the technical area under review and considers factors such as impacts on risk significance, defense-in-depth, safety margins, and the use of established versus novel methodologies. This structured approach provides a consistent basis for determining the appropriate level of NRC review while reducing unnecessary review burden in areas with limited safety significance.

The draft Appendix A to LIC-112 provides direction on the use of the binning flowchart, the consideration of approved methodologies and regulatory precedents, and the appropriate application of review tools such as audits, requests for confirmation of information, and RAIs. Aligning these review tools with the assigned review bin will help ensure that regulatory engagement remains proportional to the complexity and safety significance of the topic under review. The NRC staff also expects that, as power uprates are reviewed and the body of approved methodologies and precedents expands, more review areas may become eligible for Bin 1 categorization, resulting in further improvements in review efficiency and predictability.

The NRC staff actively engaged stakeholders on the graded review framework through workshops, tabletop exercises, and public meetings. Stakeholders generally supported the graded review approach and agreed that it has the potential to improve review efficiency and predictability. Stakeholders also identified opportunities to further strengthen the framework by enhancing the transparency of the binning logic and increasing the predictability of how review areas are assigned to Bin 2 and Bin 3.

In response to this feedback, the NRC staff will consider further refinements to the draft guidance by integrating the attributes of risk significance, defense-in-depth, and safety margin into a more structured binning methodology. The staff will expand the guidance to improve consistency in the application of the binning process, particularly with respect to the treatment of approved methodologies, established precedents, and previously reviewed applications. These enhancements are expected to improve transparency, consistency, and predictability for both NRC reviewers and applicants while maintaining a review process that remains appropriately focused on safety-significant issues. A revision of LIC-112 is expected to be issued by August 2027.

6. Other General Process Improvements and Review Efficiencies

The NRC staff identified several process improvements that can enhance the timeliness, predictability, and effectiveness of future power uprate reviews. Leveraging existing licensing efficiency tools and practices, including streamlined safety evaluation processes, the appropriate use of super intelligence (SI)-enabled tools for document analysis and consistency reviews, and applying approaches developed under the ADVANCE Act Section 505 initiatives (“NRC Licensing Efficiency Initiatives Update” (ML25191A155)), can improve review quality while reducing unnecessary burden on both the NRC and applicants. The NRC staff has implemented performance metrics, such as leading and lagging indicators to support efficient reviews.

The regulatory audit process can be an effective mechanism for facilitating the timely exchange of information and improving NRC staff understanding of complex power uprate applications. The staff also found that leveraging communications during audit meetings, when appropriately documented if relied on to make a finding and used consistent with agency guidance (OEDO Procedure-0235, “Driving Regulatory Decisions Through More Effective Communications, ML25167A039), can help resolve clarification questions efficiently and reduce the need for formal RAIs when the issue can be addressed through a licensee supplement or other routine correspondence.

The NRC staff has evaluated and expanded the use of NRC-approved generative SI tools to support review efficiency. The staff developed and tested standardized prompts for activities such as acceptance reviews performed under LIC-109, summarizing applications and technical documents, identifying applicable technical review areas and review organizations, preparing

meeting summaries, and drafting acceptance review memoranda and letters. These tools have demonstrated the potential to reduce administrative burden and allow reviewers to focus more time on risk-significant technical evaluations. The NRC staff also identified additional opportunities to leverage generative SI tools throughout the review process. Examples include developing plant-specific summaries and key plant characteristics, comparing new applications to precedents, identifying whether a new question was addressed in previously issued RAIs, extracting relevant licensing basis information, drafting safety evaluation templates, and performing preliminary assessments of applications using the draft graded review approach to support the initial binning of Standard Review Plan areas. The staff found that these tools can improve consistency across reviews, accelerate information gathering and analysis, and support more informed resource and schedule planning.

Proactive resource planning is essential to successfully manage the anticipated increase in power uprate applications. To support this effort, the NRC developed an internal dashboard that utilizes Reactor Program System (RPS) data to track projected power uprate applications, support workload forecasting, and facilitate resource planning across affected organizations. These insights help staff identify future resource needs and better align review capacity with anticipated workload demands.

The NRC staff identified the need for a dedicated core-team approach to support future reviews, as discussed in a memorandum dated June 24, 2024 (ML24156A109). Relying only on the assigned plant project manager could limit opportunities to leverage lessons learned and specialized expertise across multiple reviews. As a result, the staff established a power uprate core team consisting of experienced project managers and technical reviewers to support power uprate licensing actions. This approach promotes consistency in review practices, facilitates knowledge sharing, improves resource planning, and enhances review efficiency. The staff expects that maintaining a dedicated core team will better position the NRC to manage the anticipated volume and complexity of future power uprate applications while supporting predictable and timely reviews.

The NRC staff also implemented organizational changes intended to streamline review and approval processes. On October 17, 2024 (ML24248A187, Non-Public), signature authority for EPU licensing actions was delegated to the Director of the Division of Operating Reactor Licensing (renamed after the agency reorganization, as the Director of Licensing Projects I), enabling division-level approval of power uprate licensing actions and reducing unnecessary process delays.

The NRC staff continues to coordinate with the Advisory Committee on Reactor Safeguards (ACRS) regarding future power uprate reviews. On July 11, 2025 (ML25177B284), the ACRS issued a memorandum documenting a revised framework for staff engagement on future power uprate licensing actions. Under this framework, the ACRS has focused its review efforts on power uprate applications that involve new, novel, or first-of-a-kind approaches, while reducing its involvement in applications that rely on previously approved methods, established precedents, and well-understood technical issues. The staff found that this risk-informed approach helps provide greater predictability for routine power uprate applications. The staff also found that early communication and engagement with the ACRS regarding planned power uprate activities supports effective review planning, facilitates timely identification and resolution of potential policy or technical issues, and helps reduce schedule risk by providing early clarity regarding the scope and timing of ACRS involvement in the review process.

Additional References:

A summary of each significant engagement is provided below.

On June 26, 2024, a public meeting was held to present NRC staff's ongoing power uprate streamlining efforts and engage industry and the public to discuss possible enhancements to power uprate applications and reviews (ML24172A147).

On September 5, 2024, a public meeting was held to discuss current NRC guidance related to combined or linked license amendments (ML24249A115).

On November 14, 2024, NRC staff held a public meeting to present staff's ongoing power uprate streamlining efforts and engage industry and the public to discuss possible enhancements to power uprate applications and reviews (NRC slides - ML24318C512, NEI slides - ML24318C453).

On March 5, 2025, NRC staff held a public meeting with PSEG Nuclear LLC representatives. PSEG representatives discussed the status of activities to support a planned power uprate at Salem Nuclear Generating Station (ML25056A067).

On December 11 and 12, 2025, NRC staff held a public meeting to present staff's draft graded approach guidance (ML25344A410) for power uprate reviews and also participate in increased enrichment (IE) exemption tabletop exercises. There were tabletop exercises examples for a pressurized water reactor (ML25343A012) and boiling water reactor (ML25343A103).

NEI issued a report on the summary of the meeting (https://www.nei.org/resources/reports-briefs/nei-white-paper-process-improvements-for-power-uprate-reviews).

On March 19, 2026, NRC staff met with NEI to discuss NEI and industry feedback (ML26077A129) on the NRC's graded approach and use of risk insights in power uprate reviews. Additionally, NEI discussed draft regulatory engagement plans (ML26076A026) for power uprate applications, and NRC staff discussed its Enhanced Topical Report Implementation (ETRI) Process (ML26076A018).

On May 28, 2026, NRC staff met with NEI to discuss, via tabletop exercises, industry's plans to implement the NRC graded approach for power uprate reviews. The objective of this workshop was to obtain NRC and industry alignment on reasonable and acceptable approaches for binning safety evaluation inputs, the level of detail expected for justifying proposed bins for RS-001 items, and the level of detail expected in LARs. Additional goals included confirming the acceptability of using precedent and NRC-approved methods to justify review levels, as well as identifying and gaining concurrence on areas where the NRC expects a Bin 3 review (NRC slides - ML26147A274, NEI and industry slides - ML26147A142).

NEI discussed the overall approach of tabletop exercises and explained how it would fit into the pre-submittal meeting concept described in NEI's Regulatory Engagement Strategy. NEI also outlined the general guidelines and assumptions used for the proposed binning tables for each pilot plant. Each pilot plant, both a PWR (Duke Energy) and a BWR (Constellation), discussed their proposed binning tables and draft LAR sections by sharing the tables, walking through each RS-001 element using NRC's draft graded approach for power uprate reviews to describe binning justification and receive NRC feedback, and presented draft LAR sections based on

previous LARs with emphasis on items that are new, complex, or different from previously approved uprates.

In September 2026, NEI published an industry survey which supports the high interest in power uprates (link).

Letters Issued to Industry:

On May 7, 2024 (ML24106A068), the NRC issued a letter to NEI that provides NRC's goal of power uprate LAR review targets of 12 months for an EPU, 9 months for a SPU, and 6 months for a MUR.

On February 7, 2025 (ML25007A001), the NRC issued a RIS to request information on planned power uprate-related licensing submittals for all power reactor licensees. Submittal of the requested information was strictly voluntary. This RIS was intended to promote early communication with NRC licensees regarding planned power uprate-related licensing activities. This information will assist the NRC in budgeting for and allocating its resources and will enable the agency to more efficiently and effectively plan its licensing work.

SUBJECT: OFFICE OF NUCLEAR REACTOR REGULATION FINAL REPORT ON IMPROVING THE POWER UPRATE REVIEW PROCESS DATED NOVEMBER 17, 2026

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