From: Zackary Stone
Sent: Monday, February 6, 2023 4:56 PM
To: Rusty Towell; Jordan Robison; Tim Head; Lester Towell
Cc: Richard Rivera; Edward Helvenston; Michael Wentzel; Michelle Hayes
Subject: Abilene Christian University - Audit Questions Regarding the ACU CP Technical Topics Audit

Dear Dr. Towell,

Please see below for a list of questions the NRC staff has prepared for Abilene Christian University (ACU) related to the technical topics provided to ACU in the acceptance letter (ML22313A097) issued for ACU's molten salt research reactor construction permit application. The NRC staff would like to discuss these questions within the scope of the Audit (see audit plan dated 1/13/2023, ML23013A089), and I am providing these in advance to facilitate discussion during an audit meeting. Once ACU is ready to discuss, please let us know and we can set up a meeting. We will add this e-mail, with questions, to public ADAMS. If you have any questions, please let Edward, Richard, or I know.

Topic	Question Number	Question
Research and development programs necessary to confirm the adequacy of the MSRR design	Gen-1	It is not clear to the NRC staff on how some of the material ACU is using is qualified to the specifications needed for the MSRR, for example, per the ASME code. Are R&D programs necessary, for example, with respect to qualifications of these materials, or with respect to other additional novel aspects of the MSRR design?
Properties of graphite used in MSRR components	Gen-2	ACU provided the document, "Initial Audit Response to Technical Topic areas", in the electronic reading room that provided information on the proposed graphite to be used. However, the NRC staff notes that this response does not appear to describe topics such as whether properties for certain commercially available grades of graphite will bound the ACU qualification envelope (temperature, fluence, and oxidation) and be consistent with ASME Code Section III Division 5 requirements for qualifying or designing graphite components. Additionally, there is no information that describes how salt infiltration will be minimized, whether graphite components will operate past turnaround or crossover, or how property variations will be assessed. Please clarify whether ACU intends to meet ASME Code requirements (as endorsed by NRC RG 1.87, Revision 2) for graphite and as appropriate, describe how data for the chosen grade of graphite will meet ASME Code requirements and bound the qualification envelope for the ACU MSRR.
Potential corrosion and degradation mechanisms of metallic MSRR components	Gen-3	The ACU document, "Initial Audit Response to Technical Topic areas", provided discussion on potential corrosion and degradation mechanisms. The NRC staff noted that several comparisons are drawn to MSRE experience and experience from other programs. However, the NRC staff notes that the MSRR uses a different salt and a different structural alloy than the MSRE. The NRC staff would like to understand how ACU will demonstrate that MSRE and other data are applicable to the MSRR design including salt compositions (including generation of fission products), acceptable levels of impurities, appropriate quantities of beryllium (Be) to add for redox control, alloys used (including weld filler metals), and operating and accident conditions (temperatures/fluences).
Potential corrosion and degradation mechanisms of metallic MSRR components	Gen-4	The NRC staff notes that the discussion of potential corrosion and degradation mechanisms of metallic components in the ACU document, "Initial Audit Response to Technical Topic areas", does not appear to consider degradation mechanisms other than general corrosion. How does ACU plan to address other modes of degradation that should be taken into account for design or service life such as environmentally assisted cracking, irradiation effects, thermal fatigue/stress, etc.?

Use of effluent tanks in the fuel handling enclosure and how this may affect the proposed maximum hypothetical accident	Gen-5	Based on its audit review of the ACU document, "Initial Audit Response to Technical Topic areas", the NRC staff would like to understand: where precisely are the two barriers assumed as part of the maximum hypothetical accident (MHA) located, and what radionuclides are present outside one or both of these barriers? For example, are gas management, tritium, spent fuel, or sample lines outside the reactor system boundary? The NRC staff notes that the restrictive assumed barrier leak rates appear to play a large role in the calculated dose, so a relatively small radionuclide source outside these barriers could be capable of producing a comparable dose.
Use of effluent tanks in the fuel handling enclosure and how this may affect the proposed maximum hypothetical accident	Gen-6	Based on its audit review of the ACU document, "Initial Audit Response to Technical Topic areas", the NRC staff would like to understand: what mechanism(s) for release of radionuclides from any sources listed in the examples in Audit Question Gen-5 are credible (e.g., small leaks, handling mishaps, or release of accumulated gases)? The NRC staff notes that this helps inform the potential dose, because although the fuel handling system could be the most obvious potential release pathway (and the treatment is not fully clear in the PSAR), this may not be the only release pathway.

Thank you,

Zackary Stone, Project Manger
Advanced Reactor Licensing Branch 2
Division of Advanced Reactors and Non-Power
  Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-610

Hearing Identifier: NRR_DRMA
Email Number: 1939

Mail Envelope Properties (BY3PR09MB8676F306D96D8732E8BB80B0E1DA9)

Subject: Abilene Christian University - Audit Questions Regarding the ACU CP Technical Topics Audit
Sent Date: 2/6/2023 4:56:23 PM
Received Date: 2/6/2023 4:56:00 PM
From: Zackary Stone

Created By: Zackary.Stone@nrc.gov

Recipients:
"Richard Rivera" <richard.rivera@nrc.gov>
Tracking Status: None
"Edward Helvenston" <Edward.Helvenston@nrc.gov>
Tracking Status: None
"Michael Wentzel" <Michael.Wentzel@nrc.gov>
Tracking Status: None
"Michelle Hayes" <Michelle.Hayes@nrc.gov>
Tracking Status: None
"Rusty Towell" <rxt01a@acu.edu>
Tracking Status: None
"Jordan Robison" <jcr20b@acu.edu>
Tracking Status: None
"Tim Head" <tlh07b@acu.edu>
Tracking Status: None
"Lester Towell" <ldt20a@acu.edu>
Tracking Status: None

Post Office: BY3PR09MB8676.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	5547	2/6/2023 4:56:00 PM

Options
Priority: Normal
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date: