From: Edward Helvenston
Sent: Monday, July 3, 2023 4:22 PM
To: Rusty Towell; Lester Towell; Jordan Robison; Tim Head; Alexander Adams; Benjamin Beasley
Cc: Richard Rivera; Zackary Stone (He/Him/His); Michael Wentzel; Greg Oberson (He/Him); Boyce Travis
Subject: ACU MSRR Chapter 10 Audit Questions

Dear Dr. Towell,

Below are questions the NRC staff has prepared for Abilene Christian University (ACU) related to the ACU Preliminary Safety Analysis Report, primarily Chapter 10, "Experimental Facilities and Utilization." The NRC staff would like to discuss these questions within the scope of the ACU construction permit (CP) application review Audit Plan for Chapters 1, 5, 8, 9 (Except 9.2 and 9.6), 10, 11, 12, 14-18, and General Topics (see audit plan dated 3/2/2023, ML23065A052), and I am providing in advance to facilitate discussion during an audit meeting. We will add this email, with the questions, to public ADAMS. If you have any questions, please let Richard, Zackary, or I know.

Thank you,

Ed Helvenston, U.S. NRC
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Item #	Question
10.2-1	PSAR Section 10.2.1 references PDC 55 with respect to the salt sampling and measurement experimental systems. PDC 55, "Radionuclide interfacing lines penetrating containment," as provided in PSAR Section 3.1, states: Each line where a single failure could lead to a bypass of functional containment, such as those that interface directly with fuel or fission products and interface with systems outside the functional containment, shall be provided two adequately reliable containment isolation mechanisms, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, or small fuel sampling lines are acceptable on some other defined basis. These mechanisms shall be located to minimize the probability of failure due to environmental or external hazards. [The staff notes that ACU has discussed possible revisions to PDC 55 in response to other audit questions.] PSAR Section 10.2.1.1 states, with respect to the fuel salt sample extraction system, that "[r]emotely controlled isolation values are used to maintain appropriate functional containment." PSAR Section 4.3.11 states that the fuel salt sample extraction system, which penetrates fission product barriers, will utilize a system of interlocks to ensure the intent of PDCs is met. PSAR Section 6.2.2.7 states that the MSRR "enclosure relies upon isolation of penetrations to meet the functional containment design leak rate so that consequences are enveloped by the MHA. Isolation and monitoring of radionuclide bearing penetrations will be implemented by suitably redundant values, physical breaks, or component barriers in other portions of the facility." However, it is not clear to the staff which portions of the salt sampling and measurement experiment systems (i.e., only the fuel salt sample extraction system, or other systems) PDC 55 is meant to apply to. In addition, it is not fully clear to the staff how PDC 55 will be met for any of the applicable systems, including, for example, whether the fuel salt sample extraction system will be designed with "two adequately reliable containment isolation mechanisms" or other "containment isolation provisions" that "are acceptable on some other defined basis." Please discuss.
10.2-2	PSAR Section 10.2.2 states that "[t]he gas sampling system is in compliance with [PDC] 55." Please clarify whether PDC 55 applicability includes the entire gas sampling and measurement experimental system discussed in PSAR Section 10.2.2 or only those portions which involve gas sampling or removal from the MSRR off-gas system. In addition, please discuss how PDC 55 is met for any applicable portions of the gas sampling and measurement experimental system.
10.2-3	The revision of PSAR Table 3.4-1 provided for audit on June 2, 2023, in response to audit question Gen-7 states that in general, scientific surveillance systems are non-safety related, and experimental systems are safety-related. However, the boundaries between safety- and non-safety portions of experimental facilities discussed in PSAR Ch 10, as well as what portions of the experimental facilities are considered "experimental systems" versus "scientific surveillance systems" for the purposes of safety classification are not fully clear to the staff. The reasons for the classifications (e.g., are systems safety-related because they are

	fuel-salt-wetted, because of the functions they perform, or both?) are also not fully clear. Please discuss. (See also question 10.2-4.)
10.2-4	PSAR Section 10.2.5 states that the scientific surveillance facilities "are designed to gather information and data to support future licensing and development of molten salt reactors" and "form a layer of instrumentation, computer hardware and software, and supporting design features, called the scientific surveillance layer (SSL), which is capable of capturing the MSRR behavior during its operation." Do the scientific surveillance facilities consist of dedicated instrumentation which is separate from the instrumentation of other experimental facilities discussed in PSAR Sections 10.2.1 through 10.2.3, or are these facilities based on data feeds from those systems? If the scientific surveillance facilities include dedicated instrumentation, should such instrumentation be subject to PDC(s)? Please also discuss the extent to which portion(s) of the scientific surveillance facilities may be safety-related, if applicable.
10.2-5	PSAR Section 10.2.2.3 discusses potential reactivity changes induced by the gas sampling and measurement experimental facility but refers to "salt sampling and measurement." Please clarify and confirm why reactivity changes from the gas sampling and measurement experimental facility would be small, as appropriate.
10.2-6	PSAR Section 10.2.1 states that the reactor access vessel has a "port and system for coupon testing of reactor materials." PSAR Section 4.3.11 states that these coupons "will be periodically introduced and extracted from the fuel salt" and will include but not be limited to 316H stainless steel. PSAR Section 14.3.8 states that these "coupons testing the response to the fuel salt environment are the only experimental materials used with the reactor." Please clarify whether ACU intends the use of coupons to be limited to evaluating the performance of actual MSRR materials over time, or whether ACU also plans to use the MSRR coupon system to evaluate "novel" materials, i.e., materials not otherwise found in the MSRR.
10.2-7	It is not clear whether the information regarding salt sampling and measurement experimental systems ports in PSAR Section 10.2.1, Section 10.2.1.4, Table 10.2-2, and Figure 4.3-1 is fully consistent. For example, PSAR Section 10.2.1 describes a port "included for in-line measurement of salt parameters" and PSAR Section 10.2.1.4 and Table 10.2-2 mention a gamma measurement port that do not appear to be mentioned in the other referenced sections. Please clarify.
10.3-1	PSAR Section 10.3 states that: "Management review of experiments are [sic] conducted prior to review by the MSRR Review and Audit Committee and includes representation from the Radiation Safety Office. The committee reviews and approves all experimental facilities, procedures for experiments, and assess [sic] each experiment within the guidance of 10 CFR 50.59. Review includes the description and purpose of experiment [sic], experimental facilities, experimental procedures, and a safety assessment of the experiments (described in Chapter 12)." a) PSAR Section 12.3.1 states that new experiments and substantive changes to experiments are reviewed by the MSRR Review and Audit Committee, and approved by the Level 2 (i.e., the MSRR Facility Director). Please clarify the apparent discrepancies and what the approval versus review functions of the committee and the Level 2 are. b) Please clarify what is meant by "[m]anagement review of experiments … includes representation from the Radiation Safety Office." c) It is not clear to the staff what portion of PSAR Chapter 12 is being referred to in PSAR Section 10.3; please clarify. d) The staff notes that 10 CFR 50.59, "Changes, tests, and experiments," is a regulation that applies to nuclear reactors during operation. Should 10 CFR 50.59 be referred to as a requirement rather than guidance?

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