From: Edward Helvenston
Sent: Tuesday, May 2, 2023 6:30 PM
To: Rusty Towell; Lester Towell; Jordan Robison; Tim Head; Alexander Adams
Cc: Richard Rivera; Zackary Stone (He/Him/His); Michael Wentzel; Greg Oberson (He/Him); Boyce Travis; Kyle Song; Alexander Chereskin
Subject: ACU MSRR Chapter 13 and Section 9.2 Audit Question

Dear Dr. Towell,

Below is a question the NRC staff has prepared for Abilene Christian University (ACU) related to the ACU Preliminary Safety Analysis Report, primarily Chapter 13, "Accident Analyses." The NRC staff would like to discuss this question within the scope of the ACU construction permit (CP) application review Audit Plan for Chapter 13 and Section 9.2 (see audit plan dated 3/2/2023, ML23065A056), and I am providing in advance to facilitate discussion during an audit meeting. We will add this email, with the question, to public ADAMS. If you have any questions, please let Richard, Zackary, or I know.

Thank you,

Ed Helvenston, U.S. NRC
Non-Power Production and Utilization Facility Licensing Branch (UNPL)
Division of Advanced Reactors and Non-Power Production and Utilization Facilities (DANU)
Office of Nuclear Reactor Regulation (NRR)
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Item #	Question
13.1-13	(Follow-up to audit question 13.1-10) The staff reviewed the information ACU provided for audit on 4/13/2023 in response to audit question 13.1-10, and notes that the testing used to provide ASME Code mechanical properties (referenced in the information) is done in air and does not include any environmental effects on the material (e.g., corrosion in Flibe). ASME BPVC Section III, Division 5, Article HHA-1130, "Limits of These Rules," states that rules in Section III Division 5 "...do not cover deterioration that may occur in service as a result of radiation effects, corrosion...," but that "[t]hese effects shall be taken into account with a view to realize the design or the specified life of the components and supports." Article HBB-1110(g) states that Section III, Division 5 does not "provide methods to evaluate deterioration that may occur in service as a result of corrosion, mass transfer phenomena, radiation effects, or other material instabilities." PSAR Section 13.1.2 states that a postulated accident is loss of fuel salt from piping and components of the reactor system. Another postulated accident identified in PSAR Section 13.1.2 is a rupture of a primary heat exchanger tube. If one of these pipes or components fail the staff notes that it could introduce air into the fuel salt boundary as well as the RTMS and reactor enclosure. As stated in ACU PSAR Section 4.2.1.6, air could create a corrosive environment for the fuel salt in the RTMS and/or reactor enclosure. While corrosion could be a concern affecting long-term operation and maintenance of the MSRR, it is not clear to the staff whether potential rapid corrosion related to a postulated event could also affect the assumptions in the analyses of MSRR postulated events. Please discuss the following to allow the NRC staff to evaluate whether air ingress during a postulated accident could cause rapid corrosion of salt wetted components: a) Clarify whether the fuel salt will be relocated to the RTMS or the reactor enclosure during a postulated accident. b) Chapter 6 of the PSAR appears to describe an air environment in the reactor enclosure and RTMS. However, the information provided for audit on 4/13/23 in response to audit question 13.1-10 appears to describe a different environment. Clarify what the environment will be in both the RTMS and the reactor enclosure. c) What is the environment of the coolant salt and heat management enclosure? d) PSAR Section 9.6 appears to indicate that pressure equalization is the only safety-related function for the gas management system (GMS). Clarify whether the function to supply inert gas is safety-related and whether it can supply helium to the RTMS/reactor enclosure during an accident or if it gets isolated. e) Based on allowable leak rates for the reactor enclosure, the potential for air ingress prior to isolation (e.g., the staff notes that air may

		enter a broken pipe prior to all penetrations isolating), and potential air ingress through a broken heat exchanger tube during postulated accidents, discuss whether and how data will bound the effects of air leaks on corrosion rates of the RTMS and/or the reactor enclosure (depending on where the fuel salt spills). f) Confirm there is no potential pathway for bulk water ingress into the fuel salt boundary.

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