January 26, 2023 Docket No. 52-050

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Submittal of Presentation Materials Entitled "SDAA Presentation, Treatment of DC Power in Safety Analysis," PM-134581-P, (Closed Session)

This submittal supplements the January 19, 2023, meeting with NuScale regarding the treatment of the EDAS in safety analyses.

Enclosure 1 is the proprietary version of the presentation entitled Treatment of DC Power in Safety Analysis. NuScale requests that the proprietary version be withheld from public disclosure in accordance with the requirements of 10 CFR § 2.390. The enclosed affidavit (Enclosure 3) supports this request.

Enclosure 2 contains a detailed description of multiple precedents further supporting NuScale's position regarding the classification of its DC power system.

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions, please contact Brian Meadors at 541-452-7846 or bmeadors@nuscalepower.com.

Sincerely,

Mark W. Shaver
Acting Director, Regulatory Affairs
NuScale Power, LLC

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Enclosure 1: SDAA Presentation, Treatment of DC Power in Safety Analysis, PM-134581-P, (Closed Session)
Enclosure 2: Detailed Description of Multiple Precedents Further Supporting Nuscale's Position on EDAS Classification
Enclosure 3: Affidavit of Mark W. Shaver AF-134588

Enclosure 1:

SDAA Presentation, Treatment of DC Power in Safety Analysis, PM-134581-P, (Closed Session)

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Enclosure 2:

Detailed Description of Multiple Precedents Further Supporting Nuscale's Position on EDAS Classification

NuScale Treatment of DC Power: Precedent Examples

Recent NRC-approved industry precedent exists to support NuScale's positions that:

- Loss of power is assumed only at event initiation or based on a deterministic causal failure
- Random failures of power supplies during event progression can be excluded based on reliability and probability considerations
- GDC 17 is satisfied by performing safety analyses with power and without power
- Nonsafety-related power supplies and components can be assumed to function during safety analyses, based on their reliability, without requiring reclassification under the 10 CFR 50.2 definition of "safety-related"

The following relevant examples of precedent are provided for NRC review and consideration.

1. Design Certification Application: US-APWR
   - **ML13262A481:** Design Control Document (DCD) Section 15.0.0.7 discusses assumptions for the loss of offsite AC power. Analyses are described as considering both with and without offsite power available for cases where the event may be accompanied by a reactor/turbine generator trip. The DCD describes that a minimum delay of 3 seconds is assumed between reactor trip/turbine generator trip and a postulated loss of offsite power (LOOP). This 3-second delay allows credit for continued forced flow from reactor coolant pumps (RCPs) while control rods are dropping from the reactor trip. The time delay assures that the loss of flow transient caused by power loss to the RCPs does not occur until after minimum departure from nucleate boiling rate (DNBR) had already occurred. As a result, the LOOP cases are not limiting for DNBR. The justification for the 3-second delay is provided in DCD Section 8.2.3.
   - **ML13262A473:** DCD Section 8.2.3 describes how the RCPs are powered following a reactor/turbine trip. Various timer delays associated with the generator are described but not credited. The design is described as ensuring the RCPs remain powered as long as offsite power is available. The stability of the offsite power system is credited as the reason that the RCPs will remain powered for at least 3 seconds. Confirmation of the grid stability is included as an interface requirement for a COL applicant. DCD Section 8.2.1.2 identifies that the offsite power system is a nonsafety-related system. DCD Section 8.2.3 identifies that the RCP motors are connected to the nonsafety-related buses. The RCP motors are also not identified as safety-related in DCD Table 3.2-2 (ML13262A464).
   - **ML12167A444:** The safety evaluation report (SER) with open items for Chapter 15 describes the review of the DCD Section 15.0.0.7 LOOP assumptions. The SER describes verification of minimum DNBR for cases with no LOOP compared to cases with LOOP delayed by 3 seconds after reactor/turbine generator trip. Cases assuming a LOOP either just before reactor/turbine generator trip such that the 3-second delay did not apply or in the first 3 seconds after reactor/turbine generator trip are not described nor required to be performed as an open item. The SER describes an RAI requesting additional justification of the 3-second delay. The SER describes the response as revising DCD Chapter 15 to point to Section 8.2.3 for the details of the electrical systems, which was tracked as a confirmatory item.
   - **ML19155A293:** The advanced SER (with no open items) for DCD Chapter 8 describes the interface with DCD Chapter 15 regarding the 3-second delay for RCPs. The SER

indicates that RAIs on the subject were closed by the inclusion of the interface requirement for a COL applicant to confirm the grid stability.

- **Summary of precedent:** The Chapter 15 analyses credit a nonsafety-related power supply (the offsite power system) to power the RCP motors on nonsafety-related buses to continue to provide forced coolant flow following reactor/turbine trip. This assumption ensures decreasing flow conditions are not present when evaluating other initiating events for DNBR. The justification is based on the reliability of the power supply. Although the design certification was not completed, the NRC did issue SERs that accepted the approach. This precedent shows that nonsafety-related power supplies and components can be credited in safety analyses, when justified to be reliable, to ensure that specified acceptable fuel design limits (SAFDLs) are met for anticipated operational occurrences (AOOs). This precedent further shows that loss of power is only assumed at discrete times (either at event initiation or following reactor/turbine generator trip) and mid-event random power failures (i.e., "smart failures") are not assumed.

2. Certified Design: AP1000
   - **ML11171A367:** DCD Section 15.0.14 discusses assumptions for the loss of offsite AC power. The loss of offsite power is described as a potential consequence of the event. Random loss of power is not assumed as shown by the statement that "*[e]vent analyses that do not result in a possible consequential disruption of offsite ac power do not assume offsite power is lost.*" The DCD describes that a minimum delay of 3 seconds is assumed between turbine trip and a postulated LOOP. During this 3-second delay, credit is taken in the safety analyses for continued operation of RCPs, feedwater pumps, and the condenser. The justification for the 3-second delay is provided in DCD Section 8.2.
   - **ML11171A478:** DCD Section 8.2.2 describes how the RCPs can receive power from the main generator or the grid for a minimum of 3 seconds following a turbine trip. Neither of these power sources is safety-related. The design of the generator and the stability of the offsite power system are credited as the reasons that the RCPs will remain powered for at least 3 seconds. Confirmation of the grid stability is included as an interface requirement for a COL applicant as described in DCD Section 8.2.5. The RCP motors are identified as nonsafety-related in DCD Table 3.2-3 (ML11171A425).
   - **NUREG-1793 Chapter 8:** The final SER for Chapter 8 accepts the 3-second time delay for continued operation and the associated COL applicant confirmation of grid stability. The SER identifies that cases where the initiating event involved an electrical system failure could not rely upon the 3-second delay because the electrical system was known to be failed. The SER notes that a failure modes and effects analysis (FMEA) could be used to address whether the electrical system failures would cause a loss of RCP function. The isophase bus failure is identified as an example, but it is identified that the isophase bus has to be operational at the start of the event for the turbine to be in operation. The SER documents that a failure of a passive component, such as the isophase bus, that is known to be initially operational within a 3-second window is "*a very low probability event.*"
   - **NUREG-1793 Chapter 15:** The final SER for DCD Chapter 15 describes the continued operation of RCPs for 3 seconds following turbine trip as acceptable based on the generator design features and the COL grid stability analysis. The SER states that Chapter 15 analyses are evaluated with and without LOOP. Based on review of DCD Chapter 15, the cases with LOOP refer to the delay as a reason for DNBR not being limiting compared to the base case without LOOP. The SER also describes situations where nonsafety-related systems are assumed to be operational, including "*when a*

detectable and nonconsequential random, independent failure must occur in order to disable the system." For example, the nonsafety-related main feedwater control system is assumed to operate during analysis of events not related to feedwater system malfunction, loss of AC power, or turbine trip. The SER states that "*[t]he staff concludes that the assumption of MFCS continued operation is acceptable because a failure in the MFCS is not a consequence of the initiating event, and the probability of a random, independent failure occurring in the MFCS within the timeframe of the initiating event is extremely low.*"

