NRC Staff Feedback Regarding White Papers Related to
Hadron Energy, Inc. White Paper Principal Design Criteria for the
Hadron Modular Microreactor (MMR), Revision 0 (EPID L-2026-LRO-0027)

The NRC staff feedback and observations on these white papers are preliminary and subject to change. The feedback and observations provided by the NRC staff are not regulatory findings on any specific licensing matter and are not official agency positions; thus, they should not be construed as information needed or required in any submittal or future licensing action. Rather, the NRC staff feedback and observations are provided for the applicant's consideration.

The NRC staff captures its feedback and observations with the focus on major design development needs, followed by comments for each white paper section separately, as documented below:

Major Design Development Needs

Hadron Energy provided presentations on their design based on staff preliminary questions (public ML26147A016, proprietary ML26147A019) on May 28, 2026. Based on the information made available during the presentation, NRC staff recommended that several major design developments be discussed further with the staff to facilitate identification of acceptable resolution pathways before Hadron Energy pursues future licensing topical report development and regulatory reviews.

Reactor Coolant Pump NPSH Margin and Potential Cavitation

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.**]]** A feasibility evaluation should be performed to demonstrate sufficient NPSH margin for these reactor coolant pumps.

Once-Through Steam Generator Performance Evaluation Needed

Hadron Energy presented a reactor design that uses an integrated once-through steam generator **[[**
.**]]** Given the limited shell side volume compared to conventional once-through steam generators comprehensive analysis using relevant test or operational data is necessary. This provides reasonable assurance of the specified secondary side steam flow rate and sustained heat removal. Failure to establish steam generator performance early in the design process may lead to complicated and costly changes and affect the timeliness of the licensing review.

[[**]]**

In response to staff comments on potential boron dilution during long term cooling after the ECCS actuation, Hadron Energy introduced a **[[**

]]The PSAR should address if the valves can perform their safety-function without electrical power. This supports the General Design Criteria (GDC) 17 and 18 exemptions.

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ECCS Valves Fail/Open

Hadron Energy, seeking exemptions from GDC 17 and 18 for safety-related power supply, stated that all ECCS valves (RVVs and RRVs) would open if power is lost, a fail-to-open design feature. This could cause ECCS activation during an anticipated operational occurrence, such as loss of offsite or onsite DC power. When the ECCS valves open, blowdown may expose the core and result in reactor heat-up. This design feature needs to be evaluated properly to reduce the overall core damage frequency and protect SAFDLs during limiting AOO events.

Feedback on Principal Design Criteria:

The feedback is currently based on the initial design information presented on May 28, 2026. After the major design developments are completed by Hadron Energy, additional feedback may become available for desired deviations, licensing topical reports and the licensing path forward options.

For LWR designs which include features that differ from the currently licensed fleet (e.g., passive safety systems, elimination of the need for offsite power, or other innovations), certain GDCs in Appendix A may not be directly applicable. When a GDC is not directly applicable to the advanced LWR design, an applicant may propose a PDC appropriate to its facility, as permitted by 10 CFR 50.34(a)(3), without the need for an exemption from the 10 CFR Part 50, Appendix A, GDCs, provided that the departures from the GDC are identified and justified. The staff will review the proposed PDCs to ensure they meet the underlying safety objectives of the associated GDC and are consistent with NRC requirements.

GDC 17 and 18 - Electric Power Systems:

The staff notes that Hadron utilizes passive safety functions for reactor trip, emergency core cooling, containment isolation, and decay heat removal. Each of these safety functions is able to be performed independent of electrical power, reducing the safety benefit gained from emergency power sources and systems.

The staff recognizes the presence of non-safety related DC power systems with augmented design, 125V DC battery banks and supporting non-Class 1E diesel generator, as defense-in-depth measures consistent with the NuScale EDAS approach.

The staff recommends integrating the removal of electric power provision in Section *5.5 GDC 34, 35, 38, 41, and 44 - Passive Fluid Systems and Electric Power Provisions* to the basis for the proposed PDC 17 and 18 (Section 5.1) in order to facilitate efficient review by combining topics of similar technical and regulatory bases.

GDC 19 - Control Room (Safe Shutdown vs. Cold Shutdown)

The white paper states that the Hadron MMR design will include passive systems to remove decay heat following design basis events and maintain subcriticality. Because Hadron MMR design does not have active cooling system, **[[**

.**]]** If this is indeed true, the staff recommends Hadron to re-evaluate utilizing an alternative PDC to GDC 19 within the context of Safe Shutdown vs Cold Shutdown.

