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OKLO INC. – FINAL SAFETY EVALUATION OF TOPICAL REPORT OKLO-2025-RX-R012-P, "PRINCIPAL DESIGN CRITERIA FOR THE AURORA POWERHOUSE," REVISION 1 (EPID L-2025-TOP-0028)

SPONSOR AND SUBMITTAL INFORMATION

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Project No.:	99902095
Submittal Date:	August 6, 2025

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Revision Letter Date and ADAMS Accession No: Revision 1, March 5, 2026, (ML26064A243).

Brief Description of the Topical Report:
By letter dated August 6, 2025 (ML25220A125), Oklo, Inc. (Oklo) submitted a topical report (TR) entitled "Principal Design Criteria for the Aurora Powerhouse," Revision 0, for the U.S. Nuclear Regulatory Commission (NRC) staff's review. By letter dated March 5, 2026, Oklo submitted Revision 1 of the TR. The TR describes the result of Oklo's process to develop principal design criteria (PDCs) for the Aurora powerhouse facility to comply with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) 52.79(a)(4)(i). Oklo requested the NRC's review and approval of these PDCs for use in future licensing applications for the Aurora powerhouse.

Oklo used Regulatory Guide (RG) 1.232, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," Revision 0 (ML17325A611), to inform the development of its PDCs for the Aurora powerhouse. In addition, the TR refers to experience and information from prior U.S. Department of Energy sodium-cooled fast reactors (SFRs), particularly the Experimental Breeder Reactor-II (EBR-II) and the Fast Flux Test Facility (FFTF), as technological precedent for the proposed PDCs.

By email dated August 25, 2025, the NRC staff informed Oklo that the TR provided sufficient information for the NRC staff to conduct a detailed technical review (ML25232A123). On September 11, 2025, the NRC staff transmitted an audit plan to Oklo (ML25251A229) and subsequently conducted an audit of materials related to the TR from September 19, 2025, to March 16, 2026. The NRC staff issued the audit summary dated April 13, 2026 (ML26049A258).

REGULATORY EVALUATION

The provisions in 10 CFR 52.79(a)(4)(i) require combined license applicants to include PDCs as part of the final safety analysis report (FSAR) for a proposed facility. The required design information that must also be provided as part of the FSAR includes: (1) the design bases and the relation of the design bases to the PDCs, in accordance with 10 CFR 52.79(a)(4)(ii); and (2) "[i]nformation relative to materials of construction, arrangement, and dimensions, sufficient to provide reasonable assurance that the design will conform to the design bases with adequate margin for safety," in accordance with 10 CFR 52.79(a)(4)(iii).

The regulations under 10 CFR 52.79(a)(4)(i) state, in part, that "Appendix A to part 50 of this chapter, 'General Design Criteria for Nuclear Power Plants,' establishes minimum requirements for the [PDCs] for water-cooled nuclear power plants similar in design and location to plants for which construction permits have previously been issued by the Commission and provides guidance to applicants in establishing [PDCs] for other types of nuclear power units." Since the Aurora powerhouse is an SFR plant, its PDCs are not required to meet the general design criteria (GDCs) in 10 CFR Part 50, Appendix A. Nonetheless, the introduction to 10 CFR Part 50, Appendix A, generally describes the PDCs as "establish[ing] the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public."

Recognizing that the GDCs in 10 CFR Part 50, Appendix A may not be appropriate for non-light-water reactors (non-LWRs), the NRC staff issued RG 1.232, Revision 0, which serves as guidance for developing PDCs for non-LWR designs. RG 1.232, Appendix B, "Sodium-Cooled Fast Reactor Design Criteria," provides the guidance for SFR design criteria (SFR-DCs).

TECHNICAL EVALUATION

1. Aurora Powerhouse Design

Section 1.2, "Aurora powerhouse design overview," of the TR provides an overview of the key design features of the Aurora powerhouse. The TR states that the term "Aurora powerhouse" describes the nuclear power plant generically and does not refer to a specific structure, system, or component (SSC). The TR states that the safety of the Aurora reactor and associated heat transport systems relies on inherent features and designed passive safety functions typical of SFRs that were demonstrated through operation at EBR-II and FFTF. The metal-fueled Aurora reactor operates at near-atmospheric pressure, and the powerhouse uses a functional containment with multiple barriers to prevent release of fission products. In addition, the TR states that the passive reactor vessel auxiliary cooling system (RVACS) can provide all necessary residual heat removal.