- **Summary of precedent:** The Chapter 15 analyses credit a nonsafety-related power supply (either from the generator or the offsite power system) to power the nonsafety-related RCP motors to continue to provide forced coolant flow following turbine trip. This assumption ensures decreasing flow conditions are not present when evaluating other initiating events for DNBR. The justification is based on the design features of the generator and the reliability of the offsite power supply. This precedent shows that nonsafety-related power supplies and components can be credited in safety analyses, when justified to be reliable, to ensure that SAFDLs are met for AOOs. This precedent further shows that loss of power is only assumed when shown to be a consequence of the event progression (i.e., following turbine trip) and mid-event random power failures (i.e., "smart failures") are not assumed. Finally, this precedent shows explicit NRC approval of the position that continued operation of nonsafety-related systems is acceptable if their failure is not a consequence of the event and the probability of a random independent failure during the timeframe of the initiating event is extremely low.

3. Design Certification Application: US-APWR
   - **ML13262A481:** DCD Section 15.3.3 evaluates the RCP rotor seizure. The event assumes instantaneous RCP rotor seizure of one RCP rotor with a rapid reduction in flow, including reverse flow in that loop. Assumption of a LOOP results in the other three RCPs coasting down and exacerbating the decrease in RCS flow. However, the LOOP is assumed to only occur at the time of turbine trip. (A 3-second delay in RCP coastdown following turbine trip is also assumed, but that treatment is addressed separately in this precedent review as example #1.) A LOOP is not assumed either at event initiation or during the event just prior to reactor trip, as demonstrated by DCD Figure 15.3.3-1 which shows no decrease in flow from the other RCPs. The evaluation shows that fuel failure does occur and dose consequences are calculated. No justification is provided for why a LOOP is not assumed at any point prior to turbine trip. DCD Table 1.9.2-15 (ML13262A462) identifies that the Section 15.3.3 evaluation conforms to SRP 15.3.3-15.3.4 with no exceptions. Since the analysis is not performed with alternate LOOP assumptions, it is not known whether the results still meet 10 CFR 100 limits if alternate assumptions are applied.
   - **ML12167A444:** The SER with open items for Chapter 15 describes the review of the DCD Section 15.3.3 LOOP assumptions. The SER describes how GDC 17 is interpreted by Items 7 and 9 in SRP 15.3.3-15.3.4, which include consideration of a LOOP at time of turbine trip. There is no discussion of a LOOP at event initiation or during the event progression prior to turbine trip. The SER states that the evaluation was acceptable and conforms with the SRP regarding LOOP assumptions.
   - **ML070550012:** The SRP 15.3.3-15.3.4 Item 7 states that "*Only safety-grade equipment should be used to mitigate the consequences of the event. Safety functions should be accomplished assuming the worst single failure of a safety system active component. For new applications, loss of offsite power should not be considered a single failure;*

reactor coolant pump rotor seizures and shaft breaks should be analyzed with a loss of off-site power (see item 9, below) in combination with a single active failure. (This position is based upon interpretation of GDC 17, as documented in the Final Safety Evaluation Report for the ABB-CE System 80+ design certification.)" Item 9 states that "*This event should be analyzed assuming turbine trip and coincident loss of offsite power and coastdown of undamaged pumps.*" No discussion of the assumption of a LOOP at other times that generates a more limiting reduction in RCS flow (and therefore increased consequences) is provided.