Additionally, staff requested information on control room dose requirements and habitability criteria in a future PDC 19 and Hadron MMR licensing basis. Staff looks forward to further engagement on this topic.

GDC 27 - Combined Reactivity Control Capability

Staff requested that Hadron describe the need for a PDC different from GDC 27 given the design described in the white paper. Staff have found that previous reactor designs conform with GDC 27 without including active boron injection through ECCS. An exemption would not be needed solely because the Hadron MMR does not include active boron injection through ECCS.

This section of the white paper also requested pre-application engagement on several topics related to a reactivity control system **[[** **]]** of the Hadron MMR. Staff provided information requests related to these topics, including information discussed in the **[[** **]]** section of this feedback. Requested information also relates to the conditions and phases of design-based events in which this system needs to function, and conditions of this system during normal operation. Staff look forward to further pre-application engagement on these topics.

GDC 33 - Reactor Coolant Makeup

Hadron MMR design proposes to address the safety objective of GDC 33 by leveraging its integral reactor pressure vessel (RPV) and high-pressure containment vessel (CV) configuration. Instead of providing a dedicated, reactor coolant makeup system as described in GDC 33 for conventional reactors, Hadron's approach relies on the containment vessel to retain any coolant released from small breaks or leaks in the reactor coolant pressure boundary. In this design, any loss of primary coolant is confined within the sealed annulus between the RPV and the CV, ensuring that the coolant remains available for recirculation and core cooling. Routine and minor leakage is managed by the non-safety-related Chemical and Volume Control System (CVCS), which collects, processes, and recirculates the retained coolant to maintain safe operation or enable a controlled shutdown.

The rationale for this proposed approach is based on the Hadron MMR's inherent safety features, which fundamentally alter the consequences of small-break events compared to traditional pressurized water reactors. By ensuring that all leaked coolant is retained within the containment, the design precludes the risk of core uncovering due to inventory loss, thereby achieving the underlying safety objective of GDC 33—maintaining sufficient coolant inventory to prevent fuel damage. This strategy is considered feasible with regulatory precedent, as demonstrated by the NRC staff review and regulatory finding on the NuScale Power's integral design, which also relied on containment inventory retention rather than a dedicated makeup system. The design features relied on to justify this approach, such as ECCS design, integral containment design, will need to be reviewed as part of a future licensing submittal to confirm that they are adequate to meet the safety objective described above and in the proposed PDC 33.

GDC 34, 35, 38, 41, and 44 - Passive Fluid Systems and Electric Power Provisions

GDC 34

The purpose of this GDC is to ensure the residual heat removal system can transfer decay heat from the reactor core to the ultimate heat sink, maintaining fuel and reactor coolant pressure boundary limits. Hadron Energy plans to accomplish this passively by heat transfer from the reactor pressure vessel through the containment vessel to the reactor pool without active pumps, fans, or powered components. Redundancy, leak detection, and isolation features are provided to meet single-failure criteria. In addition, the safety-related decay heat removal system (DHRS) passive heat exchangers will be designed to function as a supplementary safety-related cooling function for non-LOCA events, offering modulated cooldown capability beyond what the CV-to-pool mechanism alone provides. The PSAR should address whether passive heat transfer features have sufficient decay heat removal.

GDC 35

This GDC intends to ensure the emergency core cooling system (ECCS) can provide adequate core cooling following a loss-of-coolant accident (LOCA). **[[**

]] The PSAR should address whether the ECCS can maintain two-phase water level above the core throughout the entire LOCA transient or in compliance of 10 CFR 50.46 requirements.

GDC 38

This GDC ensures the containment heat removal system can rapidly reduce and maintain containment pressure and temperature at safe levels after a LOCA. Hadron Energy MMR design can achieve the containment heat removal passively by transferring heat from the containment vessel to the reactor pool. The pool's immersion level ensures the active fuel region is always below pool water. Therefore, Hadron Energy states that no active components are required for this function.

GDC 41

This GDC intends to limit the release of fission products and control hydrogen/oxygen concentrations in the containment atmosphere following accidents. Hadron Energy MMR's sealed containment inherently limits contamination. **[[**

]] Hydrogen monitoring is provided for operational awareness; no active cleanup systems are required. Therefore, Hadron Energy states that no active components are required for containment cleanup.