The NRC staff did not perform a technical review of this information but used it as context to inform the review of the proposed PDCs. Accordingly, an applicant or licensee referencing this TR must propose a design that is substantially similar to the Aurora powerhouse design as discussed in the TR, or otherwise justify that any departures from these design features do not affect the conclusions of the TR and this safety evaluation (SE). This is documented as Limitation and Condition 1 in section 4 of this SE.

2. Methodology

Section 2.2, “Approach for the Aurora powerhouse,” of the TR describes Oklo’s process for developing the Aurora powerhouse PDCs. Oklo stated that it first assessed and adopted the SFR-DCs from Appendix B to RG 1.232, where appropriate. Where the powerhouse design was not well represented by the SFR-DCs, Oklo stated that it reviewed the language from the other RG 1.232 appendixes (i.e., Appendix A, “Advanced Reactor Design Criteria” [ARDCs],[1] and Appendix C, “Modular High-Temperature Gas-Cooled Reactor Design Criteria” [MHTGR-DCs]) to determine if a criterion from those other RG 1.232 appendices could be added without modification, with modification, or if a new PDC would be required. Finally, Oklo reviewed the initial list of PDCs to determine whether any additional PDCs were warranted.

The NRC staff considers this overall approach to be acceptable because it uses the NRC staff-approved guidance in RG 1.232 as a basis for developing Aurora powerhouse design-specific criteria and considers the need for PDCs not contemplated in RG 1.232.

3. Evaluation of Aurora Powerhouse Principal Design Criteria

Section 2.3, “Summary of changes to the RG 1.232 design criteria,” of the TR provides Oklo’s justification for the types of changes it made to the RG 1.232 DCs to ensure that the Aurora powerhouse PDCs collectively provide a comprehensive design framework for the Aurora powerhouse advanced reactor. Table 3-1, “Principal design criteria for the Aurora powerhouse,” of the TR contains a list of the Aurora powerhouse PDCs, the source language (e.g., SFR-DC, MHTGR-DC), and justification for any changes.

The NRC staff’s review was limited to an evaluation of the PDCs in the context of the proposed Aurora powerhouse design and did not include a detailed review of how Oklo intends for the design to meet the PDCs (e.g., specific design features, design limits, plant programs). Additionally, the NRC staff notes that exemptions from NRC regulations may be necessary to support use of these PDCs and should be addressed in separate licensing actions referencing this TR.

Section 3.1, “General Changes to RG 1.232 DCs,” of this SE, provides the staff’s evaluation of broad, conceptual changes to the RG 1.232 DCs. Section 3.1 of this SE includes high-level updates, such as introducing the concept of functional containment. Section 3.2, “Evaluation of Specific Aurora Powerhouse Principal Design Criteria,” of this SE focuses on the staff’s evaluation of detailed, design-specific changes to the RG 1.232 DCs.

3.1 General Changes to RG 1.232 DCs

3.1.1 Use of Functional Containment Concept

Section 2.3.1, “Use of functional containment,” of the TR discusses the use of the functional containment concept for the Aurora powerhouse design. A “functional containment” is defined in

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[1] As stated in RG 1.232, Rev. 0, “The NRC intends the ARDC to apply to the six advanced reactor technology types identified in the [U.S. Department of Energy] report [titled ‘Guidance for Developing Principal Design Criteria for Advanced (Non-Light Water) Reactors,’ December 2014 (ML14353A246, ML14353A248)]; however, in some instances, one or more of the criteria from the SFR-DC or MHTGR-DC may be more applicable to a design or technology than the ARDC.”

Appendix C to RG 1.232 as a "barrier, or set of barriers taken together, that effectively limit the physical transport and release of radionuclides to the environment across a full range of normal operating conditions, [anticipated operational occurrences], and accident conditions." Incorporation of a functional containment concept into the Aurora powerhouse PDCs results in the use of language from MHTGR-DCs 16, 71, and 72; adoption of SFR-DCs 13 and 64 with modifications; and exclusion of PDCs 38-43 and 50-57.