- **ML13267A423:** NUREG-0138 Item 5 addresses the flow coastdown of undamaged pumps during an RCP rotor seizure or shaft break. The potential for more limiting LOOP assumptions is considered, such as a LOOP coincident with event initiation. The coincident LOOP is identified as resulting in larger calculated radiological consequences, although still within 10 CFR 100 limits. The review of the issue concludes that it is likely that offsite power remains available and the occurrence of the initiating event with a coincident LOOP *"is not considered to be a design basis accident*" and is "*too improbable to require consideration.*" The review also assesses a possibility of a LOOP due to turbine trip and states that the impact is minimal as the RCP coastdown likely does not occur until after minimum DNBR because of delays.
- **Summary of precedent:** The Chapter 15 analyses credit a nonsafety-related power supply (the offsite power system) to power the RCP motors on nonsafety-related buses to continue to provide forced coolant flow after event initiation and until reactor/turbine trip. The SRP identifies the need to assess LOOP to satisfy GDC 17, but does not require assuming LOOP at event initiation or during the event progression before reactor/turbine trip. NUREG-0138 identifies that the consequences of the event are more limiting with alternate LOOP assumptions but determines that alternate LOOP assumptions are not required due to the low probability of such sequences.

4. Operating Plants: Vogtle 1&2
   - **FSAR:** Section 15.3.3 identifies that the RCP shaft seizure event only considers a LOOP after reactor trip and not at event initiation or during the event progression. In addition, the analysis assumes that power to the RCPs is not lost until 2 seconds after trip due to grid stability. The RCPs not affected by the shaft seizure are assumed to continue to provide forced flow during the event despite the fact that the nonsafety-related motors (Table 3.2.2-1) are powered by the nonsafety-related offsite power grid.
   - **Summary of precedent:** The precedent demonstrated in examples #1 through #3 above for new plants is also found in currently operating plants.

5. Operating Plant: Fermi 2
   - **ML17237A176:** A license amendment request was submitted to the NRC by the licensee to revise the Technical Specifications and modify the Chapter 15 safety analysis method for the control rod drop accident. The Chapter 15 safety analysis was revised to take credit for an automatic trip of multiple nonsafety-related components to ensure calculated radiological consequences complied with the regulatory limits of 10 CFR 50.67 (equivalent to those limits in 10 CFR 50.34(a)(1) specified in the safety-related definition in 10 CFR 50.2). The automatic trips were added to the plant Technical Specifications, including Surveillance Requirements to periodically perform logic system functional tests. Although safety-related detection signals were used for the trips, the license amendment request stated that "*the trip function logic is neither safety-related nor single failure proof.*" This design, which included nonsafety related components

performing a function credited in the Chapter 15 safety analysis, was described as based upon and consistent with other industry precedent.

- **ML18250A163:** The NRC approved the request as License Amendment 212. The NRC did not require all components of the credited trip to be made safety-related. No exemption from the safety-related definition in 10 CFR 50.2 was described.
- **Summary of precedent:** Chapter 15 safety analyses credit the performance of certain nonsafety-related components to meet regulatory dose limits. This precedent shows that a strict deterministic interpretation of the 10 CFR 50.2 safety-related definition is not always applied.

6. NUREG-0138 Issue 4
   - **ML13267A423:** NUREG-0138 identifies an issue where alternate LOOP sequences are postulated that result in more severe consequences. The alternate sequences involve a LOOP occurring after operators have taken action to manually reset the safety injection system following a LOCA. The LOOP after reset results in certain important electrical loads not being automatically loaded and requires further operator actions to mitigate this sequence. If the LOOP occurs shortly after the LOCA (before reset) or a long time after the LOCA, the original safety analysis is bounding. The review of the issue concludes that "*this specific failure sequence has sufficiently low probability as to preclude its being considered as a design basis event.*" The probability of this sequence is estimated to be approximately 2E-8 per year, based on the combination of a LOCA probability of one chance in 1000 per year and a LOOP within a one-hour period following a LOCA probability of one chance in 50,000 per year. The review also recommends that procedures be updated so that operator actions can respond to such an event sequence, despite its low probability.
   - **Summary of Precedent:** The NUREG identifies that there are certain event sequences that can be postulated to be worse than the event sequences assumed in the safety analyses. The NUREG recognizes that these alternate sequences do not need to be considered part of the design basis due to their low probability and establishes an example threshold on the order of 2E-8.