GDC 44

This GDC ensures that the ultimate heat sink has sufficient capacity to remove heat from safety-related systems under all conditions. **[[**

]] Therefore, Hadron Energy states that no active components are required to resupply the water to the dedicated pool. The PSAR should demonstrate whether the pool has sufficient water volume to function as the ultimate heat sink.

In conclusion, the staff finds the proposed removal of electric power provisions from proposed PDC 34, 35, 38, 41, and 44 for the Hadron design to be reasonable, provided all passive safety claims are substantiated and all regulatory requirements for redundancy, reliability, and qualification are met. Additional detail and confirmatory analysis may be requested during the design review to confirm that the safety objectives of the proposed PDCs are met without electric power.

<u>GDC 40 - Containment Heat Removal System Testing</u>

The applicant has identified that the containment heat removal function is accomplished by passive means, there are no active component credited with containment heat removal function that requires testing. The applicant indicates that the safety objective of GDC 40 is fulfilled by compliance with the requirements of GDC 39. At the time of application review, the staff will evaluate the thermal analysis that demonstrate adequate heat removal capability from containment, and the details of the pre-operational test program and the in-service inspection program features that verify containment heat removal capability in accordance with safety analysis.

The NRC staff recognizes that the Hadron MMR containment heat removal function is a passive cooling characteristic of the integral steel containment vessel rather than based on active components, e.g., sprays, pumps, valves, fans, or heat exchangers requiring powered operation. **[[**

]] the staff would suggest the applicant to implement a testing, inspection, and analysis program like NuScale adopted to meet the underlying safety objective of GDC 40 (assurance of operability/performance). The staff expects to evaluate the Hadron MMR application for heat removal capability, pre-operational test program, and in-service inspection program.

GDC 52 - Containment Leakage Rate Testing

The white paper indicates that performing integrated leak rate testing (ILRT/Type A) for an ASME Class 1 factory-fabricated steel vessel is not needed to demonstrate that the reactor containment and other equipment will perform its pressure-retention function during design-basis accidents. The white paper further indicates that containment leakage integrity can be periodically verified to confirm that the containment will perform its pressure-retention function during design-basis accidents by other means. The white paper indicates that the NRC staff have previously approved a similar departure from GDC 52 for the NuScale design, which is similar to the Hadrons Energy MMR.

The staff acknowledge that the Nuscale design presented adequate justification to not be required to perform integrated leak rate testing (ILRT/Type A) for an ASME Class 1 factory-fabricated steel vessel. It is reasonable for the Hadron Energy MMR to request a similar departure from GDC 52, provided that the design includes means to periodically confirm containment leakage integrity. The Staff looks forward to pre-application engagement and application review to evaluate the credited pressure vessel design, and the applicant's commitments for inspections of containment pressure retaining credited SSCs, pre-service pressure/leakage tests, and the adequacy of the Inservice inspection programs and the local leak rate testing program (in accordance with 10 CFR 50, Appendix J, Type B and Type C tests).

GDC 55, 56 and 57 - Containment Isolation

GDC 55 "Reactor coolant pressure boundary penetrating containment" and 56 "Primary containment isolation" requires that piping systems that penetrate primary reactor containment be provided with redundant isolation barriers. This is typically achieved by crediting one isolation valve inside containment and one outside containment. **[[**

.**]]** The piping segment of the vessel-to-isolation valve connection will be designed as a "no-break zone" in accordance with ASME Section III, Division 1, Class 1 standards. The area is provided with leakage detection capability and defense-in-depth systems to mitigate consequences of system leakage. The white paper states that this approach is consistent with the precedent set by the NRC approved NuScale SDA.

The staff reviewed the information provided about the Hadron Energy MMR and found that is reasonable for the proposed Hadron Energy MMR design to use the precedent set by the NuScale design. The staff looks forward to pre-application engagement and application review to evaluate the design piping design for the "no-break zone", the credited leakage detection capability and the design of the defense-in-depth systems capable to mitigate consequences of system leakage.

The white paper also indicates that the applicant will request a departure from GDC 57, "Closed system isolation valves," to utilize a closed system outside containment, designed to intact-loop criteria, in conjunction with at least one automatic isolation valve located outside the containment vessel, to satisfy the underlying safety objective of GDC 57. The white paper indicates that the proposed departure from GDC 57 is consistent with the precedent set by the NuScale SDA.