Oklo's rationale for the use of a functional containment concept is summarized in TR section 2.3.1. Oklo states that a functional containment strategy is appropriate because the Aurora reactor operates with its coolant well below its boiling point, maintains near-atmospheric pressure, and is not susceptible to loss-of-primary-coolant accidents due to the entire primary heat transport system being contained within the reactor vessel and the reactor vessel being surrounded by a guard vessel.

SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water Reactors" (ML18114A546), as approved by the Commission in a staff requirements memorandum (ML18338A502), describes considerations for the implementation of a functional containment approach. The NRC staff notes that while the use of a functional containment approach is typically associated with high-temperature gas-cooled reactors (as shown by its incorporation into the RG 1.232 MHTGR-DC), SECY-18-0096 states that it is applicable to all non-LWRs. SECY-18-0096 predicates the use of a functional containment approach on the identification of performance criteria for SSCs that play a role in radionuclide retention. As such, the NRC staff considers it conceptually reasonable to apply a functional containment approach to the Aurora powerhouse, provided that Oklo can appropriately identify functional containment performance criteria and justify those functional containment performance criteria are adequate.

The proposed process for developing functional containment performance criteria documented in SECY-18-0096 is a risk-informed, performance-based process that relies on mechanistic source term analyses. SECY-18-0096 also lists conditions derived from SECY-93-092, "Issues Pertaining to the Advanced Reactor (PRISM, MHTGR, and PIUS) and CANDU 3 Designs and Their Relationship to Current Regulatory Requirements" (ML040210725), that mechanistic source term analyses should meet. Oklo has stated that it intends to use mechanistic source term analyses as part of the safety analysis approach.[2] The NRC staff notes that, in general, mechanistic source term analyses evaluate the capability of the functional containment on a layer-by-layer basis and may provide a starting point for establishing functional containment performance criteria. However, Oklo has not proposed an approach that aligns with the methodology documented in SECY-18-0096 to the NRC staff. To support use of the functional containment concept, the NRC staff expects that Oklo will identify and justify appropriate functional containment performance criteria as part of a future licensing submittal. This is captured in Limitation and Condition 2a in section 4 of this SE.

3.1.2 Removal of Important-to-Safety Electrical Power

Section 2.3.2, "Deletion of SFR-DC 17 and 18," of the TR discusses the removal of SFR-DCs 17 and 18 due to the Aurora powerhouse being designed "such that electrical power is not relied

[2] The NRC staff previously reviewed and provided feedback (ML23187A577) on an Oklo white paper (WP), "Source Term Modeling Overview," dated April 2023 (ML23111A297). The WP described a mechanistic source term approach for source term and dose analyses.

upon to support any important-to-safety functions during anticipated operational occurrences or postulated accidents." The NRC staff determined this deletion to be acceptable provided safety analyses of the Aurora powerhouse or other justification demonstrates that no important-to-safety functions rely on electrical power. As noted in RG 1.232, such important-to-safety functions may include post-accident monitoring, control room habitability, emergency lighting, radiation monitoring, communications, and potentially others appropriate for the design. This is captured in Limitation and Condition 2b in section 4 of this SE.

This determination should not be interpreted as the NRC staff concluding that no criteria for the design of electrical power systems are necessary for the Aurora powerhouse; rather, it indicates that such criteria may appropriately be established through means other than PDCs (e.g., system descriptions in licensing basis documentation) if Limitation and Condition 2b is satisfied. The NRC staff emphasizes that defense in depth remains a fundamental NRC philosophy, relying on multiple independent and redundant layers of protection to address design uncertainties.

3.1.3 Onsite Monitoring Room

Section 2.3.3, "Modification of SFR-DC 19," of the TR discusses the modification of SFR-DC 19 to refer to "onsite monitoring room" rather than "control room." Oklo's justification is that automatic controls maintain the plant in safe and stable conditions during power operation with no need for operator action. The TR states that **[[**

]]. For defense in depth, the operators can shut down the reactor from an alternate location outside of the onsite monitoring room.

The NRC staff notes that Oklo's operational staffing plan is not within the scope of the PDC TR; therefore, this SE does not address the acceptability of the operational staffing plan.[3] Rather, this SE focuses on the design of the onsite monitoring room. The NRC staff considers Oklo's changes to SFR-DC 19 to use the terminology "onsite monitoring room" to be primarily nomenclature changes that do not substantively impact the meaning of the PDC. Oklo's PDC 19 includes the key aspects of SFR-DC 19: capabilities (e.g., control room indications and ability for operators to control and manually shut down the reactor), habitability, and protection of the control room, as well as ability for operators to manually shut down the reactor from a location outside the control room. Therefore, the NRC staff determined that the use of the term "onsite monitoring room" instead of "control room" is acceptable.