Enclosure 3:

Affidavit of Mark W. Shaver AF-134588

NuScale Power, LLC

AFFIDAVIT of Mark W. Shaver

I, Mark W. Shaver, state as follows:

(1) I am the Acting Director of Regulatory Affairs of NuScale Power, LLC (NuScale), and as such, I have been specifically delegated the function of reviewing the information described in this Affidavit that NuScale seeks to have withheld from public disclosure, and am authorized to apply for its withholding on behalf of NuScale

(2) I am knowledgeable of the criteria and procedures used by NuScale in designating information as a trade secret, privileged, or as confidential commercial or financial information. This request to withhold information from public disclosure is driven by one or more of the following:

(a) The information requested to be withheld reveals distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by NuScale competitors, without a license from NuScale, would constitute a competitive economic disadvantage to NuScale.

(b) The information requested to be withheld consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), and the application of the data secures a competitive economic advantage, as described more fully in paragraph 3 of this Affidavit.

(c) Use by a competitor of the information requested to be withheld would reduce the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

(d) The information requested to be withheld reveals cost or price information, production capabilities, budget levels, or commercial strategies of NuScale.

(e) The information requested to be withheld consists of patentable ideas.

(3) Public disclosure of the information sought to be withheld is likely to cause substantial harm to NuScale's competitive position and foreclose or reduce the availability of profit-making opportunities. The accompanying presentation reveals distinguishing aspects about the process by which NuScale develops its Treatment of DC Power in Safety Analysis.

NuScale has performed significant research and evaluation to develop a basis for this process and has invested significant resources, including the expenditure of a considerable sum of money.

The precise financial value of the information is difficult to quantify, but it is a key element of the design basis for a NuScale plant and, therefore, has substantial value to NuScale.

If the information were disclosed to the public, NuScale's competitors would have access to the information without purchasing the right to use it or having been required to undertake a similar expenditure of resources. Such disclosure would constitute a misappropriation of NuScale's intellectual property, and would deprive NuScale of the opportunity to exercise its competitive advantage to seek an adequate return on its investment.

(4) The information sought to be withheld is in the enclosed presentation entitled NuScale Power, LLC Submittal of Presentation Materials Entitled "SDAA Presentation, Treatment of DC Power in Safety Analysis," PM-134581-P. The enclosure contains the designation "Proprietary" at the top of each page containing proprietary information.

(5) The basis for proposing that the information be withheld is that NuScale treats the information as a trade secret, privileged, or as confidential commercial or financial information. NuScale relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC §

552(b)(4), as well as exemptions applicable to the NRC under 10 CFR §§ 2.390(a)(4) and 9.17(a)(4).

(6) Pursuant to the provisions set forth in 10 CFR § 2.390(b)(4), the following is provided for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld:

(a) The information sought to be withheld is owned and has been held in confidence by NuScale.

(b) The information is of a sort customarily held in confidence by NuScale and, to the best of my knowledge and belief, consistently has been held in confidence by NuScale. The procedure for approval of external release of such information typically requires review by the staff manager, project manager, chief technology officer or other equivalent authority, or the manager of the cognizant marketing function (or his delegate), for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside NuScale are limited to regulatory bodies, customers and potential customers and their agents, suppliers, licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or contractual agreements to maintain confidentiality.

(c) The information is being transmitted to and received by the NRC in confidence.

(d) No public disclosure of the information has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or contractual agreements that provide for maintenance of the information in confidence.

(e) Public disclosure of the information is likely to cause substantial harm to the competitive position of NuScale, taking into account the value of the information to NuScale, the amount of effort and money expended by NuScale in developing the information, and the difficulty others would have in acquiring or duplicating the information. The information sought to be withheld is part of NuScale's technology that provides NuScale with a competitive advantage over other firms in the industry. NuScale has invested significant human and financial capital in developing this technology and NuScale believes it would be difficult for others to duplicate the technology without access to the information sought to be withheld.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 1/26/2023.

Mark W. Shaver

Mark W. Shaver