The staff has identified that the underlying safety objective of GDC 57 is to provide containment isolation capability that supports the safety function of containment to provide a barrier to the release of radioactivity associated with each line that is neither part of the RCPB nor connected directly to the containment atmosphere and penetrates primary reactor containment. This is generally accomplished by providing redundant means of isolation (two isolation barriers in series), physically separated by the primary containment boundary. The staff evaluated the Hadron Energy MMR design description provided in the white paper and determined that it is reasonable to use the precedent set by the NuScale SDA with the proposed Hadron Energy MMR design.

The staff looks forward to pre-application engagement and application review to evaluate the design features credited to provide containment isolation capability that supports the safety function of containment isolation without the need for CIVs inside containment.

Feedback on Regulatory Exemptions

<u>10 CFR 50.46a and 50.34(f)(2)(vi) - Reactor Coolant System High Point Vents</u>

In 10 CFR 50.46a, “Acceptance Criteria for Reactor Coolant System Venting Systems,” and 10 CFR 50.34(f)(2)(vi), the NRC requires high-point vents to ensure adequate core cooling. **[[**

]] These features are similar to the NuScale SDA design, which included a similar exemption request, and received NRC approval. The staff reviewed the information provided about the Hadron Energy MMR and found that is reasonable for the proposed Hadron Energy MMR design to use the precedent set by the NuScale design. The applicant should provide, either in pre-application engagement or in the application submittal, an evaluation of the system design configuration and the features credited to eliminate the potential for non-condensable gas accumulation in the RCS that could prevent or inhibit the natural circulation coolant flow that the design credits to provide adequate reactor cooling.

<u>10 CFR 50.34(f)(2)(xvii)(C) - Combustible Gas Monitoring</u>

The white paper indicates that the applicant intends to request an exemption from the requirements of 10 CFR 50.34(f)(2)(xvii)(C), which requires hydrogen and oxygen monitoring in containment post-accident. The NuScale SDA set a precedent when it received an approved exemption from 10 CFR 50.34(f)(2)(xvii)(C) on the basis that the NuScale containment design does not require this monitoring capability. **[[**

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The staff reviewed the information provided about the Hadron Energy MMR and found that it is reasonable for the proposed Hadron Energy MMR design to use the precedent set by the NuScale design. The applicant should provide either in pre-application engagement or in the application submittal an evaluation of the adequacy of these passive provisions for post-accident hydrogen management for the refueling cycle.

10 CFR 50.62(c)(1) - ATWS Diverse Turbine Trip

This regulatory provision requires pressurized water reactors (PWRs) to have equipment that is diverse from the reactor trip system to automatically initiate a turbine trip during conditions indicative of an anticipated transient without scram (ATWS). This regulation aims to ensure that, in the event of a failure to shut down the reactor by normal means, a separate and diverse system can trigger a turbine trip to mitigate potential safety consequences.

The Hadron reactor design plans to employ inherent passive safety features which provide adequate protection against ATWS events. During an ATWS, Hadron Energy MMR has a small reactor core and low power level with strong negative moderator temperature and Doppler coefficients. **[[** **]]** These features collectively could limit the consequences of an ATWS event and ensure core cooling regardless of turbine trip status. Based on this information, the NuScale precedent appears to be reasonable for use with the proposed Hadron Energy MMR design, and the staff will evaluate whether the diverse turbine trip is needed once relevant information is available. Therefore, the request to be exempted from this regulatory requirement can be considered as similar approval was given to NuScale exemption request and it constitutes special circumstances under 10 CFR 50.12(a)(2)(ii).

10 CFR 50.60 and 50.61 - Fracture Toughness and Pressurized Thermal Shock

The white paper indicates that the applicant intends to request an exemption from the requirements of 10 CFR 50.60, which requires that reactor vessel materials meet fracture toughness and material surveillance requirements of 10 CFR Part 50, Appendices G and H. The applicant also intends to request exemption from the requirements of 10 CFR 50.61, which requires evaluation of reactor vessel materials against pressurized thermal shock (PTS) screening criteria, including reference temperature projections.

The applicant references the exemption to these regulations obtained by NuScale for a similar design. The applicant states that the Hadron Energy design is smaller and intends to operate at a lower thermal output, which would lead to lower neutron fluence compared to even the NuScale design. The applicant also noted that the Hadron vessel is expected to have lower fluence than previous large PWR designs. Because of this, the applicant does not believe the PTS screening criteria will be limiting for the design.

The applicant should provide, either in pre-application engagement or in the application submittal, an evaluation of the reactor vessel materials, design, and fluence of the Hadron Energy MMR.