The last paragraph of PDC 19 includes several related changes relative to SFR-DC 19: deleting "and controls" from the term "instrumentation and controls," changing "maintain" to "verify," and deleting text about the potential capability for cold shutdown. Along with the justification that operators can shut down the plant from a location outside the onsite monitoring room, these changes indicate that operators will have the ability to perform a shutdown from an alternate location but may not have the ability to take additional actions from an alternate location to maintain a safe shutdown condition. The NRC staff determined this is acceptable because the alternative manual shutdown ability is the key design consideration; assuming the shutdown

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[3] Oklo submitted two TRs regarding operator licensing and staffing plans: "Product-Based Operator Licensing Framework," Rev. 0, dated March 2025 (ML25070A325), and "Staffing Plan Validation Methodology," dated January 2026 (ML26034C407). Both TRs are currently under NRC staff review.

margin is properly calculated with sufficient allowances for uncertainties and potential malfunctions, no further actions would be needed to hold the reactor subcritical. The NRC staff addresses the concept of cold shutdown in section 3.2.4, “Modifications from SFR- and MHTGR-DCs,” of this SE.

3.1.4 Removal of Intermediate Heat Transfer System as Important to Safety

Section 2.3.4, “Deletion of SFR-DC 70 and 75-77,” of the TR discusses the removal of SFR-DCs 70 and 75-77 due to the design of the Aurora powerhouse not requiring the intermediate heat transport system (IHTS) to perform important-to-safety functions. Oklo’s rationale is that “[f]ailure of the intermediate coolant boundary has no significant impact on the plant,” and “[t]he RVACS is designed with sufficient redundancy and margin to preclude the IHTS from being relied upon for important-to-safety decay heat removal functions.”

During the audit related to this TR, the NRC staff and Oklo discussed Oklo’s statement that failure of the IHTS has no significant impact on the plant (ML26049A258). The NRC staff noted potential impacts of a postulated steam generator tube rupture (SGTR) in the power generation system as well as potential leaks resulting in interactions of intermediate sodium with other media. Oklo clarified that the intermediate heat exchanger (IHX), which forms the interface between the primary and intermediate sodium loops, is designed to a higher pressure than several other components in the IHTS, and portions of the IHX that are part of the primary coolant boundary are safety related. In addition, Oklo stated that each IHTS loop is equipped with redundant rupture discs to mitigate pressure waves that could occur due to a SGTR. Oklo also stated that an uncontrolled release of all activity in the IHTS is expected to have limited off-site consequences.

The NRC staff notes that in the TR, PDC 73, “Sodium leakage detection and reaction prevention and mitigation,” and PDC 74, “Sodium/water reaction prevention/mitigation,” apply to any sodium-containing system, which would include the IHTS. These PDCs address the NRC staff’s primary technical observations related to potential IHTS failures. Furthermore, the NRC staff expects that the portions of the IHX that form part of the primary coolant boundary will meet PDC 14, “Primary coolant boundary,” PDC 30, “Quality of primary coolant boundary,” PDC 31, “Fracture prevention of primary coolant boundary,” and PDC 32, “Inspection of primary coolant boundary,” which would minimize the potential for their failure.

The NRC staff notes that the IHTS rupture discs may have an important-to-safety function in mitigating the pressure wave due to a SGTR. The NRC staff also notes that it may be possible for the remainder of the IHTS to have no important-to-safety functions, but this must be further justified in future licensing submittals. Future licensing submittal justifications could include, for example, safety analyses that show the adequacy of the rupture discs to relieve the worst-case pressure wave from a postulated SGTR; the sufficiency of the RVACS alone to remove decay heat, accounting for single failures as well as diversity and defense-in-depth considerations for decay heat removal; and the radiological and integrated plant consequences of an uncontrolled release of intermediate coolant, considering possible interactions of sodium with other media.

These considerations are captured in Limitation and Condition 2c in section 4 of this SE. Provided that adequate justification is provided in a future submittal, the NRC staff determined the deletion of SFR-DCs 70 and 75-77 is acceptable.

This determination should not be interpreted as the NRC staff concluding that no criteria for the design of the IHTS are necessary for the Aurora powerhouse; rather, it indicates that such criteria may appropriately be established through means other than PDCs (e.g., system descriptions in licensing basis documentation) if Limitation and Condition 2c is satisfied.

3.2 Evaluation of Specific Aurora Powerhouse Principal Design Criteria

Table 3-1 of the TR contains each Aurora powerhouse PDC, the source language (e.g., SFR-DC, MHTGR-DC), and justification for any changes from RG 1.232 DC source language.

3.2.1 SFR-DC-derived PDCs

Many of the Aurora powerhouse PDCs are derived from the SFR-DCs in Appendix B to RG 1.232, including PDCs 1-5, 10-15, 19-26, 28-36, 60-64, 71-74, 78, and 79. Beyond those subjects considered in the GDCs, the SFR-DCs cover SFR-specific topics, including the intermediate coolant system, coolant and cover gas purity control, cover gas inventory maintenance, sodium heating systems, and issues related to the chemical reactivity of sodium (including leakage detection, sodium and water reaction prevention and mitigation, and separation of sodium from chemically incompatible fluids). Because the SFR-DCs are specific to SFRs like the Aurora powerhouse, the NRC staff considers these PDCs to provide an acceptable basis for the Aurora powerhouse PDCs. Oklo’s adaptations to the SFR-DCs are discussed in SE section 3.2.4.

3.2.2 MHTGR-DC-derived PDCs

Aurora powerhouse PDCs 16, 37, 58, and 59 are based on MHTGR-DCs 16, 37, 71, and 72, respectively, in Appendix C to RG 1.232. While the Aurora powerhouse design does not have much in common with the MHTGR design used to develop the criteria in Appendix C to RG 1.232, the RG states that applicants are “free to choose among the ARDC, SFR-DC, or MHTGR-DC to develop each PDC after considering the underlying safety basis for the criterion and evaluating the rationale for the adaptation described in this RG.” The NRC staff therefore considers the use of the MHTGR-DCs acceptable as the basis for establishing DCs for an SFR design, provided that the safety basis is appropriately preserved and the adaptations are relevant to the design.

The MHTGR-DCs used as the basis for Aurora powerhouse PDCs 16, 58, and 59 are used because they implement the functional containment approach. Because the functional containment approach is technology inclusive and Oklo has proposed its use for the Aurora powerhouse, as discussed in section 3.1.1 of this SE, it is appropriate to use the MHTGR-DCs as the basis for these PDCs. MHTGR-DC 37 is used as the basis for PDC 37 because MHTGR-DC 37 pertains to a passive heat removal system, which the NRC staff notes is consistent with the RVACS design. Oklo’s adaptations to the MHTGR-DCs are discussed in SE section 3.2.4.

3.2.3 “Deleted” PDCs

Oklo did not include PDCs numbered 17 and 18; these were marked as deleted due to the Aurora powerhouse not being reliant on electric power systems to perform important-to-safety functions. This change is addressed generically in section 3.1.2 of this SE and is considered by the NRC staff to be acceptable, subject to applicable limitations and conditions, for the reasons previously discussed.

Oklo did not include PDCs numbered 38-43 and 50-57 (and therefore did not incorporate SFR-DCs 38-43 and 50-57); these were marked as deleted due to the adoption of the functional containment approach, consistent with the MHTGR-DCs in RG 1.232 Appendix C. The NRC staff determined that this is acceptable, subject to applicable limitations and conditions, because the Aurora powerhouse employs a functional containment as discussed in SE section 3.1.1.

Oklo did not include PDCs numbered 44-46; these were marked as deleted because, according to Oklo in TR Table 3-1, the Aurora powerhouse RVACS provides indefinite core cooling capability without the need for structural and equipment cooling systems. The NRC staff notes that such systems typically provide cooling to SSCs such as primary coolant pumps and control rod drives. Conceptually, it may be possible that no important-to-safety SSCs rely on structural and equipment cooling systems to perform their safety functions. Therefore, the NRC staff determined it is acceptable to delete PDCs 44-46, provided future analyses demonstrate that no SSCs require cooling beyond that provided by RVACS to perform important-to-safety functions. This is captured in Limitation and Condition 2d in section 4 of this SE. However, this determination should not be interpreted as the NRC staff concluding that no criteria for the design of structural and equipment cooling systems are necessary for the Aurora powerhouse; rather, it indicates that such criteria may appropriately be established through means other than PDCs (e.g., system descriptions in licensing basis documentation) if Limitation and Condition 2d is satisfied.