10 CFR 50.34(f)(2)(xx) and 50.34(f)(2)(xiii) - Pressurizer Power Requirements

The white paper indicates that the applicant intends to request exemptions from 10 CFR 50.34(f)(2)(xx) and 10 CFR 50.34(f)(2)(xiii), which require power supplies for pressurizer relief valves, block valves, level indicators, and pressurizer heaters. As described in NUREG-0578, the purpose of these requirements was to ensure the ability to establish and maintain natural circulation core cooling following a loss of offsite power. The white paper cites exemptions approved for NuScale Power’s design, which did not rely on pressurizer heaters or pressurizer level indication to maintain reactor pressure and remove decay heat following loss of offsite power. **[[**

]] Staff would consider these safety-related means of establishing and maintaining sufficient decay heat removal following loss of offsite power in a future design review.

<u>10 CFR 50.34(f)(2)(iv)(E) - Containment Isolation on High Radiation</u>

The white paper indicates that the applicant intends to request an exemption from 10 CFR 50.34(f)(2)(iv)(E), which requires automatic containment isolation on a high radiation signal. The paper also indicates that the containment isolation function for the Hadron design is accomplished by automatic isolation signals from the reactor protection system based on process parameters (pressure, temperature, level), which provide more direct and rapid actuation than a high radiation signal. NuScale Power received an approved exemption from 10 CFR 50.34(f)(2)(iv)(E) because the NuScale design provides alternative containment isolation methods.

The staff reviewed the information provided about the Hadron Energy MMR and found that it is reasonable for the proposed Hadron Energy MMR design to use the precedent set by the NuScale design. The applicant should provide either, in pre-application engagement or in the application submittal, an evaluation of the adequacy of crediting these alternate process parameters for providing automatic containment isolation signal instead of the high radiation signal as indicated in 10 CFR 50.34(f)(2)(iv)(E).

<u>10 CFR Part 50, Appendix K and 10 CFR 50.46(a)(1)(i) - ECCS Evaluation Model and LOCA Spectrum</u>

10 CFR 50.46(a)(1)(i) is a regulation governing the acceptance criteria for emergency core cooling systems (ECCS) in light-water nuclear reactors. Specifically, this section requires that the ECCS must be capable of limiting the peak cladding temperature of the fuel during a loss-of-coolant accident (LOCA) so that it does not exceed 2200°F. 10 CFR Part 50, Appendix K establishes the required assumptions, analytical methods, and criteria for evaluating the performance of emergency core cooling systems (ECCS) during a postulated loss-of-coolant accident (LOCA) in light-water nuclear power reactors. The appendix is intended to ensure that ECCS designs are conservatively analyzed and can reliably protect the reactor core under accident conditions.

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]] Therefore, some Appendix K LOCA model requirements for reflood and post CHF heat transfer models are not needed. These requests can be considered as long as the core is not uncovered based on a conservative ECCS model. Any Appendix K LOCA model requirements described in the white paper based on the NuScale precedent should remain applicable, and additional justification needs to be provided for any additional exemptions.

<u>10 CFR 50.34(f)(2)(viii) - Post-Accident Sampling</u>

The white paper indicates that the applicant intends to request an exemption from 10 CFR 50.34(f)(2)(viii), which requires capabilities for post-accident sampling of the reactor coolant and containment atmosphere, including the ability to obtain and analyze samples without exceeding prescribed radiation dose limits to sampling personnel. The white paper indicates that the Hadron containment is not designed for personnel entry, post-accident reactor coolant and containment atmosphere conditions can be assessed through installed instrumentation (temperature, pressure, level, radiation monitors) without requiring physical sample extraction during the emergency phase. The applicant credits alternate capabilities for performing post-accident assessment for the Hadron design, that will enhance the justification following NuScale's precedence.

The staff reviewed the information provided about the Hadron Energy MMR and found that is reasonable for the proposed Hadron Energy MMR design to use the precedent set by the NuScale design. The applicant should provide either on pre-application engagement or on the application submittal an evaluation of the adequacy of crediting these alternate assessment methods for evaluating the environment inside containment post-accident without requiring physical sample extraction during the emergency phase.