Oklo did not include PDCs numbered 70 and 75-77; these were marked as deleted due to the IHTS not being important to safety. This change is addressed generically in section 3.1.4 of this SE and is considered by the NRC staff to be acceptable, subject to applicable limitations and conditions, for the reasons previously discussed.

3.2.4 Modifications from SFR- and MHTGR-DCs

As discussed above, all Aurora powerhouse PDCs are based on either the SFR-DCs or MHTGR-DCs from RG 1.232. Aurora powerhouse PDCs 1-4, 10-12, 14-16, 20-26, 28, 29, 31-33, 36, 60-63, 72-74, 78, and 79 were adopted from the SFR- and MHTGR-DCs with no changes.

Aurora powerhouse PDC 5 modified SFR-DC 5 to change “an orderly shutdown and cooldown” to “the ability to achieve and maintain safe shutdown” for consistency with SECY-94-084, “Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs” (ML003708068). The NRC staff notes that SECY-94-084 recognized that plant states besides cold shutdown may constitute a safe shutdown condition, provided that “reactor subcriticality, decay heat removal, and radioactive materials containment are properly maintained for the long term.” In addition, the temperature-based shutdown conditions in the GDCs were defined for light-water reactors and are not applicable to SFRs. The NRC staff determined that the intent of SFR-DC 5 is met through the concept of safe shutdown and therefore determined that Oklo’s changes to SFR-DC 5 are acceptable. The NRC staff will review Oklo’s criteria for safe shutdown in licensing applications that reference this TR.

Aurora powerhouse PDCs 13 and 64 were modified from SFR-DCs 13 and 64 to refer to “functional containment” rather than a physical containment structure. These changes are acceptable for the reasons discussed in section 3.1.1 of this SE.

In addition to the generic changes discussed in section 3.1.3 of this SE, Aurora powerhouse PDC 19 modified SFR-DC 19 to (1) add “postulated” to “accident conditions;” (2) add protection against inert gases; and (3) delete the terminology related to hot and cold shutdown. Regarding change (1), the addition of the word “postulated” has no significant impact on the PDC because it does not change the scope of accident conditions considered.[4] A postulated accident is an assumed or hypothetical accident scenario used for design and licensing basis analyses; in other words, an accident against which a facility is designed, in part using PDCs. Therefore, the NRC staff determined this change is acceptable. Regarding change (2), the NRC staff notes that SFRs use inert gas as a cover gas above the sodium coolant, so it is appropriate and acceptable for inert gases to be considered as a potential hazard. Regarding change (3), the NRC staff determined the change is acceptable for the reasons given in the discussion of PDC 5.

Aurora powerhouse PDC 30 modified SFR-DC 30 to change the wording from “highest quality standards practical” to “commensurate with their importance to safety,” consistent with PDC 1. Conceptually, it is reasonable to apply quality standards commensurate with their importance to safety. Therefore, the NRC staff determined PDC 30 is acceptable but notes that a future licensing submittal will have to clearly identify and justify the safety importance of primary coolant boundary components and demonstrate the adequacy of their corresponding standards for quality and design.

Aurora powerhouse PDCs 34 and 35 modified SFR-DCs 34 and 35 to delete “suitable interconnections, leak detection, and isolation capabilities” for the residual heat removal (RHR) and emergency core cooling systems. Per PDCs 34 and 35, the RVACS is credited for RHR and emergency core cooling in the Aurora powerhouse. The TR describes the RVACS as a passive, “always-on” system that relies upon natural circulation of ambient air for cooling. The NRC staff understands that the RVACS is not isolable in the same sense as the active, liquid-cooled systems contemplated by the original GDC. The NRC staff views interconnections for the RVACS as covered by the redundancy portion of the PDC. In addition, system (air) leakage is of little consequence for RVACS, as further discussed under PDC 37 below. The NRC staff determined that PDCs 34 and 35 are acceptable because they retain the pertinent portions of SFR-DCs 34 and 35.

Aurora powerhouse PDC 37 modified MHTGR-DC 37 to delete the leaktight aspect of the passive RHR system and to delete “and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including associated systems, for [anticipated operational occurrence] or postulated accident decay heat removal to the ultimate heat sink and, if applicable, any system(s) necessary to transition from active normal operation to passive mode.” The NRC rationale for MHTGR-DC 37 adaptations to

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[4] The NRC staff notes that “postulated accidents” has a specific meaning in the context of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/index); specifically, per Section 15.0, “Introduction – Transient and Accident Analyses,” Revision 3 (ML070710376), occurrences that could happen but are not expected to occur during the life of the nuclear power plant. The other category of initiating event in NUREG-0800, based on frequency, is an anticipated operational occurrence, which is defined in 10 CFR Part 50, Appendix A, as conditions of normal operation that are expected to occur one or more times during the life of the nuclear power unit. Normal conditions are already addressed in Oklo’s PDC 19.

GDC 37 in RG 1.232 states that reactor cavity cooling system (RCCS) performance does not require “leaktight” conditions, and abnormal leakage of RCCS coolant to locations other than the exhaust structure may be acceptable provided that the leakage does not impact safety functions or functional containment. In addition, the NRC staff rationale for adaptations to GDC 37 acknowledges that some RCCS designs will provide continuous passive operation, which negates the need to test the operation sequence that brings the system into operation. Because the NRC staff understands the RVACS to be consistent with this rationale, the NRC staff determined Oklo’s proposed PDC 37 is acceptable.

Aurora powerhouse PDCs 58 and 59 were modified from MHTGR-DCs 71 and 72 to delete the text related to a pathway for the release of helium from the building in the event of depressurization events. The NRC staff determined this change is acceptable because SFRs, including the Aurora design, do not use pressurized helium coolant. Therefore, the depressurization accidents referred to in the MHTGR-DCs are not applicable to SFRs.

Finally, Aurora powerhouse PDC 71 was modified from SFR-DC 71 to fix a typographical error in RG 1.232. The NRC staff determined the change is acceptable because it makes an appropriate and clarifying correction.

3.2.5 Considerations for Residual Heat Removal and Emergency Core Cooling

The TR shows that RVACS is the sole system relied upon for residual heat removal and emergency core cooling (see PDC 34-37), which is consistent with the statement from RG 1.232, “[i]n most advanced reactor designs, a single system (i.e., the residual heat removal system) is provided to perform both the residual heat removal and emergency core cooling functions.” However, RG 1.232 also states, “the applicant is responsible for considering public safety matters and fundamental concepts, such as defense in depth, in the design of their specific facility and for identifying and satisfying necessary safety requirements.” As part of a future licensing submittal, Oklo should address whether the RVACS provides sufficient diversity and defense in depth to support the safety case of the Aurora powerhouse.

4. LIMITATIONS AND CONDITIONS

The NRC staff imposes the following limitations and conditions regarding the TR:

1. An applicant or licensee referencing this TR must propose a design that is substantially similar to the Aurora powerhouse design as discussed in the TR, or otherwise justify that any departures from these design features do not affect the conclusions of the TR and this SE.

2. An applicant or licensee referencing this TR must provide additional justification to support the adequacy of the proposed PDCs for the Aurora powerhouse design. Specifically:

    a. An applicant or licensee referencing this TR must identify and justify appropriate functional containment performance criteria.

    b. An applicant or licensee referencing this TR must justify that no important-to-safety functions rely on electrical power.

c. An applicant or licensee referencing this TR must justify that the IHTS has no important-to-safety functions. Examples of such justification are provided in section 3.1.4 of this SE.

d. An applicant or licensee referencing this TR must demonstrate that no SSCs require cooling beyond that provided by RVACS to perform important-to-safety functions

CONCLUSION

Based on the above evaluation, the NRC staff concludes that Oklo has considered each of the design aspects presented in RG 1.232 and provided a sufficient set of PDCs that are appropriate for establishing requirements for the Aurora powerhouse design, subject to the limitations and conditions listed in this SE. Subject to these limitations and conditions, these PDCs establish the necessary design, fabrication, construction, testing, and performance DCs for important-to-safety SSCs to provide reasonable assurance that the Aurora powerhouse could be operated without undue risk to the health and safety of the public. The subject TR is therefore suitable for referencing in future licensing applications for the Aurora powerhouse.

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