Additional Technical Considerations:

<u>Chapter 6 Containment Safety Analyses</u>

The white paper duly refers to Chapter 15 safety analyses that involve important figures of merit for the core uncovery. However, the paper does not refer to Chapter 6 safety analyses that would involve several important safety margins for the containment thermal-hydraulic response under design basis accidents or non-LOCA events, as required by GDC 16, GDC 50, and GDC 38. The Chapter 6 containment transients and safety analyses are required to demonstrate that the containment vessel (CV) is designed to withstand the maximum pressure and temperature conditions resulting from any postulated loss-of-coolant accident, which is a different scope from the Chapter 15 safety analyses. During the public meeting, the applicant recognized the distinct scope of the Chapter 6 containment safety analyses being different from the Chapter 15 transient and accident analyses, and made a commitment to perform them as a part of the application. The applicant also explained that the main reason Chapter 6 analyses were not cited in the white paper was that their proposed exemptions do not affect the Chapter 6 analyses.

<u>Non-Condensable Gas Effects on Passive Safety Systems</u>

The paper does recognize that the accumulation of non-condensable gases at condensation surfaces (such as the inner CV wall) can reduce condensation heat transfer efficiency, and it states that the Chapter 15 analyses will include a rigorous evaluation of non-condensable gas degradation effects using validated thermal-hydraulic system codes. However, the Chapter 15 commitment is only made within the context of passive ECCS performance for core uncovery, and no such commitment is made in the paper to account for the non-condensable gas effect for the Chapter 6 containment safety analyses, where it would also be safety significant. During the public meeting, the applicant extended the non-condensable gases' scope, and made a commitment to address the non-condensable gas evaluation, radiolytic gas generation, accumulation at condensation surfaces, and degradation of condensation heat transfer in the Chapter 6 containment safety analyses in addition to the planned Chapter 15 analyses.

During a December 17, 2025 pre-application meeting, NRC staff highlighted a conference paper addressing three key phenomena affecting the long-term performance of passive safety systems in small modular light water reactors (SMR LWRs): (1) radiolytic gas generation, (2) non-condensable gas (NCG) effects on condensation heat transfer, and (3) boric acid transport and precipitation. Hadron Energy acknowledged these issues and outlined its approach to each of them.

Radiolytic gas generation

Although Hadron Energy identified potential accumulation of radiolytic gas in the annulus between RPV and CV, **[[** **]]** it is not clear whether it can accumulate in the reactor vessel above the steam generator. This needs to be further evaluated during design review.

Boric acid transport and precipitation

In response to NRC staff comments, **[[** **]]** Further interactions are needed to understand the design and analysis of this device.

<u>Long-Term Containment Cooling and Cooldown Rate</u>

The paper recognizes the safety-related passive heat removal mechanism to transfer the decay heat from the RPV, through the containment annulus and the CV wall, to the surrounding reactor pool in which the CV is partially submerged. **[[** **]]** However, the paper does not describe whether condensation heat transfer on the inner walls of the containment would be credited to the containment safety analyses. The staff needed to understand the applicant's modeling approach toward condensation on the containment inner walls and expected the phenomenon to be a "High" on the Phenomenon Identification Ranking Table (PIRT) for the Hadron Modular Microreactor (MMR) design. **[[** **]]**

<u>Multi-Module Considerations</u>

The white paper does not contain sufficient information related to system design, operation, location or failure consequences for the staff to provide any specific feedback related to multi-module failure impact.

The staff noted that the white paper identifies that the Hadron MMR design will be consistent with the design criteria identified in GDC 5. The design will include multi-module protections to ensure a transient in one module will not negatively impact the passive safety functions of other modules. The white paper further indicates that the COLA application will evaluate multi-module accident scenarios in which the initiating event affects multiple modules (e.g., loss of offsite power, external hazards, common-cause failures in shared facility systems) and demonstrates that:

> *"(1) each module's passive safety systems function independently;*
> *(2) pool inventory remains adequate for decay heat removal from all affected modules;*
> *(3) no shared structure or service can propagate failure from one module to another; and*

(4) the combined decay heat load from simultaneous multimodule operation does not exceed the pool's passive cooling capacity."

The staff considered that these design criteria provide a reasonable approach to evaluate multi-module interactions in order to demonstrate safety-related SSCs are adequately protected. The staff looks forward to pre-application engagement with the applicant on specific features and analysis credited to provide multi-module protection.

<u>Pre-Application Engagement on Safety System Testing</u>

The staff looks forward to pre-application engagement with the applicant on any integral or separate-effect testing methodologies and system validation planned to support the design of the Hadron MMR reactor and containment systems. This aspect of the licensing process would be critical for a new reactor design and where appropriately scaled legacy test data may be lacking.

Date:
July 22, 2026